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# LITHIUM IN SEDIMENTS AND ROCKS IN NEVADA

by ROBERT G. BOHANNON (cat) AND ALLEN L. MEIER (cat), 1942 —

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By

Robert G. Bohannon and Allen L. Meier

U.S. Geological Survey, Denver, CO 80225

## INTRODUCTION

Reconnaissance geochemical sampling has been conducted by the Lithium Resource Program of the United States Geological Survey for much of the Western U.S. Sediment, rock, and brine samples have been collected in many states, but this report describes just those solid samples collected in Nevada. Further reports by other members of the Lithium Program will describe water samples from Nevada and samples from other states.

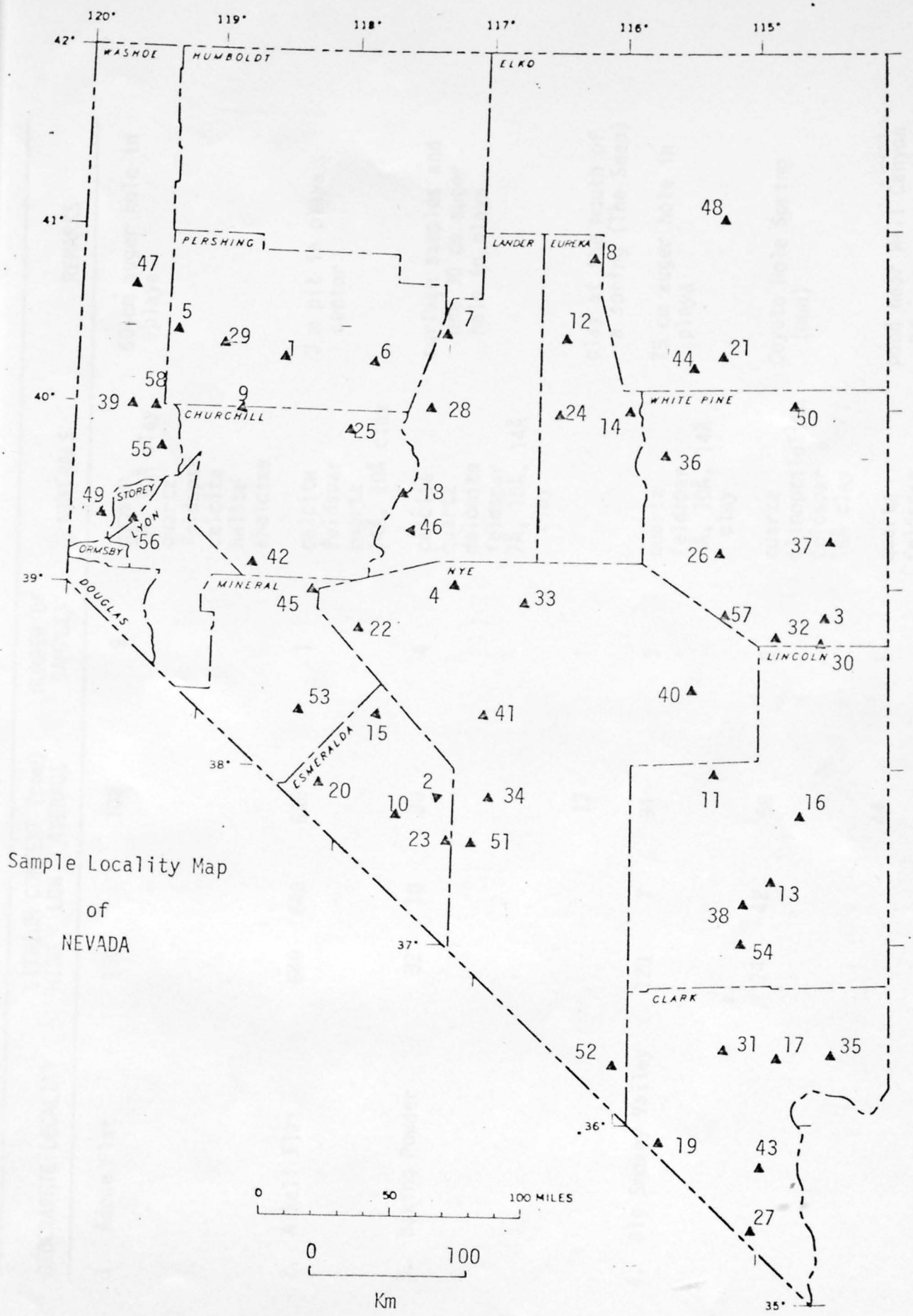
The purpose of the sampling program was to determine if areas of anonalous lithium could be recognized by reconnaissance surface sampling. The results, however, have been indeterminate because most large lithium deposits occur at depth and appear to be formed when deeply buried. Many may not manifest themselves at the surface at all. Nonetheless, the data derived during the surface sampling program will be presented in this report.

