

Green City, Missouri
Water Supply Study
City Lake

Green City is located in the Green Hills Region of Northeast Missouri in Sullivan County. Green City is a rural community serving the agricultural necessities of the surrounding rural community. Green City Reservoir is a source of water supply for Green City, Greencastle and Sullivan County rural water district. The existing Green City Reservoir was built in 1974, had a drainage area of approximately 871 acres. There are two large private ponds located in this watershed with the total drainage area with 72 acres. The two ponds result in a reduction of the watershed area of the Green City Reservoir of 8.2%. The effective drainage area for reservoir is about 800 acres. A storage capacity was estimated 186 million gallons at normal pool. The nearest weather station is at Milan in Sullivan County, Missouri. The monthly-recorded precipitation from 1952 to 1961 was used for this analysis.

Since there are no pan evaporation data for Green City Reservoir, the closest station with evaporation is at the Spickard, Missouri. However, There are no observed data during winter seasons for Spickard station, the Lakeside station was used for winter pan evaporation values. Pan evaporation data were retrieved for the stations Spickard and Lakeside from National Climatic Data Center. The free water evaporation for the Green City Reservoir was calculated from the pan evaporation and pan to lake coefficients.

There are two spillways for the Green City Reservoir. The drop inlet spillway crest is at elevation 1000 feet. The emergency spillway crest is at 1004 feet. The top of the dam is at 1011 feet. The dam height is about 30 feet. Based upon the model run requirement, the elevation of the drop inlet spillway was set as the upper limit of water elevation in the reservoir.

The NRCS's computer program called "RESOP" was used for the analysis. Following are the data and procedures for input to the program.

For this study, three scenarios were evaluated.

- 1) Normal demand: Water demand information was obtained from Drinking Water Program, Northeast Regional Office, DNR. The long term averaged water demand of 182,500 gallons per day was used. The reservoir storage lower limit for this run is set to 6.52 acre-feet which is at water intake level:
- 2) The same as Scenario 1 except the low limit was set to 50 ac-ft at elevation 989 ft.
- 3) The starting storage was 438 ac-ft at elevation 1000 ft in Jan. 52. The lower limit was 50 acre feet at elevation 989 ft. The demand was 182,500 gallons per day for the period January 1952 to December 1954. The demand was decreased to 90,000 gallons per day for the period January 1955 to December 1960.
- 4) The starting storage was 98.7 ac-ft at elevation 991 ft, September 1954. The demand was 200,000 gallons per day for the period September 1954 to December 1954. The demand was decreased to 90,000 from January 1955. The lower limit was 14.3 ac-ft at elevation 985 feet.

Following is the data and procedures for input to the "RESOP" program.

STO-AREA Elevation-Storage and Elevation-Area data were determined from July 6, 2000 surveys of both lakes made by USGS.

Elevation (feet)	Area (acres)	Volume (acre-ft)
982.0	1.5	0.6
984.0	4.2	6.5
986.0	8.3	18.8
988.0	13.2	40.3
990.0	19.9	73.2

992.0	27.2	120.5	
994.0	32.0	179.6	
995.0	35.3	213.2	Water Surface on 7/6/2000
996.0	38.7	250.1	
998.0	46.3	334.8	
1,000.0	57.7	437.9	
1,002.0	66.2	561.9	
1,004.0	76.0	704.1	Spillway Elevation

LIMITS For Starting storage see above elevation discussion..
Minimum Pool storage 14.3 Ac.Ft. .
Drainage Area 1.36 Sq.Mi.

Starting storage was considered at full pool elevation.

GENERAL The adjustment to convert from pan evaporation to lake evaporation was made for the control word EVAP. The factors were monthly values. As a result a factor of 100.0 was used here.

The record period of drought is in the 1950's.
Analysis began in January 1951 and ended December 1959.

SEEPAGE The reservoir seepage varied from 0 seepage near empty to a maximum of 1 inch per month when at full pool. The material in the dam is compacted earth of clayey soils. The lake is shallow so that static pressure is low. As a result seepage is small.

RAINFALL Rain gage at Milan for the period 1952 through 1960 is used.

RUNOFF This is the runoff into the lake from its drainage area. Monthly runoff volumes in watershed inches were determined at the Locust Creek stream gage at Linneus in Linn County, Missouri. The drainage area is 550.0 square miles.

EVAP. Pan evaporation at the Lakeside gaging station were used as a base because it has data for year around evaporation. This data was updated with gage data from stations at Spickard. The long-term average data were used when there are no data available from both stations. The monthly adjustment factors to convert from Pan to Lake evaporation was applied at this step.

DEMAND Determined from city records. Green City has a daily use of 182,500 Gallon per Day. Four scenarios mentioned above are examined in this study.

