SNEI

Biological and Botanical Services

Ivanpah N1, N2, N3, & N4 Desert Tortoise (*Gopherus agassizii*) Survey Report

Provided to:

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August 11, 2009

Provided by: SNEI, 6295 McLeod Dr, STE 1, Las Vegas, NV 89120 877-FOR-SNEI
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ATTACH BR5-2B

Report Number: NV-0227-02-1609-001-rev2

Introduction: Southern Nevada Environmental, Inc. (SNEI) was contracted by CH2MHILL to conduct a survey to determine the presence and abundance of the Desert tortoise (*Gopherus agassizii*) on the four sites N1, N2, N3, & N4. These sites will be evaluated for their suitability as possible translocation sites for the Ivanpah Solar Project. U.S Fish and Wildlife Authorized Biologist Sean St. Marie conducted the survey with the assistance of SNEI biologists Aaron Works, Tim Demers and Alana Frost, as well as CH2MHILL Biologist Vic Leighton.

Project Description: In order to conduct the surveys, biologist performed 100% coverage of the survey area. This was accomplished using 10m, or 30 ft, belt transects on the entirely of each project site. Site N1 was transected using east/west transects each approximately .49 km long. A total of 110 transects were conducted on site N1 for 100% coverage. Sites N2-N4 were transected using north/south transects each approximately .99 km long. A total of 55 transects were conducted on sites N2-N4 for 100% coverage.

Figure 1. Typical wash indicative of N1-N4.

Site Description: The four sites are all located southwest of Primm Valley, NV. The dominant vegetation type is creosote/bursage. All four sites have large expanses of desert

pavement cut by numerous washes, the bottoms of which are very sandy. Observed plant species include: creosote bush (*Larrea tridentata*), white bursage (*Ambrosia dumosa*), barrel cactus (*Ferocactus cylindraceus*), brittle bush (*Encelia* sp.), Mormon tea (*Ephedra* sp.), California buckwheat (*Eriogonum fasciculatum*), hedgehog cactus (*Echinocereus engelmannii*), beavertail cactus (*Opuntia basilaris*), desert trumpet (*Eriogonum inflatum*), black brush (*Coleogyne ramosissima*), cheat grass (*Bromus tectorum*), red brome (*Bromus rubens*), cheese bush (*Hymenoclea salsola*), Mojave yucca (*Yucca schidigera*), Joshua tree (*Yucca brevifolia*), Cottontop cactus (*Echinocactus polycephalus*), Fluff grass (*Erioneuron pulchellum*), Nipple cactus (*Mammillaria tetrancistra*), Pencil cholla (*Opuntia ramosissima),* Silver cholla (*Opuntia echinocarpa*), Buckhorn cholla, (*opuntia acanthrocarpa)*, and Cats claw (*Acacia greggii).* Fauna observed: Desert tortoise (*Gopherous agassizii*), side-blotched lizard (*Uta stansburiana*), Great Basin collared lizard (*Crotaphytus bicinctores*), Black-tail jackrabbit (*Lepus californicus*), Desert cottontail rabbit (*Sylvilagus audubonii),* Desert kangaroo rat (*Dipodomys deserti),* Desert spiny lizard (*Sceloporus magister), Whiptail*, (*Aspidcelus tigris),* Desert horned lizard, (*Phrynosoma platyrhinos),* Night hawk, (*Chordeiles minor),* Crotalis scutulatus, Zebra tails, (*Calisaurus draconoids),* and Leopord lizards (*Gambelia wislizenii).*

Figure 2. Various wildlife seen on the project.

Methodology: The four sites: N1, N2, N3, & N4 were surveyed on foot using 100 percent visual coverage transect techniques in both an east/west and north/south direction

focusing on visual signs of Desert Tortoise (i.e. burrows, shells, bones, scutes, scat, tracks, etc.). The objective of the pre-project survey is to determine the presence or absence and abundance of desert tortoises within the proposed translocation sites (as per the *Pre-Project Survey Protocol for the 2009 Field Season* (USFWS 2009)). All data was recorded with a Global Positioning System Garmin GPSmart 60 CSx.

Data: Table 1 shows a summary of the types of sign located on each site. Table two lists the burrow classes and the number of each that were found on each site. For detail pertaining to the location of individual waypoints, see appendix B.

Table 1. Summary of sign located on N1, N2, N3, N4.

Site	Burrows	Tortoises	Carcasses	Predator Sign	Other Sign
N1	77	1	4	4-5	0
N2	50	3	2	5-6	0
N3	34	0	4	8-9	0
N4	31	0	1	2-3	1

Table 2. Burrows by Site and Class.

Site	Class 1	Class 2	Class 3	Class 4	Class 5
N1	0	2	0	12	63
N2	3	6	0	5	36
N3	1	1	2	6	24
N4	0	1	0	7	23

Class 1: Currently active w/ tortoise or recent tortoise sign.
Class 2: Good condition, definitely tortoise, no recent sign.
Class 3: Deteriorated condition, definitely tortoise.
Class 4: Deteriorated condition, possibly tortoise
Class 5: Good Condition, possibly tortoise.

