

2002-483-440 Final Report - Year 1

FINAL REPORT – YEAR 1

Texas Water Development Board contract 2002-483-440

Sediment delivery and channel change on the Lower Trinity River, Texas

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1. Sediment Delivery

Purpose and methods

The overall objective of this section of the project is to provide detailed information on the current sediment dynamics of the Trinity River between Livingston Dam and Trinity Bay. This task involved establishing a new gauging station proximal to the existing USGS gauging station at Romayor (USGS 08066500) that provides the long-term discharge record. Suspended sediment was initially sampled using an automatic SIGMA 900 Max pump sampler, programmed to retrieve one 500-ml sample per day. The sampler was deployed on June 4, after an extended high-flow period that initially prevented the construction of the sampling platform. After some success during low flows from mid-June to mid-August, fluctuating water levels and flooding made the use of the automatic sampler impractical. The sampler also suffered considerable damage during a large event in November 2002. Thus, it was decided to forgo the automated sampler in favor of a YSI-6000 UPG turbidity probe. This probe is entirely self-contained, and can be installed for 6-month periods irrespective of water levels. The probe was programmed to measure turbidity every 6 hours, adding considerable temporal resolution to the sediment record and allowing for a more accurate assessment of the sediment regime. However, an important consideration here is comparability of this data with historic suspended sediment data collected manually with depth-integrating samplers. Several depth-integrated samples were therefore taken at the station, both monthly and during high-flow events, in order to calibrate the automated turbidity record with the historic record. These measurements are ongoing. Ultimately, these data will be used to compute “modern” suspended sediment rating curves which can then be compared graphically and statistically to historic rating curves. Bedload samples were also taken several times during the year. These data are yet to be analyzed within a broader, more complete bedload record.

Results and analysis

Calibration of the turbidity probe with depth-integrated samples is an ongoing aspect of the work, and it is premature to present any data at this stage (the turbidity probe was returned to the laboratory for maintenance during late-December 2002, but was re-deployed in early-January 2003 and remains in place). However, the ten-month turbidity record from June 2002 through April 2003 is presented in Figure 1. There appears to be a two-stage relationship between turbidity and discharge at Romayor: a steep initial curve between discharges of *c.* 800 cfs and 5000 cfs, and a “collapsed” curve for discharges greater than 5000 cfs. This suggests that, at

higher flows, the channel is essentially “supply-limited”. One aspect being investigated is that fines are indeed trapped behind Lake Livingston and that, downstream of the dam, the Trinity becomes a bedload-dominated channel. Another possible explanation is that, even though no general change in flow regimes are associated with the dam, as discussed below, it takes longer for flood waves to make it through the lake than before. Thus, tributary flows are out of phase with the Trinity—that is, the tributaries peak sooner. When they are carrying their maximum sediment loads into the river on the rising limb of the hydrograph, the river has not yet risen enough to transport the sand and gravel portion of the load. While the sand and gravel is deposited as deltas (for example, Long King Creek and Menard Creek), there is sufficient stream power to transport the fines. Thus the fines pass through before the river gets to high flow, and the sandy deltas provide a source of coarse material for transport at high flows. There is also clear evidence of positive hysteresis in these curves, with higher turbidity values during the early fall, as well as sediment exhaustion on the rising limbs of the flow hydrographs.

TURBIDITY-DISCHARGE ROMAYOR (08066500)

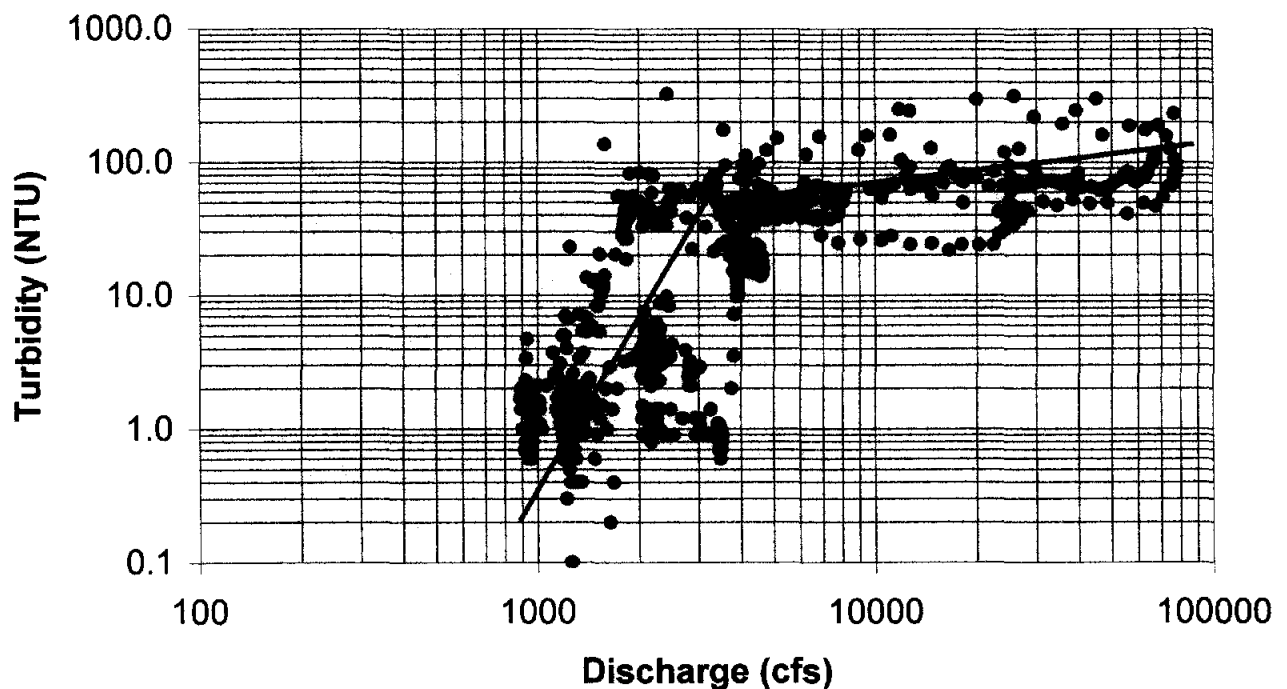


Figure 1. Turbidity-discharge rating curve for the Romayor gauging station from June 2002 through April 2003. Each data point represents the mean of four turbidity measurements taken at six-hourly intervals and the mean daily discharge.

We have also conducted two cross-sectional surveys of suspended sediment concentrations at Romayor. Although this was not part of the initial sampling strategy, we felt it important to determine the degree of variability in suspended sediment concentrations across the channel in order to determine the spatial validity of the single, depth-integrated samples being taken from the channel thalweg. The results were very encouraging, as shown in Figure 2, with little cross-channel variability in turbidity observed.

