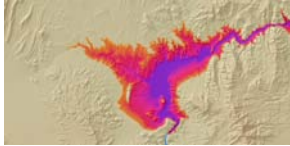


The 2001 Lake Mead Bathymetry Study



Lower Colorado Regional Office
L.C. Region GIS Group
Boulder City, Nevada
September 2003



2001 Lake Mead Bathymetry Study

Introduction

The Bureau of Reclamation (Reclamation) surveyed Lake Mead Reservoir in 2001 in order to develop a present day storage-elevation relationships. The major objective of the field collection was to map the areas of sediment accumulation since closure of Hoover Dam in February of 1935. The primary objective for conducting the reservoir survey was to measure the current reservoir area-capacity. The collected data can also be used to determine:

- storage depletion caused by sediment deposition since closure of the dam
- annual sediment yield rates
- current location of sediment deposition
- current reservoir topography
- economic life of the reservoir

Previous sedimentation surveys of Lake Mead completed in 1948-49 and 1963-64, utilized the range line collection method. The 1963-64 survey generated new reservoir topography from range lines that were collected from 300 to 400 meters apart. Results of these collections measured the vast majority of the sediments as a flat bottom deposit within the original river channel geometry. A 1999 University of Nevada and USGS sidescan sonar survey of the lower portion of Lake Mead found the accumulation of sediments to be restricted to the original river beds of the Colorado River and Las Vegas Creek and also to be flat-lying.¹ This situation was also found during the 1986 Lake Powell survey that measured the majority of sediment deposits within the original channel geometry and to be flat in nature.² Utilizing these previous survey results, and working within the available budget for conducting the Lake Mead survey, the 2001 collection focus the measurements around the original river channel areas.

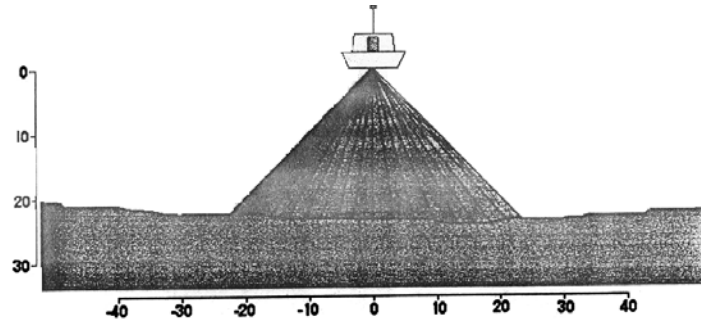
Data Collection

The 2001 survey utilized a high resolution multibeam mapping system for collecting x,y,z data of the Lake Mead bottom from depths of 3 meters in the upper portions of the lake to greater than 140 meters near Hoover Dam. The system consisted of a single transducer that was mounted on the center bow or forward portion of the boat . From the single transducer a fan array of narrow

¹Surficial Geology and Distribution of Post-Impoundment Sediment of the Western Park of Lake Mead Based on a Sidescan Sonar and High-Resolution Seismic-Reflection Survey, Open-File Report 99-581, University of Nevada at Las Vegas and U.S. Geological Survey

²1986 Lake Powell Survey, REC-ERC-88-6, USBR.

beams generated a detailed cross section of bottom geometry as the survey vessel passed over the areas to be mapped. The system used for this survey transmitted 80 separate 1-1/2 degree slant beams resulting in a 120-degree swath from the transducer (Figure 1).



The system operates at 200 kHz and can generate up to 30 profiles per second. The bottom area covered by the swath is dependant on the depth of the water column, which for Lake Mead were at times up to 500 meters of the lake bottom being mapped by an individual sweep. The multibeam system could have been used to obtain 100% underwater bottom coverage, but much greater time and budget would have been required for data collection and analysis.

The multibeam system was composed of several instruments all in communication with a central on-board computer that utilized the latest version of collection and processing software. The components included:

- GPS for positioning

Note: RTK GPS techniques were used for the lower portion of the reservoir, from the dam upstream to the upper portion of the narrows. Stationary position accuracies of up to 1 to 2 centimeters are possible. This system requires the establishment of a local base station, and maintaining constant communication between the base and survey vessel receivers.

Note: The upper portion of the reservoir above the narrows was surveyed using a “precise positioning service” which requires DOD authorization. The stationary position accuracies are around ± 4 meters. This system was

utilized to significantly reduce the collection time. The resulting lower accuracies were determined to be insignificant when measuring the location of the flat lying sediments.

- Motion reference unit (MRU) - measures the heave, pitch, and roll of the survey vessel during collection.
- Gyro - measures the yaw or vessel attitude.

With a proper calibration, the collection and data processing software utilizes all incoming information to provide a detailed x,y,z data set of the lake bottom.

The multibeam hydrographic survey system was mounted in the cabin of a 24-foot trihull aluminum vessel equipped with twin in-board motors and a on-board generator for power to the equipment. The multibeam system was installed, tested, and training was conducted in February of 2001 near Hoover Dam. The collection of underwater data on Lake Mead was conducted during a 2-week and 3-week period beginning in March and concluding in May of 2001. The areas covered included the underwater river channels of Las Vegas and Overton arms, and the Colorado River channel from the dam to just downstream of Pearce Ferry. The boat and system were operated by 2-person crews that consisted of personnel from Reclamation's Denver and Boulder City offices. For the deeper portions of the reservoir, the procedure included running parallel survey lines whose alignment was somewhat longitudinal with the original river channel alignment. The distance between the parallel survey lines was depth dependent and was set to provide some overlap of the data sweeps. Enough parallel survey lines were run to ensure that complete mapping of the deposited sediments would be obtained. As the survey vessels mapped the shallow water areas in the upper reaches of the reservoir the overlapping of the data sweeps was abandoned due to the time it would have taken to ensure full coverage. As previously stated, the sediments were found to be flat lying so it was determined that the areas missed could be projected during final analysis.

