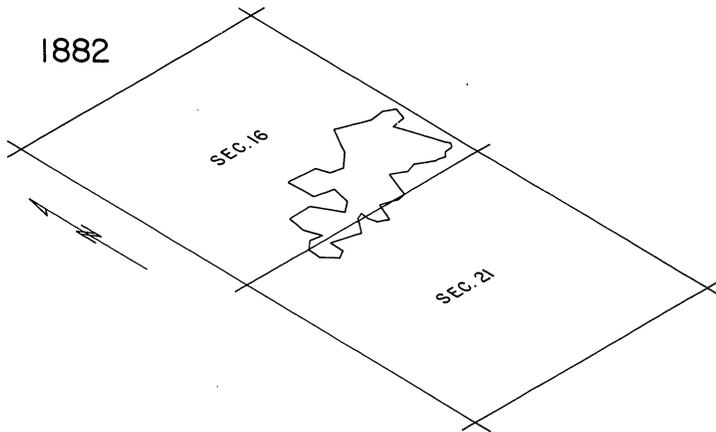


Chapter A

Restored MC Based Proportionment, Minnesota

A4



History of Surveys

- 1875** Samuel E. Stebbins surveyed the Eight Standard Parallel North, along the north boundary of the township.
- 1882** William P. Allen surveyed the south, east and west township boundaries, the subdivisional lines and meandered three lakes within the township, including Auto Lake, (now named Arrowhead Lake), located in sections 16 and 21. Allen executed his surveys during the month of March. All measurements made across the lakes were made on the ice. Presumably Allen meandered the edge of the ice around the lakes. The plat was approved August 10, 1882. See figure 1.
- 1910** A small island in section 33 and in Sand Lake was surveyed by C.M. Dorway.