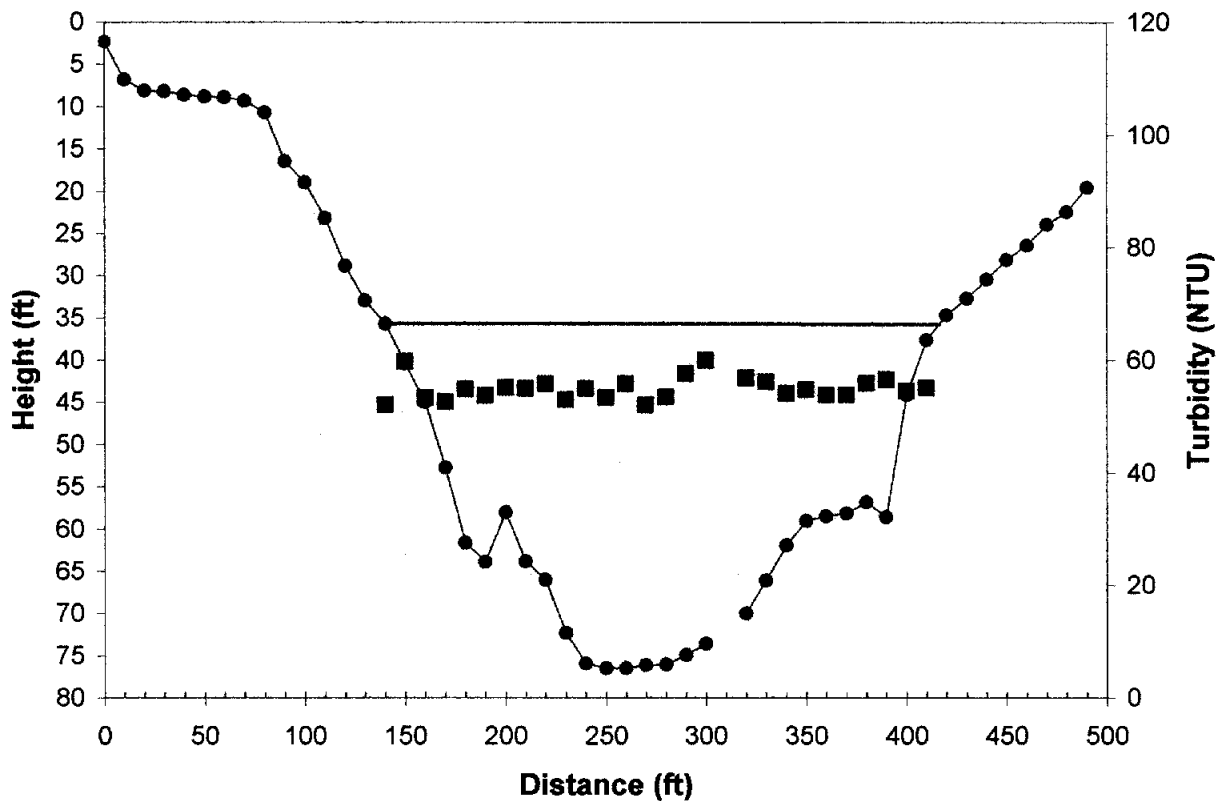


Figure 2. Channel cross-section at Romayor showing depth-integrated turbidity (purple squares) taken 7 January, 2003..

2. Channel Planform Change

Purpose and methods

The purpose of this section of the study is to qualitatively and quantitatively investigate the nature of planform change along the Lower Trinity River where the Livingston Dam is currently regulating discharge (Figure 3). The reach of the Trinity selected for investigation is 35 river miles below Livingston Dam, and contained entirely within Liberty County. The northernmost boundary is defined by the bridge of Farm Road 787, less than 2 miles from the town of Romayor. The southern boundary is located at the bridge of US-90 in the city of Liberty, upstream of the Port of Liberty.

Sixteen colour-infrared DOQQs of the study area were taken in 1995 with a 1m² pixel resolution. These served as the base for registration of all other images, and as the most recent record of the channel planform. Additionally, 50 black and white air photographs were used, flown in 1958, 1964, 1972 and 1989. Four photo-mosaic indices composed from a 1938 air photo run of undetermined origin were made available by the Liberty County NRCS office. As the individual photographs could not be located, the photo-mosaic was scanned for integration into the digital photographic archive.