Data collection areas were developed to provide data sets that were manageable for both collection and analysis. Figure 2 shows the extent of the 56 data sets collected in the 2001 bathymetry study.

Data Analysis

The first part of the analysis started with the processing of all the collected raw profile files of the bottom. This included applying all necessary correction information that was collected such as vessel location and the roll, pitch, and yaw effects on the survey vessel. Other corrections included applying the sound velocity and converting all depth data points to elevations. All elevations in the final analysis were tied to the measured water surface elevation at the time of collection. To be able to accomplish the analysis filtering of data was completed due to the

massive amount of information that was collected by the multibeam system (Over 20 million data points were collected in the 2001 study). This was accomplished by filtering the data into 5-meter grids or cells and saving one sounding per cell. Quality control of the data set was accomplished by conducting field calibration as required by the multibeam system and collecting velocity profile data for the areas being surveyed.

The second part of the analysis consisted of building lake bottom surfaces based on the filtered data from the first step. This analysis was conducted utilizing the areas and sheet boundaries as defined in previous Lake Mead Surveys. The boundaries for the areas and the sheets are shown in Figures 3 and 4 respectively.

The analysis of the 2001 bathymetric data first required the generation of the 1935 surface (also known as the original surface). Once the original surface was developed,³ the data collected in the 2001 survey was overlaid on the original surface to produce the 2001 surface. Comparison of the original surface and the 2001 surface provided the quantity and location of sediment that has been deposited in Lake Mead since the construction of Hoover Dam.

All data was collected and processed in UTM Zone 11 North, NAD 83 coordinate system.

Generation of the 1935 surfaces:

The USGS 10 Meter Lake Mead Underwater DEMs were used to generate 10 Meter contours for the entire lake. This was completed using the Contour command from 3-D Analyst in Arc Map. The resulting coverage was called usgscon_83

The 375 meter (1230 foot) contour was created using the USGS 10 Meter Lake Mead Underwater DEMs. This represented the high water mark for the entire lake. This was completed using the Contour command from 3-D Analyst in Arc Map. The resulting coverage was called usgscon375_83. (Note that the 1230 foot contour was designated as the high water mark for the lake in previous studies.)

Approximate 2.5 meter contours were developed in the original river channels of the Colorado and Virgin Rivers using the USGS 10 Meter Lake Mead Underwater DEMs. The contour coverage generated was called extra1_conts. The purpose of this coverage will be discussed later.

A polygon coverage was developed for each individual sheet identified in the 1963 study. This was done using Arc Info and the coordinates of the sheet corners noted on the Lake Mead overview sheet associated with the report. The coverage usgscon375_83 was used to define the

³ Original surfaces created from data received from the USGS Rocky Mountain Data Center.

extent of each sheet. These coverages were called asheetxx (for example asheet8 for sheet 8). See Figure 4 for an index of sheets.

A polygon coverage was developed for each individual area as identified in the 1963 study. This was done using Arc Info and the coordinates of the sheet corners noted in the report. The coverage usgscon375_83 was used to define the extent of each Area. For the 2001 analysis Areas 6 and 7 were not analyzed as they were assumed to have filled with sediment, and have no volume capacity. These coverages were called cutareax (for example cutarea1 for area 1).

Contour coverages were generated for each individual sheet. This was done using the clip command in Arc Toolbox with usgscon_83 and each asheet coverage. These coverages were called asheetx_con (for example asheet8_con for the contours on sheet 8)

Contour coverages were generated for each individual area. This was done using the clip command in Arc Toolbox with usgscon_83 and each cutarea coverage. These coverages were called areax_con (for example area1_con for the contours in area 1).

Surfaces were developed for each individual sheet using the Create Tin command in 3-D Analyst with the following components: asheetx_con, (hard line option), extra1_conts (hard line option), usgscon375_83 (hard line option) and asheet (hard clip option). These surfaces were called asheetx_tin .

Surfaces were created for each individual area using the Create Tin command in 3-D Analyst with the following components: areax_con (hard line option), extra1_conts (hard line option), usgscon375_83 (hard line option), cutarea (hard clip option). These surfaces were called areax_tin.

The area for 10 foot increments for each sheet was calculated. This was done using the Volume command in Arc Info with the option to calculate area and volume below the datum. An Arc Macro Language (AML) script was created to step through the calculations and create an info table with the area and volume at each elevation. Arc Map was used to covert the info table to a dbase database. The database was imported into Microsoft Excel and areas in square meters converted to areas in acres to match the units in Table 3-3 of the 1963 bathymetry study.

The volume for 10 foot increments for each area was calculated. This was done using the Volume command in Arc Info with the option to calculate area and volume below the datum. An AML script was created to step through the calculations and create an info table with the area and volume at each elevation. Arc Map was used to covert the info table to a dbase database. The database was imported into Microsoft Excel and volumes in cubic meters converted to volumes in acre-feet to match with the units in Table 3-7 of the 1963 bathymetry study.

Area and volume calculations were completed on the original surface to compare to values in the 1963 Lake Mead Survey. Values calculated were consistently within 2 percent, and usually

much closer to the values published in the 1963 study. This correlation of values provides a reasonable level of reliability for the methods used to perform the analysis for the 2001 survey.