Statistical analysis was conducted utilizing the equation in the Pre-Project Field Protocol for Potential Desert Tortoise Habitats:

$$\left(\begin{array}{c}\text{Estimated number of tortoises}\\ \text{within an action area}\end{array}\right) = \frac{\left(\begin{array}{c}\text{Number of Tortoises}\\ \text{observed above ground}\end{array}\right)}{\left(\begin{array}{c}\text{Probability that a}\\ \text{tortoise is above}\\ \text{ground (Pa)}\end{array}\right)\left(\begin{array}{c}\text{Probability of}\\ \text{detecting a tortoise}\\ \text{if above ground (Pd)}\end{array}\right)}\left(\frac{\text{Action area(A)}}{\text{Area surveyed(a)}}\right)$$

Because 100% survey coverage was conducted, the action area is equal to the area surveyed. Therefore the equation can be rewritten as follows:

$$\begin{pmatrix}\text{Estimated number of tortoises}\\ \text{within an action area}\end{pmatrix} = \frac{\begin{pmatrix}\text{Number of Tortoises}\\ \text{observed above ground}\end{pmatrix}}{\begin{pmatrix}\text{Probability that a}\\ \text{tortoise is above}\\ \text{ground (Pa)}\end{pmatrix}\begin{pmatrix}\text{Probability of}\\ \text{detecting a tortoise}\\ \text{if above ground (Pd)}\end{pmatrix}}$$

Pd = 0.63, value is a given, also contained in the April 2009 USFWS document referenced above. Their description of how the value was determined is: "For the past five years, surveyors in the USFWS range-wide monitoring program have undergone training on established transects with artificial tortoises. Trained surveyors detected and average of ~63% of model tortoises that were within 5-m of either side of the transect center-line."

Pa = 0.80, value determined from the probability table contained in the same document. To determine this probability, the previous winter's rainfall was calculated from the Western Regional Climate Center site: http://www.wrcc.dri.edu/summary/Climsmsca.html. Since the action area was not covered on the site, values were estimated based on the surrounding area rainfall (Table 3). There were two possible alternatives for probability values according to rainfall amount, 0.64 for total winter rainfall of less than 1.5 inches and 0.80 for winter rainfall greater than 1.5 inches. Based on the data in table 3, the value of Pa was determined to be 0.8.

Table 3. Precipitation in and surrounding the action area.

Summary of Precipitation Data for Two Nearby Stations and Estimates for Ivanpah SEGS

Average:	Jan	Feb	Mar	Oct	Nov	Dec	Total
Long-Term period (Las Vegas, 1937 through 2007; Mountain Pass, 1955 through 2005)							
Las Vegas; 2,165 feet elevation	0.5	0.58	0.46	0.26	0.37	0.39	2.56
Mountain Pass; 4,790 feet elevation	0.94	0.91	0.89	0.52	0.69	0.64	4.59
Ivanpah SEGS SE (2,760 feet elevation)	**0.59**	**0.65**	**0.55**	**0.32**	**0.44**	**0.44**	2.99
Ivanpah SEGS NW (3,410 feet elevation)	**0.71**	**0.74**	**0.67**	**0.39**	**0.53**	**0.51**	3.55
Normalized period 1971 through 2000							
Las Vegas; 2,165 feet elevation	0.6	0.68	0.49	0.24	0.33	0.43	2.77
Mountain Pass; 4,790 feet elevation	1.07	1.19	1.03	0.43	0.74	0.83	5.29
Ivanpah SEGS SE (2,760 feet elevation)	**0.7**	**0.79**	**0.6**	**0.28**	**0.42**	**0.51**	3.3
Ivanpah SEGS NW (3,410 feet elevation)	**0.83**	**0.93**	**0.75**	**0.33**	**0.53**	**0.62**	**6.86**

Notes:
Grey-shaded values are estimates based on elevational lapse rates.
All values are in inches.
NW = northwest
SE = southeast
Source: Desert Research Institute, n.d.

Using these values, the value of N (estimated number of tortoises within the action area), can be determined for each site N1 through N4 (Table 4).

Table 4. Determined values of N and their associated confidence.

		table 3** determinations		
Site	Calculated * Value of N	Value of N	Lower 95% confidence Interval	Upper 95% confidence interval
N1	2	1.8	0.34	9.98
N2	6	5.5	1.36	21.93
N3	0	0	not calculable	not calculable
N4	0	0	not calculable	not calculable

** The calculated value of N is calculated using the given equation. The values from the table 3** determinations are automatically calculated based upon input value. The variance between values calculated by hand and by the table may be due to table 3** automatically rounding the transect length to the nearest km, or due to the additional detail required in the table.*

***Table 3. USFWS Desert Tortoise Pre-Project Survey Guidance from the Pre-Project Field Protocol for Potential Desert Tortoise Habitats.*

Results:

All four sites had habitat that was conducive with and showed at least some sign of the Desert tortoise (*Gopherus agassizii*). In all four sites coyote scat was observed. While, some of the scat was found in and around pack rat middens and could have been dragged into the area, numerous other pieces of scat were noted in the open and under vegetation.