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Water Supply Study
City Lake
Storage Volume

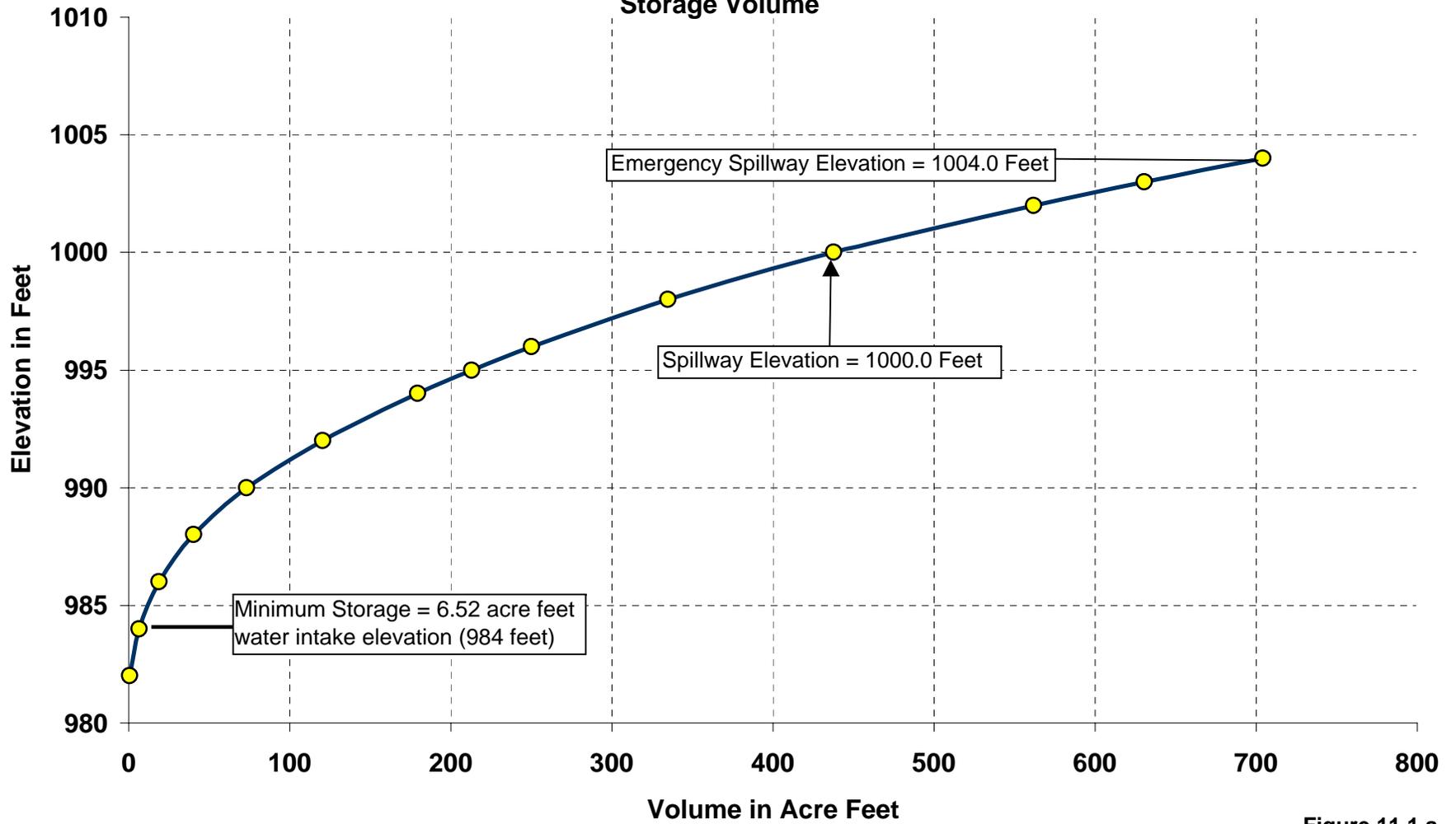


Figure 11.1.a

Green City, Missouri
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City Lake
Surface Area

