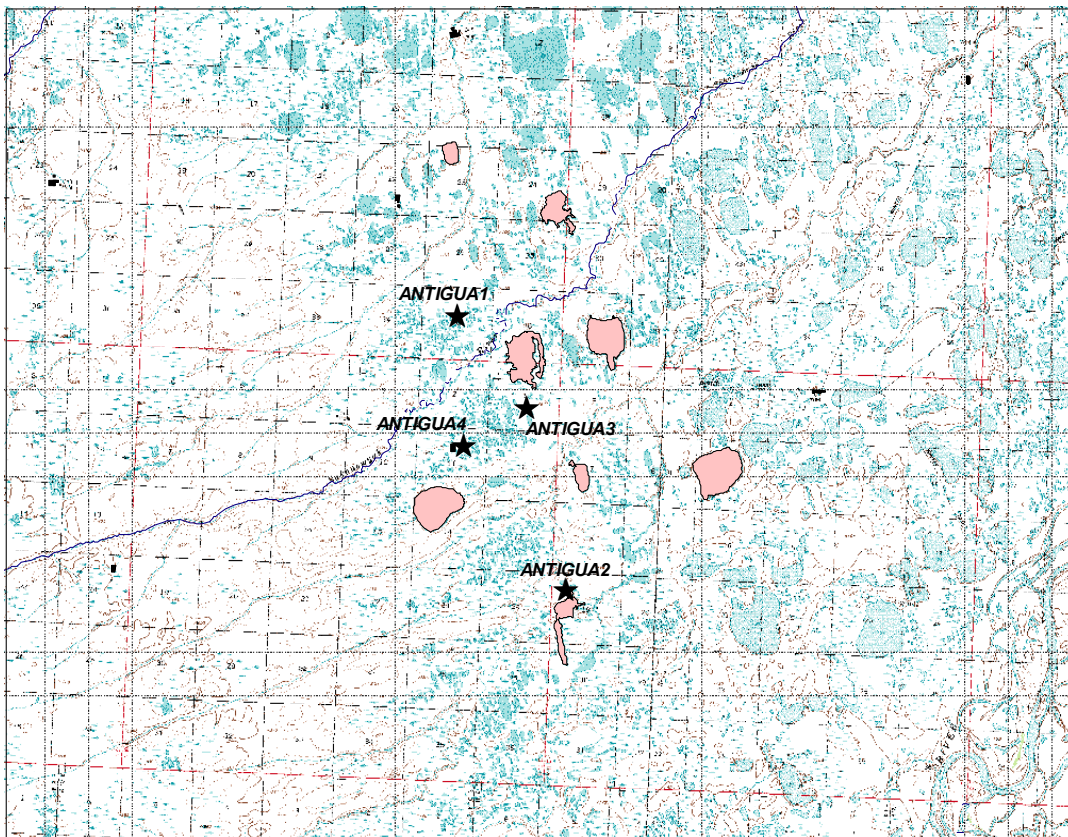


SURVEY OF LAKES IN ASSOCIATION WITH THE ANTIGUA EXPLORATION PROSPECT: 2004

Final Data Report

December 2004



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ANTIGUA PROSPECTS: 2004**

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December 2004

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EXECUTIVE SUMMARY

The objectives of the study are to document fish presence and habitat use during summer 2004 in lakes of the Antigua region, which generally lies south of the Kuparuk Field near the Sakonowiyak River.

The objectives of the survey were to:

- 1) inventory fish species in the various lakes within the project study area,
- 2) measure lake depths to estimate lake volumes, and
- 3) measure water chemistry parameters to assess suitability of water for potential uses.

The survey consisted of sampling with gill nets, minnow traps and seine combined with physical measurements. Lakes were sampled with short-duration gill net sets (typically 4 to 6 hours) using a multimesh gill net (120 feet long, six panels of variable mesh, mesh size ranging from 1 to 3.5 inches stretched mesh). Sets were kept to a short duration to minimize the chance for entangling waterfowl and to minimize fish mortality.

Minnow traps and seines were used to identify smaller fish species that may not be detected by gill nets. The traps were set and retrieved in concert with the gill net sampling. At lakes where bottom contours allowed, a 20 ft seine was pulled through vegetation beds along the lakeshore to detect small fishes.

Water chemistry parameters were measured to assess habitat conditions and provide information on the suitability of the water for domestic and industrial uses. Water chemistry measurements included surface measures of water temperature, specific conductance, dissolved oxygen, pH, and turbidity. A water sample was sent to Northern Test Labs for laboratory determination of chloride, sodium, calcium, magnesium, and hardness (as CaCO₃).

Bathymetric data were collected to allow estimating lake volume. The amount allowed for winter water withdrawal when sensitive fish species are present is currently set at 15% of the volume of the lake deeper than 7 feet. When resistant fish species (i.e. ninespine stickleback and Alaska blackfish) are present, the current allocation allowed by Alaska Dept. of Natural Resources is 30% of the volume deeper than 5 feet. There is no withdrawal limit if fish are not present.

The area potentially available for ice aggregate was estimated by calculating the area of the lake shallower than 4 feet, assuming that the ice would grow to at least 4 feet prior to the need for aggregate. If the ice is shallower than 4 feet at the time of ice removal, then the area available will be less.

A total of 8 lakes were sampled in 2004 in connection with potential exploration in the Antigua

prospect. Ninespine stickleback caught or observed in 2 of the surveyed lakes, no other fish species were recorded.

Information from fish sampling and depth measurements was used to evaluate each lake regarding its potential to support fish. Obviously, if fish were captured during gill net sampling, the lake was classified as fish-bearing. Gill net sets were relatively short, however, so absence of catch does not necessarily mean a lake does not support fish. Lakes also were assessed for their proximity to fish-bearing streams and their depth. Lakes deeper than 7 feet are likely to retain unfrozen water during winter, thus have potential to overwinter fish.

Lakes in which fish were verified as present are divided into those lakes containing species sensitive to habitat changes likely to be associated with water withdrawal and those containing species more resistant to such changes. Species sensitive to impacts of water withdrawal include lake trout, broad whitefish, least cisco and arctic grayling, while the more resistant species are Alaska blackfish and ninespine stickleback.

Based on the above lake evaluation, 2 of the surveyed lakes contained resistant species (ninespine stickleback). Fish were not detected in the other 6 lakes.

The analysis indicated that 104.7 million gallons of water are likely to be available for winter use from lakes surveyed during 2004 in association with the Antigua area. In addition, 486 acres are likely to be available for ice chips from lakes surveyed during 2004.

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INTRODUCTION

ConocoPhillips Alaska Inc. is planning to conduct exploratory drilling for oil in the Antigua region south of the Kuparuk Oil Field. Exploration includes crossing rivers and lakes with ice roads and withdrawal of water from lakes to support both industrial and domestic needs.

During review of exploration, and potentially development, permits, information is required on the biological sensitivity of lakes in the region. The study was designed to provide physical and biological information on these lakes to understand their use by various fish species. In addition, results of the survey can be used, in concert with previous surveys within the area, to direct any future investigations that may be needed.

Objectives of the study were to document fish presence and habitat use in lakes that may be used to support exploration activities associated with the Antigua Project. The region surveyed during 2004 generally lies south of the Kuparuk Field near the Sakonowyak River (Figure 1), termed the Antigua region in this report.

The objectives of the survey were to:

- 1) inventory fish species in the various lakes within the project study area (sampling area identified in Figure 1),
- 2) measure lake depths to estimate lake volumes, and
- 3) measure water chemistry parameters to assess suitability of water for potential uses.

METHODS

The biological survey consisted of sampling with gill nets, minnow traps and seine combined with physical measurements. Lakes were sampled with short-duration gill net sets (typically 4 to 6 hours) using a multimesh gill net (120 feet long, six panels of variable mesh, mesh size ranging from 1 to 3.5 inches stretched mesh). These nets have been previously used to collect inventory-level data from lakes throughout the Colville Delta and nearby areas. Sets were kept to a short duration to minimize the chance for entangling waterfowl and to minimize fish mortality. Since the objective of the gill netting is to document presence/absence, the nets were pulled after fish were detected. Fish captured were measured and released if not severely injured. Duration of each set was recorded to allow calculation of catch rates.

Minnow traps and seines were used to identify smaller fish species that may not be detected by gill nets. Minnow traps baited with preserved salmon eggs were set in pairs at the edge of surveyed lakes. The traps were set and retrieved in concert with the gill net sampling. At lakes where bottom contours allowed, a 20 ft seine was pulled through vegetation beds along the lakeshore to detect small fishes. Where this method was employed, three hauls were made at each lake.

Water chemistry parameters were measured to assess habitat conditions and provide information on the suitability of the water for domestic and industrial uses. Water chemistry measurements included surface measures of water temperature, specific conductance, dissolved oxygen, pH, and turbidity. Temperature, specific conductance and dissolved oxygen were *in situ* surface measurements taken along the edge of each lake with a YSI Model 85 meter. A sample was returned to the field office to measure pH and turbidity. PH was measured with an Oaktron Acorn Series pH5 meter. Turbidity was measured with an H.F. Scientific DRT15CE turbidity meter. A water sample was sent to Northern Test Labs for laboratory determination of chloride, sodium, calcium, magnesium, and hardness (as CaCO₃).

Bathymetric data were collected to allow estimating lake volume. In 2002 and 2003, location and depth were recorded on a Lowrance Model LCX-15MT integrated GPS/depth sounder. Location and depth were recorded at approximately 1-2 second intervals. The study design was to record at least six to eight depth transects on each lake. Lake volume was estimated by contour mapping of depth intervals. Contour maps were prepared by plotting the position and depth data obtained by GPS on GIS basemaps and plotting the contours in 1 on maps of the surveyed lakes. The surface area of each contour was obtained, then the volume was estimated using the formula for truncated cones:

$$V = h/3*(A1+A2+(A1*A2) (1/2))$$

Where h = vertical depth of the stratum, A1 = area of the upper surface, and A2 = area of the lower surface of the stratum whose volume is to be determined. The volumes of individual strata are summed to obtain the volume of the desired depth intervals.

The amount allowed for winter water withdrawal when sensitive fish species are present is currently set at 15% of the volume of the lake deeper than 7 feet. When resistant fish species (i.e. ninespine stickleback and Alaska blackfish) are present, the current allocation allowed by Alaska Dept. of Natural Resources is 30% of the volume deeper than 5 feet. There is no withdrawal limit if fish are not present.

The area potentially available for ice aggregate was estimated by calculating the area of the lake shallower than 4 feet, assuming that the ice would grow to at least 4 feet prior to the need for aggregate. If the ice is shallower than 4 feet at the time of ice removal, then the area available will be less.

Lake Summaries

This report uses lake numbering based a researcher/year code. The lake number contains several pieces of information, including the code of the sampler and the year of sampling.

Sampler Code:

MC = McElderry and Craig (1981); sampling in 1979

B = Bendock sampling from 1977-1986

L = Lobdell; water chemistry sampling in 1991-1999

M = Moulton; fish sampling in 1995-2004

MB = Michael Baker Jr., Inc. water chemistry sampling in 2002-2004

N = Netsch et al. (1977) NPRA sampling in 1977

First Two Numerals:

Year of Initial Sampling

(if Moulton sampled a lake previously sampled by McElderry and Craig, then the McElderry and Craig lake number is used)

Last Two Numerals:

Numbers from 1 to 99 used to identify the individual lake sampled within a given year

Information contained for each surveyed lake (if measured) includes:

1. A diagram of the lake,
2. Other names utilized for the same lake,
3. Lake location, in latitude/longitude,
4. The USGS quadrangle sheet and the township and range in which the lake is situated
5. Habitat classification,
6. Surface area in acres, obtained from USGS digital maps,
7. Maximum depth in feet,
8. Presence or absence of an outlet,
9. pH,
10. Calculated lake volume and volume of water permitted for winter withdrawal,
11. Water chemistry measurements,

12. Catch record, including gear used, date sampled, species caught and size range,
13. Where appropriate data exist, the length frequency of dominant species is plotted,
14. The depth distribution based on bathymetric transects that were recorded.

Six different lake types are defined, based primarily on the potential for access by fish. Definitions for the lake types are as follows:

Perched (Frequent Flooding) = Perched lake near a floodplain, but above the water surface elevation of the active channel, with an obvious high water channel. These lakes are likely subject to annual flooding.

Perched (Infrequent Flooding) = Perched lake near a floodplain, but above the water surface elevation of the active channel, with no obvious high water channel. These lakes are likely subject to flooding on an infrequent basis (every five years or more).

Deflation = Deflation lake, a lake formed when sand dunes become revegetated and the basins between the dunes become filled with water. Deflation lakes are typically the deepest coastal plain lakes.

Drainage = Drainage Lake, a lake that is part of a defined drainage system, i.e. there is an active connection to a creek.

Oxbow = Oxbow lake, formed from abandoned river channels.

Tundra = Tundra Lake, a thaw lake not within or connected to a river drainage, little potential for fish access on a regular basis.

RESULTS AND DISCUSSION

Biological Observations

A total of 8 lakes were sampled in 2004 in connection with potential exploration in the Antigua region of NPR-A (Table 1, Figure 2). Ninespine stickleback were caught or observed in two of the lakes, no other fish were encountered in the surveyed lakes. Arctic grayling young-of-the-year and juveniles were observed in the nearby Sakonowiyak River on July 22, 2004, but none were detected in any of the lakes.

Water Chemistry Measurements

Water chemistry parameters measured in the studied lakes are presented Table 3. Mean water temperatures during the survey ranged as follows:

Jul 18 to 22, 2004: 11.8°C (range: 10.5 to 13.1°C).

Dissolved oxygen was high, averaging around 95% saturation. Specific conductance (range: 140-260 microSiemens/cm) and pH (range: 8.0–8.1) were in the range typically seen in lakes in the region. The generally low specific conductance and low ion concentration indicates little marine influence in most lakes in this region.

Evaluation of Fish Concerns

Information from fish sampling and depth measurements was used to evaluate each lake regarding its potential to support fish. Obviously, if fish were captured during gill net sampling, the lake was classified as fish-bearing. Gill net sets were relatively short, however, so absence of catch does not necessarily mean a lake does not support fish. Lakes also were assessed for their proximity to fish-bearing streams and their depth. Lakes deeper than 7 feet are likely to retain unfrozen water during winter, thus have potential to overwinter fish. Deep lakes that are near fish-bearing streams and are likely to have a connection with the stream at some point during the year are classified as potential fish-bearing lakes, with additional sampling needed if further clarification of the designation is desired. Results of the evaluation are included in Table 4.

Lakes in which fish were verified as present are divided into those lakes containing species sensitive to habitat changes likely to be associated with water withdrawal and those containing species more resistant to such changes. Species sensitive to impacts of water withdrawal (such as reduced dissolved oxygen and increased dissolved solids) include lake trout, broad whitefish, least cisco and arctic grayling, while the more resistant species are Alaska blackfish and ninespine stickleback. Alaska blackfish are particularly resistant to low dissolved oxygen, being able to breathe atmospheric oxygen (Armstrong 1994). Residents of the Yukon Delta have reported observing Alaska blackfish oriented along cracks in the ice during winter to use oxygen in ponds that have gone anoxic. Ninespine stickleback can also withstand low dissolved oxygen (Lewis et al. 1972), although not the same extent as Alaska blackfish. Ninespine stickleback, however, can withstand higher levels of dissolved solids, and often frequent brackish nearshore waters during summer.