Township No 60 N Range No 18 W 4th Mer. Minnesota

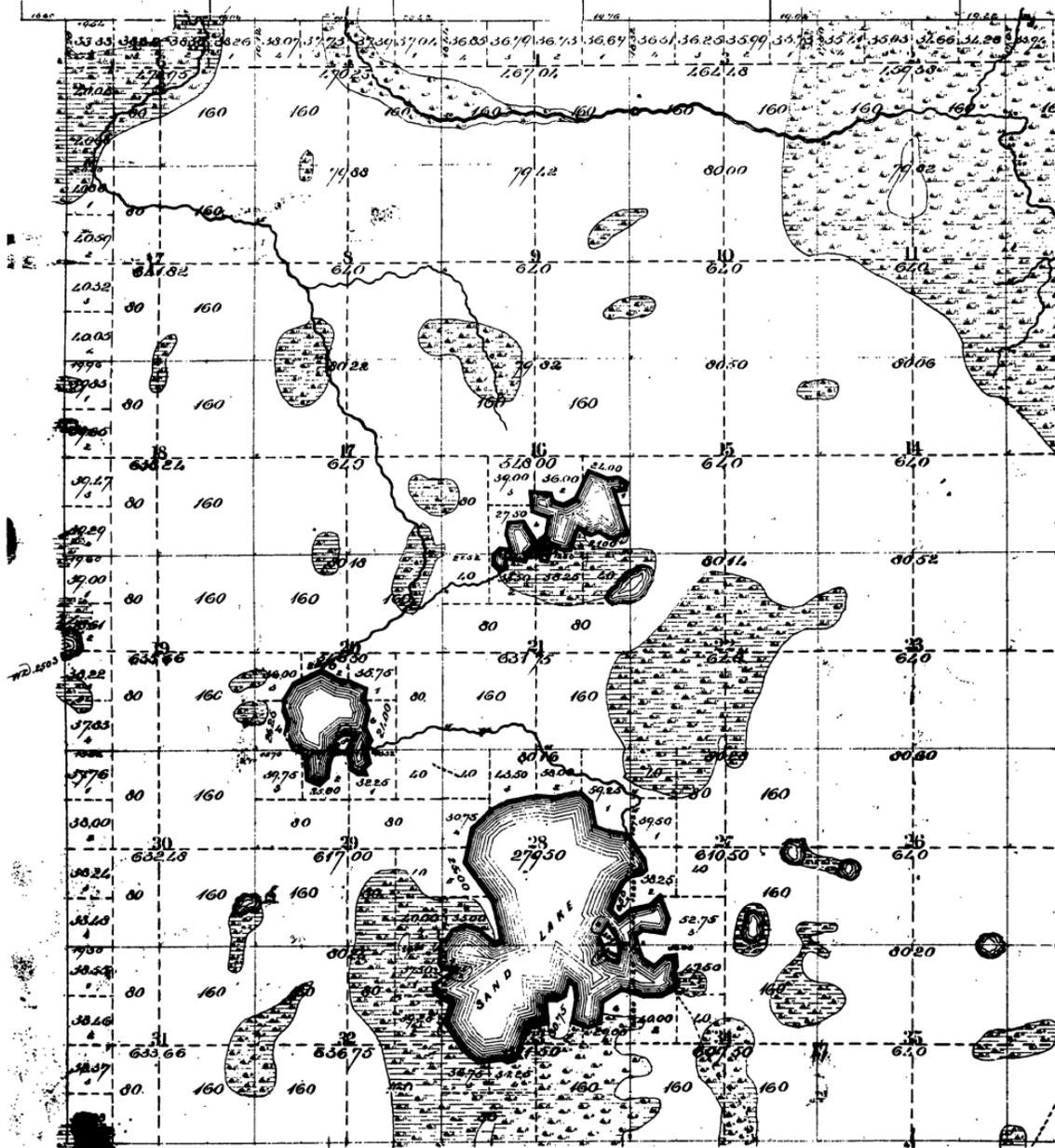


Figure 1 - Original Plat

Reasons for Request of this Survey

The federal lands in the township are within the Superior National Forest. The Forest lands are fragmentary and the original corners were either lost or extremely difficult to identify. The Forest Service requested the resurvey to mark and identify their boundaries.

Special Instructions

Special Instructions for Group 63, Minnesota, were approved July 9, 1940. They provided for the dependent resurvey of the boundaries and subdivisional lines of T. 60 N., R. 18 W., 4th P.M., Minnesota. Field work began on July 19, 1940. This discussion is limited to the restoration of the line between sections 16 and 21 and the meanders of Arrowhead (Auto) Lake.

Conditions Found on the Ground

The corner of sections 16, 17, 20 and 21 and corner of sections 15, 16, 21 and 22 were recovered from the remaining original bearing trees. No evidence could be found of the monuments for the 1/4 section corner and meander corners between sections 16 and 21. The following field notes(next page) are a transcript of Allen's record for that section line:

Transcript of Allen's Field Notes

East on random line bet. secs. 16 and 21
Va. 80301 E.