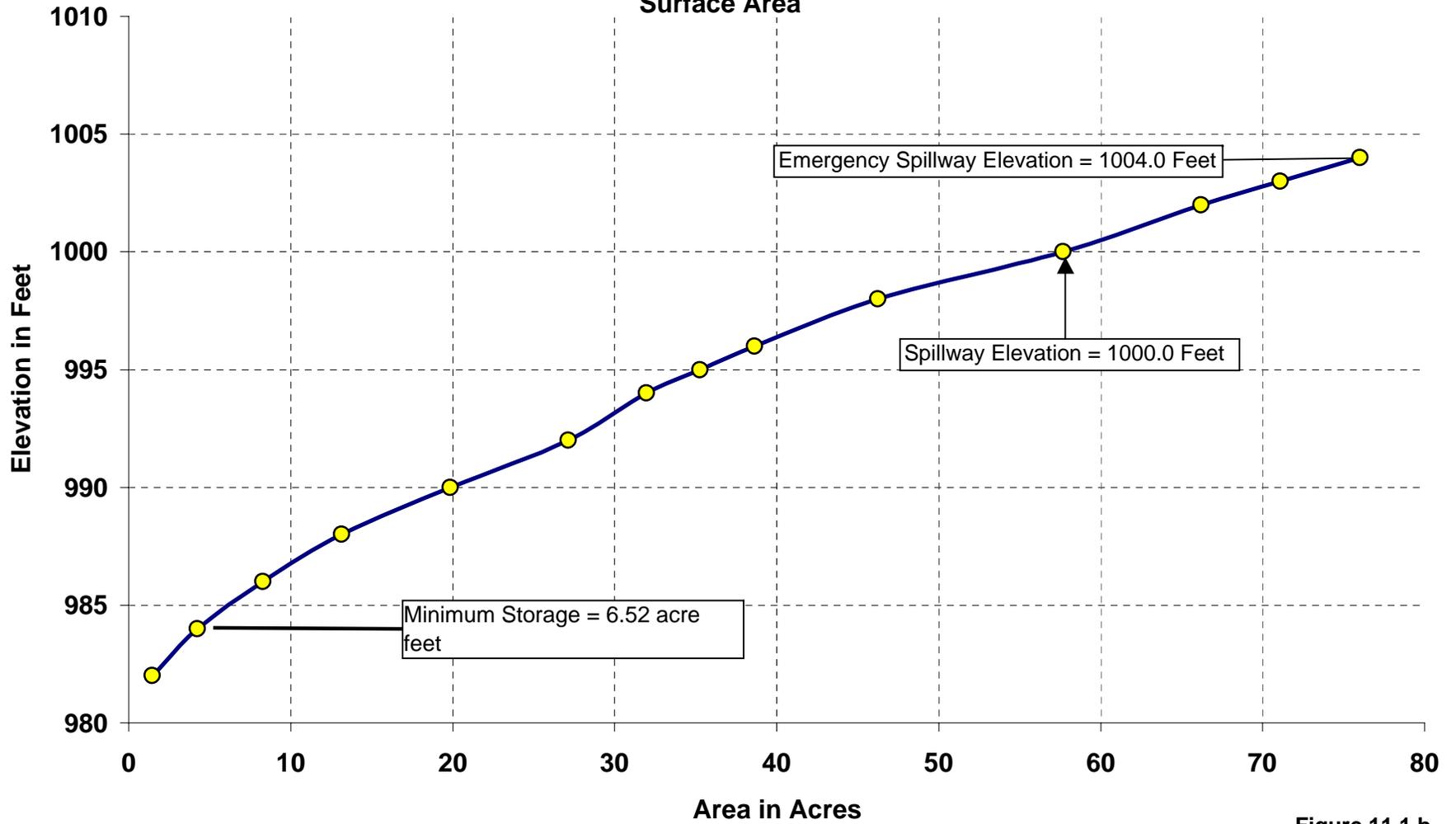


Figure 11.1.b

Green City, MO
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Green City Reservoir
Lake Storage