Sediment and rock samples were collected in Nevada and analyzed for lithium. Samples were collected from playa surfaces, shallow holes, outcrops, roadcuts, coreholes, and springs. The samples were bagged, dried, and then pulverized. The crushed samples were prepared by the hydrofluoric acid dissolution method described by Meier (in prep.) and lithium was determined by means of atomic absorption. Mineralogy of the samples was determined by X-ray diffraction.

In the following report the sample localities appear in alphabetical order and are located on figure 1. The results obtained at each locality are summarized because the total data are too voluminous to present.

Figure 1.--Index map of Nevada with locations of samples taken. Localities are in alphabetical order in the text and are shown below:

1. Adobe Flat
2. Alkali Flat
3. Baking Powder Flat
4. Big Smokey Valley
5. Black Rock Desert
6. Buena Vista Valley
7. Buffalo Valley
8. Carlin Mine
9. Carson Sink
10. Clayton Valley
11. Coal Valley
12. Crescent Valley
13. Delmar Lake
14. Diamond Valley
15. Dry Lake (38°20', 117°46')
16. Dry Lake (37°47', 114°47')
17. Dry Lake (36°27', 114°53')
18. Edward Creek Valley
19. Eldorado Valley
20. Fish Lake Valley
21. Franklin Lake
22. Gabbs
23. Goldfield
24. Grass Valley
25. Humbolt Marsh
26. Jakes Valley
27. Jean Lake
28. Jersey Valley
29. Kumiva Playa
30. Lake Valley
31. Las Vegas Valley
32. Lund
33. Monitor Valley
34. Mud Lake
35. Muddy Mountains
36. Newark Valley
37. North Spring Valley
38. Pahrangat Valley
39. Pyramid Lake
40. Railroad Valley
41. Ralston Valley
42. Rawhide Flats
43. Roach Lake
44. Ruby Lake
45. Sheelite
46. Smith Creek Valley
47. Smoke Creek Desert
48. Starr Valley
49. Steamboat Springs
50. Steptoe Valley
51. Stonewall Flat
52. Stewart Valley
53. Teels Marsh
54. Tickaboo Valley
55. Truckee River
56. Virginia City
57. Windous Butte
58. Winnemucca Lake




Sample Locality Map

of

NEVADA

| GEOGRAPHIC LOCALITY | LITHIUM CONTENT (ppm) HIGH | LOW | AVERAGE | NUMBER OF SAMPLES | MINERALS | REMARKS |
|---|---|---|---|---|---|---|
| 1. Adobe Flat | 150 | | 102 | 3 | gypsum<br>7Å, 10Å clay<br>quartz<br>feldspar<br>calcite<br>halite<br>analcime | 60 cm auger hole in playa |
| 2. Alkali Flat | 640 | 640 | 640 | 1 | calcite<br>feldspar<br>quartz<br>14Å, 10Å clay | 3 m pit in playa center |
| 3. Baking Powder | 32 | 10 | 20 | 4 | calcite<br>quartz<br>dolomite<br>feldspar<br>7Å, 10Å, 14Å clay | surface samples and one 30 cm auger hole in playa |
| | | | 17 | 1 | | clay at the mouth of a spring (The Seep) |
| 4. Big Smokey Valley | 120 | 7 | 94 | 3 | quartz<br>feldspar<br>7Å, 10Å, 14Å clay | 75 cm auger hole in playa |
| | 74 | 42 | 58 | 2 | quartz<br>clinoptilolite<br>feldspar<br>14Å clay | Coyote Hole Spring (mud) |
| | | | 44 | 1 | quartz<br>feldspar<br>10Å clay | pond near Wall Canyon Rd. |