N1 was the first site surveyed and had 77 burrows, 4 carcasses, and 1 large male tortoise. However, no class 1 burrows were located within the site. N1 had roughly 3-4 pieces of coyote scat as well as at least one set of tracks. We also found a tortoise carcass that appeared to have been bitten by a large predator and another that had its carapace "popped" off the plastron.

N2 had 50 burrows, 2 carcasses, and 3 tortoises all inside of burrows. N2 had roughly 3-4 pieces of coyote scat and two sets of tracks. We did not note any other predator sign in the site.

N3 had 34 burrows and 4 carcasses. N3 had the most predator sign, with 5-6 pieces of coyote scat and about 3 separate tracks. We also found two tortoise carcasses with bite marks on them and N3C02 was found next to a piece of coyote scat.

N4 had 31 burrows, 1 carcass, and 1 drinking circle. N4 had the least predator sign with only 2-3 pieces of coyote scat observed and 0 tracks noted.

We did not see any feral dogs, ravens, nests, or potential perches in any of the four sites.

Figure 4. The four tortoises located during the survey. Top left: Tortoise found in the open on site N1. Top right through bottom right: Tortoises located in burrows on site N2.

Conclusion:

The desert tortoise recovery plan (1994) estimates the density of the desert tortoise in the Ivanpah Valley to be between 2-97 adults/km^2. More recently, the population in the Northeastern Recovery Unit for the desert tortoise, where Ivanpah Valley is located, was determined to contain approximately 20 adult tortoises/23.3 km^2, or 0.86 adults/km^2 (USFWS 2009). Some of the decline of tortoises in the valley may be attributed to drought (Boarman 2002), although recent research on the subject is less available.

Surveys conducted in 2007 of the actual project area produced similar statistical results as the translocation site surveys. The surveys of the project sites compared to their possible corresponding translocation sites can be seen in Table 6.

Table 5. Acreage number of tortoises and determined values of N for Ivanpah 1 through Ivanpah 3 Solar Sites

Site	Acreage	Tortoises located	Calculated value of N
Ivanpah 1	852.7	10	20
Ivanpah 2	849.2	3	6
Ivanpah 3	1658.9	5	10

Table 6. Comparison of 2007 survey of solar sites and their corresponding translocation sites.

Solar Site	Value of N	Translocation Site	Value of N
Ivanpah 1	20	N4	0
Ivanpah 2	6	N3	0
Ivanpah 3	10	N2 N1	5.5 1.8

The home range of the desert tortoise can vary greatly, from as little as 7 acres to as many as 130 acres (Barrett 1990). In Ivanpah specifically, the home range of the tortoise has been determined to range from 5 acres to 220 acres (Turner et al. 1981, Medica et al. 1982). There is a possibility that translocation to the designated areas may provide only a temporary solution as tortoises may tend to move back toward the action area, if that movement is not deterred.

The large number of burrows in the proposed translocation sites is consistent with the determined values of tortoises and carcasses in the areas. A study conducted by Kenneth Nagy and Philip Medica (1986) found that 11 tortoises in an area increased the number of burrows in the area from 38 to 68 in 15 months. Similarly, it has been determined that a single tortoise has the potential to occupy an average of 7.6 dens in a one and half year period (Barrett 1990). These indicators, as well as field surveys, suggest that the density of the desert tortoise in the area is low. Likely, translocation into sites N1-N4 would not overburden the existing population.

Reference:

Barrett, S. L. 1990. Home range and habitat of the desert tortoise (Xerobates agassizii) in the Picacho Mountains of Arizona. Herpetologica 46:202-206.

The Desert Tortoise Council. July 1994 (revised 1999). Guidelines for Handling Desert Tortoises during Construction Projects. United States Fish and Wildlife Service.

Medica, P. A., C. L. Lyons, and F. B. Turner. 1982. A comparison of 1981 populations of desert tortoise (*Gopherus agassazi*) in grazed and ungrazed areas in Ivanpah Valley, California. Pp. 99-124. *In* K. Hashagen and M. Trotter (Eds.), Proc. 1982 Symp. Desert Tortoise Council, Long Beach, California.

Nagy, K. A. and P. A. Medica. 1986. Physiological ecology of desert tortoises in southern Nevada. Herpetologica 42:73-92.

Turner, F. B., P. A. Medica, and C. L. Lyons. 1981 A comparison of populations of desert tortoise, *Gopherus agassazi*, in grazed and ungrazed areas in Ivanpah Valley, California. Pp. 139-162. *In* K. A. Hashagen (Ed.), Proc. 1981 Symp. Desert Tortoise Council, Long Beach, California.

United States Fish and Wildlife Service. 1992. Field Survey Protocol for Any Federal Action that may occur Within the Range of the Desert Tortoise.