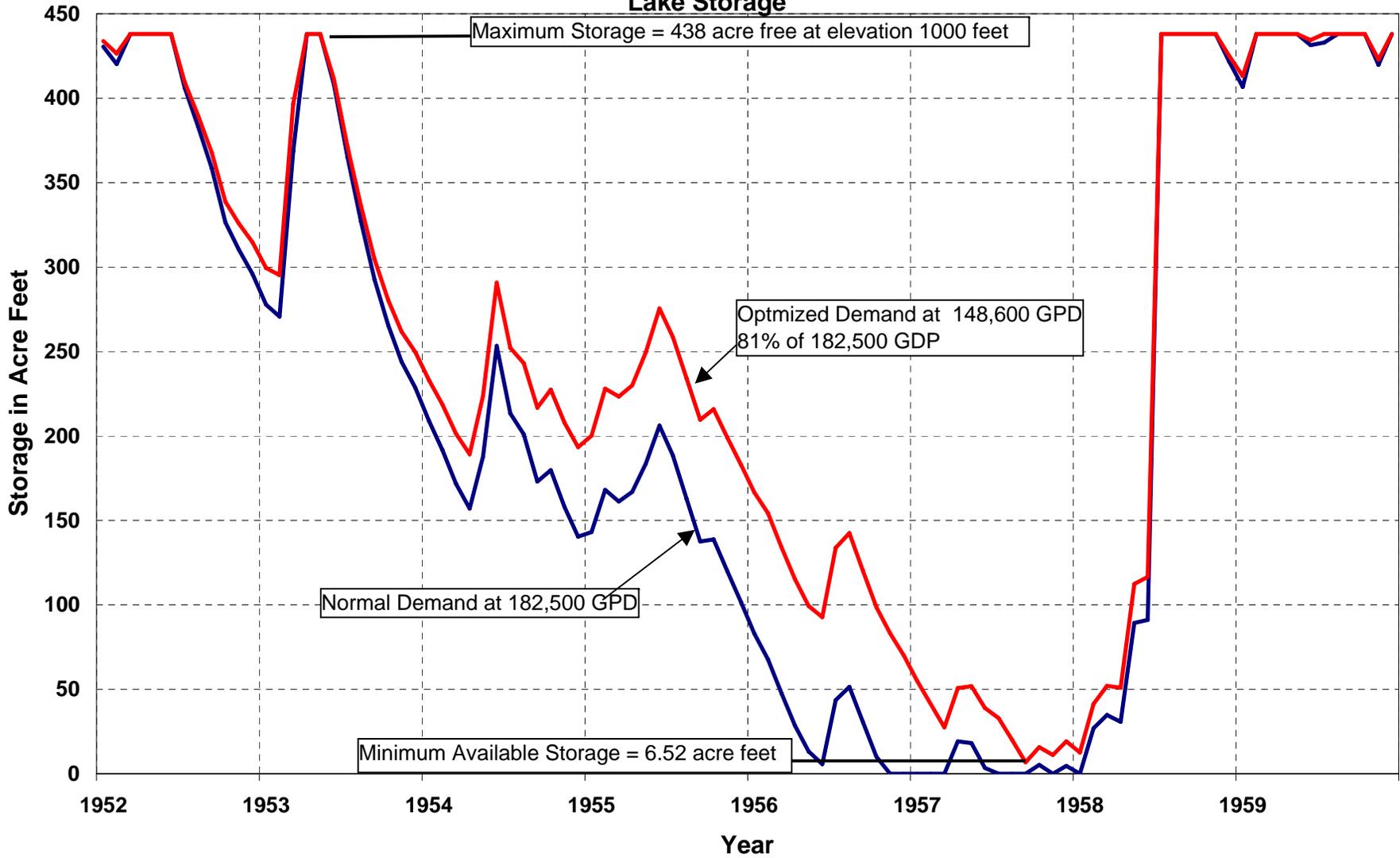


Figure 11.2.a

**Green City, MO
Water Supply Study
Green City Reservoir
Lake Storage**