When sensitive fish are present, the amount of water available during winter is limited to 15% of the volume under 7 feet of ice. The water withdrawal criteria are relaxed when only resistant fish species are present because of the greater tolerance to lower dissolved oxygen and higher concentrations of dissolved solids. In this case, up to 30% of the water volume under 5 feet of ice is allowed for winter withdrawal. For lakes that do not contain fish, there is currently no limit to the amount taken. For practical reasons, the volume available is limited to the volume of unfrozen water under the ice at the time of withdrawal. In most cases, the withdrawal occurs when the ice is 4 feet thick or greater. In order to provide some estimate of water likely to be available, the volume of water under 4 feet of ice is provided.

Based on the above lake evaluation, 2 lakes were confirmed to contain ninespine stickleback. Fish were not detected in the remaining 6 lakes.

Based on the above analysis, 104.7 million gallons of water are likely to be available for winter use from lakes surveyed during 2004 in association with the Antigua region. The entire amount comes from 4 lakes because 3 of the other lakes are shallow and likely to be frozen to the bottom during late winter. The remaining lake supports ninespine stickleback but has a maximum depth of 5.1 feet, which precludes water withdrawal.

The area covered by water less than 4 feet deep, and therefore likely to be suitable for removing ice aggregate, was estimated for each lake (Table 5). A map of the potential ice aggregate area for each lake is included in the individual lake summaries. Based on the above analysis, 486 acres are likely to be available for ice chips from lakes surveyed during 2004 in association with the Antigua region.

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- Bendock, T.N. and J. Burr. 1984. Freshwater fish distributions in the Central Arctic Coastal Plain (Ikpikpuk River to Colville River). Alaska Department of Fish and Game, Sport Fish Division, Fairbanks, AK. 52p.
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Table 1. Summary of lakes sampled in the Antigua Region, 2004.

Lake Name	Latitude (NAD83)	Longitude	Town	Range	Section	Surface Area (acres)	Maximum Depth (feet)	Calculated Volume (mill. gals)
M0421	70.21198	149.53661	10N	10E	14/23	36.6	3.7	24.60
M0422	70.20168	149.47208	10N	10E	24	93.4	less than 3	not estimated
M0423	70.17087	149.48807	9/10N	10E	1/36	176.1	5.5	179.63
M0424	70.17564	149.43825	10N	11E	31	169.6	6.6	201.34
M0425	70.13957	149.53661	9N	10E	11/14	197.6	8.5	352.94
M0426	70.14684	149.44952	9N	11E	7	43.9	3.4	26.53
M0427	70.14901	149.36730	9N	11E	9	220.0	6.2	297.61
M0428	70.11976	149.45649	9N	11E	19	79.6	5.1	72.46

Table 2. Catches of fish from lakes in the Antigua Region, 2004.

Lake Name	Sample Date	Gill Nets		Minnow Traps		Seine and Observation	
		Set Duration (hours)	Fish Species ¹	Set Duration (hours)	Fish Species ²	Number of Hauls	Fish Species ²
M0421	not sampled - lake too shallow for water withdrawal						
M0422	not sampled - lake too shallow for water withdrawal						
M0423	7/18/04	8.7	none	12.1	none	3	none
M0424	7/21/04	9.5	none	10.7	none	4	none
M0425	7/18/04	9.3	none	7.7	NSSB	0	none
M0426	7/22/04	8.4	none	11.3	none	3	none
M0427	7/22/04	8.1	none	10.7	none	0	none
M0428	7/21/04	7.9	none	0.0	none	observed	NSSB

¹ BDWF = broad whitefish, LSCS = least cisco, GRAY = Arctic grayling

² NSSB = ninespine stickleback

Table 3. Water chemistry parameters measured in conjunction with lake sampling in the Antigua Region, 2004.

Lake	Date	Water Temp (°C)	Dissolved Oxygen		Specific Conductance (microS/cm)	pH	Turbidity (NTU)	Ions ¹				Total Hardness [CaCO ₃] (mg/l)
			(mg/l)	(%)				Ca ⁺ (mg/l)	Mg ⁺ (mg/l)	Na ⁺ (mg/l)	Cl ⁻ (mg/l)	
M0421	not measured - lake too shallow for water withdrawal											
M0422	not measured - lake too shallow for water withdrawal											
M0423	7/18/04	12.2	10.55	95.9	167.0	8.10	0.6	30.4	2.6	3.9	10.0	87
M0424	7/21/04	10.7	10.30	93.3	190.8	8.09	0.1	34.1	3.1	3.3	13.8	98
M0425	7/18/04	12.0	10.46	97.1	140.7	8.00	1.1	22.6	1.7	2.0	7.0	63
M0426	7/22/04	10.5	11.13	99.6	260.7	8.14	0.9	44.6	4.8	7.8	28.2	131
M0427	7/22/04	13.1	9.55	90.9	193.6	8.12	0.5	38.5	2.6	3.0	9.1	107
M0428	7/21/04	12.3	10.05	93.5	214.3	8.12	0.8	38.1	3.8	4.5	11.1	111

¹ Ions:

Ca⁺ = Calcium

Mg⁺ = Magnesium

NA⁺ = Sodium

Cl⁻ = Chloride

Table 4. Estimated water volumes available for winter withdrawal from surveyed lakes in the Antigua Region, 2004.

(requested water based on 15% of winter volume deeper than 7 ft when sensitive species are present
50% of winter volume deeper than 5 ft when resistant or no fish are likely to be present)

Lake	Surface Area (acres)	Max. Depth (feet)	Calculated Volume (mil. gals)	Volume Under 4 ft of Ice (mil. gals)	30% of 5 ft Winter Volume (mil. gals)	15% of 7 ft Winter Volume (mil. gals)	Sensitive Fish Species Present¹	Resistant Fish Species Present²	Requested Water (mil. gals)
M0421	36.6	3.7	24.60	0.00	0.00	0.00	none	none	0.00
M0422	93.4	<3.0	not estimated	0.00	0.00	0.00	none	none	0.00
M0423	176.1	5.5	179.63	11.69	0.12	0.00	none	none	11.69
M0424	169.6	6.6	201.34	18.38	0.45	0.00	none	none	18.38
M0425	197.6	8.5	352.94	120.89	21.92	1.12	none	NSSB	21.92
M0426	43.9	3.4	26.53	0.00	0.00	0.00	none	none	0.00
M0427	220.0	6.2	297.61	52.68	3.37	0.00	none	none	52.68
M0428	79.6	5.1	72.46	2.43	0.00	0.00	none	NSSB	0.00

¹ Sensitive species include grayling, whitefishes, char, burbot, slimy sculpin, etc

² Resistant species are Alaska blackfish (BKFH) and ninespine stickleback (NSSB)

Table 5. Estimated area available for removing ice aggregate, based on the area covered by water shallower than 4 feet, for lakes surveyed in the Antigua Region, 2004.

Lake Name	Surface Area (acres)	Maximum Depth (feet)	Acres covered by Water shallower than 4 feet
M0421	36.6	3.7	36.6
M0422	93.4	less than 3	93.4
M0423	176.1	5.5	93.1
M0424	169.6	6.6	61.9
M0425	197.6	8.5	39.3
M0426	43.9	3.4	43.9
M0427	220.0	6.2	60.1
M0428	79.6	5.1	57.3

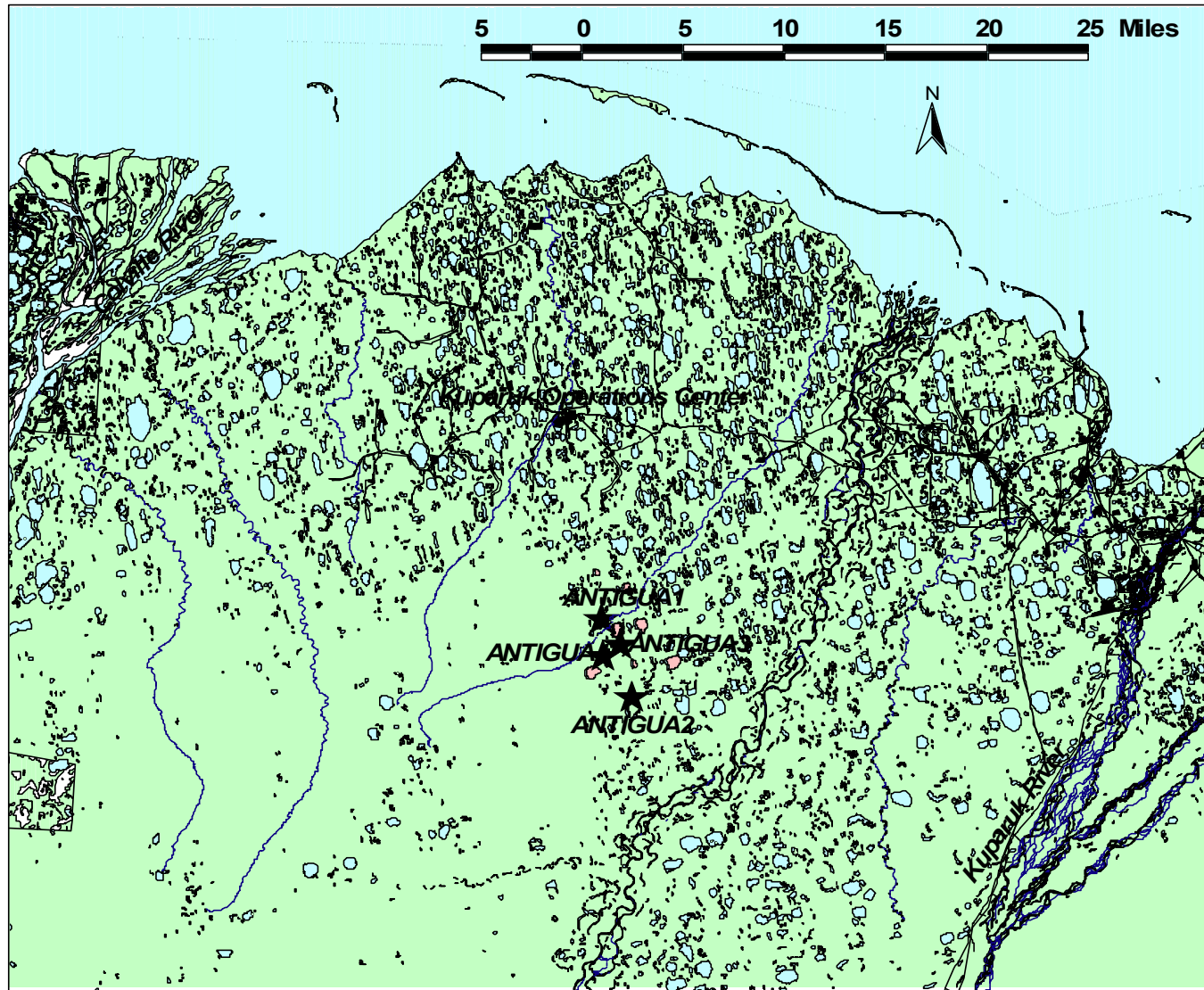
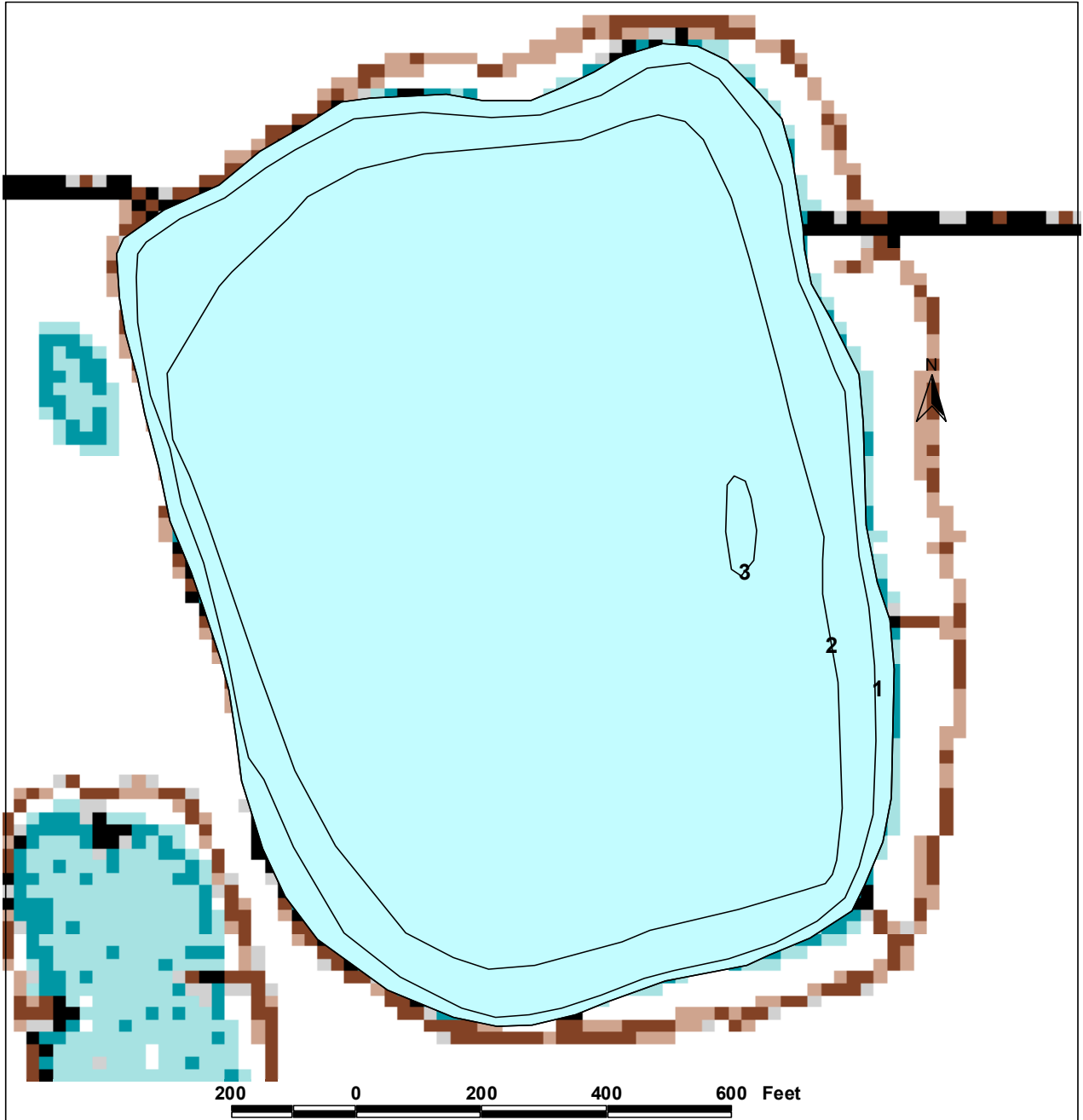


Figure 1. Location of Antigua prospect in relation to the Kuparuk and Colville rivers.