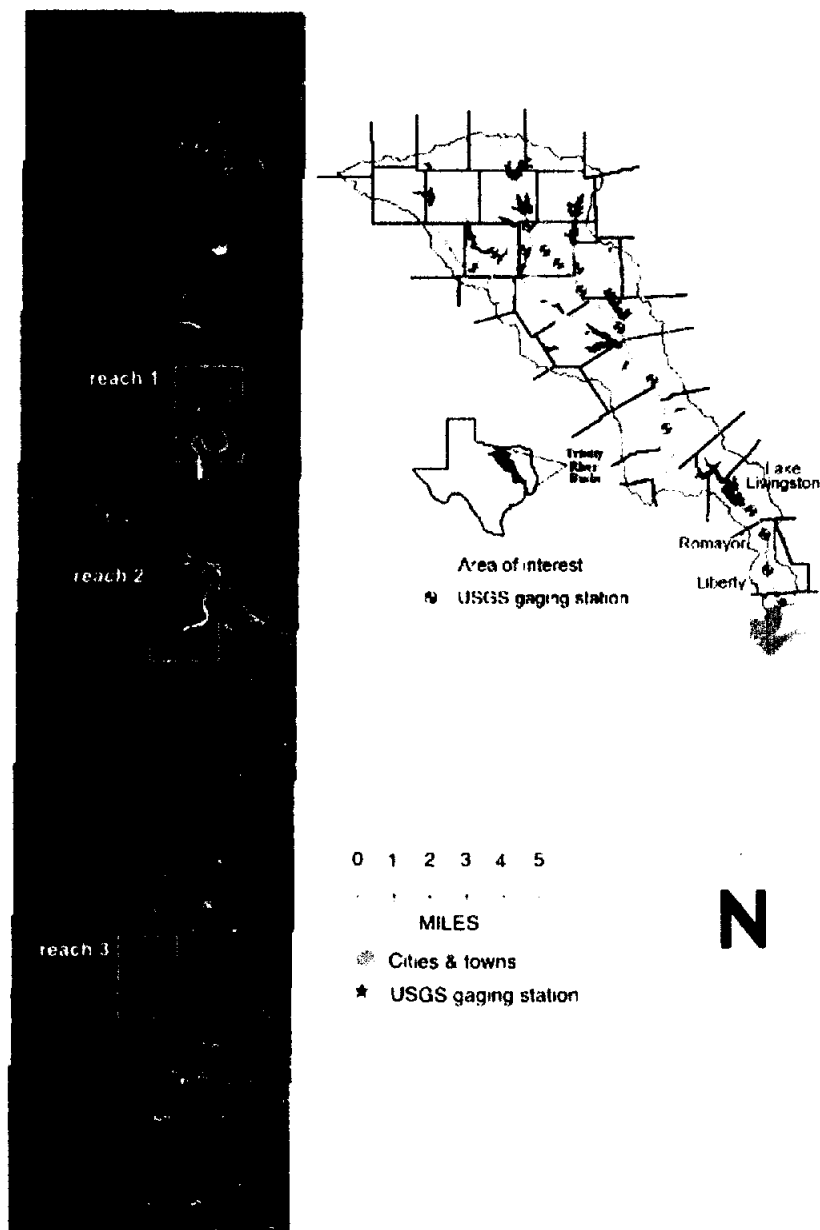


Figure 3. Photo-mosaic of the study area and the three reaches selected for detail morphologic analysis.

To investigate the stability of the channel over photographic intervals, raster overlay analysis was used to identify both stable and unstable segments of the reach. In addition, an array of vector-based morphometric characteristics were identified and quantified using ArcView and manual methods. Parameters surveyed include inflection points, bend length, baseline length, amplitude of individual bends and radius of curvature. Finally, the rate and magnitude of lateral migration occurring along the main channel and on individual bends was derived from superimposed channel centerlines of sequential years.

Results and analysis

Rainfall and discharge: Annual precipitation records at Liberty reveal totals ranging from 30-87” with a mean of 54.5” (Figure 4). The post-dam period (1972-1995) is significantly wetter than the pre-dam period (1938-1964) at the 95% confidence interval ($p=0.013$, Table 1). Individually, the 1972-89 and 1989-95 periods are wetter than the 1938-58 period. The five highest maximum 24-hour rainfall events are all greater than 8”. As shown in Figure 5, the three largest events occurred between 1977 and 1995.

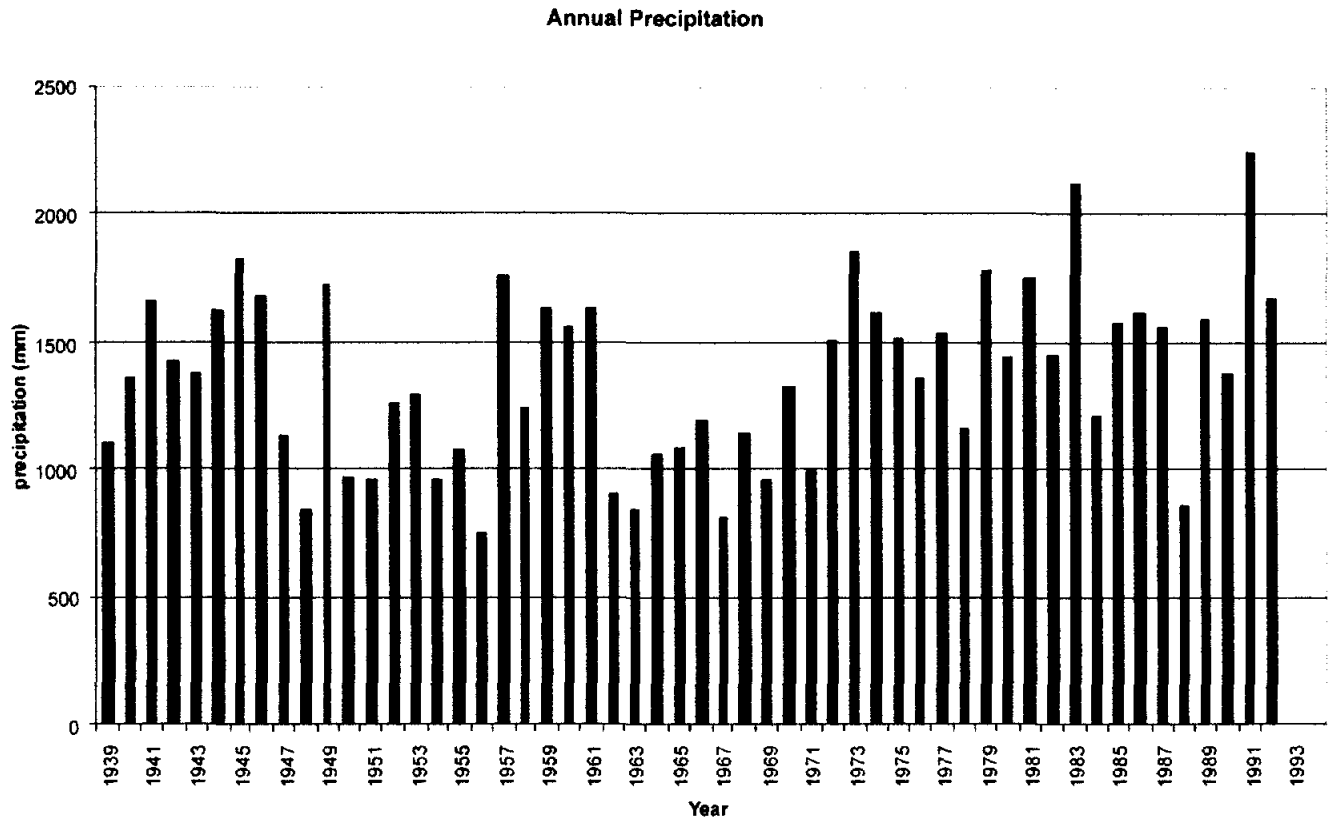


Figure 4. Annual rainfall record for Liberty, Texas.

Table 1. Correlation matrix of annual rainfall totals for the time periods studied. $P < 0.05$ indicates rainfall significantly different (Mann-Whitney U-Statistic).