1.00	Ascend hill.
7.00	Top of hill.
21.50	West margin of lake. Set a temporary meander cor.
38.40	Over lake on ice to west side of point of land. Set a temporary meander cor. and enter bog.
40.00	Set temporary 1/4 sec. cor.
41.52	East side of point of land. Set temporary meander cor.
46.60	Over bay of lake on ice. Set temporary meander cor. and enter bog.
52.80	A point 12 lks. S. of a bay of the lake.
59.00	Leave bog, bears NE and SW
69.00	Enter swamp bears N. and S.
80.42	Intersect N. and S. line at 14 lks. south of cor. to sec. 15, 16, 21 and 22. Thence I run, S. 89°54' W. on true line bet. secs. 16 and 21 with same va.
33.80	Set a post 4 ft. long, 4 ins. square, 24 ins. in the ground, for meander cor. to fractional Secs. 16 and 21, marked, T. 60 N., M.C. on E. R. 18 W., S. 16 on N. S. 21 on S. face, from which, A spruce 4 ins. diam bears S. 35°E, 11 lks. dist. marked T. 60 N R. 18 W., S. 21 M.C. B.T. A spruce 4 ins. diam. bears N. 29°E, 34 lks. dist. marked T. 60 N., R. 18 W., S. 16 M.C.B.T.
38.90	Set a post 4 ft. long, 4 ins. square, 24 ins. in the ground, for meander cor. to fractional sec. 16 and 21 marked, T. 60 N. M. C. on W. R. 18 W., S. 16 on N. S. 21 on S. face, from which, A spruce 4 iris, diam. bears S. 19° E., 61 lks. dist. marked T. 60 N., R. 18 W, S. 21 M.C.B.T.. No other tree convenient.
40.21	Set a post 3 ft. long, 3 ins. square, 24 ins. in the ground, for 1/4 sec. cor. marked 1/4 S. on W. face, from which, A tamarac 9 ins. diam. bears. S. 10° E, 36 lks. dist. marked 1/4 S.B.T. A spruce 4 ins. diam bears N. 2° E. 101 lks. dist. marked 1/4 S.B.T.
42.00	Set a post, 4 ft. long, 4 ins. square, 24 ins. in the ground, for meander cor. to fractional secs, 16 and 21 marked. T. 60 N. M. C. on E. R. 18 W. S. 16 on N. S. 12 an S. faces, from which A tamarac, 6 ins, diam bears N. 66° E. 58 lks.

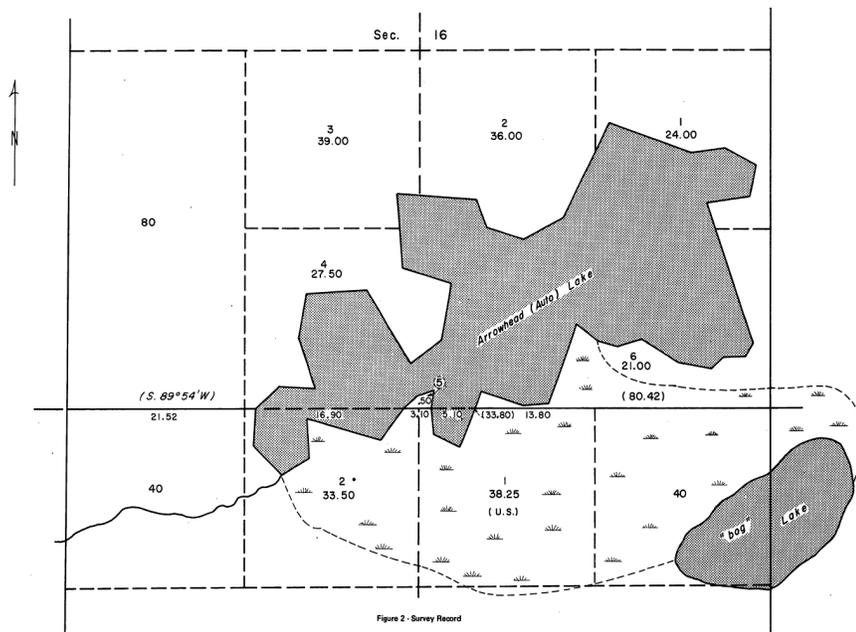
58.90

dist. marked T. 60 N. R. 18 W. S. 16 M.C.B.T.
A tamarac 6 ins. diam. bears S. 86° E. 61 lks.
dist. marked T. 60 N. R. 18 W. S. 21 M.C.B.T.
Set a post, 4 ft. long, 4 ins. square, 24 ins. in the
ground, for meander cor. to fractional secs. 16
and 21 marked
T. 60 N. M.C. on W.
T. 18 W., S. 16 on N.

80.42

S. 21 on S. faces from which,
a tamarac 6 ins. diam. bears N. 71°W. 22 lks.
dist. marked T. 60 N., R. 18 W. S. 16 M.C.B.T.
A spruce 6 ins. diam. bears S. 87°W., 33 lks. dist.
marked T. 60 N., R. 18 W., S. 21 M.C.B.T.
Cor. to secs. 16, 17, 20, and 21
Sand hilly,
Soil 4th rate.
Heavy timber and brush partly fire
killed.