USFWS. 1994. Desert tortoise (Mojave population) Recovery Plan. U.S. Fish and Wildlife Service, Portland, Oregon. 73 pages plus appendices.

United States Fish and Wildlife Service. April 2009. Pre-Project Survey Protocol for the 2009 Field Season.

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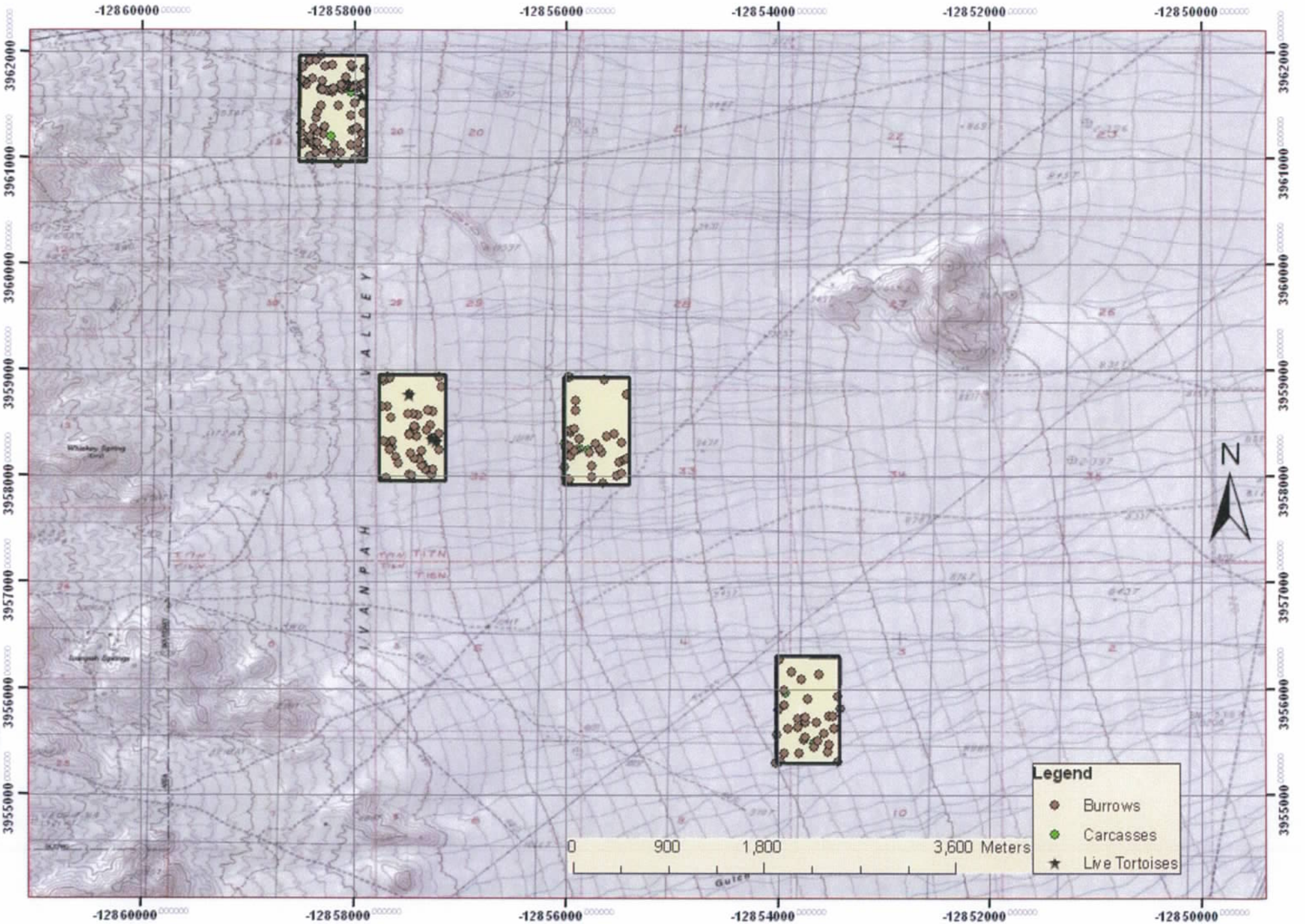
Appendix A: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IVANPAH VALLEY
N
Legend
Burrows
Carcasses
Live Tortoises
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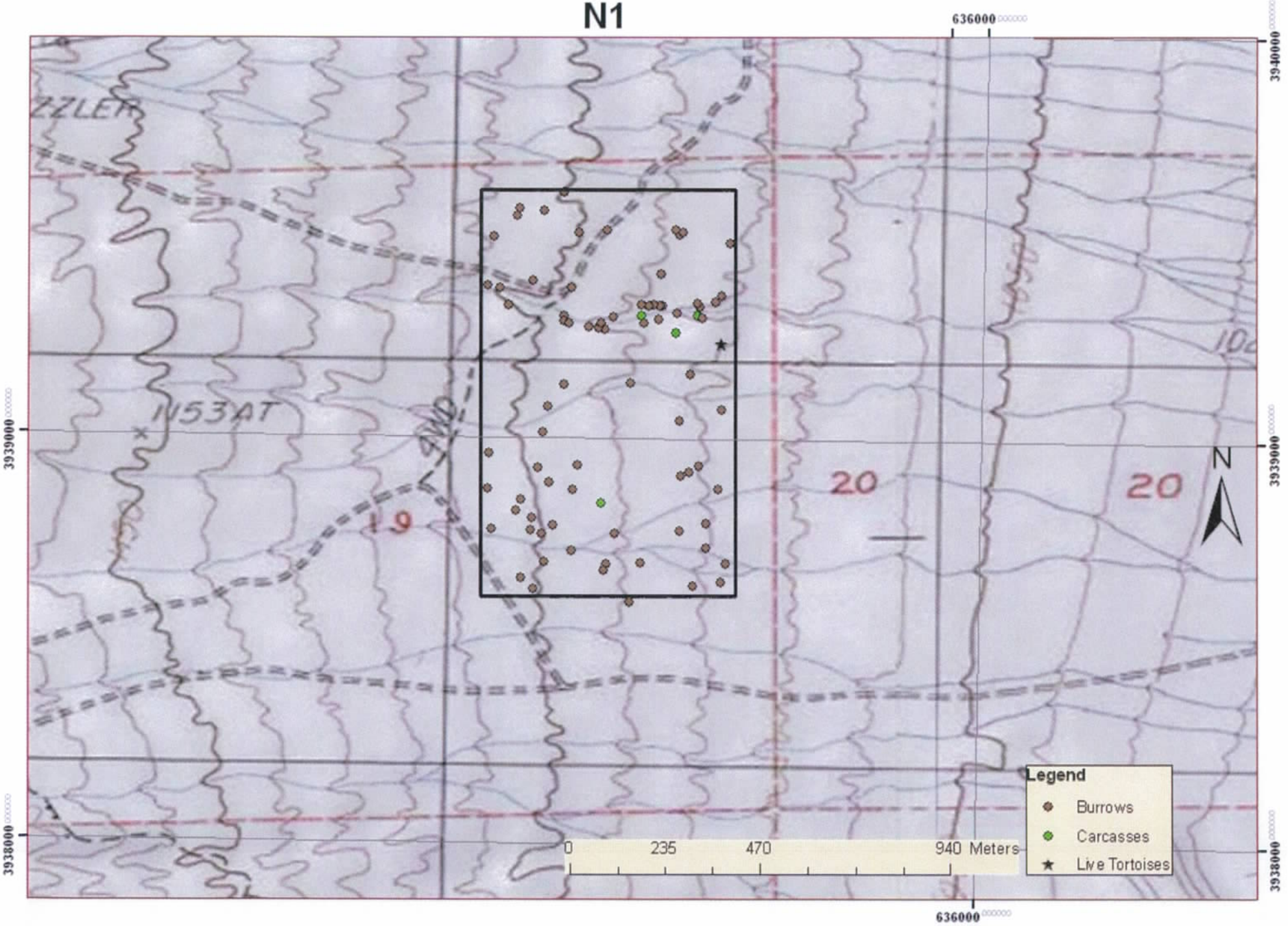
3,600 Meters