	1938-1958	1958-1964	1972-1989	1989-1995
1938-1958	*	0.670	0.050	0.023
1958-1964	0.670	*	0.317	0.082
1972-1989	0.050	0.317	*	0.126
1989-1995	0.023	0.082	0.126	*
	1972-1989			
1938-1964	0.013			

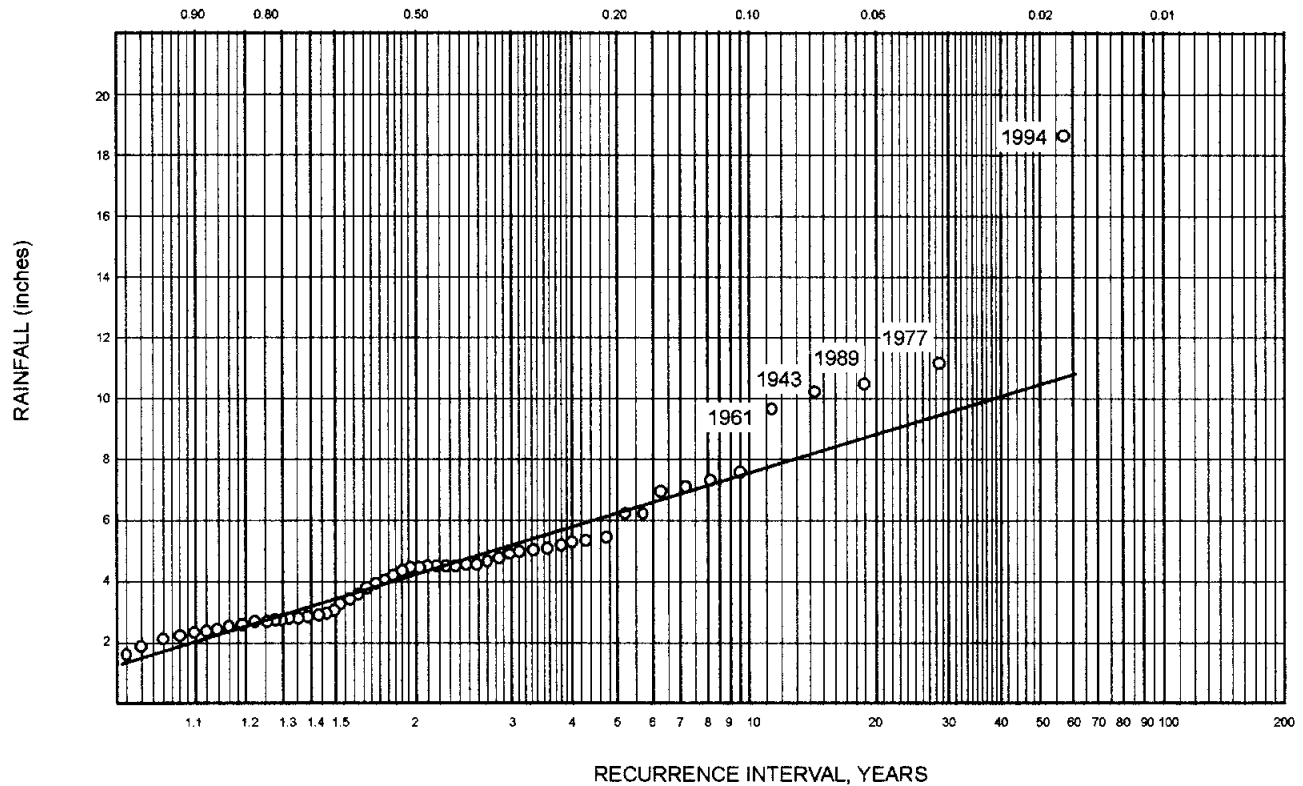


Figure 5. 24-hour maximum rainfall, Liberty, Texas.

Figure 6 shows flow duration curves for the Romayor gauging station for the pre-dam, post-dam, and complete period of record. Overall, flow regulation appears not to have altered the hydrologic regime, at least in terms of “flashiness”, in any significant way. Pre- and post-impoundment curves are of similar form, and managed release from Lake Livingston appears to closely mimic the natural flow distribution. Median discharge (Q_{d50}) has been elevated by approximately 30% following impoundment. For the lowest flows, discharges are most affected. For example, the pre-dam curve indicates flow is less than 500 cfs 15% of the time; post-dam, discharge only falls below this 5% of the time.

The flow duration curves shown in Figure 6 do not, however, reveal the full picture of regulated flow at the Romayor gauging station. Therefore, flow duration was examined during each of the photographic intervals in a second series of curves (Figures 7 and 8). The post-dam elevated low flows are again apparent (see Figure 8a) but most significant here is the 1989-95 curve which lies well above all the other curves. Q_{d50} during this period is approximately 8,000 cfs, almost three times as large as the overall mean. Clearly, this hydrologic change is not related to flow regulation but, rather, a much wetter period (two of the three wettest years and two of the three largest 24-hour maxima occur during this period). Thus, it appears that much of the elevation in the post-dam duration curve shown in Figure 6 can be attributed to anomalously high rainfall, at least for high flows, rather than flow regulation. The discharge data from 1995-2001, which were also included in this analysis, and which lie close to the long-term mean, support this reasoning.