Inclusion of Multi-beam data collected in 2001:

A Visual Basic routine was created to convert the raw X, Y, Z data files into a generate file that could be imported into an Arc Info Tin. Each raw data file was processed through this routine.

Tins were created for each data set using the Generate option in the Create Tin command in Arc Toolbox.

Point coverages of each data set were created using the Tin to Cover command in Arc Toolbox with the point option. (for example Mead125m_pt)

Polygon coverages of the extent of each point data were generated by digitizing lines around each data set. (Mead125m_bnd, for example).

The bounding polygons were merged to create a single polygon representing the data collection area for 2001. Due to a small gap in the data collection, an additional polygon resulted in the upper portion of the Overton Arm. The resulting coverage is called Mead_bound.

Generating the 2001 surfaces.

The 2001 surface was built using contours from the original surface (for areas where data was not collected in 2001) combined with the point coverages from the 2001 data. Contours for the 2001 surface were created for each sheet using the 1935 contours and the erase command with Mead_bound polygon as the erase coverage. The result was a coverage with the contours within the area of data collection removed, but the contours outside the area of data collection unchanged. The coverages called asheetx_con in the 2001 data set were created.

The 2001 surfaces for each area were created using the same technique as was used for each sheet. Contours for each 2001 were developed using the 1935 contours for the area and the erase command with the Mead_bound polygon as the erase coverage. The result is a coverage with the contours within the area of data collection removed, but the contours outside the area of data collection unchanged. These coverages called areax_con in the 2001 data set were created.

To build the 2001 surface for each sheet it was necessary to determine which data collection set was included within each sheet. Arc Map was used for this determination, and the results summarized in Table 1.

Table 1.

Sheet Number	Data Sets Within or Overlapping the Sheet					
Sheet 1-2-3	Vegas45m					
Sheet 4	Over15m	Over25m	Over35m	Over45m	Govtwsh5m	Mead45m
Sheet 4 (cont)	Mead55m					
Sheet 5	Mead35m	Mead45m	Over15m			
Sheet 6-7	Mead45m	Mead55m	Mead65m	Mead75m	Mead85m	Mead95m
Sheet 8	Dam2m	Mead12m	Mead25m	Mead35m	Mead45m	
Sheet 9	Mead85m	Mead95m	Mead105m			
Sheet 10	Mead125m					
Sheet 11-12	Mead105m	Mead115m	Mead125m	Mead135m	Mead145m	
Sheet 17	Echo2m					
Sheet 18	Over15m	Over25m				
Sheet 19	Mead135m	Mead145m	Mead155m	Mead165m	Over15m	Boneli5m
Sheet 20-21	Boneli5m					
Sheet 22	Over_top					
Sheet 23	Over115m	Over125m	Over_top			
Sheet 24	Over75m	Over8b5m	Over95m	Over105m	Over115m	Over125m
Sheet 25	Over45m	Over55m	Over65m	Over75m	Over8b5m	Echo2m
Sheet 26	Over15m	Over25m	Over35m	Over45m		
Sheet 27	Over15m	Mead165m	Mead175m	Mead185m		
Sheet 32	Over_top					
Sheet 34	Mead185m	Mead195m				
Sheet 35	Mead195m	Mead205m	Mead215m	Mead225m	Burro5m	Temp5m
Sheet 35 (cont)	Tempbay5m	Trail5m				
Sheet 36	Mead225m	Mead235m				
Sheet 37	Mead245m	Mead255m	Mead265m			
Sheet 38	Mead235m	Mead245m	Huala5m			
Sheet 40	Mead265m	Mead275m	Mead285m	Mead295m	Grand5m	
Sheet 41	Mead265m					

To build the 2001 surface for each area it was necessary to determine which data collection set was included within each area. Arc Map was used for this determination, and the results summarized the in Table 2.

Table 2

Area	Data Sets Within the or overlapping the Area								
Area 1	Dam2m	Mead12m	Mead25m	Mead35m	Mead45m	Mead55m	Mead65m	Mead75m	Mead85m
Area 1 (cont)	Over15m	Over25m	Over35m	Over45m	Govtwsh5m				
Area 2	Mead105m	Mead115m	Mead125m	Mead135m	Mead145m	Mead155m	Mead165m	Mead175m	Mead185m
Area 2 (cont)	Over15m	Over25m	Over35m	Over45m	Boneli5m				
Area 3a	Mead185m	Mead195m	Mead205m	Mead215m	Mead225m	Burro5m	Temp5m	Tempbay5m	Trail5m
Area 3b	Mead225m	Mead235m							
Area 4	Mead235m	Mead245m	Mead255m	Mead265m	Mead275m	Huala5m			
Area 5	Mead275m	Mead285m	Mead295m	Grand5m					
Area 8a	Over45m	Over55m	Over65m	Over75m	Over8b5m	Over95m	Over105m	Echo2m	
Area 8b	Over105m	Over115m	Over125m	Over_top					
Area X	Mead85m	Mead95m	Mead105m						
Area Y	Mead105m								

The surface for each individual sheet was developed using the Create Tin command in 3-D Analyst with the following components: asheetx_con, (hard line option), usgscon375_83 (hard line option) and asheetx (hard clip option) and point coverages for the relevant data sets (points). The output tins wre called asheetx_tin tin.

The surface for each individual area was developed using the Create Tin command in 3-D Analyst with the following components: areax_con, (hard line option), usgscon375_83 (hard line option) and cutareax (hard clip option) and point coverages for the relevant data sets (points) . The output tins were called areax_tin tins.