March 11th, 1882



Allen later meandered the lake. Figure 2 is a sketch of the Allen record, drawn to scale, the lot areas and status. Lot 1, section 21 is the only federal land. All other lands are patented.

Note: See next page for enlargement of Figure 2.

After retracements were completed it was found that the line between sections 16 and 21, from section corner to section corner was S. 88° 22' W., 81.05 chains in length. This direct connecting line (not shown) almost missed the "point of land" described by Allen as the location of the 1/4 corner. The line would also have largely different distances to the edges of the lake on the remainder of the line. In the east half mile two small arms (or bays) of the lake, not called by Allen, would have extended into section 21.

The point of land on which Allen reports setting the 1/4 corner is substantially in agreement with the record in shape and position relative to the corner of sections 16, 17, 20 and 21.

Preliminary Statement of the Problem

The surveyor must restore the 1/4 section corner and meander corners between sections 16 and, 21, based on the retracement data and evidence found.

Regulations

This survey illustrates the application of the following sections of the Manual of Surveying Instructions, 1973:

3-92	Sixteenth-section corners
5-9 to 5-16	Obliterated corners, topography
5-21 to 5-23	Restoration of corners
5-38	Single proportionate measurement
5-40	Restoration of meander corners
6-25 to 6-27	Dependent resurvey

Final Statement of the Problem

The surveyor must restore the 1/4 corner and meander corners between sections 16 and 21, giving due weight to the evidence found.