Lake Summaries



Depth contours of lake M0421, based on transects surveyed on August 22, 2004
(depth intervals in 1 foot increments)

Lake M0421

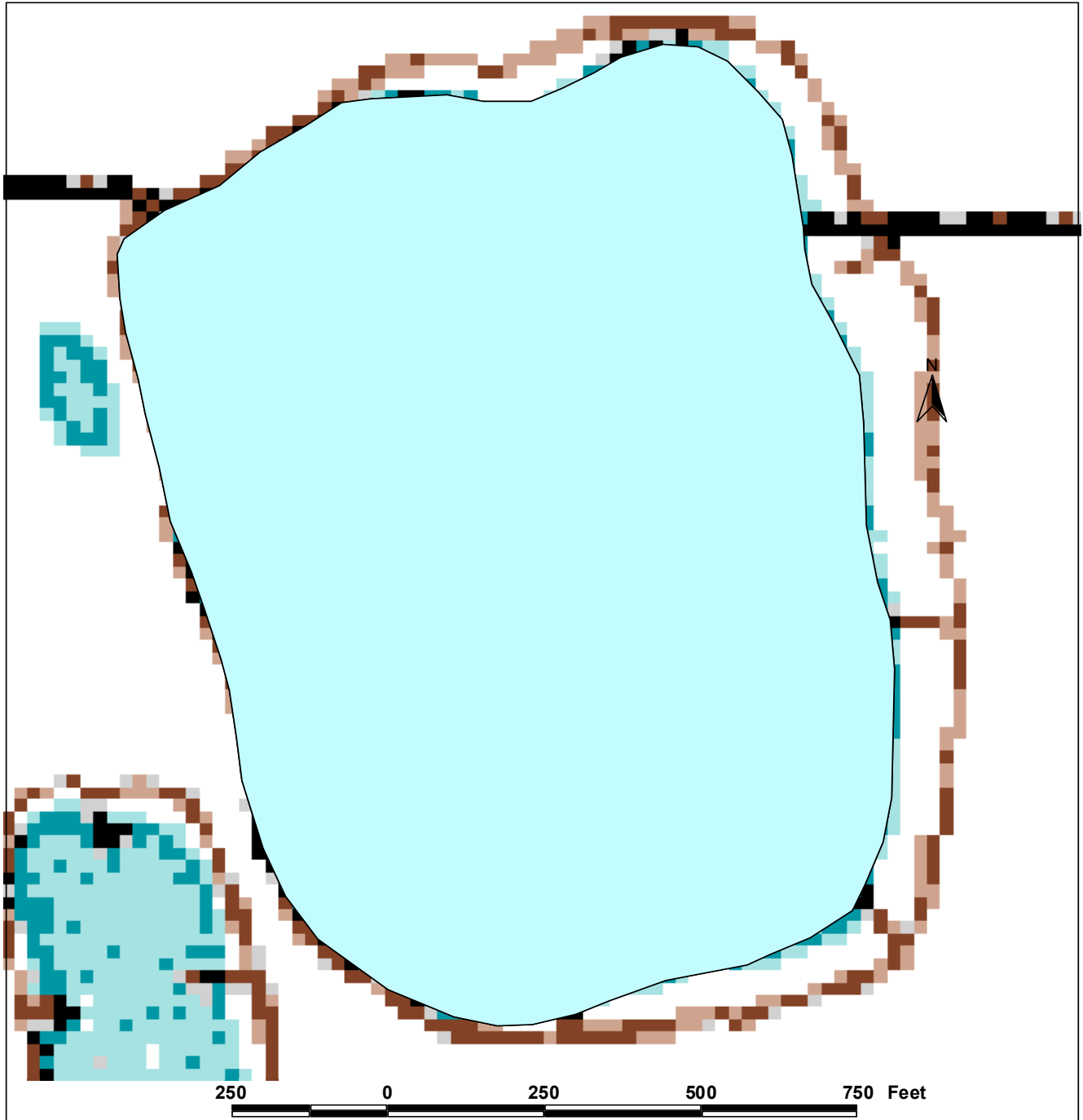
Other Names:
Location: 70.21198°N 149.53661°W
USGS Quad Sheet: Beechey Pt A-5: T10N R10E Sec. 14/23
Habitat: Tundra Lake
Area: 36.6 acres
Maximum Depth: 3.7 feet
Active Outlet: No
Calculated Volume: 24.60 million gallons
Permittable Volume: 0.0 million gallons
Potential Aggregate: 36.6 acres (water depth 4 ft or less)

Water Chemistry:

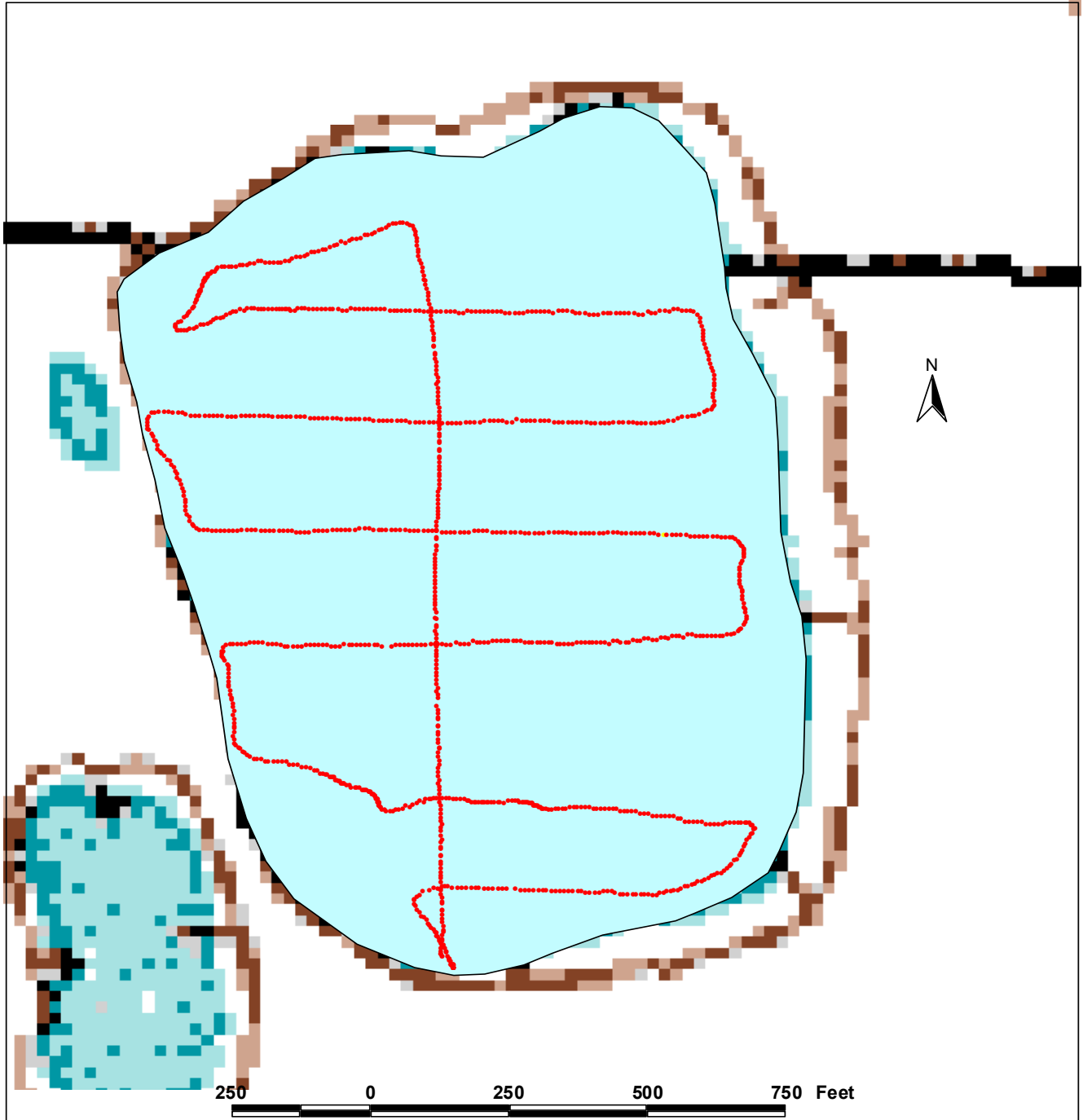
Year	Calcium	Magnesium	Chloride	Sodium	Total Hardness	Specific Conductance	Turbidity	pH	Source
of	(mg/l)	(mg/l)	(mg/l)	(mg/l)	[CaCO ₃]	(microS/cm)	(NTU)		
Test					(mg/l)				
not sampled, too shallow									

Catch Record:

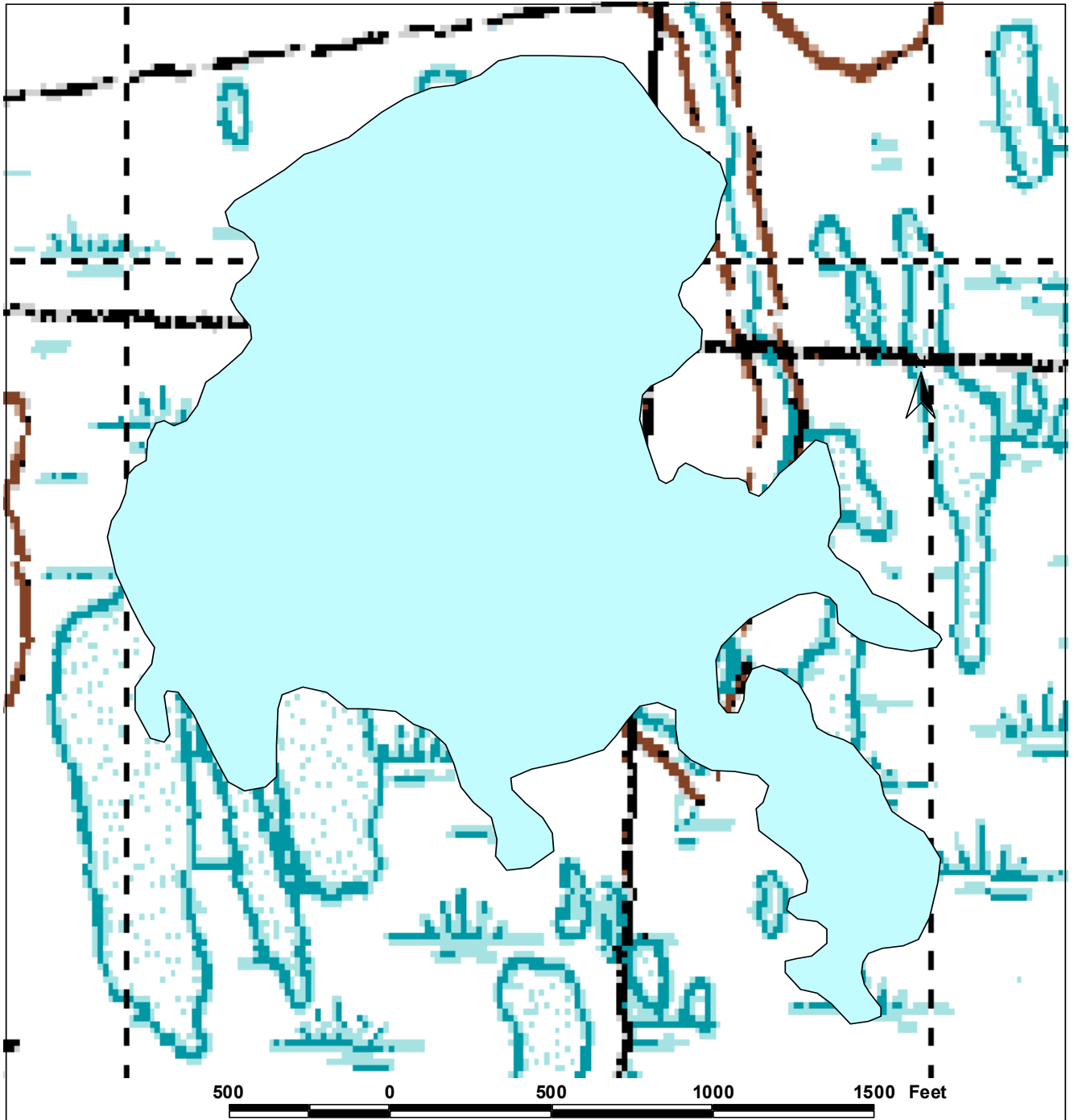
Gear	Date	Effort (hours)	Species	Number Caught
not sampled, too shallow				



Lake M0421 was less than 4 ft deep when visited on August 22, 2004
and is available for ice chips,



Depth transects surveyed at lake M0421 on August 22, 2004.



Depth transects were not surveyed at lake M0422;
the lake was less than 3 feet deep when visited on July 22, 2004.