| GEOGRAPHIC LOCALITY | LITHIUM CONTENT (ppm) HIGH | LOW | AVERAGE | NUMBER OF SAMPLES | MINERALS | REMARKS |
|---|---|---|---|---|---|---|
| 5. Black Rock Desert | 120 | 7 | 94 | 3 | quartz<br>feldspar<br>7Å, 10Å, 14Å clay | 75 cm auger hole in playa |
| 6. Buena Vista Valley | 140 | 61 | 88 | 6 | quartz<br>calcite<br>feldspar<br>analcime<br>dolomite<br>halite<br>7Å, 10Å, 14Å clay | 160 cm auger hole in playa |
| 7. Buffalo Valley | 170 | 34 | 91 | 3 | halite<br>feldspar<br>quartz<br>calcite<br>7Å, 10Å clay | 50 cm auger hole in playa |
| 8. Carlin Mine | | | 13 | 1 | calcite | mine dump sample |

| GEOGRAPHIC LOCALITY | LITHIUM CONTENT (ppm) HIGH | LOW | AVERAGE | NUMBER OF SAMPLES | MINERALS | REMARKS |
|---|---|---|---|---|---|---|
| 9. Carson Sink (Lahontan Valley & Salt Wells Basin) | 170 | 30 | 80 | 13 | halite<br>feldspar<br>calcite<br>~~feldspar~~<br>quartz<br>dolomite<br>silica<br>7Å, 10Å clay | 5 holes near Nutgrass Dike, Indian Lakes, Fourmile Flat, Salt Wells, and Carson Lake |
| | 22 | 82 | 52 | 2 | quartz<br>calcite<br>feldspar<br>halite<br>clay | outcrops at Eagle's House |
| | | | 110 | 1 | crystobalite<br>halite<br>feldspar | Brady Hot Spring (mud) |
| 10. Clayton Valley | 300 | 16 | 97 | 7 | halite<br>bassanite<br>quartz<br>feldspar<br>7Å, 10Å clay | 2 auger holes in playa |
| | 460 | 59 | 259 | 4 | tridymite<br>crystobalite<br>quartz<br>feldspar<br>calcite<br>halite<br>~~halite~~<br>7Å, 10Å clay | samples of volcanic ash |

| GEOGRAPHIC LOCALITY | LITHIUM CONTENT (ppm) HIGH | LOW | AVERAGE | NUMBER OF SAMPLES | MINERALS | REMARKS |
|---|---|---|---|---|---|---|
| 10. Clayton Valley (continued) | | | 24 | 1 | calcite<br>quartz<br>feldspar<br>halite<br>7Å, 10Å clay | outcrop of Paymaster Canyon |
| 11. Coal Valley | 32 | 30 | 31 | 5 | dolomite<br>calcite<br>quartz<br>feldspar<br>7Å clay | 110 cm auger hole in playa |
| 12. Crescent Valley | | | 40 | 1 | calcite | Hot Spring Pt spring clay |
| 13. Delmar Lake | 69 | 58 | 62 | 4 | quartz<br>feldspar<br>calcite | Two 15 cm auger holes in playa |
| 14. Diamond Valley | 69 | 46 | 56 | 4 | undetermined | 180 cm auger hole in playa |
| 15. Dry Lake (38°20', 117°46') | 63 | 64 | 63 | 2 | quartz<br>calcite<br>feldspar<br>10Å clay | 20 cm auger hole in playa |
| 16. Dry Lake (37°47', 114°47') | 100 | 87 | 93 | 6 | quartz<br>calcite<br>feldspar<br>7Å, 10Å, 12Å clay | 80 cm auger hole in playa |

| GEOGRAPHIC LOCALITY | LITHIUM CONTENT (ppm) HIGH | LOW | AVERAGE | NUMBER OF SAMPLES | MINERALS | REMARKS |
|---|---|---|---|---|---|---|
| 17. Dry Lake (36°27', 114°53') | 550 | 9 | 175 | 129 | gypsum<br>calcite<br>quartz<br>glauberite<br>clay<br>feldspar<br>dolomite | U.S.G.S. core samples |
| 18. Edward Creek Valley | 85 | 47 | 58 | 5 | quartz<br>plagioclase<br>calcite<br>halite<br>7Å, 10Å clay | 170 cm auger hole in playa |
| 19. Eldorado Valley | 120 | 84 | 101 | 4 | calcite<br>feldspar<br>quartz<br>7Å, 10Å, 14Å clay | 85 cm auger hole in playa |
| 20. Fish Lake Valley | 460 | 63 | 184 | 4 | undetermined | playa surface samples |
| 21. Franklin Lake | 80 | 55 | 64 | 4 | quartz<br>dolomite<br>feldspar<br>calcite<br>7Å, 10Å clay | 175 cm auger hole in playa |