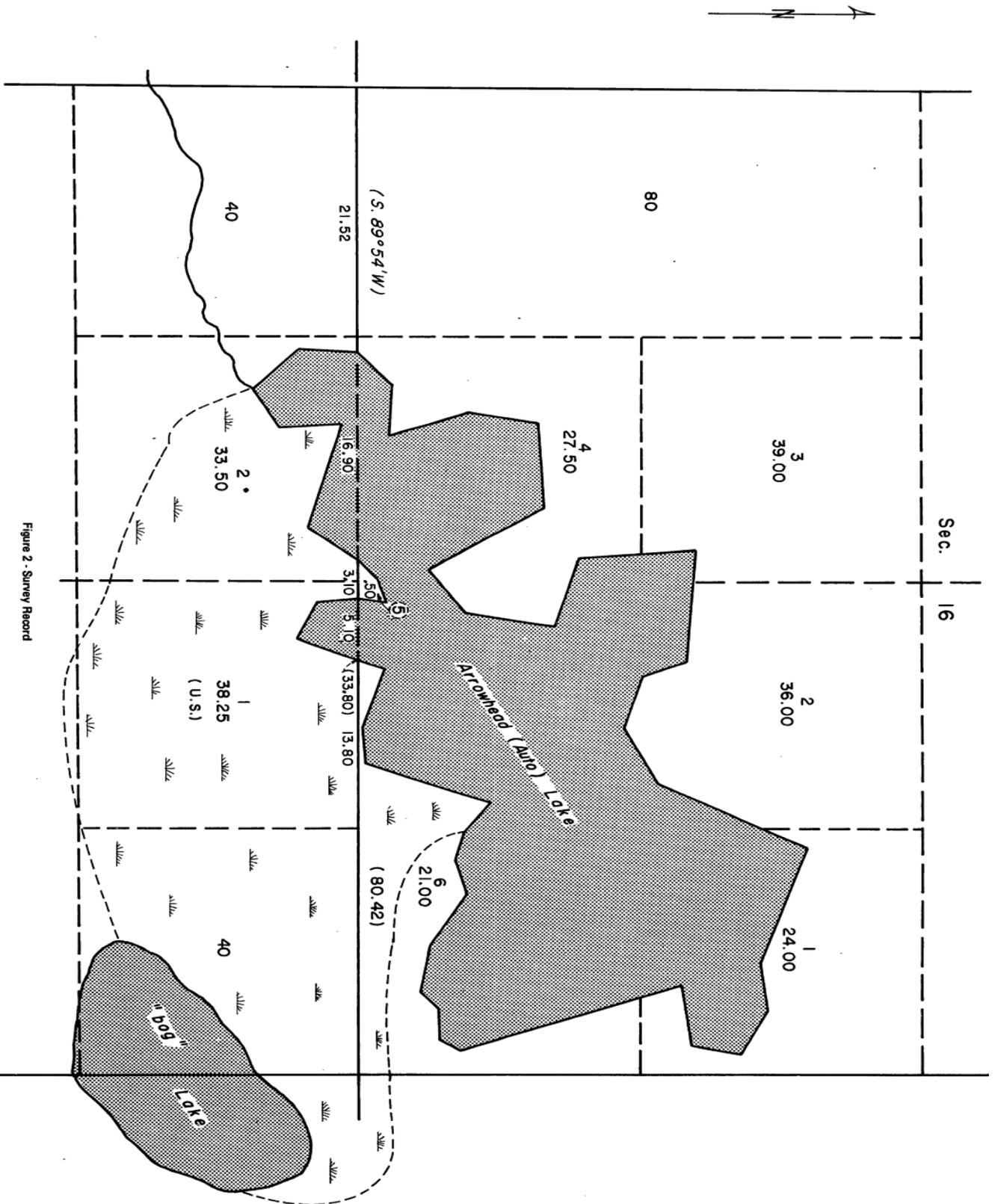


Figure 2 - Survey Record

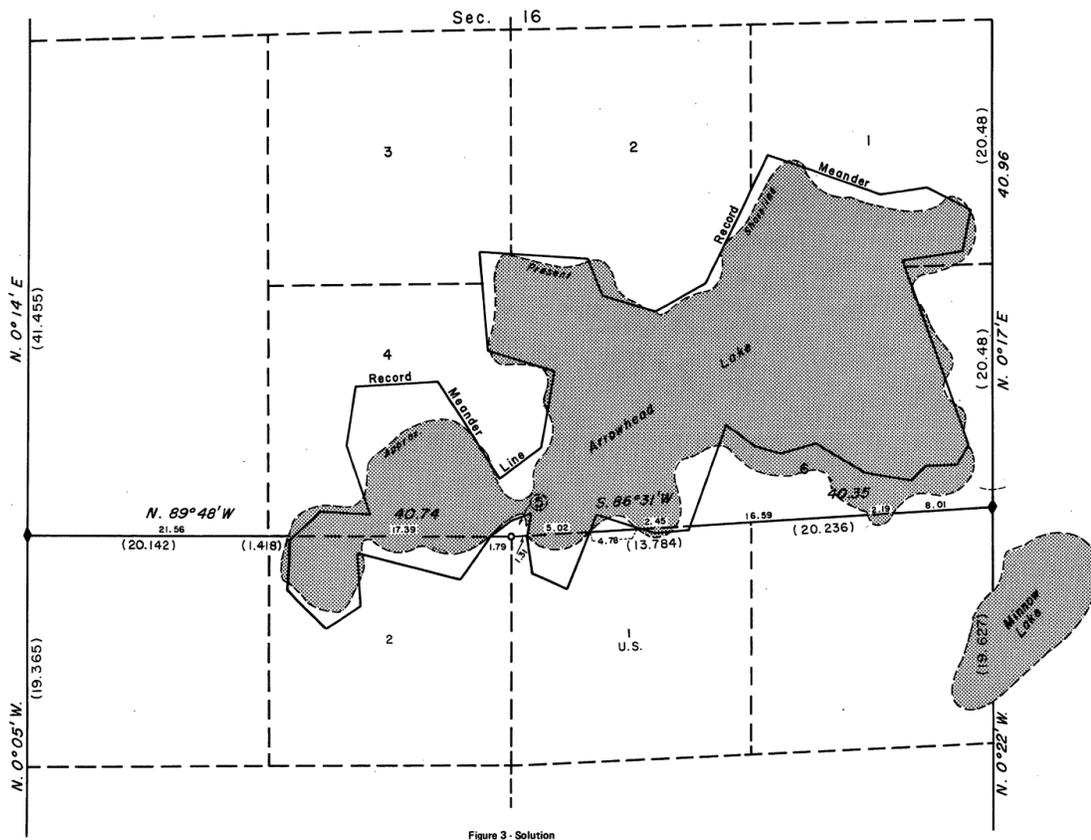


Figure 3 - Solution

Figure 3 depicts the solution adopted in this case.

Note: See next page for enlargement of Figure 3.

Solution

The 1/4 corner was restored on the "point of land" by measurements from MC's restored by using the actual shoreline. The latitudinal position was determined by an E-W line which crossed the point at record distance (3.10 chains) between edges of the lake. The longitudinal position was then at record distance from each side of the point. The section corners were then connected to the 1/4 corner by straight lines.

The shoreline of the lake was thus treated as direct evidence of the position of the original meander corners, rather than a single proportionate position restoration. The meander corners of record on this line were not proportioned. They were restored on the section line at intersections with the actual shoreline.

Four additional meander corners were established on the shoreline of the two small arms of the lake in the east half mile.

The lake was not remeandered but an informative traverse (not given in the field notes) was made for purposes of topography.

The 1/16 section corners were not established.

The plat was approved May 6, 1942, and accepted on November 17, 1942, shown in figure 4.