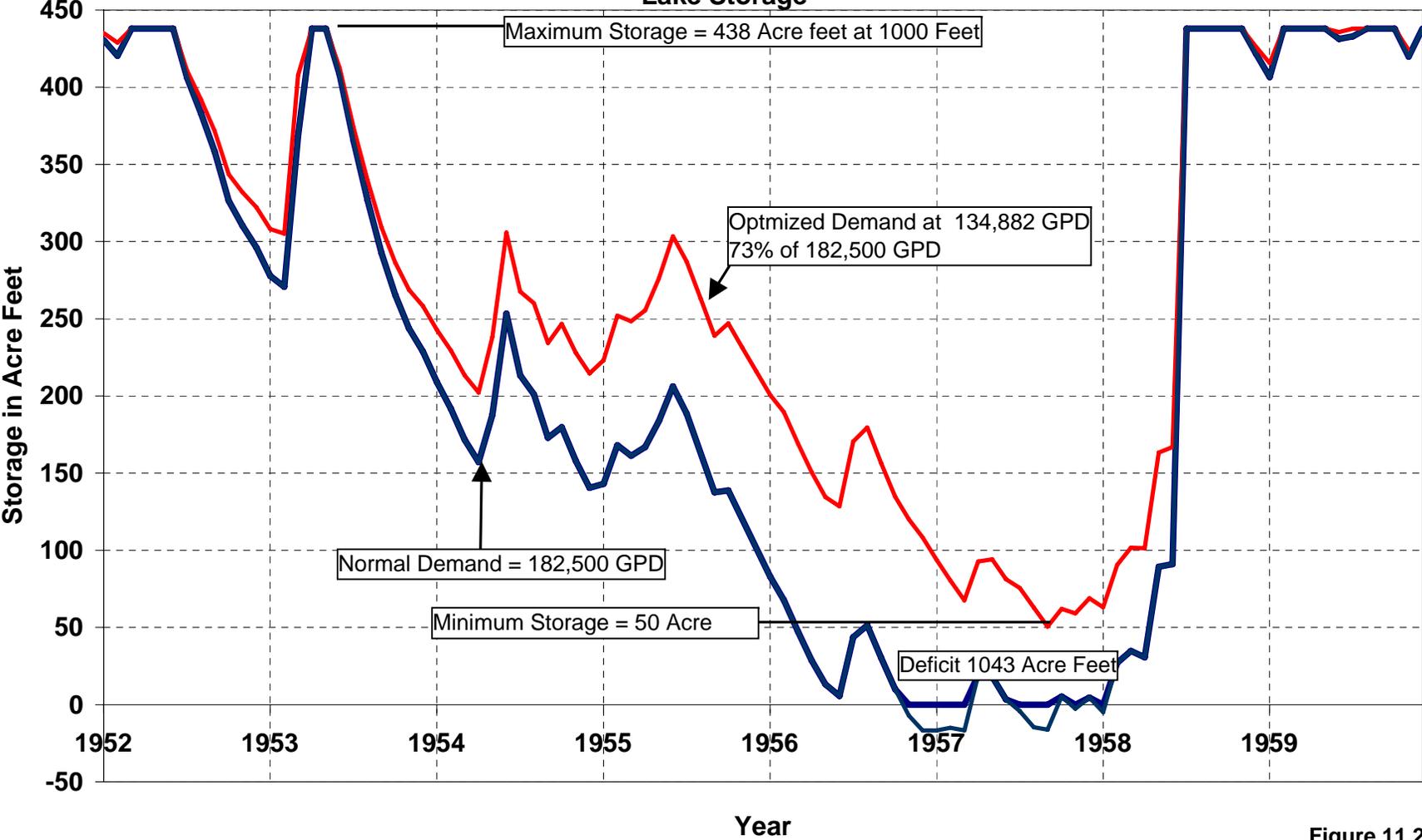


Figure 11.2.b

Green City, MO
Water Supply Study
Green City Reservoir
Lake Storage

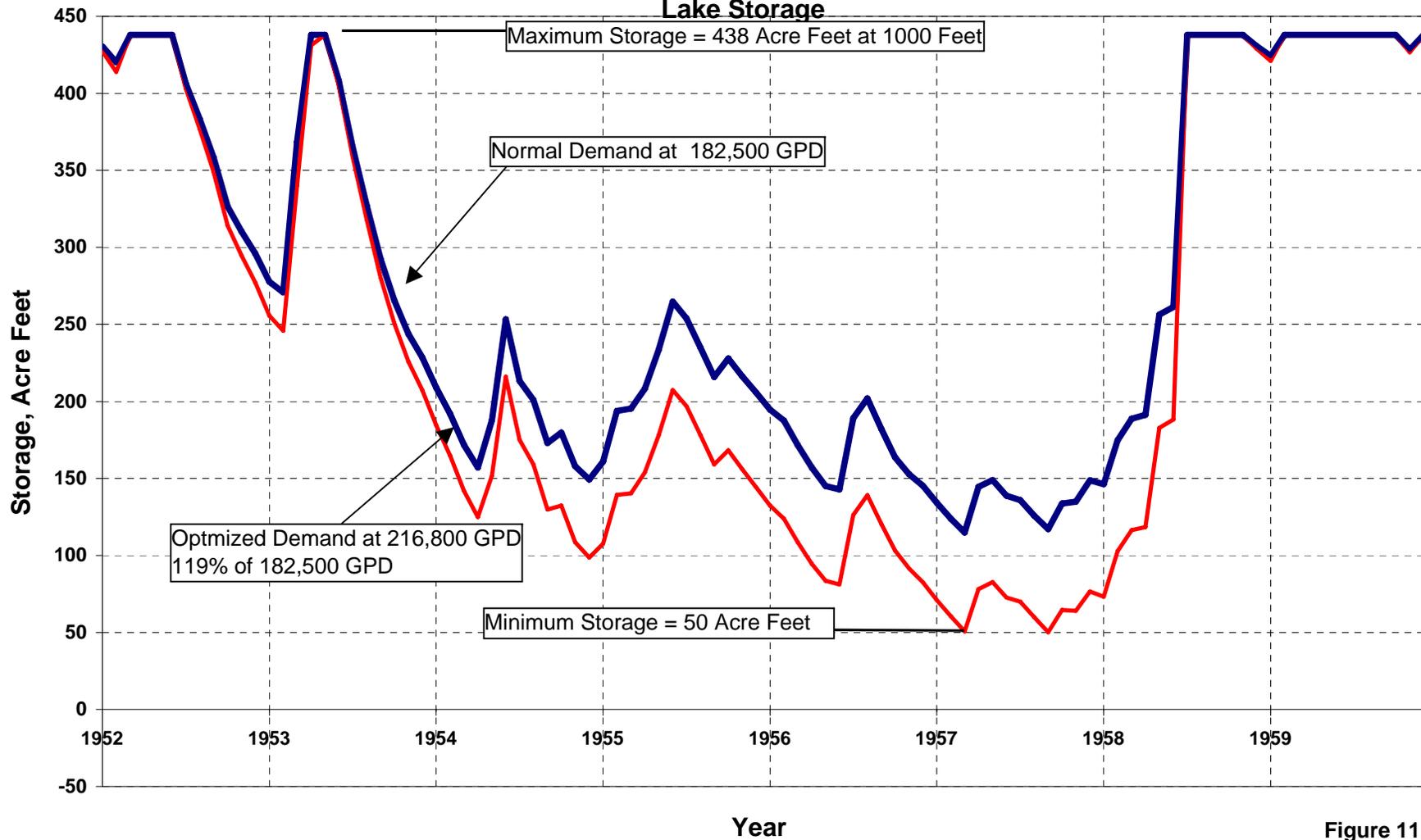