| GEOGRAPHIC LOCALITY | LITHIUM CONTENT (ppm) HIGH | LOW | AVERAGE | NUMBER OF SAMPLES | MINERALS | REMARKS |
|---|---|---|---|---|---|---|
| 22. Gabbs | 8 | 2 | 4 | 4 | brucite<br>magnesite | mine dump samples |
| | 40 | 28 | 36 | 3 | feldspar<br>quartz<br>halite<br>calcite<br>gypsum<br>7Å, 10Å, 14Å clay | playa surface samples |
| 23. Goldfield | 7 | 2 | 5 | 4 | quartz<br>feldspar<br>calcite<br>dolomite<br>7Å, 10Å clay | Ralston Mining Area outcrop samples |
| 24. Grass Valley | 270 | 180 | 208 | 5 | halite<br>calcite<br>quartz<br>analcime<br>feldspar<br>7Å, 10Å clay | 140 cm auger hole in playa |
| | 50 | 20 | 27 | 4 | calcite | hot spring mud |
| 25. Humbolt Marsh | 87 | 35 | 62 | 3 | halite<br>quartz<br>feldspar<br>gypsum<br>calcite<br>7Å, 10Å, 14Å clay | 85 cm auger hole in playa |

| GEOGRAPHIC LOCALITY | LITHIUM CONTENT (ppm) HIGH | LOW | AVERAGE | NUMBER OF SAMPLES | MINERALS | REMARKS |
|---|---|---|---|---|---|---|
| 26. Jakes Valley | | | 60 | 1 | quartz<br>calcite<br>feldspar<br>7Å, 10Å clay | mud from Waldy Pond |
| 27. Jean Lake | 74 | 56 | 63 | 4 | quartz<br>dolomite<br>calcite<br>feldspar<br>7Å, 10Å, 14Å clay | 75 cm auger hole in playa |
| 28. Jersey Valley | | | 10 | 1 | undetermined | spring mud |
| 29. Kumiva Playa | 59 | 52 | 56 | 3 | feldspar<br>quartz<br>calcite<br>7Å, 10Å clay | 30 cm auger hole in playa |
| 30. Lake Valley | | | 16 | 1 | undetermined | lakebed outcrops |
| | | | 11 | 1 | undetermined | spring mud |
| 31. Las Vegas Valley | 19 | 17 | 18 | 2 | dolomite<br>quartz<br>calcite | Corn Springs area |
| | 29 | 8 | 17 | 5 | calcite<br>dolomite<br>quartz<br>feldspar<br>10Å, 11-14Å clay | Quaternary sediment North Las Vegas |

| GEOGRAPHIC LOCALITY | LITHIUM CONTENT (ppm) HIGH | LOW | AVERAGE | NUMBER OF SAMPLES | MINERALS | REMARKS |
|---|---|---|---|---|---|---|
| 32. Lund | | | 11 | 1 | calcite | spring mud |
| | | | 17 | 1 | feldspar<br>quartz | rocks around spring |
| 33. Monitor Valley | 75 | 6 | 35 | 6 | quartz<br>calcite<br>feldspar<br>dolomite<br>halite<br>7Å, 10Å clay | playa surface samples |
| 34. Mud Lake | 76 | 67 | 73 | 4 | quartz<br>calcite<br>feldspar<br>10Å clay | 100 cm auger hole in playa |
| 35. Muddy Mountains | 1400 | 100 | ≈500 | ≈300 | quartz<br>calcite<br>feldspar<br>borates<br>magnesite<br>dolomite<br>clays | Horse Spring Formation & Thumb Formation |
| 36. Newark Valley | 85 | 61 | 70 | 6 | quartz<br>calcite<br>halite<br>dolomite<br>7Å, 10Å clay | 130 cm auger hole in playa |