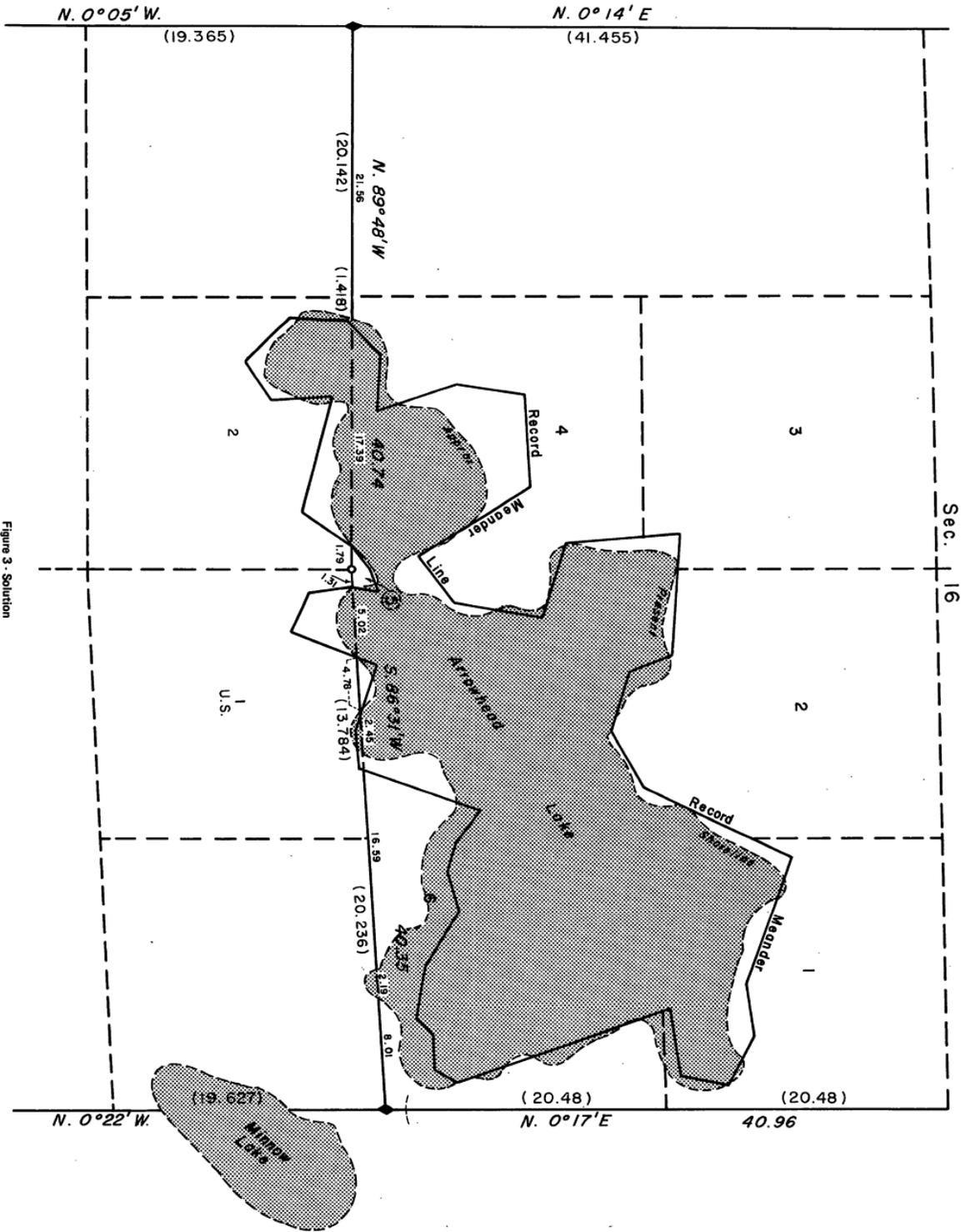
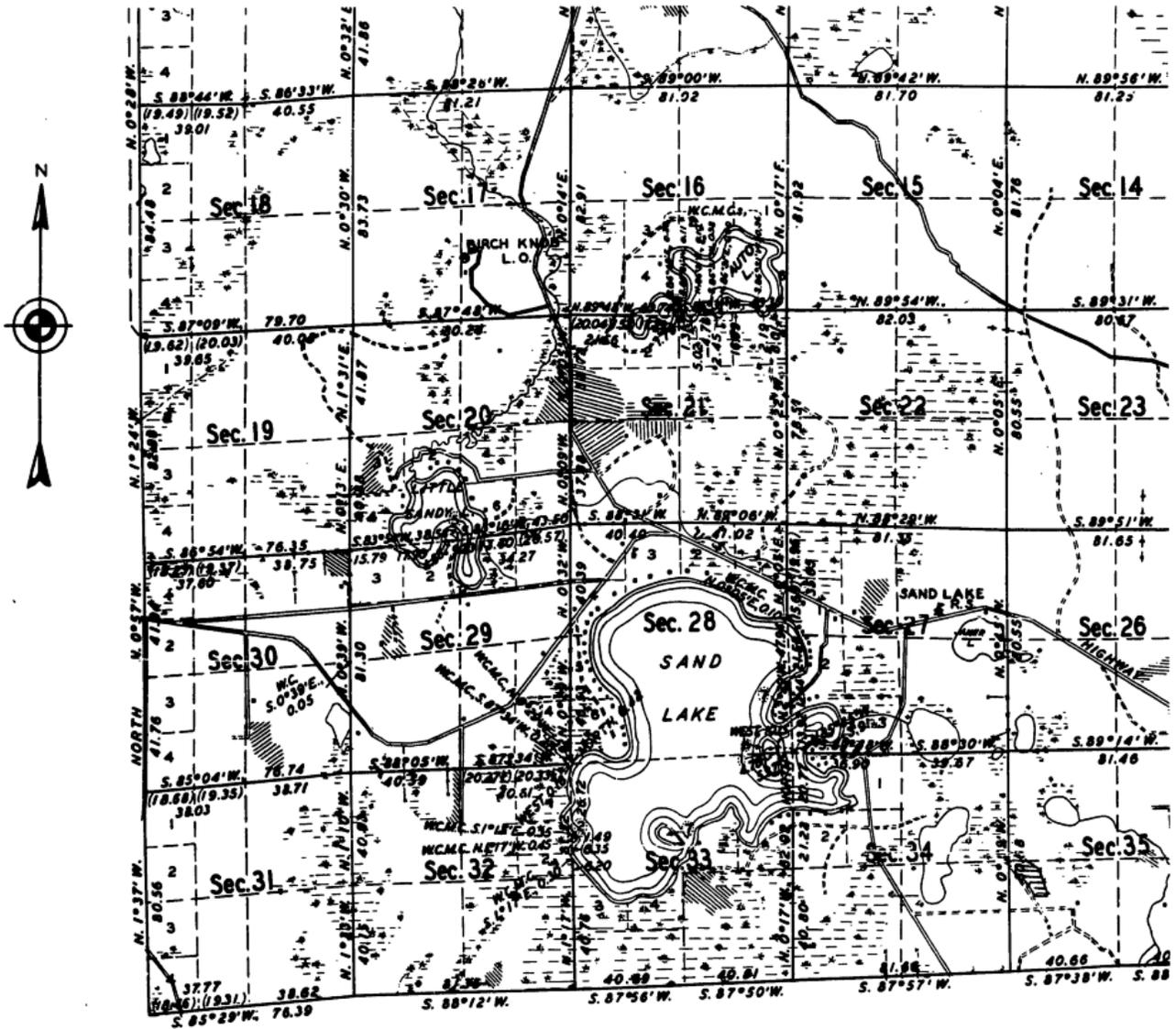