Lake M0422

Other Names:

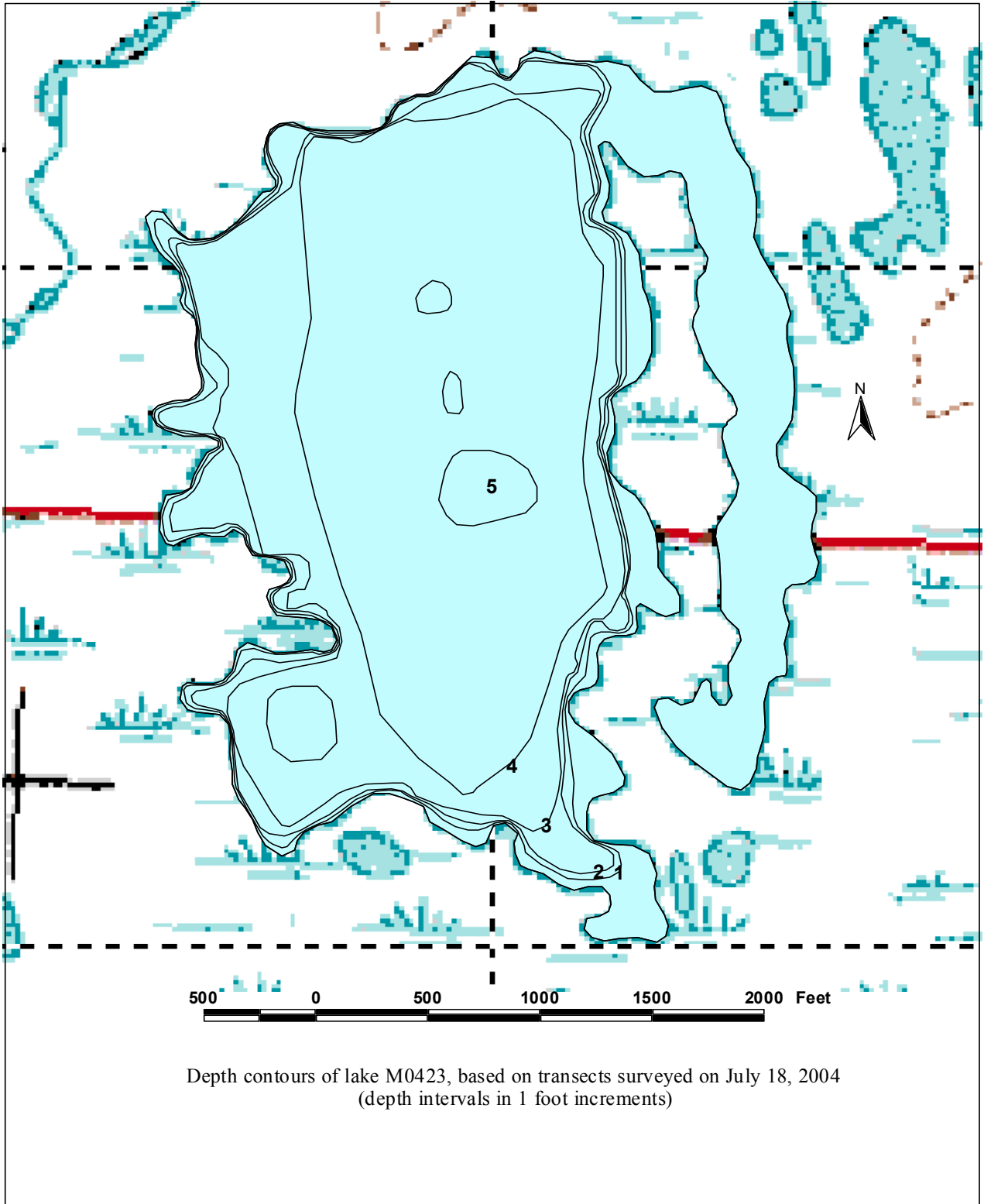
Location: 70.20168°N 149.47208°W
USGS Quad Sheet: Beechey Pt A-5: T10N R10E Sec. 24
Habitat: Tundra Lake
Area: 93.4 acres
Maximum Depth: less than 3 feet
Active Outlet: No
Calculated Volume: not estimated
Permittable Volume: 0.0 million gallons
Potential Aggregate: 93.4 acres (water depth 4 ft or less)

Water Chemistry:

Year	Calcium	Magnesium	Chloride	Sodium	Total	Specific	Turbidity	pH	Source
of	(mg/l)	(mg/l)	(mg/l)	(mg/l)	Hardness	Conductance	(NTU)		
Test					[CaCO ₃]	(microS/cm)			
not sampled, too shallow									

Catch Record:

Gear	Date	Effort	Species	Number
		(hours)		Caught
not sampled, too shallow				



Depth contours of lake M0423, based on transects surveyed on July 18, 2004
(depth intervals in 1 foot increments)

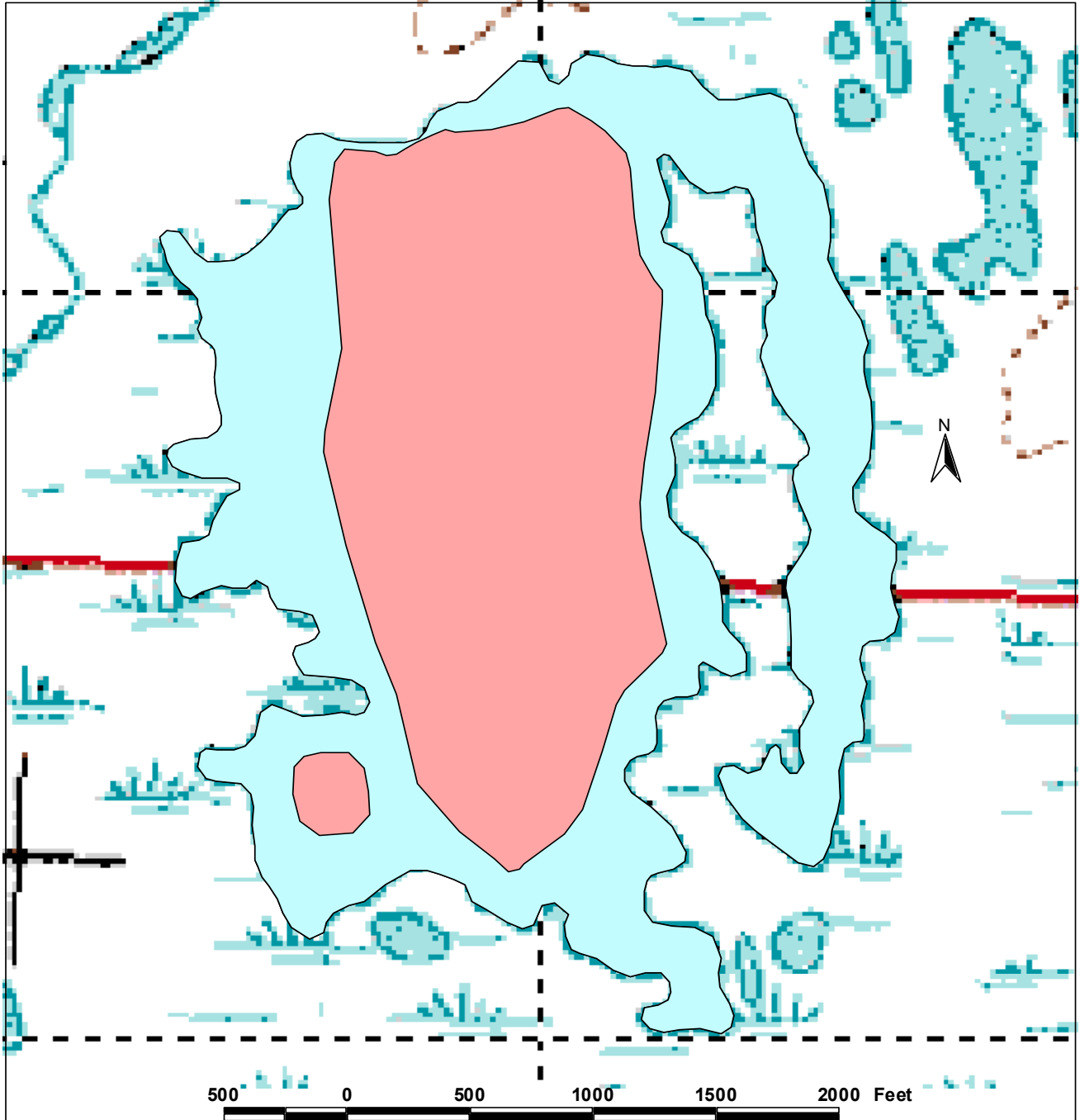
Lake M0423

Other Names:**Location:** 70.17087°N 149.48807°W**USGS Quad Sheet:** Beechey Pt A-5: T9/10N R10E Sec. 1/36**Habitat:** Tundra Lake**Area:** 176.1 acres**Maximum Depth:** 5.5 feet**Active Outlet:** No**Calculated Volume:** 179.63 million gallons**Permittable Volume** 11.69 million gallons**Potential Aggregate** 93.1 acres (water depth 4 ft or less)**Water Chemistry:**

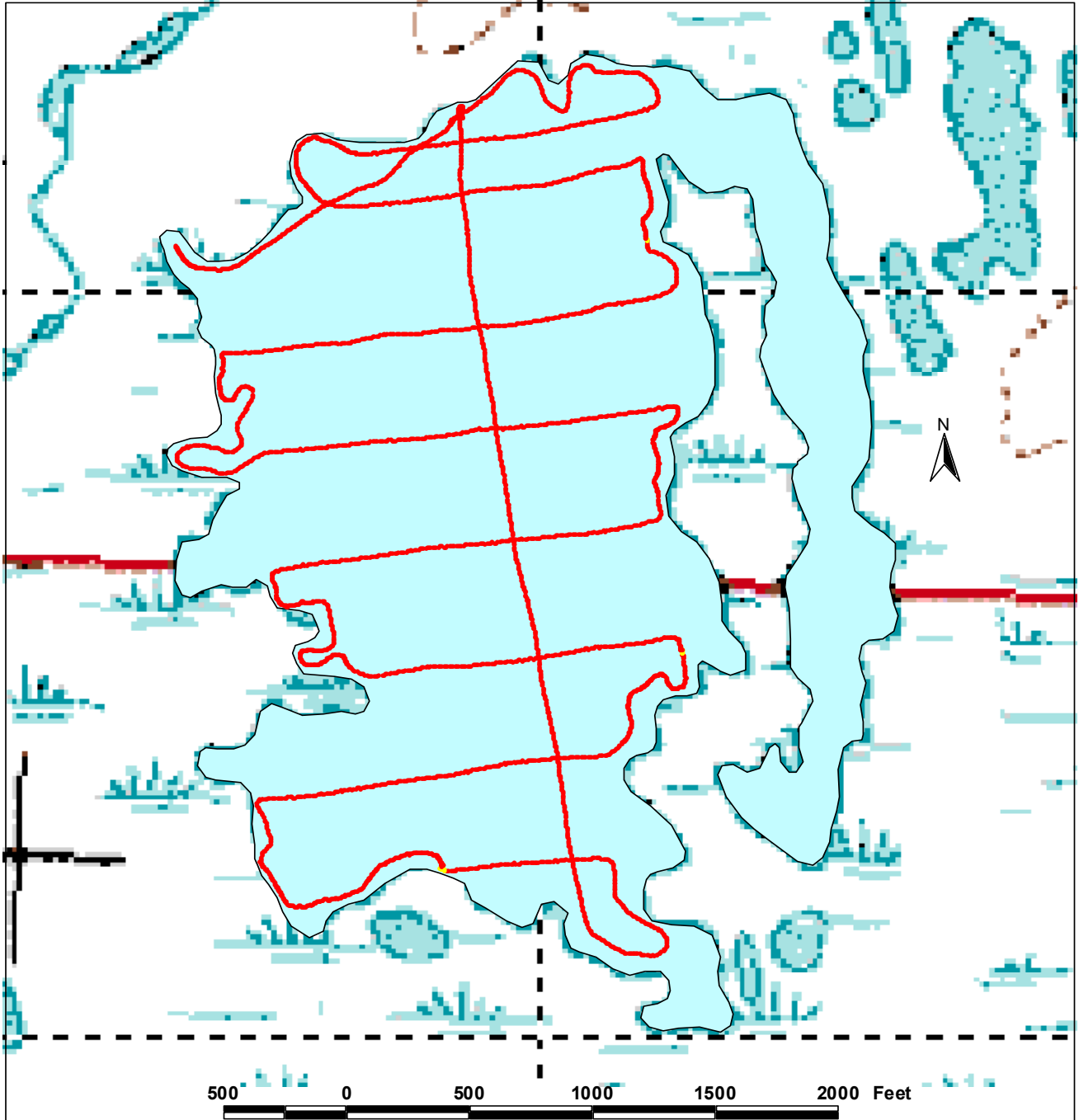
Year of Test	Calcium (mg/l)	Magnesium (mg/l)	Chloride (mg/l)	Sodium (mg/l)	Total Hardness [CaCO ₃] (mg/l)	Specific Conductance (microS/cm)	Turbidity (NTU)	pH	Source
2004	30.4	2.6	10.0	3.9	87	167	0.6	8.10	This Study

Catch Record:

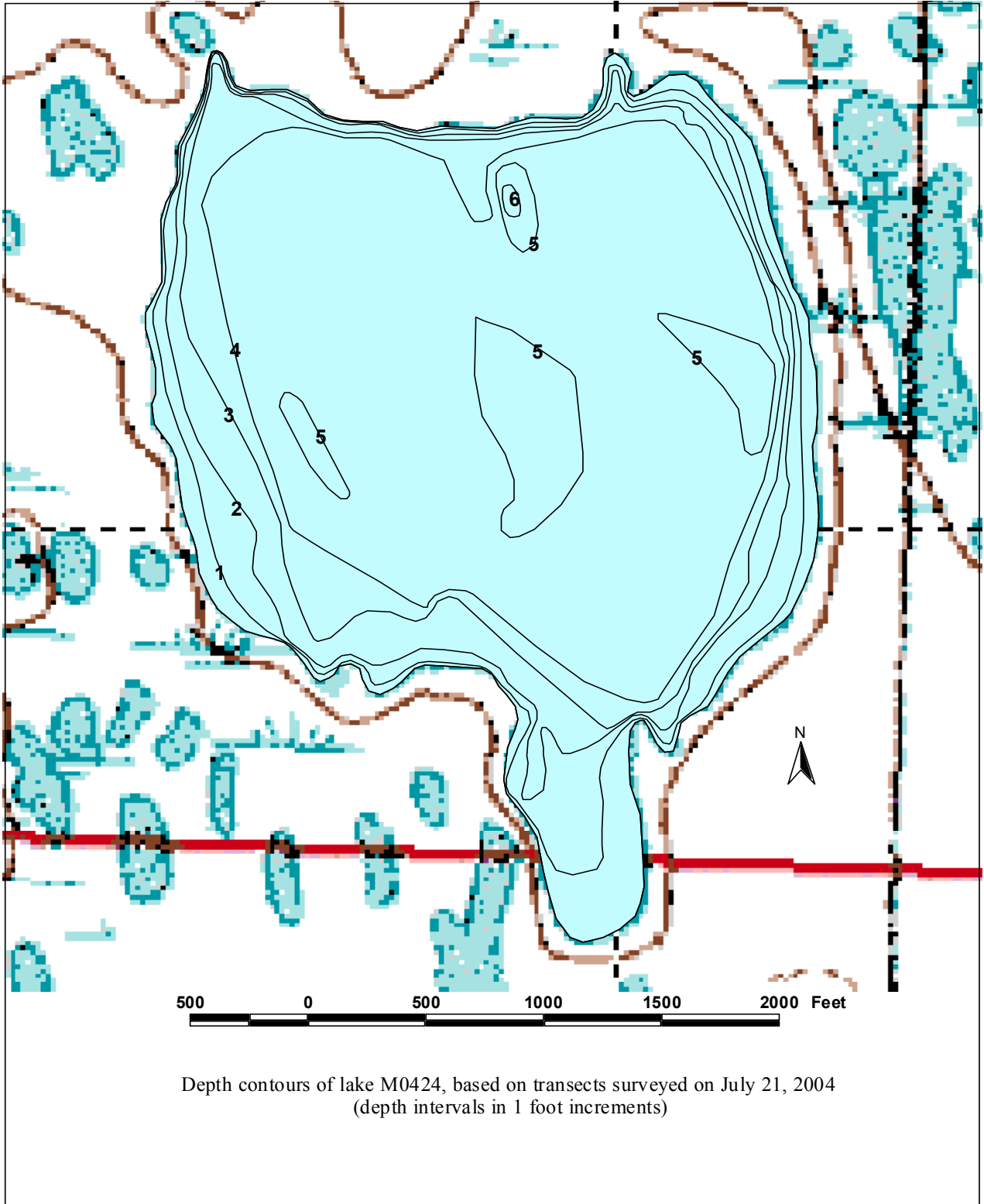
Gear	Date	Effort (hours)	Species	Number Caught
Gill Net	Jul 18 04	8.7	None	0
Minnow trap	Jul 18 04	12.1	None	0
Seine	Jul 18 04	3 hauls	None	0



Regions of lake M043 less than 4 ft deep (light shaded), and likely to be available for ice chips, based on transects surveyed on July 18, 2004



Depth transects surveyed at lake M0423 on July 18, 2004.