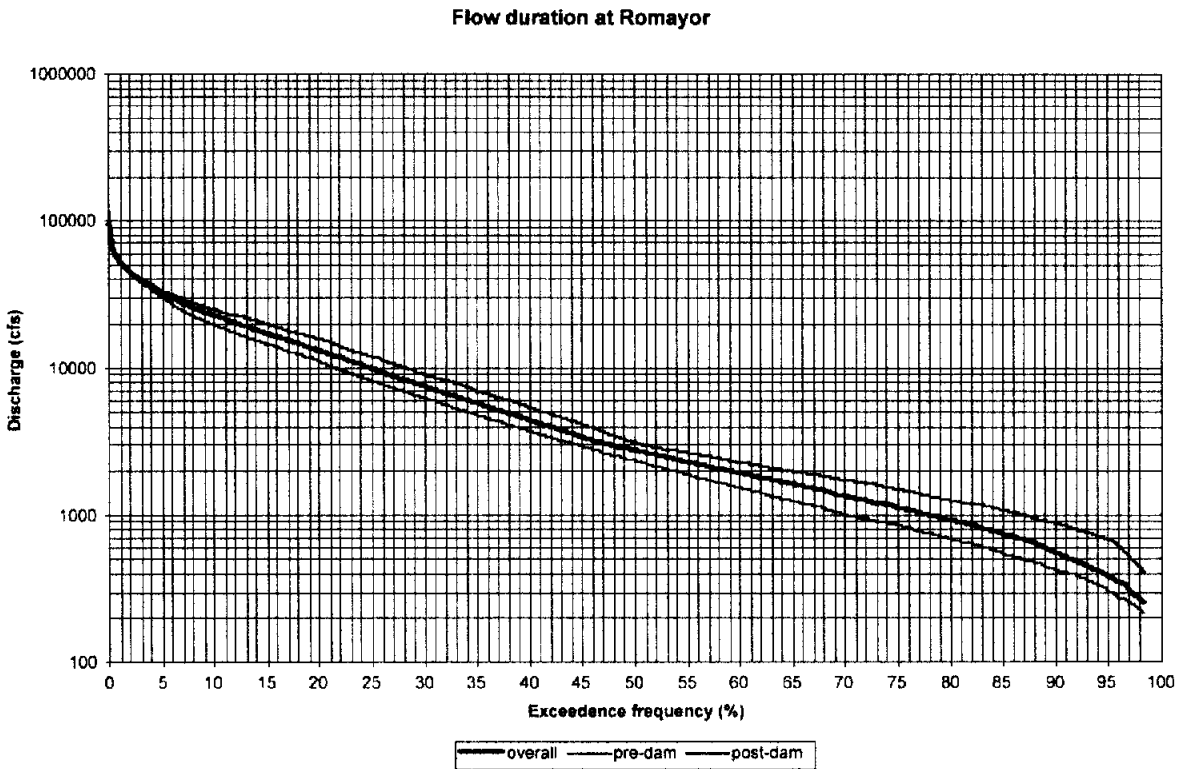


Figure 6. Flow duration curves for Romayor, Texas, for the pre- and post-dam period.

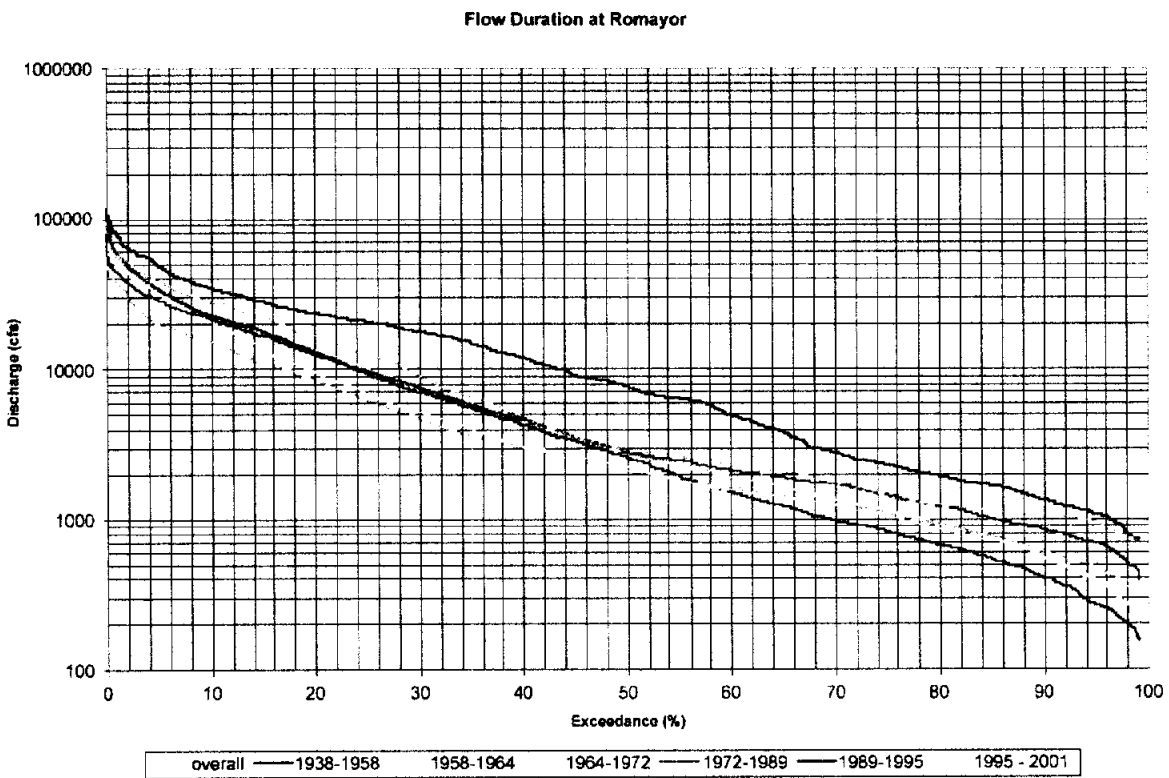


Figure 7. Flow duration curves for Romayor, Texas, for the five time periods under study. Data for 1995-2001 have also been included.