Figure 3 - Solution



10 0 10 20 40 80
 SCALE: 40 CHAINS TO AN INCH.

AREA RESURVEYED: 21,968.80 ACRES.
 MEAN MAGNETIC DECLINATION 4°30'E.

Figure 4 - Portion of Accepted Plat

Supplementary Topic

On June 30, 1966, Mr. Richard L. Floyd, surveyor from Ely, Minnesota, requested an opinion from the Washington Office concerning the proper method of establishing the W1/16 corner between sections 16 and 21. Should the 1/16 corner be placed at midpoint between the 1/4 corner and section corner, or should it be proportioned between the most westerly meander corner and section corner? The following reply (in part) was made:

July 7, 1966

Mr. Richard L. Floyd
Zenith Surveying Company
P.O. Box 628
Ely, Minnesota 55731

Dear Mr. Floyd:

Your letter of June 30 has requested advice on how to establish the North 1/16th corner of the Northwest Quarter, Section 21, T. 60 N., S. 00051, W. R. 18 W., 4th PM, Minnesota.

Resurveys executed in 1940 reflect that in crossing the southwesterly arm of Auto Lake, on the W 1/2 mile of the line between secs. 16 and 21, there is an apparent difference of 49 links between the original and resurvey record (original - 16.90 chains; resurvey - 17.39 chains). To protect the riparian rights of Lot 2, Section 21, this difference should be isolated in the lake crossing. Therefore, we would not establish the 1/16th corner of interest at midpoint of the W 1/2 mile. Rather, it would be set at a proportionate point on the line between the northwest section corner and the found meander corner on the west shore of Auto Lake, based on the original record. These proportions would be:

$$\frac{\text{New 1/16 sec. dist.}}{\text{New distance}} = \frac{\text{Record 1/16 sec. dist.}}{\text{Record distance}}$$

In conformity with the method outlined, the parenthetical distances shown on figure 3 are the proportionate positions of the E 1/16 and W 1/16 section corners based on the 1940 resurvey.

It should also be noted that prior to acceptance of the resurvey plat, the propriety of establishing the four most easterly meander corners was also questioned.

It would not be the policy of the Bureau, today, to set those corners and (by survey) determine the rights of lot 6, section 16 and/or the patented NE1/4 NE1/4 of section 21. The main target of this discussion, however, is the methods used in restoration of the section line and method of establishing the 1/16 section corners.