Lake M0424

Other Names:

Location: 70.17564°N 149.43825°W

USGS Quad Sheet: Beechey Pt A-5: T10N R11E Sec. 31

Habitat: Tundra Lake

Area: 169.6 acres

Maximum Depth: 6.6 feet

Active Outlet: No

Calculated Volume: 201.34 million gallons

Permittable Volume: 18.38 million gallons

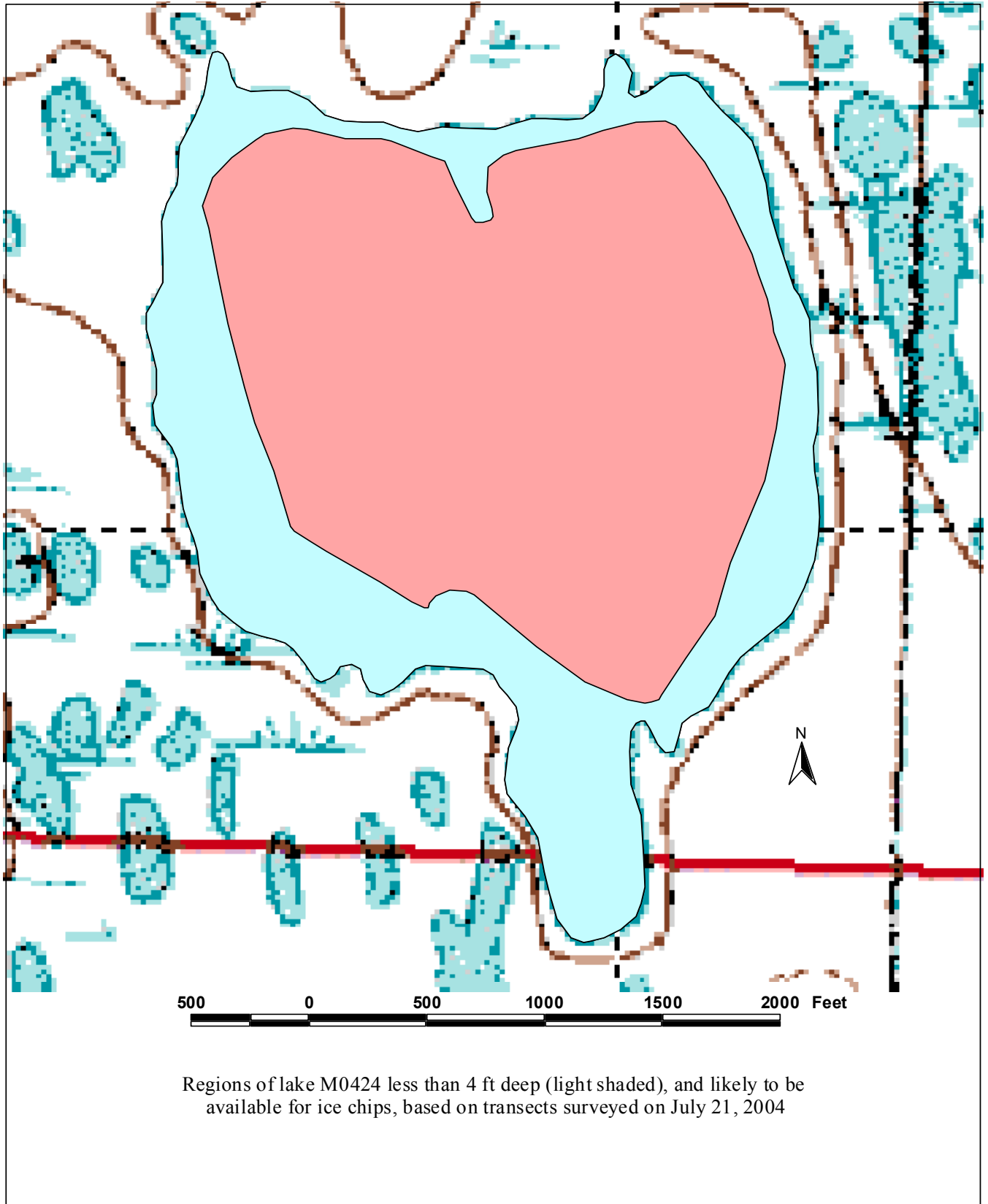
Potential Aggregate: 61.9 acres (water depth 4 ft or less)

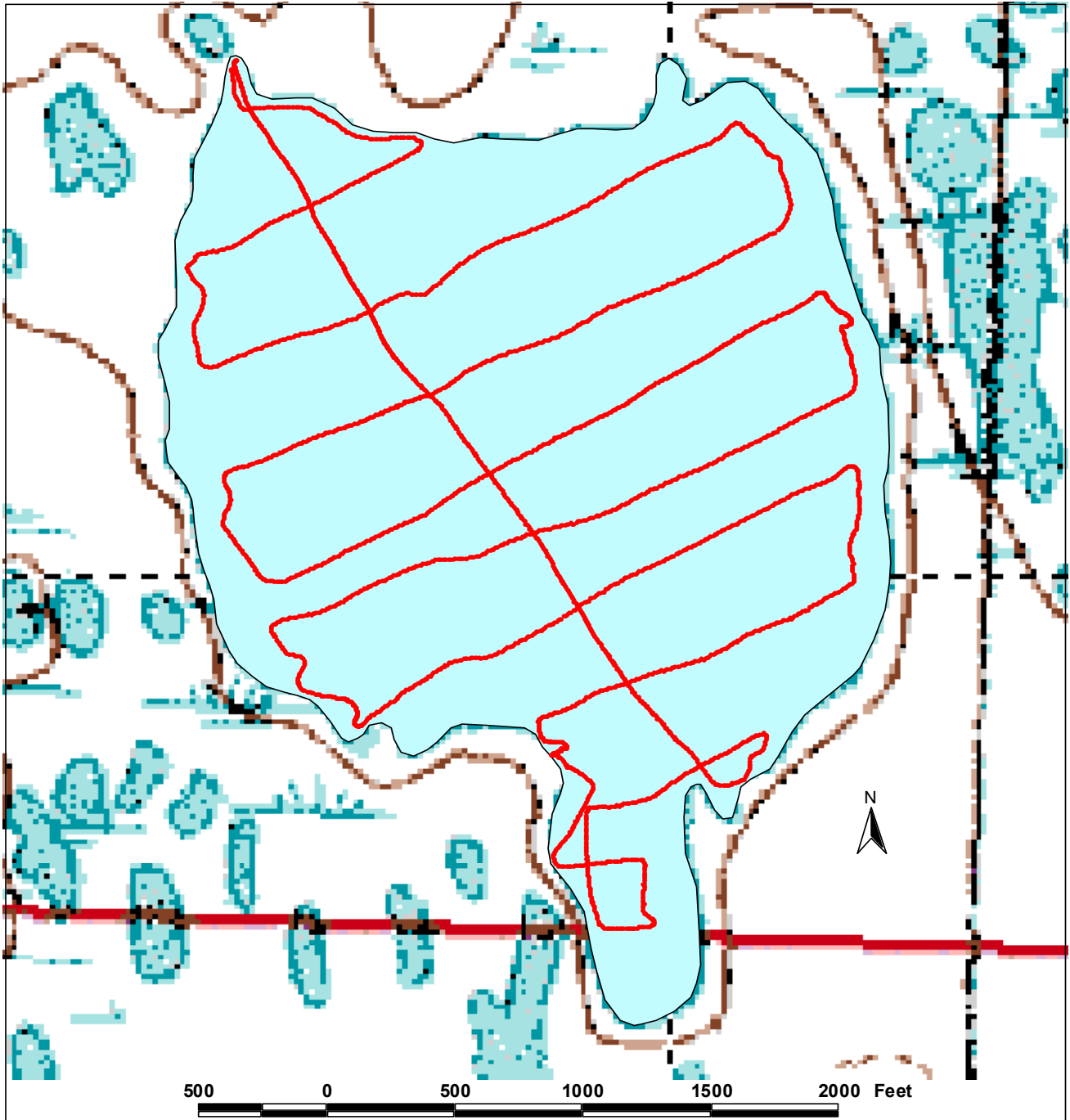
Water Chemistry:

Year of Test	Calcium (mg/l)	Magnesium (mg/l)	Chloride (mg/l)	Sodium (mg/l)	Total Hardness [CaCO ₃] (mg/l)	Specific Conductance (microS/cm)	Turbidity (NTU)	pH	Source
2004	34.1	3.1	13.8	3.3	98	191	0.1	8.09	This Study

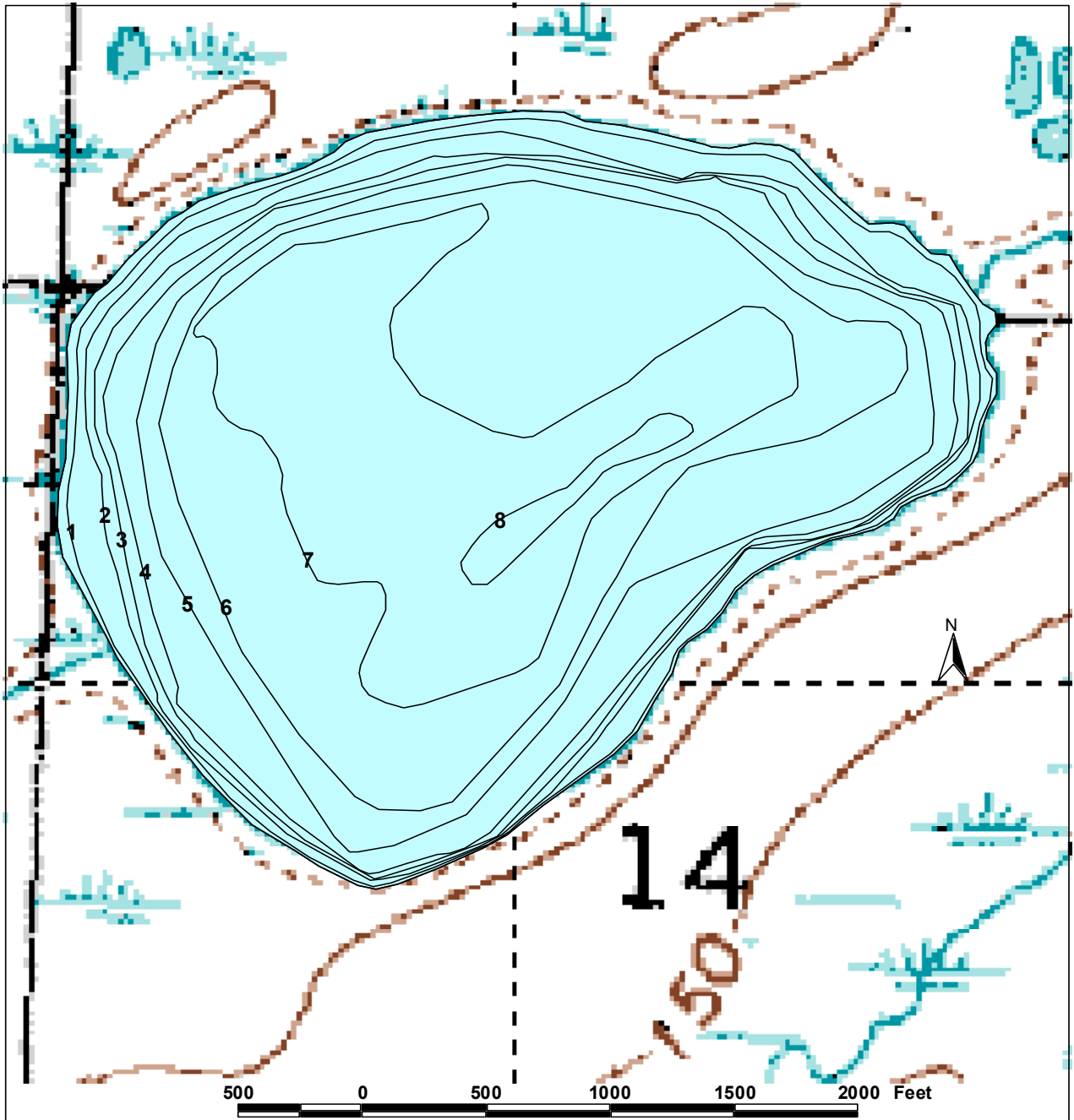
Catch Record:

Gear	Date	Effort (hours)	Species	Number Caught
Gill Net	Jul 21 04	9.5	None	0
Minnow trap	Jul 21 04	10.7	None	0
Seine	Jul 21 04	4 hauls	None	0





Depth transects surveyed at lake M0424 on July 21, 2004.