The area for 10 foot increments for each sheet was calculated. This was done using the Volume command in Arc Info with the option to calculate area and volume below the datum. An AML script was created to step through the calculations and create an info table with the area and volume at each elevation. Arc Map was used to convert the info table to a dbase database. The database was imported into Microsoft Excel and areas in square meters converted to areas in

acres to match the units in Table 3-3 of the 1963 bathymetry study. The results of the area calculations are summarized in Table 3 on the following pages.

The volume for 10 foot increments for each area was calculated. This was done using the Volume command in Arc Info with the option to calculate area and volume below the datum. An AML script was created to step through the calculations and create an info table with the area and volume at each elevation. Arc Map was used to covert the info table to a dbase database. The database was imported into Microsoft Excel and volumes in cubic meters converted to volumes in acre-feet to match the units in Table 3-7 of the 1963 bathymetry study. The results of the volume calculations are summarized in Table 4. Also included for reference are the volumes for the original 1935 surface as reported in the 1963 Lake Mead Survey.

A complete summary of volumes for 1935, 1948, 1963 and 2001 can be found in the Microsoft Excel file name Mead_Volumes.xls on the DVD Rom.

Data Included on the DVD:

Polygon coverage for Lake Mead Areas

Polygon coverage for Lake Mead Sheets

Line coverage of 375 meter (1230 foot) contour around Lake Mead

Data sets for 1935

- Contours for each area and sheet
- 1935 surfaces (also known as the original surfaces)

Data sets from 2001

- point coverages for each data set
- polygon coverage showing extent of each data set
- 2001 surfaces

Table 3
10 Foot Contour Areas in Acres

Sheet No	Elevation									
	660	670	680	690	700	710	720	730	740	750
1,2,3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	76.84	269.97	415.86
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	329.28	551.65	754.17
6,7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	46.29	987.44	1,873.93
8	0.00	0.00	0.00	0.02	0.47	3.90	53.69	897.15	1,339.46	1,538.96
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	13.16	128.95
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11,12	0.00	0.00	0.00	0.00	0.00	0.03	0.16	0.39	0.67	1.21
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20,21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
42 - 52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Total	0.00	0.00	0.00	0.02	0.47	3.94	53.87	1,349.98	3,162.35	4,713.08
-------	------	------	------	------	------	------	-------	----------	----------	----------

Table 3 (continued)
10 Foot Contour Areas in Acres

Sheet No	Elevation									
	760	770	780	790	800	810	820	830	840	850
1,2,3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	500.83	549.20	587.39	623.41	659.48	703.03	752.02	798.01	845.61	897.58
5	850.62	904.43	973.14	1,098.43	1,230.64	1,361.64	1,504.31	1,670.13	1,811.84	1,942.51
6,7	2,355.17	2,565.14	2,740.22	2,905.14	3,063.96	3,216.72	3,369.35	3,533.64	3,695.57	3,848.57
8	1,616.86	1,676.60	1,734.08	1,791.60	1,847.54	1,902.93	1,956.91	2,016.28	2,067.31	2,117.84
9	607.48	734.58	765.77	796.79	827.09	858.45	891.20	937.37	977.54	1,019.53
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11,12	73.08	410.62	1,236.24	1,472.00	1,612.52	1,702.32	1,784.41	1,868.78	1,934.07	1,997.25
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	238.17	417.33	560.81	724.76	882.40	987.53
19	0.40	1.32	139.87	1,025.85	3,085.51	3,543.35	4,002.76	4,344.40	4,652.05	4,912.08
20,21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	0.00	0.00	0.00	0.62	547.91	817.64	950.32	1,009.83	1,085.42	1,187.93
27	0.00	0.00	0.00	3.35	303.19	846.99	1,218.16	1,403.46	1,548.08	1,728.11
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
34	0.00	0.00	0.00	0.00	0.01	0.08	101.14	326.70	352.36	373.24
35	0.00	0.00	0.00	0.00	0.00	0.00	0.03	193.19	812.56	1,342.20
36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.70	1.21	1.81
37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
42 - 52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	6,004.44	6,841.90	8,176.71	9,717.19	13,415.99	15,370.46	17,091.42	18,827.25	20,666.02	22,356.17

Table 3 (continued)
10 Foot Contour Areas in Acres

Sheet No	Elevation									
	860	870	880	890	900	910	920	930	940	950
1,2,3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	959.22	1,025.48	1,094.30	1,205.14	1,300.25	1,397.60	1,555.88	1,661.24	1,765.66	1,870.31
5	2,160.76	2,314.55	2,468.43	2,731.72	2,861.72	2,990.02	3,263.06	3,393.21	3,523.61	3,657.61
6,7	4,039.35	4,189.68	4,333.74	4,568.76	4,713.03	4,859.08	5,118.43	5,278.01	5,415.45	5,540.47
8	2,194.19	2,245.75	2,296.30	2,375.01	2,427.55	2,477.25	2,548.23	2,596.01	2,645.10	2,693.54
9	1,079.21	1,131.37	1,183.05	1,255.44	1,311.65	1,367.66	1,450.24	1,503.35	1,554.55	1,605.51
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11,12	2,088.16	2,151.99	2,214.13	2,337.49	2,413.29	2,483.49	2,608.53	2,668.81	2,730.14	2,792.25
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	1,064.52	1,118.59	1,168.26	1,260.40	1,309.58	1,359.86	1,479.85	1,526.63	1,572.95	1,620.02
19	5,258.81	5,464.75	5,656.53	6,056.46	6,232.11	6,402.19	6,805.17	6,947.34	7,093.55	7,248.50
20,21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	3.56	63.48	130.48	188.96	283.42	452.48	663.65	970.29
26	1,332.72	1,500.40	1,661.91	1,854.56	1,989.29	2,116.45	2,305.34	2,414.15	2,512.54	2,614.35
27	1,986.67	2,107.71	2,230.41	2,511.23	2,683.54	2,869.30	3,571.35	3,725.12	3,868.61	4,005.44
28	0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.35	0.53	0.72
30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
34	404.23	428.63	453.42	499.30	534.48	569.09	646.38	694.00	736.32	776.66
35	1,633.81	1,768.44	1,895.00	2,092.73	2,228.59	2,361.97	2,577.39	2,720.11	2,863.17	3,003.00
36	173.29	386.12	466.87	505.19	534.03	562.07	602.11	630.00	656.52	682.31
37	0.00	0.00	0.00	1.87	3.53	5.51	19.23	154.18	479.79	771.55
38	0.60	3.08	59.24	191.93	659.20	1,211.92	1,693.24	1,936.46	2,046.41	2,146.96