| GEOGRAPHIC LOCALITY | LITHIUM CONTENT (ppm) HIGH | LOW | AVERAGE | NUMBER OF SAMPLES | MINERALS | REMARKS |
|---|---|---|---|---|---|---|
| 37. North Spring Valley | 57 | 50 | 54 | 3 | quartz<br>calcite<br>7Å, 10Å clay | 50 cm auger hole in playa |
| 38. Pahrangat Valley | | | 10 | 1 | undetermined | valley floor sediment |
| 39. Pyramid Lake | 97 | 25 | 46 | 5 | calcite<br>aragonite<br>feldspar<br>halite<br>10Å clay | shore sediments |
| 40. Railroad Valley | 120 | 59 | 81 | 4 | calcite<br>quartz<br>halite<br>dolomite<br>10Å clay | 120 cm auger hole in playa |
| | | | 43 | 1 | undetermined | evaporating pond sediment |
| 41. Ralston Valley | | | 25 | 1 | feldspar<br>quartz<br>10Å clay | spring sediment |
| 42. Rawhide Flats | 200 | 44 | 125 | 6 | feldspar<br>quartz<br>halite<br>gypsum<br>dolomite<br>magnesite<br>7Å, 10Å, 14Å clay | 100 cm auger hole in playa |

| GEOGRAPHIC LOCALITY | LITHIUM CONTENT (ppm) HIGH | LOW | AVERAGE | NUMBER OF SAMPLES | MINERALS | REMARKS |
|---|---|---|---|---|---|---|
| 43. Roach Lake | 86 | 56 | 66 | 3 | quartz<br>calcite<br>feldspar<br>7Å, 10Å, 14Å clay | 70 cm auger hole in playa |
| 44. Ruby Lake | 40 | 12 | 26 | 2 | dolomite<br>calcite<br>quartz<br>feldspar<br>7Å, 11-15Å clay | lakeshore sediment |
| 45. Sheelite | | | 10 | 1 | undetermined | stream sediment sample |
| 46. Smith Creek Valley | 85 | 49 | 61 | 4 | quartz<br>halite<br>calcite<br>feldspar<br>10Å clay | 160 cm auger hole in playa |
| 47. Smoke Creek Desert | 74 | 43 | 62 | 4 | quartz<br>feldspar<br>calcite<br>halite<br>10Å clay | 140 cm auger hole in playa |
| 48. Starr Valley | | | 56 | 1 | quartz<br>calcite<br>feldspar<br>7Å, 10Å, 14Å clay | roadcut on highway 40 in Quaternary rocks |

| GEOGRAPHIC LOCALITY | LITHIUM CONTENT (ppm) HIGH | LOW | AVERAGE | NUMBER OF SAMPLES | MINERALS | REMARKS |
|---|---|---|---|---|---|---|
| 49. Steamboat Springs | 40 | 17 | 28 | 2 | quartz<br>plagioclase<br>glass | spring sediment |
| | 2 | 1 | 2 | 5 | quartz<br>feldspar<br>glass<br>kaolinite | tuff in claypits near springs |
| 50. Steptoe Valley | 23 | 15 | 18 | 3 | quartz<br>plagioclase<br>calcite<br>dolomite<br>10Å clay | 115 cm auger hole in Goshute Lake |
| 51. Stonewall Flat | 65 | 64 | 64 | 2 | quartz<br>plagioclase<br>calcite<br>10Å clay | surface sediment |
| 52. Stewart Valley | 88 | 72 | 80 | 2 | quartz<br>feldspar<br>calcite<br>dolomite<br>10Å clay | surface samples |

| GEOGRAPHIC LOCALITY | LITHIUM CONTENT (ppm) HIGH | LOW | AVERAGE | NUMBER OF SAMPLES | MINERALS | REMARKS |
|---|---|---|---|---|---|---|
| 53. Teels Marsh | 850 | 24 | 223 | 47 | | samples near springs marginal to playa |
| | 580 | 13 | 115 | 50 | undetermined | from seven backhoe pits near springs |
| | 560 | 25 | 76 | 30 | | playa surface |
| 54. Tickaboo Valley | 68 | 25 | 40 | 23 | undetermined | surface samples from playa |
| 55. Trucke River | 33 | 27 | 30 | 2 | calcite<br>halite<br>gypsum<br>feldspar<br>10Å, 14Å clay | Quaternary beds near Truckee River |
| 56. Virginia City | | | 22 | 1 | quartz<br>gypsum<br>7Å, 14Å clay | altered, clay-rich rocks |
| 57. Windous Butte | 35 | 3 | 15 | 11 | dolomite<br>magnesite<br>quartz<br>7Å clay | magnesite mines |
| 58. Winnemucca Lake | 100 | 81 | 89 | 3 | quartz<br>calcite<br>feldspar<br>halite<br>10Å clay | 2 auger holes in playa |

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