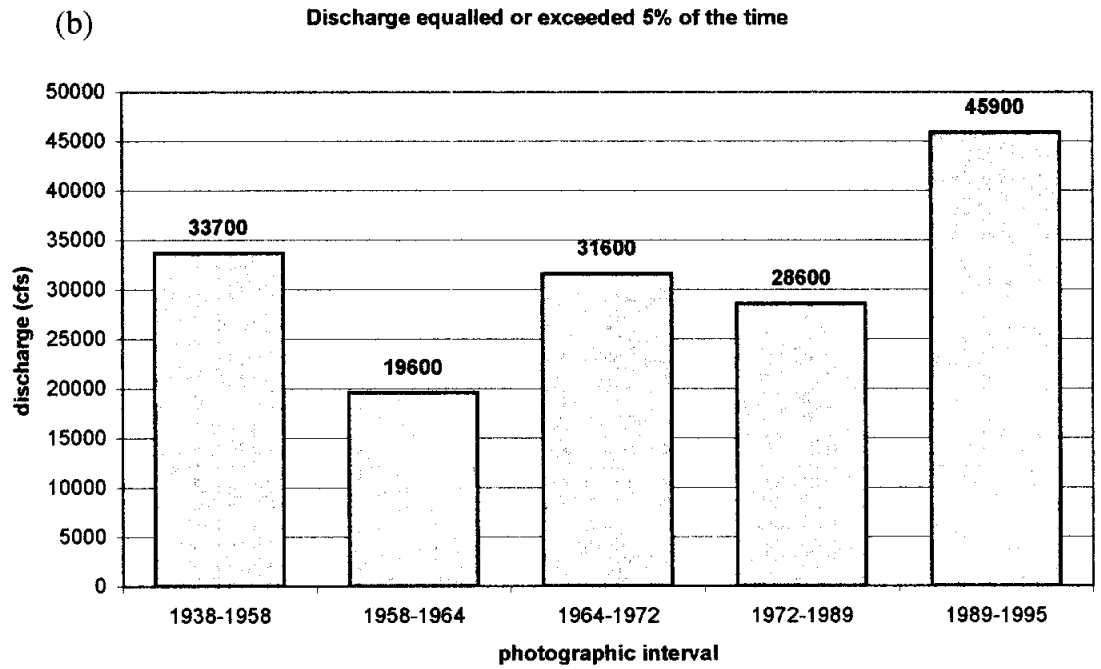
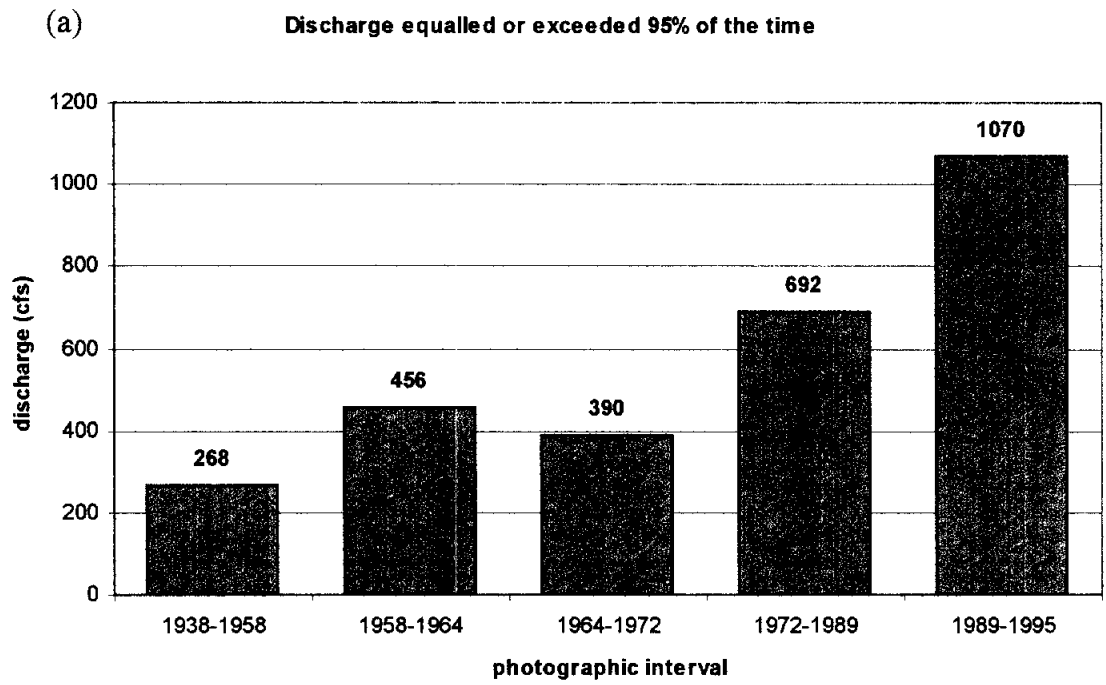


Figure 8. Flow duration for Romayor, Texas, for 95% (a) and 5% (b) exceedances.

Channel change: When flow is impounded and regulated, the natural discharge regime is generally altered and the behavior or rate of meander evolution tends to be effected. Park (1977) and others note that constructed reservoirs strip downstream flow of its sediment load and regulation dampens peak flow events. This may induce a shift reducing erosional capability and channel capacity immediately downstream. Gregory and Park (1977) also attributed decreased channel capacity to flow regulation upstream. It is well documented that stabilization of a planform is to be expected downstream following impoundment and regulation. Multiple studies in the U.S. confirm the theory of planform stabilization. Gillespie and Giardino (1997) observed an accelerated stabilization and equilibration on the Brazos River following impoundment. In Montana and Alberta, Bradley and Smith (1987) observed a reduction in channel width along with slowed meander migration initiated by dampened peak flows below the Fresno Dam. Similarly, Shields *et al.* (2000) found channel migration on the Missouri River immediately below Fort Peck Dam to be nearly four times less than prior to impoundment.

Figure 9 shows the study reach during the five time intervals with areas of channel erosion and deposition. Table 2 shows preliminary data on erosion and lateral migration rates for the five time periods under study. The pre-dam periods show consistent rates of channel erosion with a doubling in lateral migration during the last six years (1958-1964). The 1964-1972 period spans construction of the dam, but erosion and migration rates remain consistent with the pre-dam period. The period immediately following impoundment indicates some stabilization of the channel and a decrease in migration, even though this period is still relatively wet. However, the 1989-1995 period shows a significant increase in channel activity, with the highest measured erosion rates (45 ha/yr) and lateral migration rates comparable to pre-dam conditions. This increase in channel erosion is consistent with the significantly increased flow durations, as shown in Figures 7 and 8.

These data raise interesting questions regarding the magnitude and frequency of geomorphic events. Certainly, the 1994 rainfall maxima (18.5 inches in 24 hours) represents a storm of exceptional magnitude, with a return period in excess of 200 years, and probably closer to 500 years (see Figure 5). The 1989 maxima (10.6 inches in 24 hours) occurred in mid-May and has a return period greater than 20 years, but was then followed by tropical storm Allison in June (8.99 inches in 24 hours). The 1989-1995 period is clearly one of substantial rainfall and erosion, and this is reflected in the channel activity data. One area that requires further examination, however, is the 6.5 m/yr lateral migration rates observed during 1958-64, a period of substantially *lower* high flows (see Figure 8b). One possibility is that, during these lower-than-normal flows, channel banks became increasingly unstable, requiring only a few events of mid-range magnitude to cause accelerated lateral migration, possibly facilitated by mass movements along the channel course.

Table 2. Channel activity for the Trinity River downstream of Lake Livingston.

	Channel erosion (ha/yr)	Lateral migration (m/yr)
1938-1958	33.0	3.4
1958-1964	33.6	6.5
1964-1972	28.8	3.6
1972-1989	10.7	1.7
1989-1995	45.1	3.9