39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
42 - 52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	24,375.54	25,836.55	27,185.14	29,510.71	31,332.31	33,222.42	36,528.02	38,301.45	40,128.55	41,999.46

Table 3 (continued)
10 Foot Contour Areas in Acres

Sheet No	Elevation									
	960	970	980	990	1000	1010	1020	1030	1040	1050
1,2,3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.22	30.96	55.50
4	2,060.97	2,186.42	2,317.44	2,536.12	2,689.25	2,853.42	3,218.53	3,417.15	3,599.28	3,958.40
5	3,924.64	4,083.62	4,246.48	4,441.85	4,589.86	4,742.27	4,936.24	5,077.82	5,221.45	5,402.84
6,7	5,816.81	5,945.12	6,071.09	6,349.90	6,500.98	6,652.95	6,925.50	7,051.77	7,178.92	7,439.67
8	2,779.50	2,827.39	2,873.19	2,958.52	3,011.98	3,065.01	3,146.17	3,193.76	3,240.55	3,324.70
9	1,684.86	1,738.32	1,791.36	1,876.64	1,937.84	1,998.83	2,087.71	2,143.23	2,198.87	2,283.89
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11,12	2,943.17	3,011.13	3,079.42	3,275.84	3,347.48	3,418.73	3,576.29	3,645.26	3,714.70	3,887.05
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	1,737.95	1,787.37	1,836.75	1,984.23	2,042.41	2,098.11	2,243.35	2,297.49	2,351.08	2,479.70
19	7,653.41	7,837.23	8,012.06	8,580.42	8,806.73	9,042.62	9,680.13	9,903.90	10,125.32	10,611.06
20,21	0.00	0.00	10.34	39.60	61.19	89.37	165.37	206.27	243.86	370.69
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	0.00	0.18	198.65	658.15	1,178.64	1,691.55	2,351.22	2,806.86	3,402.45	4,537.39
25	1,417.64	1,904.49	2,131.11	2,361.66	2,523.77	2,684.05	3,005.41	3,171.87	3,340.98	3,704.39
26	2,858.60	2,986.77	3,114.00	3,411.27	3,546.73	3,683.49	4,061.54	4,183.05	4,302.48	4,649.66
27	4,338.42	4,479.49	4,622.06	4,964.34	5,099.41	5,232.29	5,633.95	5,761.22	5,887.01	6,194.91
28	1.18	1.57	1.99	9.14	12.62	16.45	30.30	37.47	44.69	63.42
30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
34	857.46	897.61	936.60	1,039.33	1,090.93	1,141.58	1,268.39	1,319.80	1,370.47	1,482.78
35	3,254.53	3,400.20	3,545.21	3,860.26	4,031.05	4,199.11	4,534.43	4,693.24	4,850.22	5,172.78
36	714.13	740.20	766.03	803.47	833.21	862.68	913.38	947.59	981.20	1,025.29

37	1,052.45	1,316.80	1,598.15	1,929.98	2,145.52	2,314.36	2,608.28	2,772.24	2,920.88	3,160.34
38	2,259.66	2,351.30	2,435.74	2,572.99	2,651.43	2,730.37	2,893.92	2,976.82	3,060.11	3,256.66
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.76	40.26
42 - 52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	45,355.38	47,495.21	49,587.68	53,653.74	56,101.04	58,517.24	63,280.09	65,611.04	68,072.23	73,101.39