N1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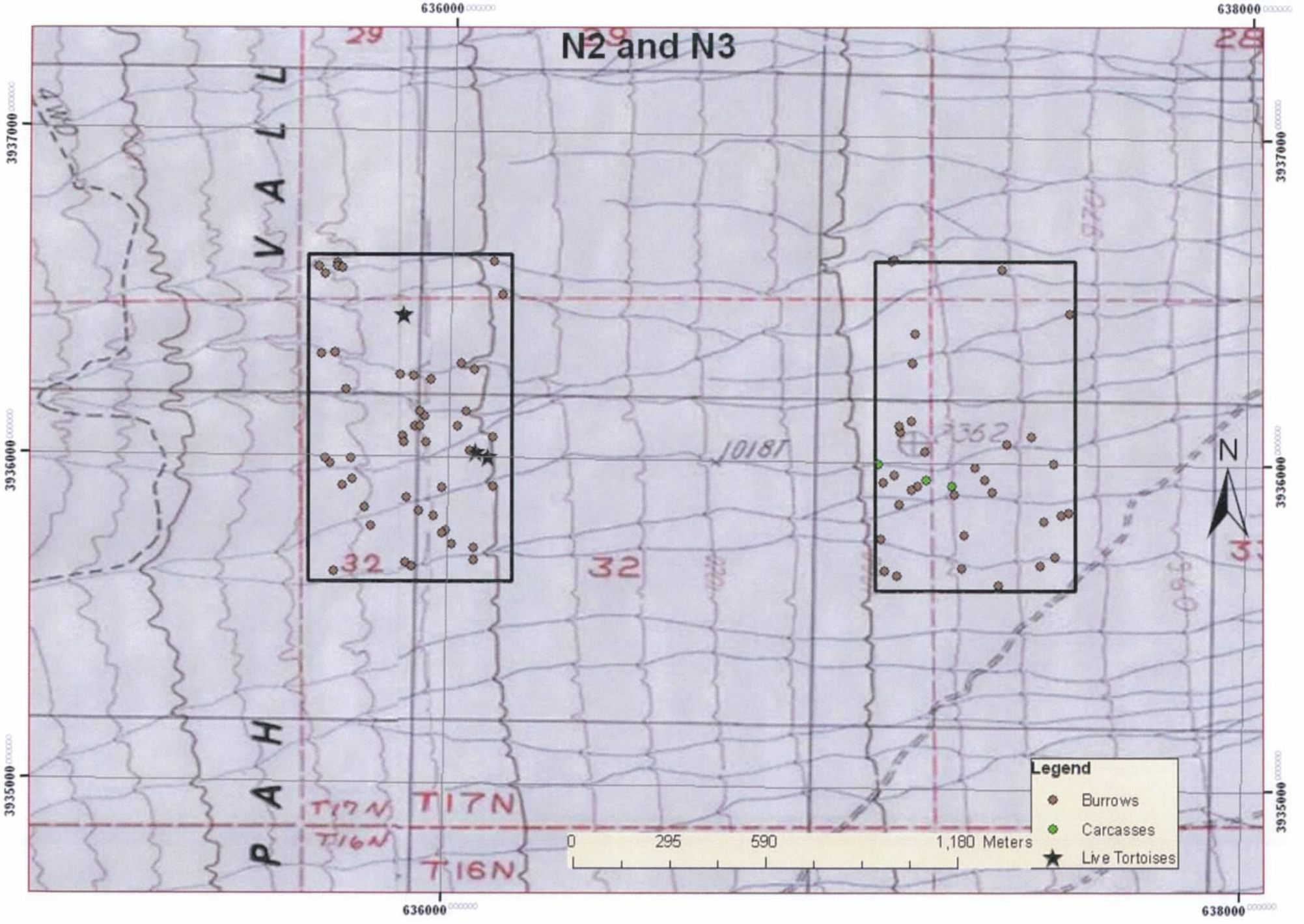
Burrows
Carcasses
Live Tortoises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28
32
32
33
VALL
PAH
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Carcasses
Live Tortoises
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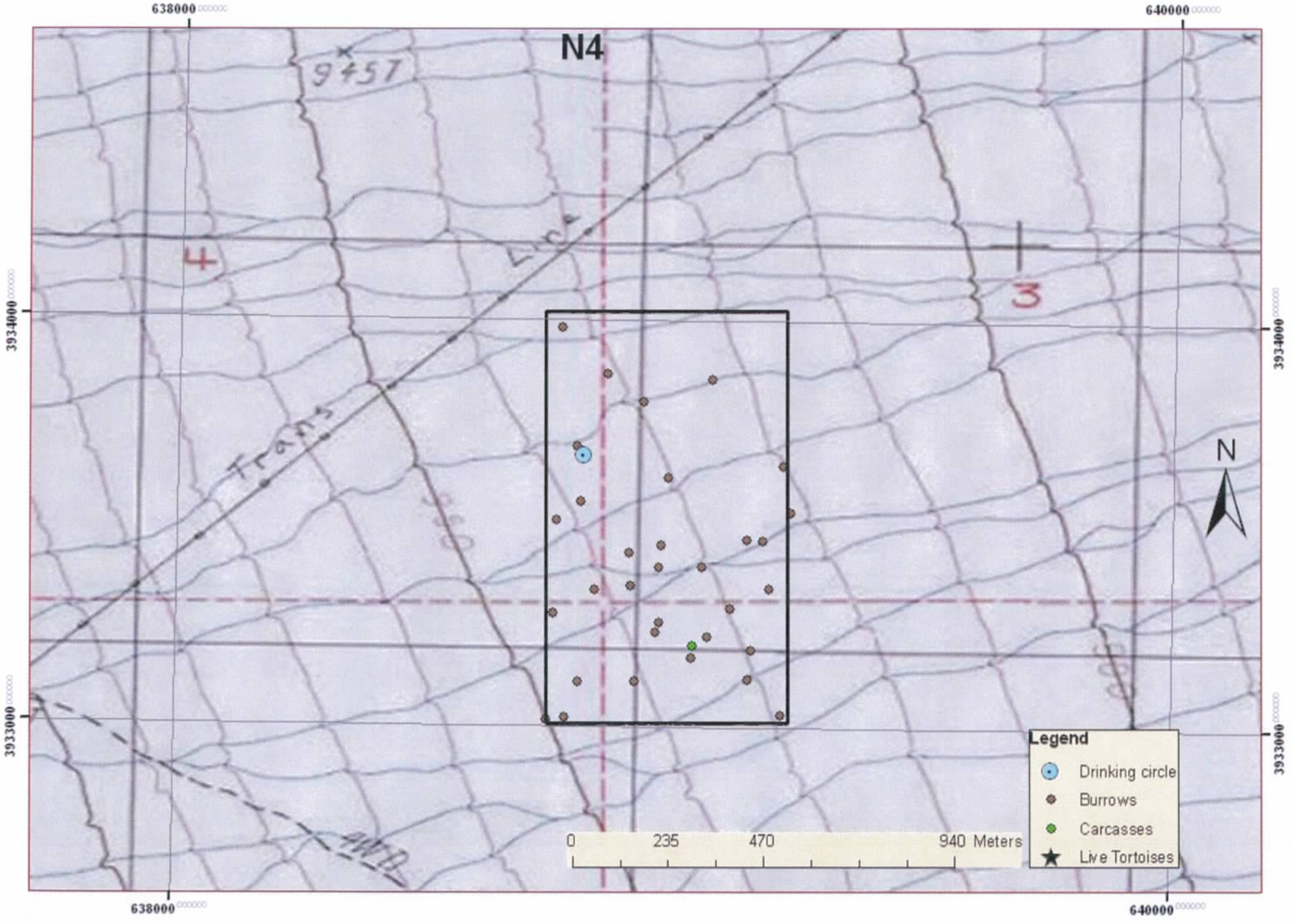