Depth contours of lake M0425, based on transects surveyed on July 18, 2004
(depth intervals in 1 foot increments)

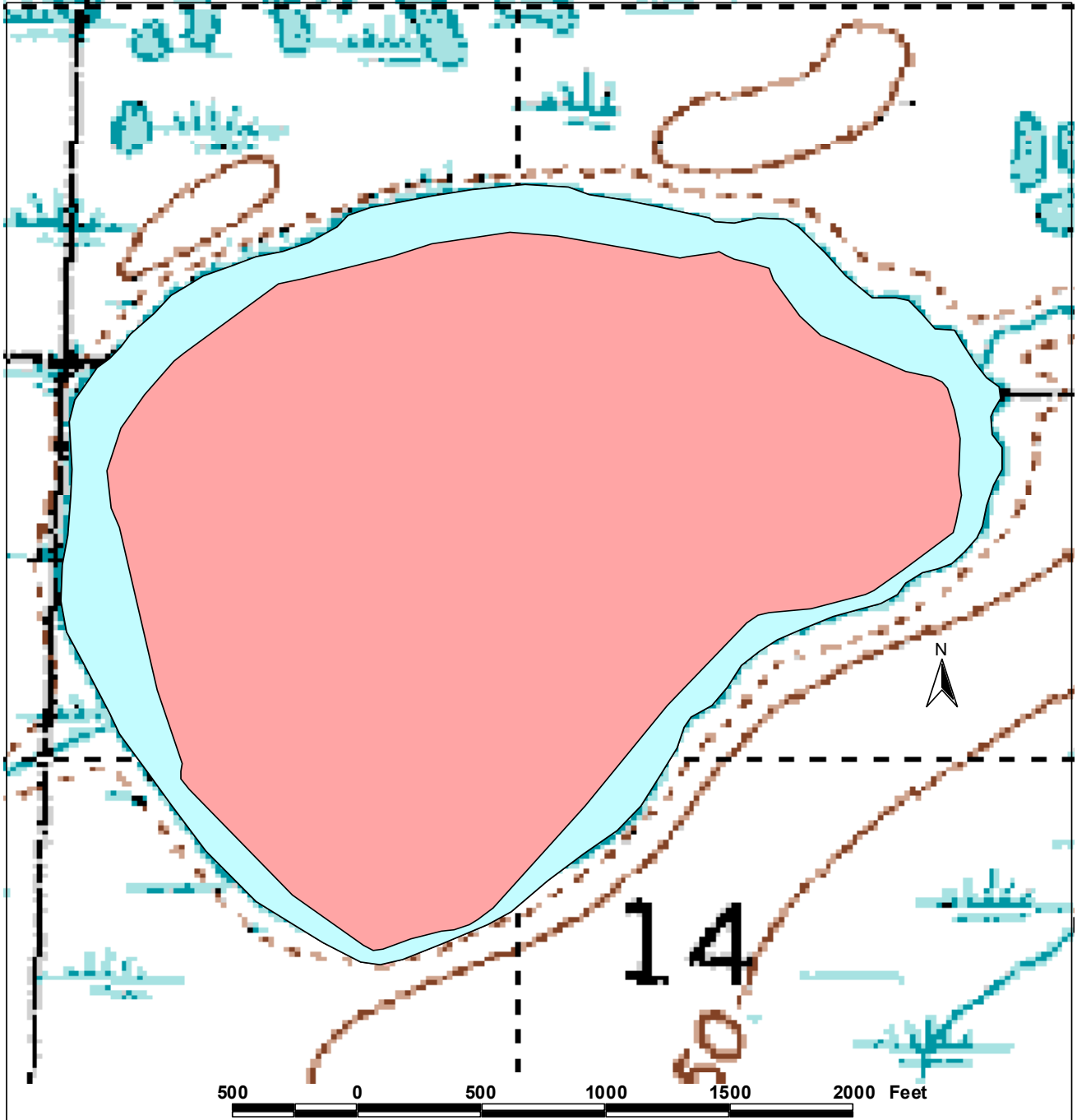
Lake M0425

Other Names:**Location:** 70.13957°N 149.53661°W**USGS Quad Sheet:** Beechey Pt A-5: T9N R10E Sec. 11/14**Habitat:** Tundra Lake**Area:** 197.6 acres**Maximum Depth:** 8.5 feet**Active Outlet:** No**Calculated Volume:** 352.94 million gallons**Permittable Volume:** 21.92 million gallons**Potential Aggregate:** 39.3 acres (water depth 4 ft or less)**Water Chemistry:**

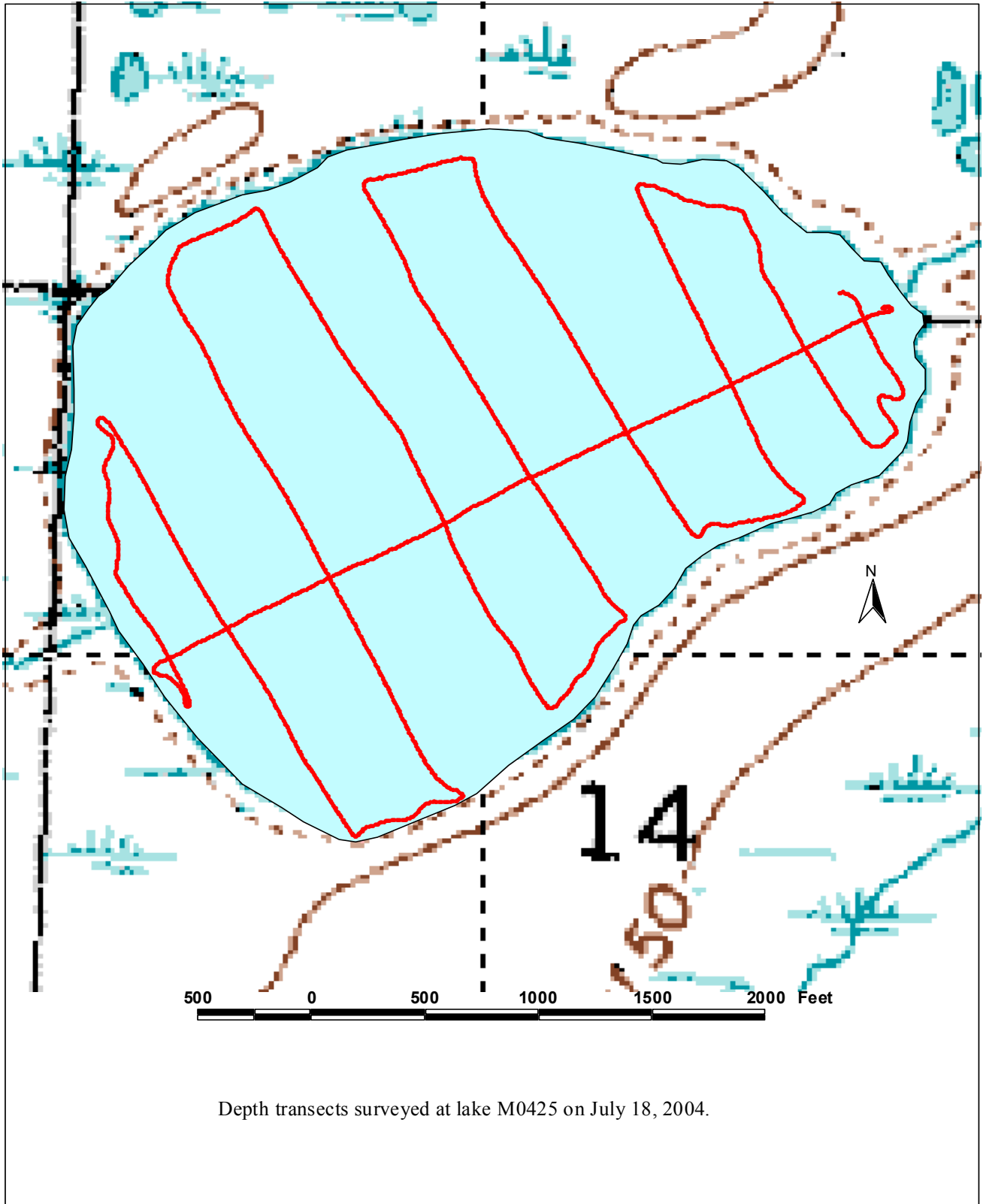
Year of Test	Calcium (mg/l)	Magnesium (mg/l)	Chloride (mg/l)	Sodium (mg/l)	Total Hardness [CaCO ₃] (mg/l)	Specific Conductance (microS/cm)	Turbidity (NTU)	pH	Source
2004	22.6	1.7	7.0	2.0	63	141	1.1	8.00	This Study

Catch Record:

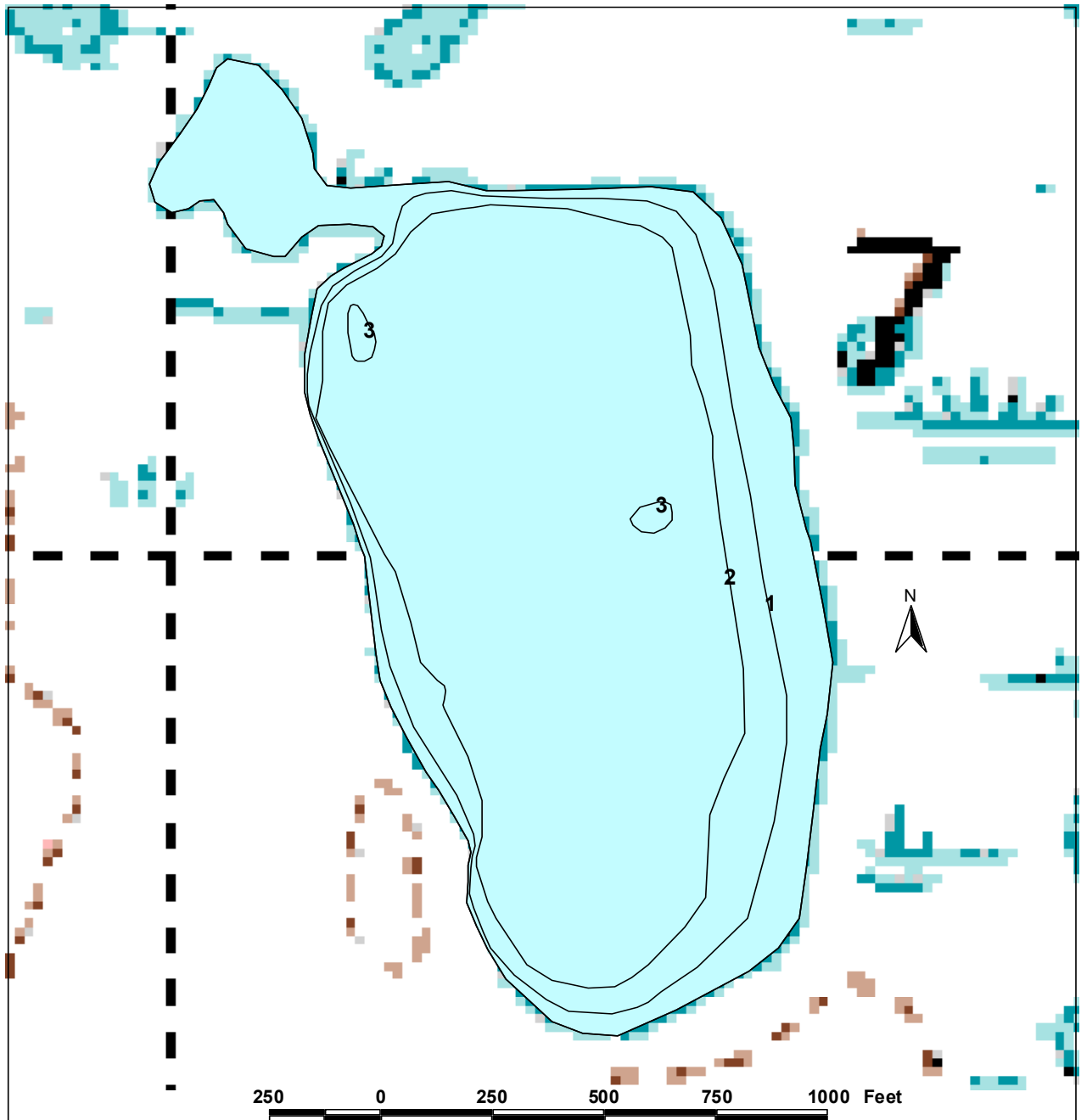
Gear	Date	Effort (hours)	Species	Number Caught
Gill Net	Jul 18 04	9.3	None	0
Minnow trap	Jul 18 04	7.7	Ninespine stickleback	15
Seine		0 hauls		



Regions of lake M0425 less than 4 ft deep (light shaded), and likely to be available for ice chips, based on transects surveyed on July 18, 2004



Depth transects surveyed at lake M0425 on July 18, 2004.



Depth contours of lake M0426, based on transects surveyed on July 22, 2004
(depth intervals in 1 foot increments)

Lake M0426

Other Names:

Location: 70.14684°N 149.44952°W

USGS Quad Sheet: Beechey Pt A-5: T9N R11E Sec. 7

Habitat: Tundra Lake

Area: 43.9 acres

Maximum Depth: 3.4 feet

Active Outlet: No

Calculated Volume: 26.53 million gallons

Permittable Volume: 0.00 million gallons

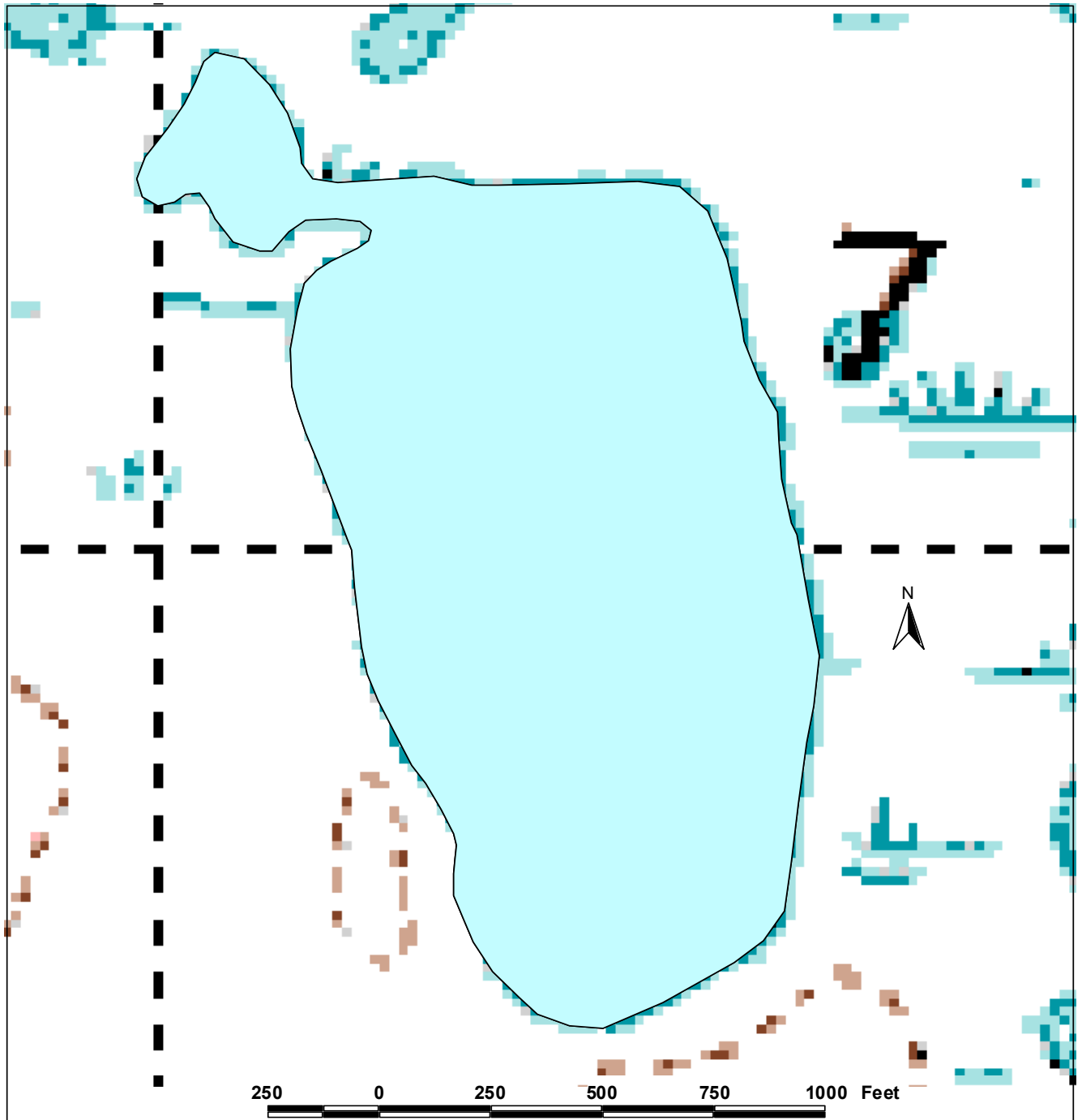
Potential Aggregate: 43.9 acres (water depth 4 ft or less)

Water Chemistry:

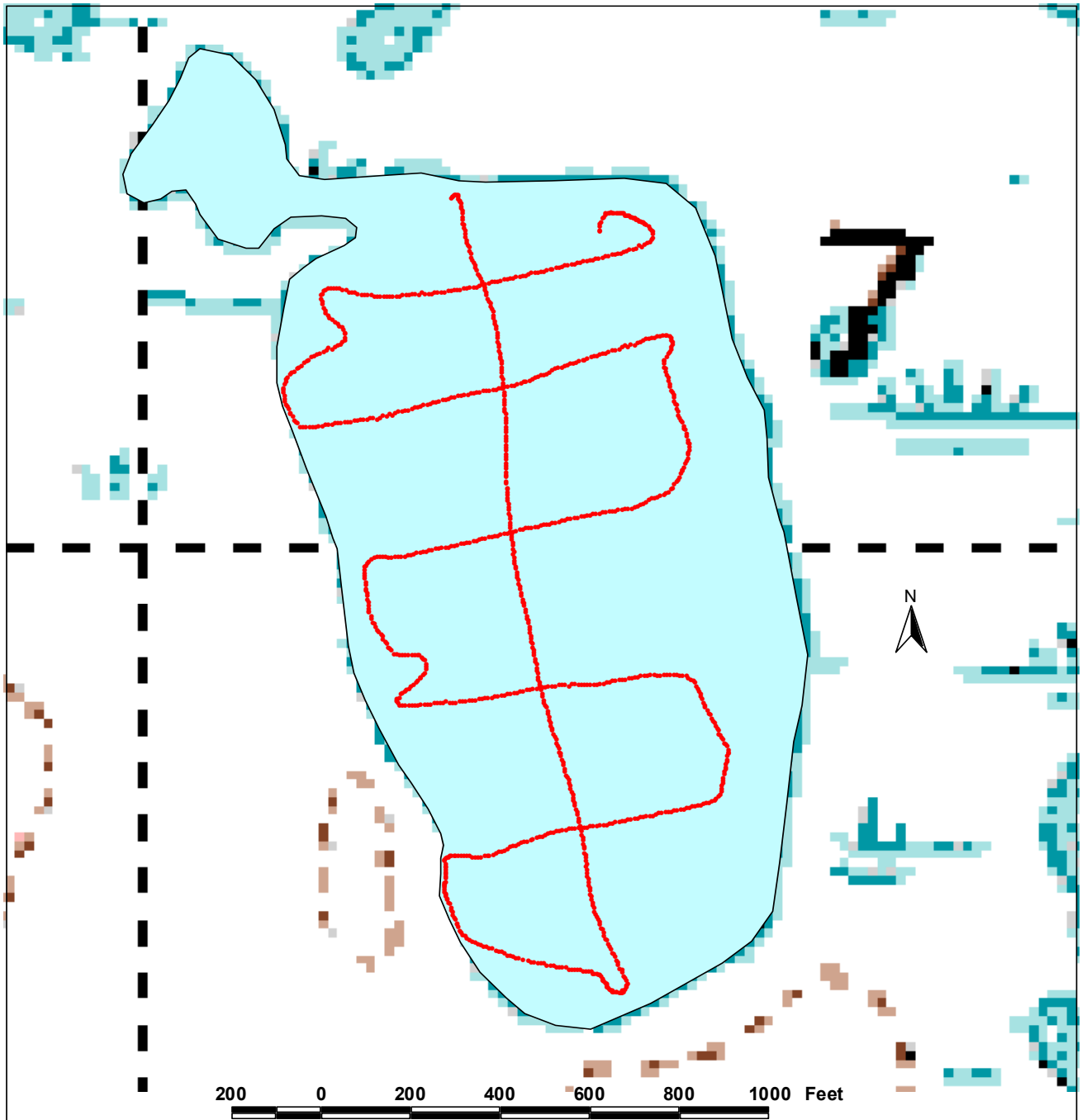
Year of Test	Calcium (mg/l)	Magnesium (mg/l)	Chloride (mg/l)	Sodium (mg/l)	Total Hardness [CaCO ₃] (mg/l)	Specific Conductance (microS/cm)	Turbidity (NTU)	pH	Source
2004	44.6	4.8	28.2	7.8	131	261	0.9	8.14	This Study

Catch Record:

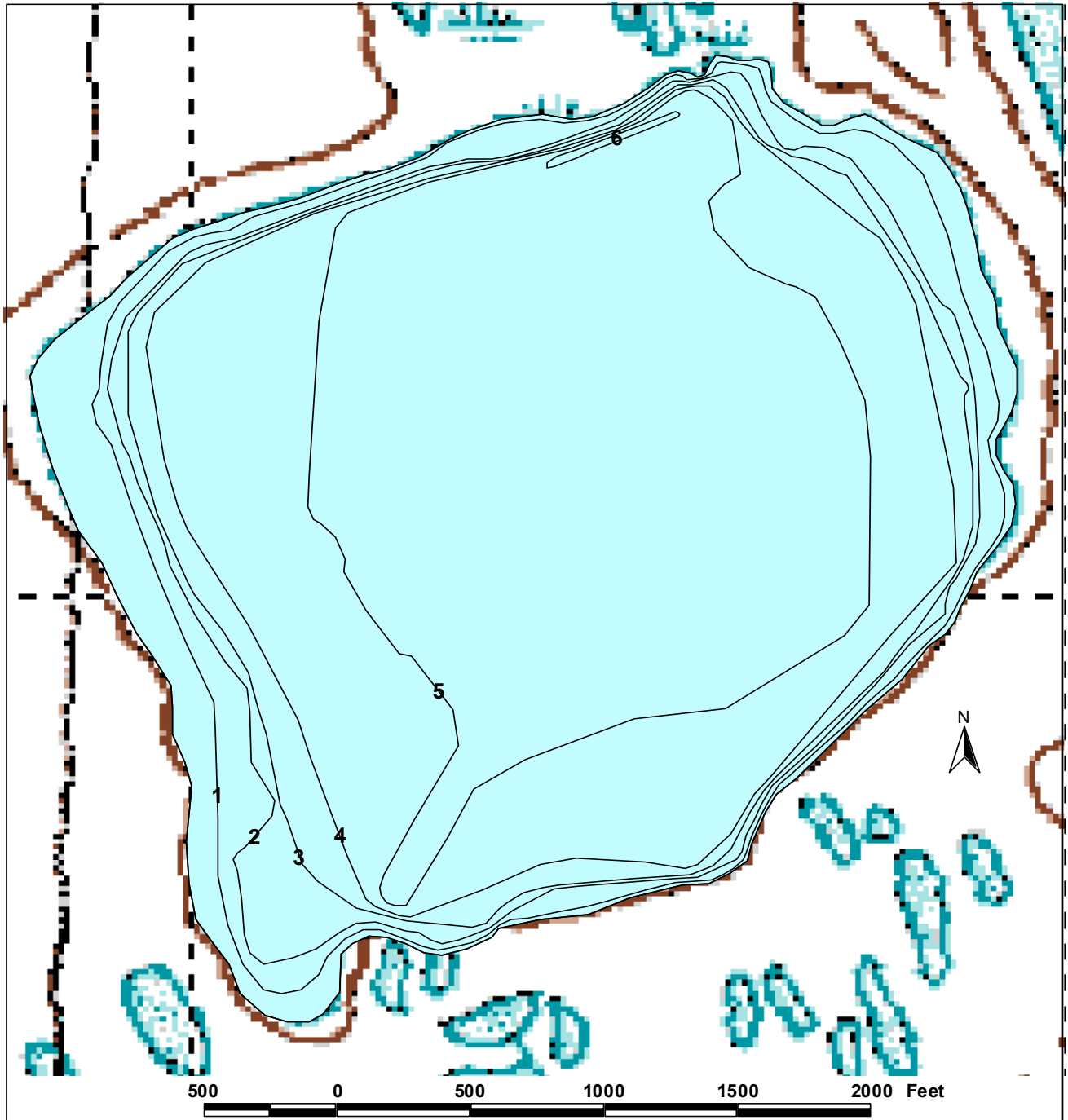
Gear	Date	Effort (hours)	Species	Number Caught
Gill Net	Jul 22 04	8.4	none	0
Minnow trap	Jul 22 04	11.3	none	0
Seine	Jul 22 04	3 hauls	none	0



Lake M0426 was less than 4 ft deep when visited on July 22, 2004
and is available for ice chips,



Depth transects surveyed at lake M0426 on July 22, 2004.



Depth contours of lake M0427, based on transects surveyed on July 22, 2004
(depth intervals in 1 foot increments)

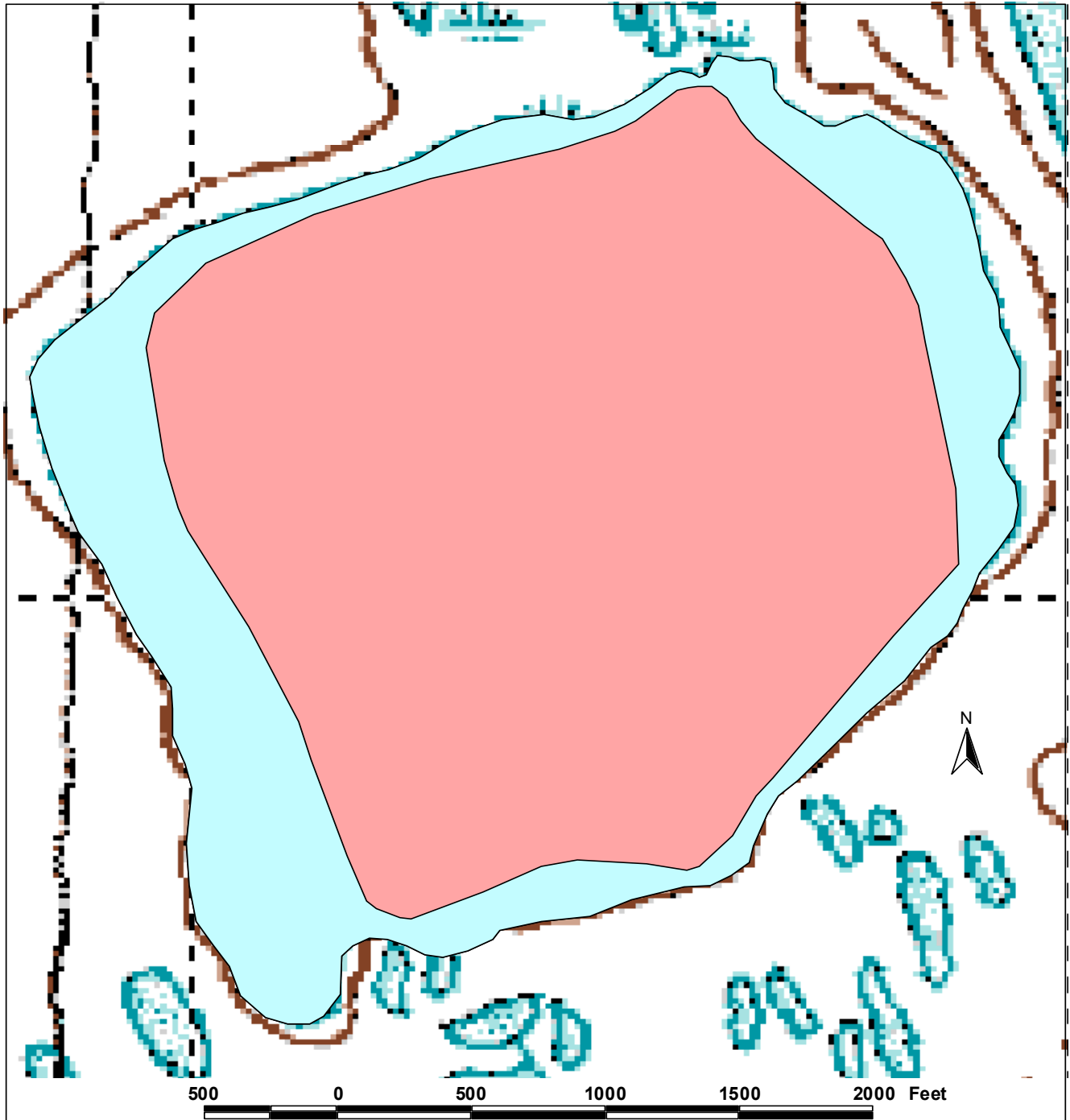
Lake M0427

Other Names:**Location:** 70.14901°N 149.36730°W**USGS Quad Sheet:** Beechey Pt A-4: T9N R11E Sec. 9**Habitat:** Tundra Lake**Area:** 220.0 acres**Maximum Depth:** 6.2 feet**Active Outlet:** No**Calculated Volume:** 297.61 million gallons**Permittable Volume:** 52.68 million gallons**Potential Aggregate** 60.1 acres (water depth 4 ft or less)**Water Chemistry:**

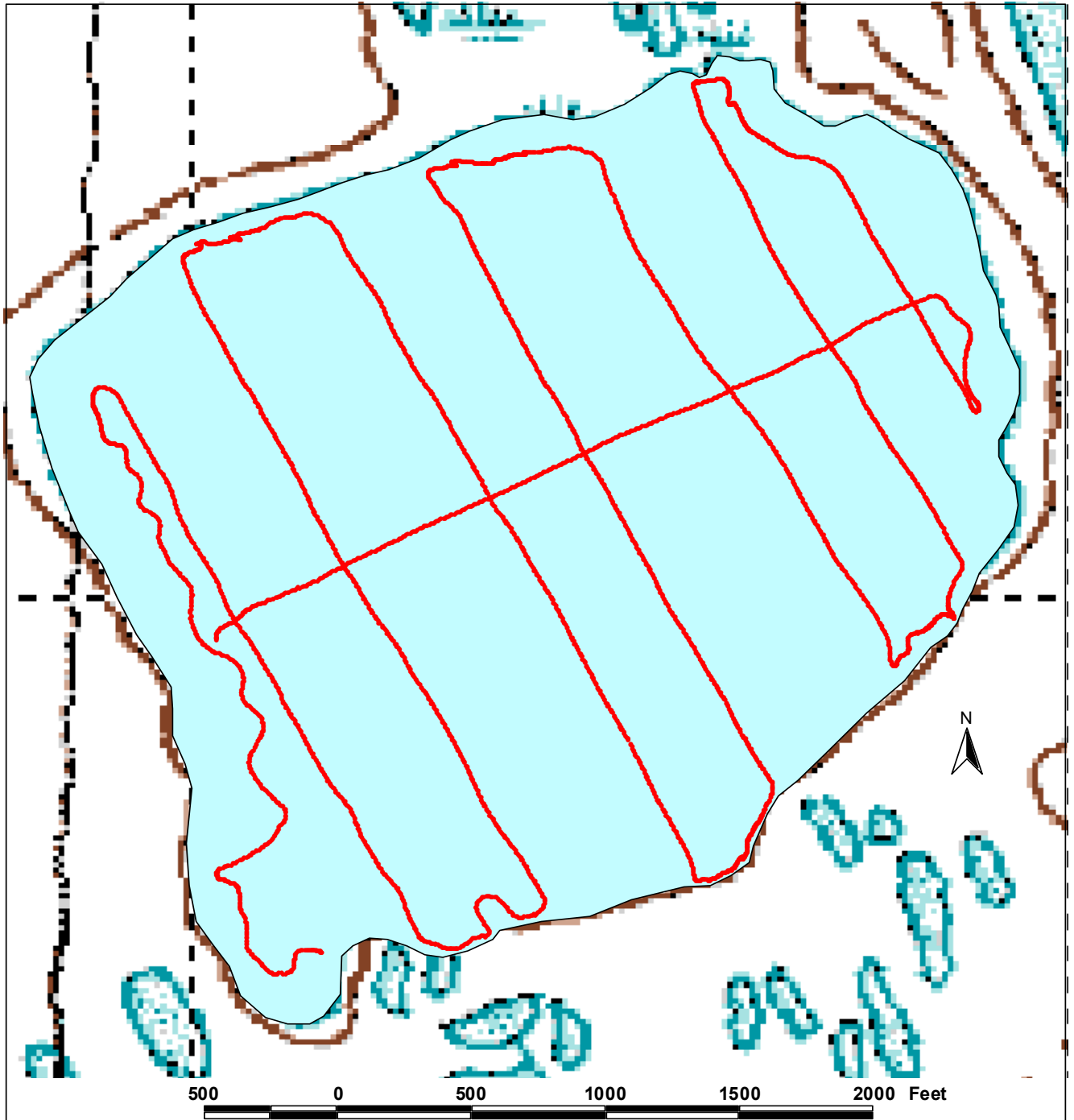
Year of Test	Calcium (mg/l)	Magnesium (mg/l)	Chloride (mg/l)	Sodium (mg/l)	Total Hardness [CaCO ₃] (mg/l)	Specific Conductance (microS/cm)	Turbidity (NTU)	pH	Source
2004	38.5	2.6	9.1	3.0	107	194	0.5	8.12	This Study