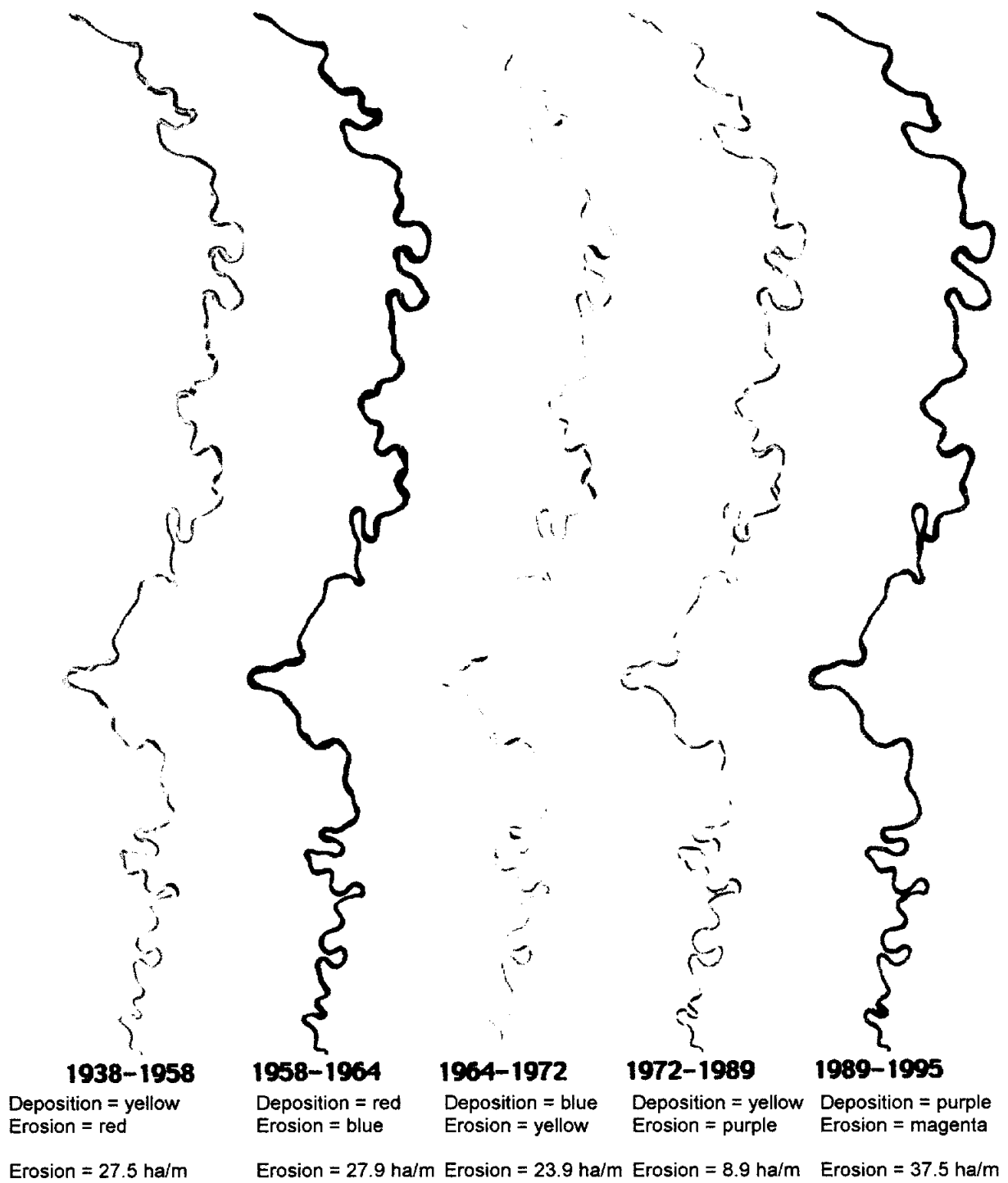


Figure 9. Erosion and deposition along the Lower Trinity during the five time periods.

Overall, there appears at this stage to be little evidence of major changes in channel morphology attributable to the impoundment of the Lower Trinity by Lake Livingston. Certainly, channels are actively shifting and the banks are eroding (see Table 3), but not in any discernibly different way than before the dam was constructed. As noted by Phillips (2003), while dam releases are unnaturally flashy and abrupt on a day-to-day basis, the long-term pattern of releases combined with some downstream smoothing creates a flow regime in the lower basin which mimics the pre-dam regime, at least at monthly and annual time scales.

Table 3. Percentage 1938 channel present in subsequent time periods. These data indicate that 75% of the 1995 channel is new channel actively cut into the floodplain.

Channel stability from 1938 through (%)	1958	1964	1972	1989	1995
1938	56	43	36	29	25

Date	Time	Q (cfs)	Turbidity
1-Apr-02	0:00:00	19511	
	6:00:00	20578	
	12:00:00	21903	
	18:00:00	22380	
2-Apr-02	0:00:00	22619	
	6:00:00	22948	
	12:00:00	23102	
	18:00:00	23036	
3-Apr-02	0:00:00	23651	
	6:00:00	24516	
	12:00:00	25110	
	18:00:00	25291	
4-Apr-02	0:00:00	25343	
	6:00:00	25343	
	12:00:00	25526	
	18:00:00	23904	
5-Apr-02	0:00:00	22119	
	6:00:00	23036	
	12:00:00	24158	
	18:00:00	24928	
6-Apr-02	0:00:00	25213	
	6:00:00	25343	
	12:00:00	25526	
	18:00:00	25578	
7-Apr-02	0:00:00	25396	
	6:00:00	25657	
	12:00:00	25448	
	18:00:00	25526	
8-Apr-02	0:00:00	25604	
	6:00:00	26156	
	12:00:00	27060	
	18:00:00	29239	
9-Apr-02	0:00:00	32848	
	6:00:00	36683	
	12:00:00	39623	
	18:00:00	40339	
10-Apr-02	0:00:00	40267	
	6:00:00	39944	
	12:00:00	39587	
	18:00:00	39373	
11-Apr-02	0:00:00	39267	
	6:00:00	38807	
	12:00:00	38913	
	18:00:00	38913	
12-Apr-02	0:00:00	38771	
	6:00:00	38525	
	12:00:00	38419	
	18:00:00	38384	
13-Apr-02	0:00:00	38279	

	6:00:00	38174
	12:00:00	38244
	18:00:00	37894
14-Apr-02	0:00:00	37303
	6:00:00	35757
	12:00:00	34855
	18:00:00	34349
15-Apr-02	0:00:00	33757
	6:00:00	32384
	12:00:00	30695
	18:00:00	29823
16-Apr-02	0:00:00	28633
	6:00:00	26793
	12:00:00	24133
	18:00:00	18484
17-Apr-02	0:00:00	14417
	6:00:00	16108
	12:00:00	19552
	18:00:00	21687
18-Apr-02	0:00:00	22663
	6:00:00	22838
	12:00:00	23102
	18:00:00	23124
19-Apr-02	0:00:00	23234
	6:00:00	23212
	12:00:00	23256
	18:00:00	23168
20-Apr-02	0:00:00	23367
	6:00:00	23278
	12:00:00	23256
	18:00:00	23124
21-Apr-02	0:00:00	23124
	6:00:00	23124
	12:00:00	23234
	18:00:00	23212
22-Apr-02	0:00:00	23168
	6:00:00	23102
	12:00:00	23036
	18:00:00	23102
23-Apr-02	0:00:00	23190
	6:00:00	23212
	12:00:00	23367
	18:00:00	23058
24-Apr-02	0:00:00	23168
	6:00:00	23081
	12:00:00	23133
	18:00:00	23184
25-Apr-02	0:00:00	23235
	6:00:00	23234
	12:00:00	23168