Table 3 (continued)
10 Foot Contour Areas in Acres

Sheet No	Elevation									
	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150
1,2,3	85.50	119.99	156.03	210.66	258.78	326.58	410.59	486.26	559.45	701.88
4	4,119.37	4,290.42	4,472.16	4,922.14	5,079.86	5,238.01	5,748.25	5,953.32	6,163.19	6,687.67
5	5,514.01	5,629.15	5,746.86	5,917.08	6,021.01	6,125.75	6,306.17	6,414.52	6,524.90	6,708.44
6,7	7,567.41	7,691.31	7,811.89	8,086.20	8,218.47	8,347.21	8,609.85	8,727.27	8,843.22	9,115.45
8	3,372.31	3,418.46	3,463.43	3,556.43	3,609.69	3,662.45	3,755.22	3,803.46	3,850.84	3,944.41
9	2,341.74	2,399.73	2,457.17	2,554.70	2,616.86	2,678.15	2,767.57	2,818.51	2,868.57	2,931.90
10	0.27	1.06	2.23	3.67	5.33	7.44	10.00	12.18	14.41	17.04
11,12	3,964.66	4,042.70	4,121.08	4,323.39	4,400.04	4,478.02	4,672.48	4,744.84	4,819.61	4,999.32
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	9.14	17.16	49.94	137.06	177.15	224.79	363.25
17	0.00	0.00	0.00	8.89	14.77	25.80	101.34	126.76	155.03	261.04
18	2,532.78	2,583.88	2,632.44	2,779.30	2,841.86	2,903.14	3,052.61	3,111.98	3,169.74	3,293.34
19	10,811.42	11,010.85	11,207.20	11,666.91	11,888.30	12,107.02	12,667.73	12,879.87	13,092.30	13,742.31
20,21	436.11	490.25	548.43	678.47	726.00	786.71	914.95	972.11	1,037.76	1,254.25
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.98
23	66.88	541.29	893.44	1,178.72	1,496.98	2,060.26	2,528.33	2,833.91	3,195.28	3,994.43
24	5,422.17	5,827.31	6,180.96	6,798.94	7,030.48	7,252.72	7,983.51	8,184.04	8,387.00	9,020.73
25	3,869.37	4,036.32	4,204.78	4,740.93	4,909.35	5,074.11	5,548.86	5,711.86	5,875.95	6,310.42
26	4,761.13	4,873.95	4,986.69	5,298.78	5,408.44	5,517.22	5,807.04	5,913.61	6,019.66	6,308.58
27	6,335.89	6,478.38	6,620.70	7,030.99	7,179.50	7,322.57	7,659.94	7,792.97	7,924.10	8,313.95
28	74.95	87.47	100.83	148.57	173.72	199.96	264.08	290.26	317.68	380.18
30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
32	0.00	0.00	0.00	0.00	2.32	20.97	132.17	191.03	255.85	393.12
33	0.00	0.00	0.00	0.00	0.00	0.00	95.87	138.45	186.57	287.58
34	1,544.61	1,607.68	1,671.13	1,865.81	1,941.04	2,012.23	2,174.27	2,238.25	2,300.36	2,442.50

35	5,333.78	5,491.41	5,650.31	6,019.50	6,188.76	6,353.13	6,700.75	6,858.74	7,013.75	7,299.15
36	1,062.21	1,098.81	1,135.26	1,196.11	1,237.70	1,279.27	1,344.21	1,386.80	1,429.13	1,485.49
37	3,276.91	3,383.77	3,484.52	3,748.21	3,862.32	3,974.41	4,240.06	4,357.67	4,474.57	4,715.90
38	3,350.01	3,442.09	3,533.00	3,761.97	3,866.93	3,970.72	4,181.75	4,271.97	4,360.78	4,521.82
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
40	0.00	0.00	8.12	57.93	95.45	209.21	471.25	606.10	1,331.89	2,501.39
41	92.04	136.92	177.64	202.01	208.41	212.71	217.42	221.57	225.77	233.19
42 - 52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	75,935.53	78,683.20	81,266.33	86,765.46	89,299.52	92,195.69	98,503.33	101,225.46	104,622.16	112,242.7

Table 3 (continued)
10 Foot Contour Areas in Acres

Sheet No	Elevation							
	1160	1170	1180	1190	1200	1210	1220	1230
1,2,3	770.02	838.77	915.76	1,134.64	1,228.53	1,328.48	1,593.17	1,681.21
4	6,931.98	7,177.18	7,424.59	7,964.22	8,133.08	8,302.79	8,671.16	8,812.95
5	6,842.32	6,980.97	7,123.50	7,338.47	7,504.22	7,682.08	7,906.27	8,060.99
6,7	9,227.99	9,336.29	9,446.90	9,700.68	9,834.83	9,962.86	10,212.63	10,392.97
8	3,991.80	4,038.07	4,083.54	4,179.17	4,230.04	4,279.00	4,330.22	4,380.27
9	2,981.04	3,029.98	3,078.57	3,177.91	3,258.52	3,337.77	3,469.12	3,592.40
10	19.54	21.40	23.17	32.49	38.43	44.50	52.54	60.93
11,12	5,067.79	5,135.03	5,200.87	5,375.87	5,466.15	5,557.82	5,755.81	5,871.92
14	0.00	0.00	0.00	0.00	0.00	0.00	97.93	347.09
15	0.00	0.00	0.00	0.00	0.00	0.00	13.18	31.98
16	406.39	456.31	513.11	706.22	771.27	841.73	1,016.89	1,078.14
17	314.69	371.05	439.99	685.36	767.90	851.13	1,064.77	1,132.64
18	3,348.48	3,401.45	3,452.10	3,560.68	3,624.33	3,686.58	3,807.81	3,868.09
19	13,955.00	14,165.75	14,374.02	14,966.37	15,185.24	15,384.46	15,881.89	16,058.96
20,21	1,332.72	1,420.85	1,530.83	1,850.95	1,961.56	2,081.57	2,573.93	2,752.73
22	32.80	52.80	345.14	979.61	1,238.06	1,550.75	2,554.41	2,977.29
23	4,449.33	5,028.05	5,788.23	6,463.32	6,746.92	7,055.01	7,737.18	7,990.32
24	9,228.69	9,434.59	9,638.42	10,252.55	10,469.90	10,674.78	11,061.20	11,247.32
25	6,468.51	6,623.86	6,776.79	7,247.17	7,457.08	7,661.64	8,052.56	8,206.43
26	6,408.99	6,509.23	6,609.40	6,875.23	7,001.21	7,127.88	7,363.49	7,463.02
27	8,465.95	8,615.22	8,761.67	9,241.49	9,442.85	9,638.63	10,161.05	10,359.86
28	410.14	440.28	470.35	540.59	580.55	621.15	733.18	790.99
30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31	1.57	7.32	67.82	129.75	151.09	177.41	520.00	636.78
32	463.78	596.68	735.59	881.24	958.24	1036.51	1252.03	1333.02