Figure 11.2.c

**Green City, MO
Water Supply Study
Green City Reservoir
Lake Storage**

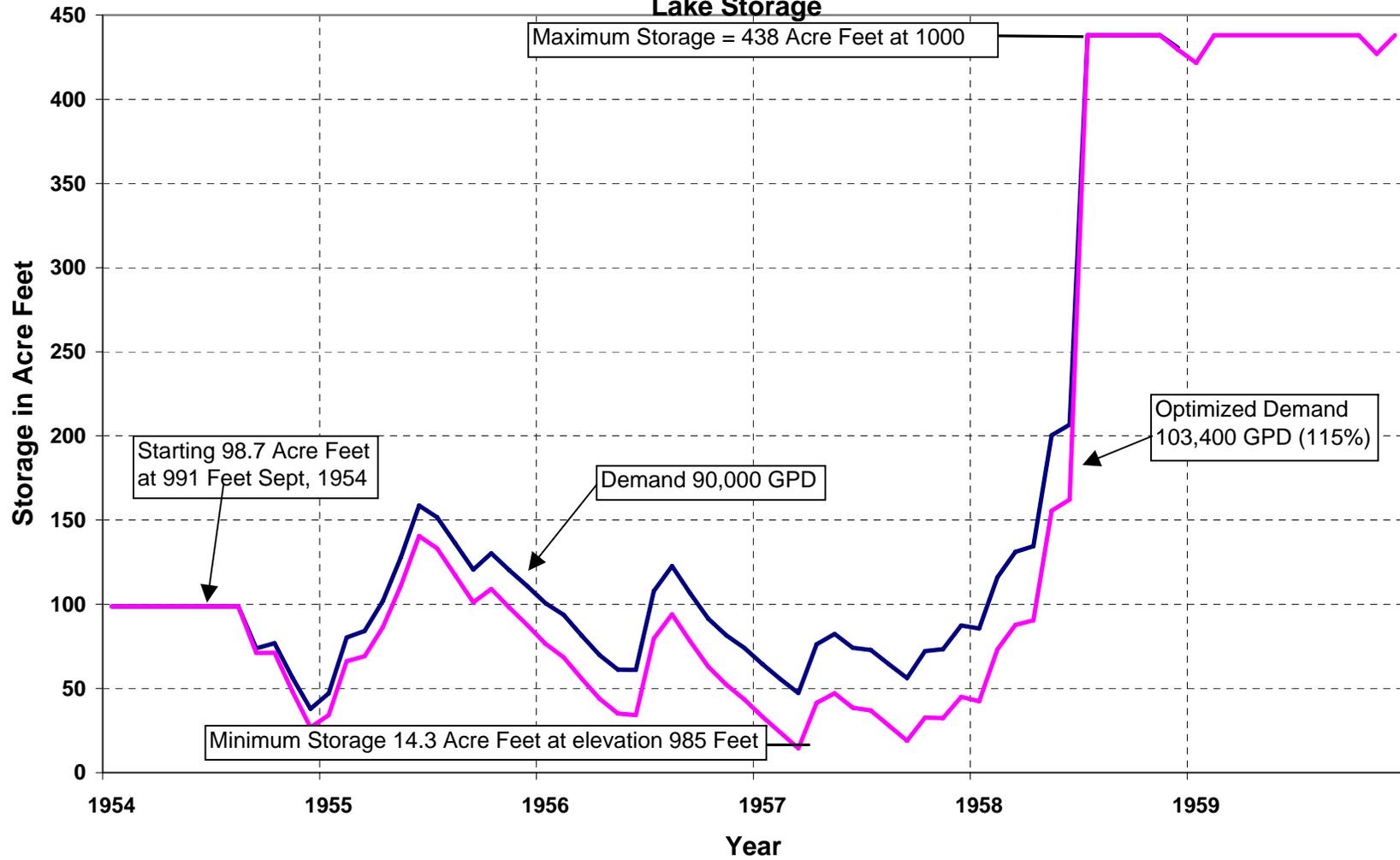