Catch Record:

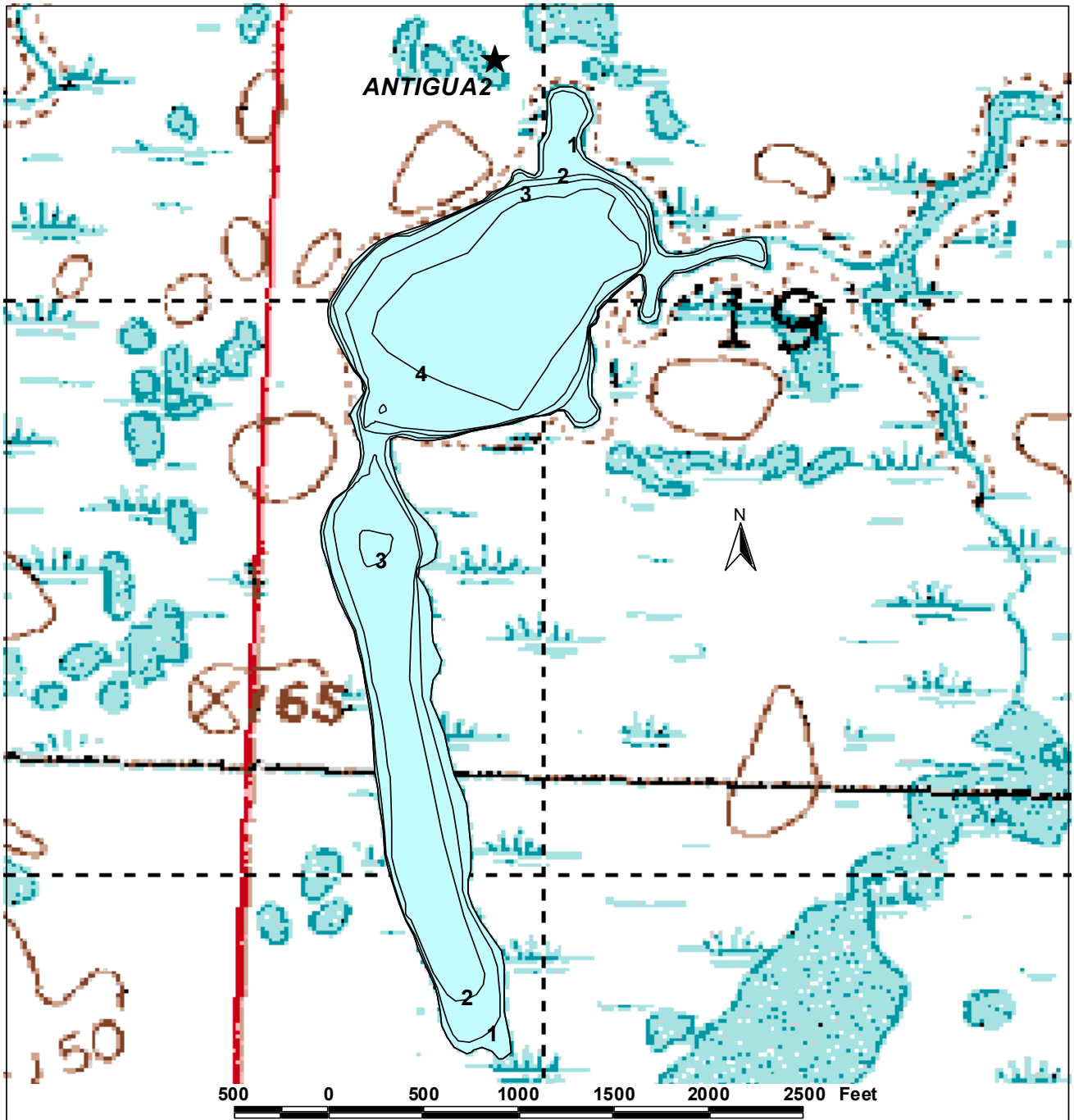
Gear	Date	Effort (hours)	Species	Number Caught
Gill Net	Jul 22 04	8.1	none	0
Minnow trap	Jul 22 04	10.7	none	0
Seine		0 hauls		



Regions of lake M0427 less than 4 ft deep (light shaded), and likely to be available for ice chips, based on transects surveyed on July 22, 2004



Depth transects surveyed at lake M0427 on July 22, 2004.



Depth contours of lake M0428, based on transects surveyed on July 21, 2004
 (depth intervals in 1 foot increments)

Lake M0428

Other Names:

Location: 70.11976°N 149.45649°W

USGS Quad Sheet: Beechey Pt A-5: T9N R11E Sec. 19

Habitat: Tundra Lake

Area: 79.6 acres

Maximum Depth: 5.1 feet

Active Outlet: No

Calculated Volume: 72.46 million gallons

Permittable Volume: 0.00 million gallons

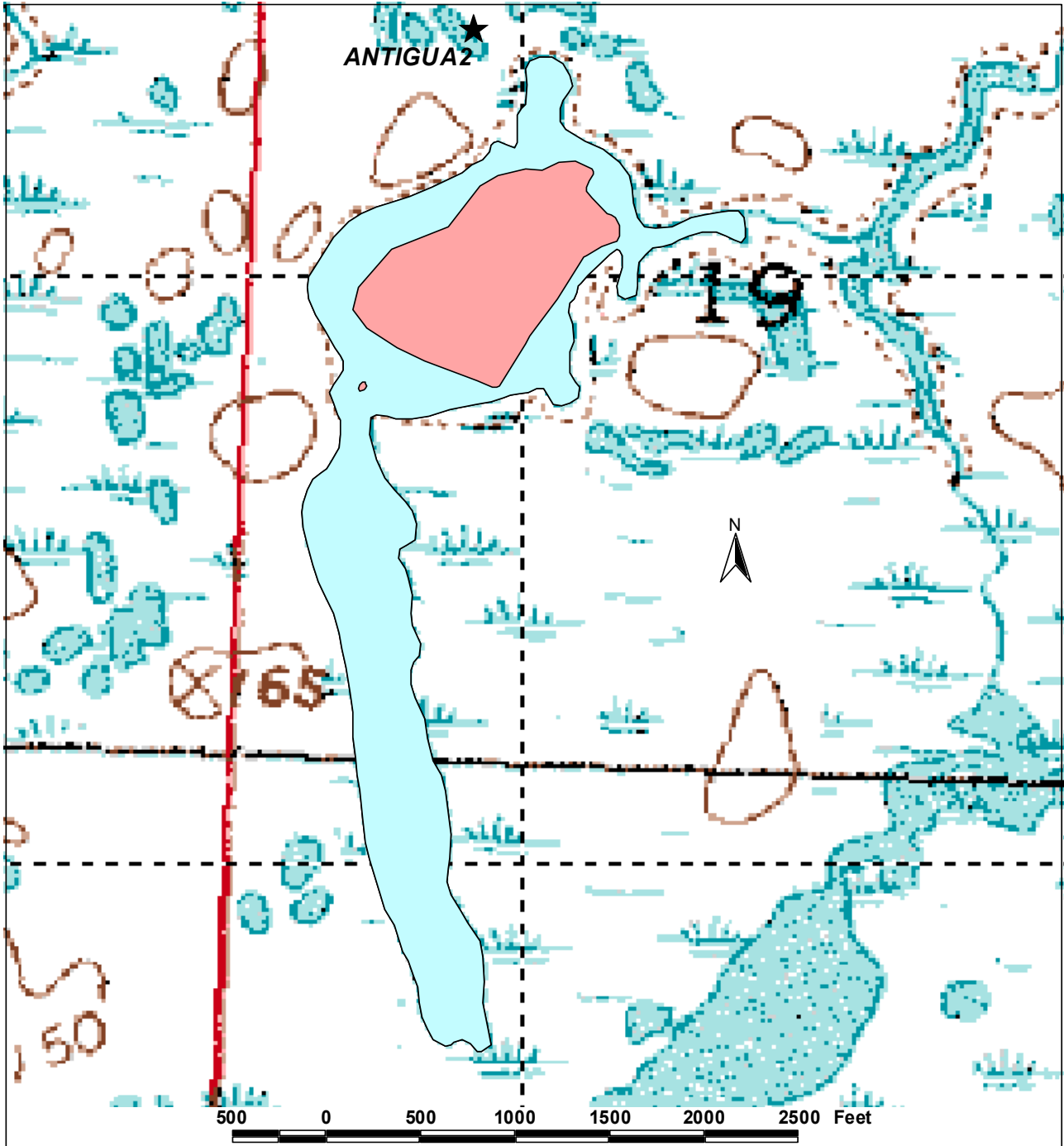
Potential Aggregate: 57.3 acres (water depth 4 ft or less)

Water Chemistry:

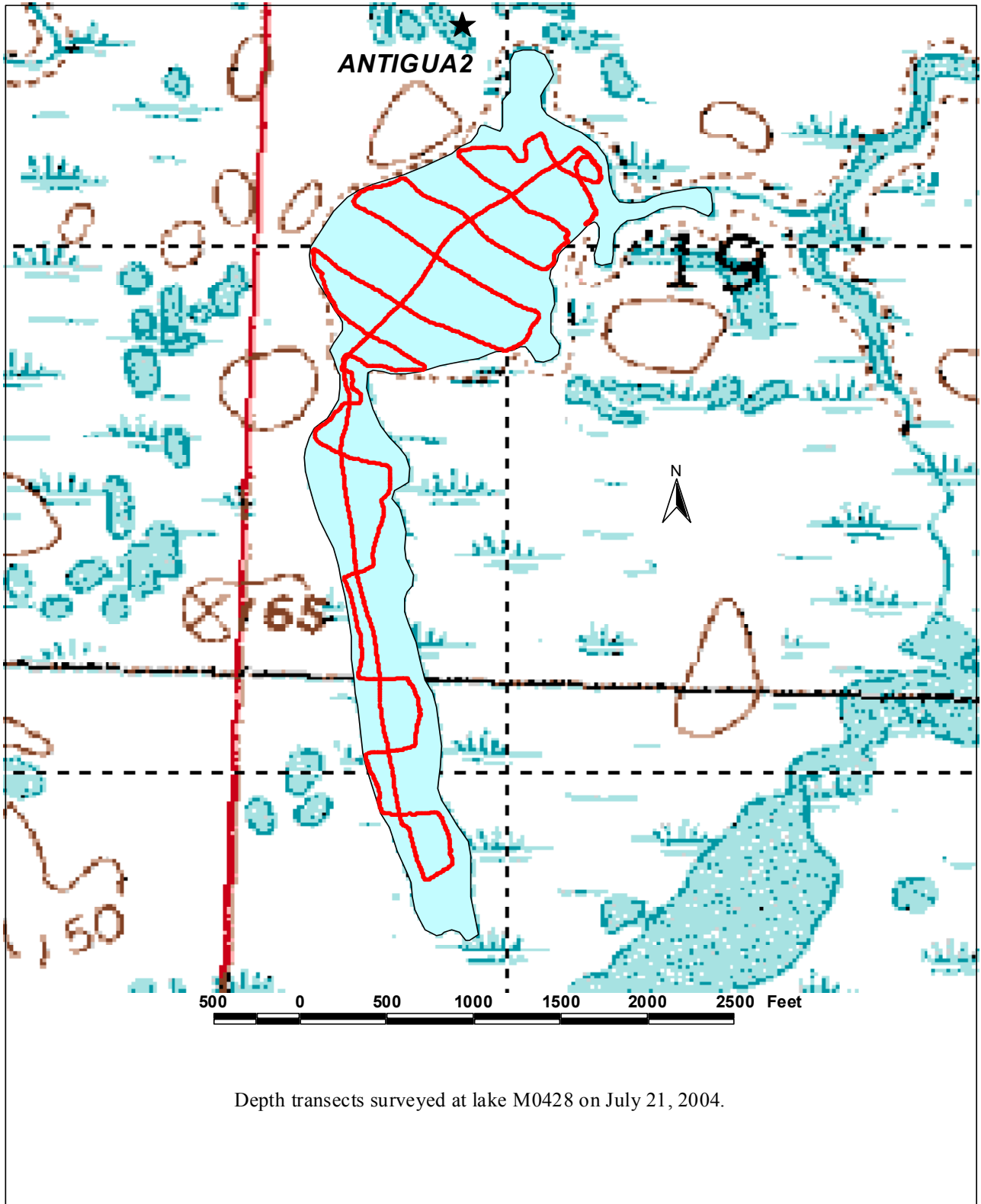
Year of Test	Calcium (mg/l)	Magnesium (mg/l)	Chloride (mg/l)	Sodium (mg/l)	Total Hardness [CaCO ₃] (mg/l)	Specific Conductance (microS/cm)	Turbidity (NTU)	pH	Source
2004	38.1	3.8	11.1	4.5	111	214	0.8	8.12	This Study

Catch Record:

Gear	Date	Effort (hours)	Species	Number Caught
Gill Net	Jul 21 04	7.9	Broad whitefish	0
Minnow trap	Jul 21 04	0.0	none	0
Observed	Jul 21 04		Ninespine stickleback	many



Regions of lake M048 less than 4 ft deep (light shaded), and likely to be available for ice chips, based on transects surveyed on July 21, 2004



Depth transects surveyed at lake M0428 on July 21, 2004.