33	348.77	413.16	482.46	634.28	696.61	761.03	870.24	934.12
34	2,499.97	2,555.86	2,610.00	2,767.95	2,832.78	2,896.07	3,009.99	3,058.87
35	7,442.80	7,583.96	7,723.81	7,946.01	8,079.76	8,212.87	8,437.06	8,574.67
36	1,530.88	1,577.12	1,624.08	1,739.16	1,828.67	1,921.25	2,080.58	2,179.67
37	4,818.72	4,921.67	5,024.64	5,263.92	5,406.26	5,547.31	5,760.05	5,874.31
38	4,604.28	4,682.89	4,758.31	4,928.37	5,038.97	5,149.46	5,301.42	5,387.63
39	0.00	0.00	0.00	24.16	33.81	44.28	59.55	75.72
40	3,078.92	3,383.60	3,541.52	3,798.83	3,936.74	4,068.31	4,270.46	4,385.49
41	239.14	245.14	251.16	263.28	274.18	285.35	342.86	360.94
42 - 52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	115,683.0	119,044.5	122,816.3	130,650.0	134,177.8	137,770.4	146,014.6	149,959.7

Table 4
Lake Volume in Acre-Feet

Elevation	Boulder and Virgin Basins		Temple Bar area and Virgin Canyon		Gregg Basin		Grand Bay		Pierce Basin		Lower Granite Gorge		Overton Arm		Totals	
	(Areas 1, X, Y and 2)		(Areas 3a and 3b)		(Area 4)		(Area 5)		(Area 6)		(Area 7)		(Areas 8a and 8b)		1935	2001
	1935	2001	1935	2001	1935	2001	1935	2001	1935	2001	1935	2001	1935	2001		
660	1,000	0	0	0	0	0	0	0	0	0	0	0	0	0	2,562	0
670	7,000	0	0	0	0	0	0	0	0	0	0	0	0	0	10,007	0
680	21,000	0	0	0	0	0	0	0	0	0	0	0	0	0	23,815	0
690	43,000	0	0	0	0	0	0	0	0	0	0	0	0	0	47,328	0
700	73,000	1	0	0	0	0	0	0	0	0	0	0	0	0	79,318	1
710	111,000	26	0	0	0	0	0	0	0	0	0	0	0	0	118,067	26
720	156,000	202	0	0	0	0	0	0	0	0	0	0	0	0	163,409	202
730	207,000	5,199	0	0	0	0	0	0	0	0	0	0	0	0	215,611	5,199
740	265,000	28,417	0	0	0	0	0	0	0	0	0	0	0	0	277,446	28,417
750	336,000	67,440	0	0	0	0	0	0	0	0	0	0	0	0	351,385	67,440
760	422,000	121,481	1,000	0	0	0	0	0	0	0	0	0	0	0	438,625	121,481
770	518,000	185,740	3,000	0	0	0	0	0	0	0	0	0	0	0	538,951	185,740
780	626,000	260,072	7,000	0	0	0	0	0	0	0	0	0	0	0	651,900	260,072
790	745,000	349,342	15,000	0	0	0	0	0	0	0	0	0	0	0	779,990	349,342
800	877,000	465,441	27,000	0	1,000	0	0	0	0	0	0	0	0	0	925,986	465,441
810	1,026,000	609,647	41,000	0	2,000	0	0	0	0	0	0	0	0	0	1,091,429	609,647
820	1,189,000	772,019	57,000	311	3,000	0	0	0	0	0	0	0	0	0	1,273,389	772,331
830	1,365,000	948,531	76,000	3,383	7,000	0	0	0	0	0	0	0	0	0	1,471,891	951,915
840	1,553,000	1,137,658	95,000	11,856	15,000	0	0	0	0	0	0	0	0	0	1,686,458	1,149,514
850	1,755,000	1,338,348	116,000	26,439	28,000	0	0	0	0	0	0	0	0	0	1,919,277	1,364,787
860	1,970,000	1,553,308	139,000	46,118	46,000	3	1,000	0	0	0	0	0	0	0	2,176,093	1,599,429
870	2,197,000	1,780,140	164,000	70,271	68,000	14	2,000	0	0	0	0	0	0	0	2,451,564	1,850,425
880	2,437,000	2,016,376	191,000	97,383	92,000	312	5,000	0	0	0	0	0	0	4	2,743,872	2,114,075
890	2,690,000	2,266,945	220,000	126,993	120,000	1,468	9,000	0	0	0	0	0	0	330	3,058,139	2,395,737
900	2,955,000	2,532,765	251,000	159,127	150,000	5,661	15,000	0	1,000	0	0	0	1,000	1,335	3,396,024	2,698,888
910	3,234,000	2,809,307	285,000	193,250	182,000	15,381	21,000	0	3,000	0	1,000	0	3,000	2,875	3,752,285	3,020,814
920	3,529,000	3,098,542	321,000	229,529	215,000	29,891	29,000	0	6,000	0	4,000	0	6,000	5,235	4,130,691	3,363,197
930	3,837,000	3,408,761	360,000	268,951	251,000	48,994	38,000	0	11,000	0	7,000	0	11,000	8,891	4,540,826	3,735,597
940	4,161,000	3,729,890	401,000	310,657	291,000	72,132	47,000	0	16,000	0	11,000	0	16,000	14,301	4,970,327	4,126,980
950	4,498,000	4,060,759	445,000	354,469	332,000	99,441	57,000	0	22,000	0	16,000	0	25,000	22,368	5,419,942	4,537,037
960	4,851,000	4,411,139	491,000	401,683	375,000	130,911	67,000	0	29,000	0	22,000	0	38,000	34,430	5,902,264	4,978,163