Figure 11.2.d

Green City, Missouri

Water Supply Study

Water Use

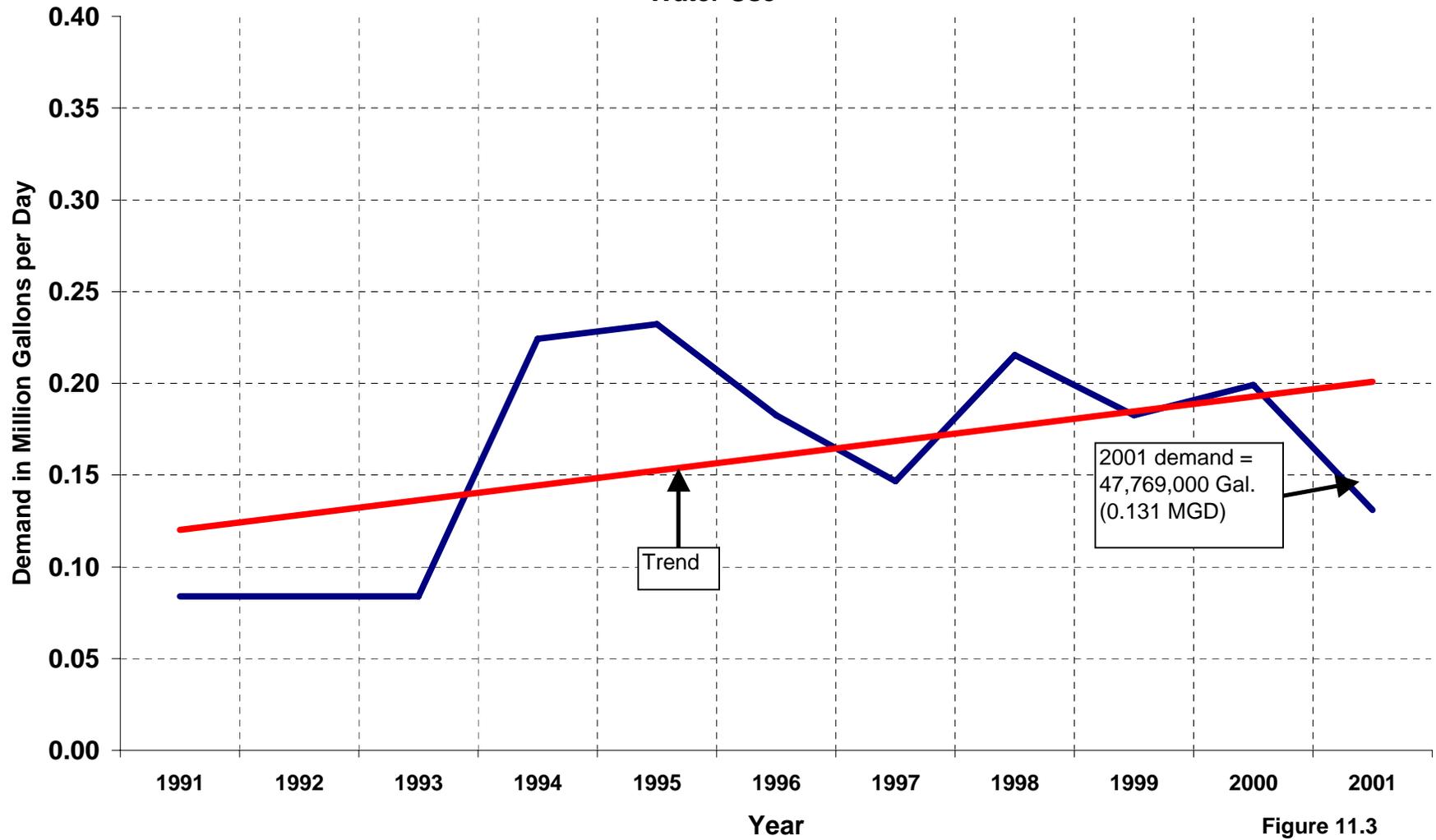
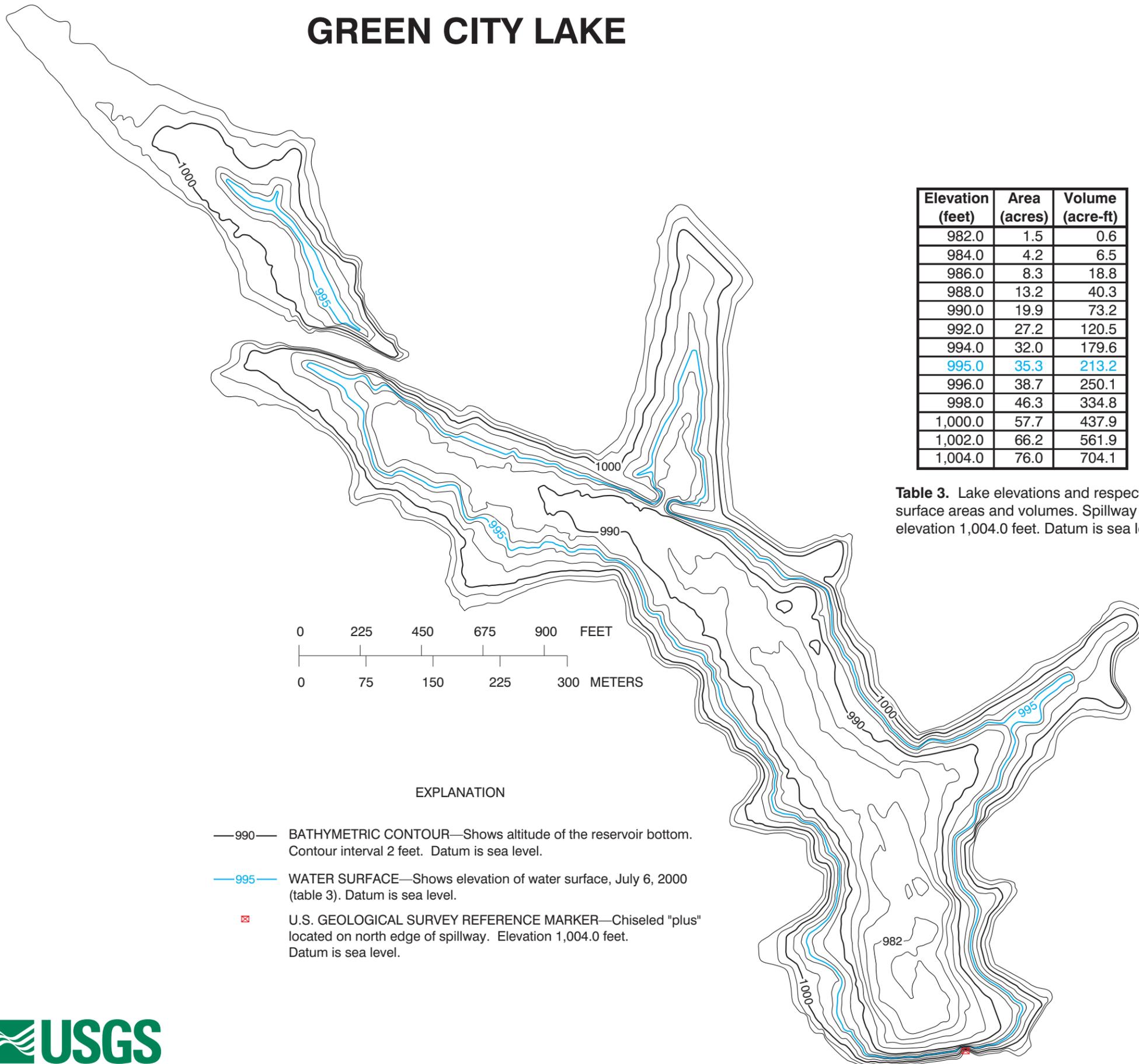