N4
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4
3
Trans
Line
N
Legend
Drinking circle
Burrows
Carcasses
Live Tortoises
0
235
470
940 Meters

Appendix B: Waypoints by site, location of all tortoise sign.

N1

Waypoint	Easting	Northing	Elevation
N1B01	635299	3938596	3539
N1B02	635104	3938625	3598
N1B03	635081	3938653	3600
N1B03	636131	3936499	3400
N1B04	635426	3938637	3546
N1B05	635481	3938646	3529
N1B06	635490	3938693	3528
N1B07	635318	3938691	3561
N1B08	635249	3938689	3573
N1B09	635244	3938674	3574
N1B10	635125	3938692	3599
N1B11	635181	3938721	3583
N1B12	635451	3938730	3541
N1B13	635397	3938771	3546
N1B14	635266	3938763	3564
N1B15	635121	3938762	3592
N1B16	635097	3938769	3602
N1B17	635020	3938773	3608
N1B18	635068	3938819	3605
N1B19	635101	3938799	3594
N1B20	635141	3938784	3594
N1B21	635451	3938791	3542
N1B22	635077	3938845	3608
N1B23	635474	3938874	3533
N1B24	635181	3938871	3585
N1B25	635009	3938871	3612
N1B26	635133	3938888	3606
N1B27	635396	3938907	3530
N1B28	635414	3938917	3530
N1B29	635433	3938931	3529
N1B30	635190	3938933	3575
N1B31	635110	3938925	3589
N1B32	635012	3938960	3607
N1B33	635119	3939013	3579
N1B34	635391	3939044	3538
N1B35	635478	3939071	3529
N1B36	635129	3939076	3593

Waypoint	Easting	Northing	Elevation
N1B37	635159	3939129	3577
N1B38	635293	3939135	3561
N1B39	635412	3939158	3551
N1B40	635317	3939284	3567
N1B41	635239	3939267	3581
N1B42	635226	3939271	3575
N1B43	635206	3939273	3580
N1B44	635157	3939300	3579
N1B45	635157	3939287	3585
N1B46	635167	3939280	3577
N1B47	635230	3939281	3569
N1B48	635256	3939298	3567
N1B49	635346	3939294	3561
N1B50	635436	3939298	3542
N1B51	635431	3939324	3535
N1B52	635424	3939333	3547
N1B53	635382	3939308	3539
N1B54	635354	3939328	3548
N1B55	635349	3939326	3547
N1B56	635336	3939329	3556
N1B57	635326	3939326	3553
N1B58	635311	3939329	3560
N1B59	635045	3939324	3597
N1B60	635461	3939337	3541
N1B61	635475	3939351	3538
N1B62	635170	3939369	3597
N1B63	635028	3939366	3615
N1B64	635002	3939372	3612
N1B65	635094	3939386	3621
N1B66	635349	3939404	3573
N1B67	635012	3939493	3623
N1B68	635386	3939501	3556
N1B69	635393	3939507	3560
N1B70	635489	3939482	3542
N1B71	635378	3939514	3555
N1B72	635240	3939513	3584
N1B73	635183	3939505	3594
N1B74	635060	3939546	3612
N1B75	635064	3939563	3613
N1B76	635113	3939559	3612

Waypoint	Easting	Northing	Elevation
N1B77	635151	3939603	3593
N1C01	635238	3938840	3581
N1C02	635381	3939259	3559
N1C03	635313	3939302	3563
N1C04	635425	3939303	3544
N1NEC	635505	3939604	3579
N1NWC	635005	3939604	3586
N1T01	635475	3939236	3544