970	5,218,000	4,774,043	540,000	451,295	419,000	165,932	79,000	0	36,000	0	29,000	0	55,000	51,121	6,407,202	5,442,391
980	5,598,000	5,146,765	591,000	502,870	467,000	204,436	91,000	0	44,000	0	37,000	0	76,000	72,019	6,934,001	5,926,090
990	5,994,000	5,539,337	647,000	558,125	516,000	247,432	104,000	0	52,000	0	48,000	0	104,000	98,799	7,497,639	6,443,694
1000	6,405,000	5,949,379	705,000	616,882	567,000	294,171	118,000	0	61,000	0	59,000	0	139,000	132,399	8,093,489	6,992,831
1010	6,832,000	6,371,731	766,000	678,198	621,000	343,577	132,000	0	71,000	0	73,000	0	182,000	172,788	8,718,614	7,566,294
1020	7,275,000	6,811,235	830,000	742,827	678,000	396,076	148,000	0	81,000	0	87,000	0	233,000	221,097	9,374,888	8,171,234
1030	7,735,000	7,272,436	899,000	811,669	736,000	452,414	166,000	0	91,000	0	103,000	0	292,000	277,469	10,071,220	8,813,989
1040	8,212,000	7,747,248	969,000	883,214	797,000	511,422	184,000	0	103,000	0	120,000	0	361,000	340,449	10,799,581	9,482,334
1050	8,704,000	8,234,500	1,043,000	957,244	861,000	572,816	204,000	0	117,000	0	138,000	0	439,000	412,947	11,563,711	10,177,507
1060	9,214,000	8,745,570	1,121,000	1,035,952	928,000	638,896	224,000	0	131,000	0	159,000	0	528,000	500,534	12,375,329	10,920,952
1070	9,739,000	9,272,062	1,202,000	1,117,814	998,000	707,989	247,000	0	146,000	0	181,000	0	631,000	599,803	13,219,149	11,697,668
1080	10,281,000	9,807,107	1,288,000	1,201,761	1,069,000	779,053	271,000	0	163,000	0	204,000	0	746,000	707,879	14,092,516	12,495,801
1090	10,841,000	10,367,546	1,377,000	1,291,333	1,144,000	855,132	296,000	0	181,000	0	228,000	0	874,000	829,858	15,014,574	13,343,870
1100	11,418,000	10,944,651	1,470,000	1,384,839	1,222,000	934,789	323,000	0	200,000	0	255,000	0	1,012,000	960,927	15,973,851	14,225,205
1110	12,013,000	11,532,372	1,567,000	1,480,933	1,303,000	1,017,119	352,000	6	222,000	0	282,000	0	1,160,000	1,100,163	16,968,520	15,130,593
1120	12,625,000	12,144,208	1,669,000	1,581,944	1,387,000	1,104,654	383,000	346	244,000	0	311,000	0	1,320,000	1,255,559	18,013,804	16,086,711
1130	13,256,000	12,773,715	1,775,000	1,686,792	1,474,000	1,196,037	415,000	1,223	268,000	0	342,000	0	1,492,000	1,424,589	19,098,866	17,082,356
1140	13,904,000	13,418,039	1,885,000	1,794,681	1,564,000	1,290,126	450,000	5,179	293,000	0	375,000	0	1,675,000	1,602,716	20,222,180	18,110,741
1150	14,569,000	14,078,315	1,999,000	1,905,641	1,656,000	1,386,788	488,000	15,307	319,000	0	410,000	0	1,874,000	1,793,545	21,396,173	19,179,597
1160	15,254,000	14,767,489	2,116,000	2,021,194	1,752,000	1,487,286	527,000	32,248	349,000	0	447,000	0	2,089,000	2,005,734	22,629,094	20,313,950
1170	15,959,000	15,470,175	2,239,000	2,139,245	1,851,000	1,589,795	570,000	58,962	378,000	0	486,000	0	2,320,000	2,228,868	23,896,792	21,487,047
1180	16,685,000	16,184,172	2,365,000	2,259,375	1,951,000	1,693,943	613,000	91,313	411,000	0	526,000	0	2,570,000	2,467,610	25,217,529	22,696,413
1190	17,432,000	16,931,818	2,495,000	2,384,444	2,055,000	1,802,251	660,000	131,473	445,000	0	569,000	0	2,840,000	2,739,307	26,602,933	23,989,294
1200	18,197,000	17,697,040	2,630,000	2,512,678	2,161,000	1,913,578	708,000	174,034	481,000	0	614,000	0	3,129,000	3,025,862	28,031,392	25,323,193
1210	18,984,000	18,477,698	2,769,000	2,643,844	2,270,000	2,027,725	758,000	218,686	519,000	0	661,000	0	3,442,000	3,325,737	29,514,040	26,693,690

1220	19,797,000	19,285,323	2,912,000	2,779,228	2,381,000	2,145,561	812,000	265,371	558,000	0	710,000	0	3,775,000	3,652,704	31,059,362	28,128,188
1230	20,632,000	20,113,943	3,059,000	2,917,917	2,495,000	2,266,010	867,000	313,681	600,000	0	760,000	0	4,134,000	4,002,787	32,287,371	29,614,33