Figure 11.3

GREEN CITY LAKE



Elevation (feet)	Area (acres)	Volume (acre-ft)
982.0	1.5	0.6
984.0	4.2	6.5
986.0	8.3	18.8
988.0	13.2	40.3
990.0	19.9	73.2
992.0	27.2	120.5
994.0	32.0	179.6
995.0	35.3	213.2
996.0	38.7	250.1
998.0	46.3	334.8
1,000.0	57.7	437.9
1,002.0	66.2	561.9
1,004.0	76.0	704.1

Table 3. Lake elevations and respective surface areas and volumes. Spillway elevation 1,004.0 feet. Datum is sea level.

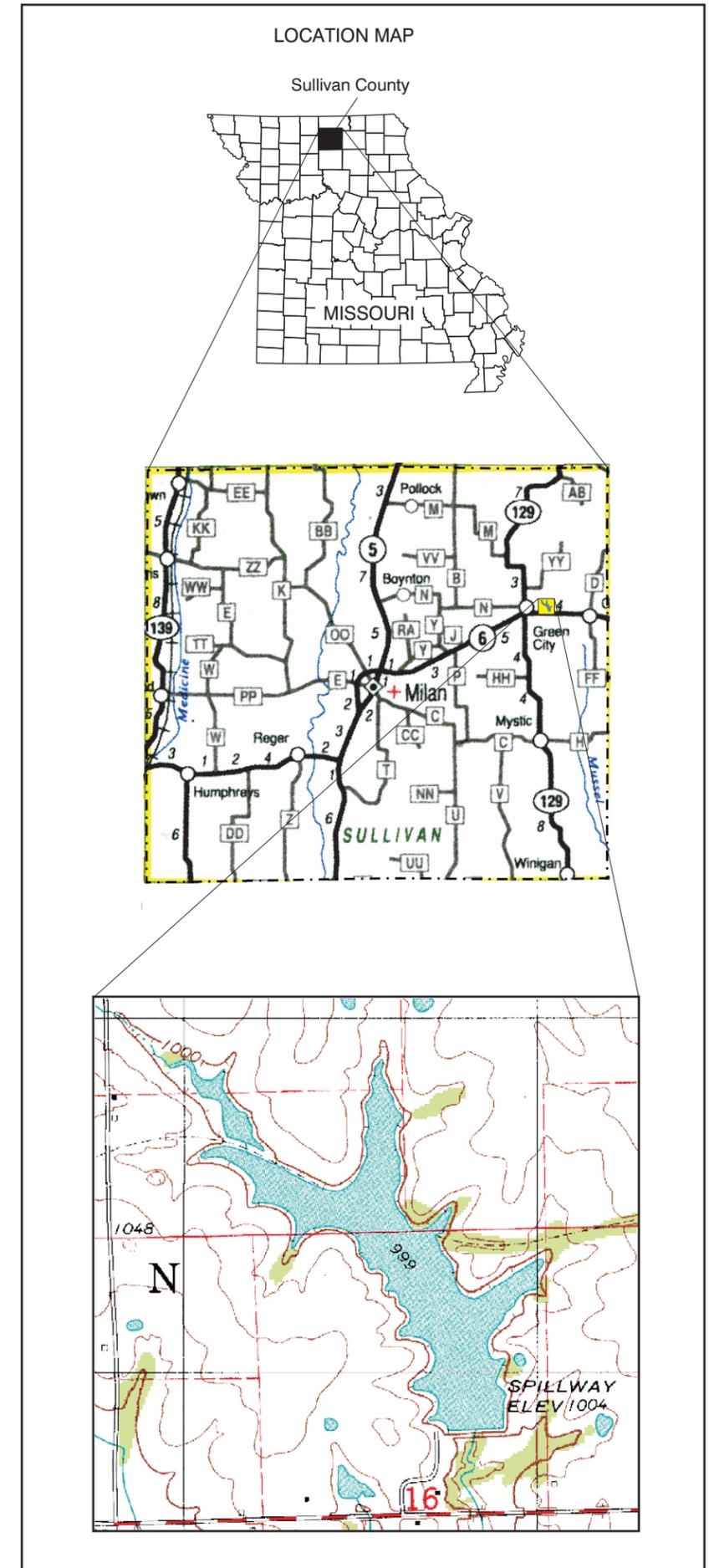


Figure 3. Bathymetric map and area/volume table for Green City Lake near Green City, Missouri.