N2

Waypoint	Easting	Northing	Elevation
N2B01	636115	3935909	3422
N2B02	636112	3936059	3424
N2B04	636107	3936601	3415
N2B06	636069	3935684	3436
N2B07	636069	3935722	3437
N2B08	636056	3936020	3444
N2B10	636044	3936139	3431
N2B11	636063	3936267	3418
N2B12	636028	3936286	3440
N2B13	636023	3936092	3445
N2B14	636012	3935729	3458
N2B15	635998	3935772	3465
N2B16	635987	3935766	3466
N2B17	635987	3935905	3463
N2B18	635954	3936237	3448
N2B19	635939	3936124	3452
N2B20	635945	3936043	3464
N2B21	635967	3935818	3476
N2B22	635912	3935663	3456
N2B23	635929	3935833	3455
N2B23	637197	3936031	3243
N2B24	635915	3936091	3463
N2B25	635928	3936091	3459
N2B26	635928	3936136	3446
N2B27	635911	3936247	3447
N2B29	635877	3936249	3463
N2B30	635885	3936062	3481
N2B31	635888	3936044	3476
N2B32	635898	3935871	3493

Waypoint	Easting	Northing	Elevation
N2B33	635897	3935672	3484
N2B34	635912	3935661	3488
N2B35	635791	3935841	3502
N2B36	635810	3935784	3503
N2B37	635760	3935927	3514
N2B38	635755	3935991	3520
N2B39	635714	3936592	3483
N2B40	635712	3936581	3489
N2B41	635726	3936575	3478
N2B42	635710	3936314	3502
N2B43/C02	635740	3936203	3498
N2B44	635737	3935907	3519
N2B45	635718	3935643	3521
N2B46	635705	3935977	3519
N2B47	635692	3935990	3547
N2B48	635676	3936312	3516
N2B49	635683	3936558	3503
N2B50	635668	3936579	3502
N2C01	635720	3936519	3509
N2NEC	636156	3936621	3023
N2NWC	635656	3936621	2928
N2SEC	636156	3935621	3131
N2SWC	635656	3935621	3073
N2T01/B05	636102	3935999	3431
N2T02/B09	636070	3936015	3438
N2T03-B28	635881	3936434	3485

N3

Waypoint	Easting	Northing	Elevation
N3B01	637386	3935623	3218
N3B02	637100	3935666	3265
N3B03	637130	3935649	3257
N3B04	637490	3935687	3195
N3B05	637293	3935676	3228
N3B06	637527	3935713	3192
N3B08	637090	3935761	3264
N3B09	637298	3935776	3230
N3B10	637498	3935820	3145
N3B11	637542	3935841	3180
N3B12	637558	3935850	3190

Waypoint	Easting	Northing	Elevation
N3B13	637134	3935869	3252
N3B14	637271	3935902	3225
N3B15	637368	3935909	3218
N3B16	637179	3935925	3250
N3B17	637164	3935913	3252
N3B18	637093	3935935	3262
N3B19	637121	3935959	3252
N3B20	637347	3935949	3220
N3B21	637322	3935984	3224
N3B22	637520	3935999	3189
N3B24	637402	3936056	3174
N3B25	637464	3936080	3204
N3B26	637133	3936092	3259
N3B27	637131	3936112	3254
N3B28	637161	3936124	3243
N3B29	637161	3936304	3224
N3B30	637166	3936392	3262
N3B31	637554	3936460	3180
N3B32	637380	3936593	3206
N3B33	637104	3936614	3236
N3B34	637111	3936618	3236
N3C01	637264	3935927	3239
N3C02	637199	3935944	3236
N3C03	637079	3935991	3260
N3NEC	637579	3936618	2452
N3NWC	637079	3936618	2450
N3SEC	637579	3935619	3187
N3SWC	637079	3935618	3156

N4

Waypoint	Easting	Northing	Elevation
N4B01	638762	3933506	3079
N4B02	638759	3933276	3091
N4B03	638748	3933014	3110
N4B04	638784	3933021	3112
N4B05	638767	3933978	3053
N4B06	638801	3933688	3060
N4B07	638812	3933551	3071
N4B08	638811	3933107	3099
N4B09	638842	3933335	3072

Waypoint	Easting	Northing	Elevation
N4B10	638860	3933866	3038
N4B11	639219	3933030	3043
N4B12	639150	3933116	3050
N4B13	638925	3933108	3083
N4B14	639037	3933169	3065
N4B15	639157	3933188	3045
N4B16	639069	3933219	3063
N4B17	638910	3933425	3081
N4B18	638913	3933346	3057
N4B19	638965	3933230	3074
N4B19	638971	3933255	3075
N4B20	639114	3933289	3050
N4B21	639191	3933340	3030
N4B22	638970	3933390	3055
N4B23	639056	3933393	3044
N4B24	639146	3933461	3045
N4B25	639179	3933457	3027
N4B26	638974	3933446	3057
N4B27	639234	3933529	3030
N4B28	638985	3933611	3048
N4B29	639218	3933641	3009
N4B30	638934	3933797	3031
N4B31	639071	3933853	3012
N4C01	639038	3933198	3062
N4DC01	638816	3933666	3059
N4NEC	639236	3934003	2744
N4NWC	638735	3934003	2763
N4SEC	639235	3933003	2800
N4SWC	638735	3933003	2859