	18:00:00	23411
26-Apr-02	0:00:00	23345
	6:00:00	23212
	12:00:00	23345
	18:00:00	23168
27-Apr-02	0:00:00	23256
	6:00:00	23190
	12:00:00	22970
	18:00:00	22162
28-Apr-02	0:00:00	20641
	6:00:00	20472
	12:00:00	20073
	18:00:00	19990
29-Apr-02	0:00:00	19823
	6:00:00	19906
	12:00:00	19594
	18:00:00	19139
30-Apr-02	0:00:00	19324
	6:00:00	19263
	12:00:00	19304
	18:00:00	19324
1-May-02	0:00:00	19180
	6:00:00	19324
	12:00:00	19242
	18:00:00	14165
2-May-02	0:00:00	12265
	6:00:00	13532
	12:00:00	14749
	18:00:00	15363
3-May-02	0:00:00	15563
	6:00:00	15643
	12:00:00	15764
	18:00:00	15684
4-May-02	0:00:00	14808
	6:00:00	13267
	12:00:00	12155
	18:00:00	11134
5-May-02	0:00:00	10380
	6:00:00	9837
	12:00:00	9642
	18:00:00	9538
6-May-02	0:00:00	9450
	6:00:00	9420
	12:00:00	9450
	18:00:00	8951
7-May-02	0:00:00	7993
	6:00:00	7284
	12:00:00	6877
	18:00:00	6220
8-May-02	0:00:00	5379

	6:00:00	4862
	12:00:00	4591
	18:00:00	4421
9-May-02	0:00:00	4373
	6:00:00	4361
	12:00:00	4373
	18:00:00	4349
10-May-02	0:00:00	4325
	6:00:00	4313
	12:00:00	4313
	18:00:00	4775
11-May-02	0:00:00	5664
	6:00:00	6180
	12:00:00	6423
	18:00:00	6766
12-May-02	0:00:00	7115
	6:00:00	7313
	12:00:00	7398
	18:00:00	8091
13-May-02	0:00:00	9009
	6:00:00	9568
	12:00:00	9807
	18:00:00	9957
14-May-02	0:00:00	9972
	6:00:00	10047
	12:00:00	9987
	18:00:00	10002
15-May-02	0:00:00	9957
	6:00:00	10047
	12:00:00	10017
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16-May-02	0:00:00	10032
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18-May-02	0:00:00	11793
	6:00:00	12393
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	6:00:00	12744
	12:00:00	12818
	18:00:00	12707
20-May-02	0:00:00	12707
	6:00:00	12707
	12:00:00	12781

	18:00:00	12725
21-May-02	0:00:00	12707
	6:00:00	12688
	12:00:00	12725
	18:00:00	12725
22-May-02	0:00:00	12725
	6:00:00	12744
	12:00:00	12651
	18:00:00	12669
23-May-02	0:00:00	12707
	6:00:00	12688
	12:00:00	12707
	18:00:00	12725
24-May-02	0:00:00	12688
	6:00:00	12707
	12:00:00	12744
	18:00:00	12651
25-May-02	0:00:00	12725
	6:00:00	12651
	12:00:00	12596
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26-May-02	0:00:00	12577
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	18:00:00	8893
28-May-02	0:00:00	8063
	6:00:00	7656
	12:00:00	7412
	18:00:00	6505
29-May-02	0:00:00	5405
	6:00:00	4738
	12:00:00	4566
	18:00:00	4385
30-May-02	0:00:00	4265
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	12:00:00	4182
	18:00:00	4182
31-May-02	0:00:00	4123
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1-Jun-02	0:00:00	4100
	6:00:00	4076
	12:00:00	4088
	18:00:00	4088
2-Jun-02	0:00:00	4053

	6:00:00	4029	
	12:00:00	4029	
	18:00:00	4029	
3-Jun-02	0:00:00	4006	
	6:00:00	4006	
	12:00:00	4018	
	18:00:00	4006	
4-Jun-02	0:00:00	3994	
	6:00:00	4006	
	12:00:00	3994	
	18:00:00	3994	23.5
5-Jun-02	0:00:00	3960	24.2
	6:00:00	3960	19.8
	12:00:00	3994	18.1
	18:00:00	3960	22.2
6-Jun-02	0:00:00	3948	24.5
	6:00:00	3936	21.9
	12:00:00	3960	23.8
	18:00:00	3948	27.5
7-Jun-02	0:00:00	3936	20.8
	6:00:00	3936	21.4
	12:00:00	3936	20.8
	18:00:00	3960	21.3
8-Jun-02	0:00:00	3718	19.8
	6:00:00	3155	32.8
	12:00:00	2736	3.9
	18:00:00	2496	4.3
9-Jun-02	0:00:00	2392	3.7
	6:00:00	2327	3.4
	12:00:00	2308	8.7
	18:00:00	2280	3.8
10-Jun-02	0:00:00	2280	3.6
	6:00:00	2271	4.7
	12:00:00	2308	4
	18:00:00	2280	4.1
11-Jun-02	0:00:00	2280	3.7
	6:00:00	2271	3.5
	12:00:00	2262	4.6
	18:00:00	2308	5.7
12-Jun-02	0:00:00	2290	5.2
	6:00:00	2280	5.4
	12:00:00	2280	4.9
	18:00:00	2271	5
13-Jun-02	0:00:00	2262	6
	6:00:00	2253	6.2
	12:00:00	2244	5
	18:00:00	2225	5.6
14-Jun-02	0:00:00	2216	3.5
	6:00:00	2216	3.3
	12:00:00	2207	6.1

	18:00:00	2152	3.6
15-Jun-02	0:00:00	1898	3.4
	6:00:00	2033	4.2
	12:00:00	2345	4.3
	18:00:00	2430	3.4
16-Jun-02	0:00:00	2336	3.1
	6:00:00	2262	1.2
	12:00:00	2327	4.1
	18:00:00	2327	4
17-Jun-02	0:00:00	2317	3.6
	6:00:00	2280	3.7
	12:00:00	2280	3.9
	18:00:00	2271	4.3
18-Jun-02	0:00:00	2244	3.5
	6:00:00	2225	4.7
	12:00:00	2244	4.8
	18:00:00	2244	3.3
19-Jun-02	0:00:00	2225	4.2
	6:00:00	2225	4.2
	12:00:00	2253	4.9
	18:00:00	2225	4.6
20-Jun-02	0:00:00	2253	2.9
	6:00:00	2244	4.5
	12:00:00	2244	5.9
	18:00:00	2143	3.7
21-Jun-02	0:00:00	2133	3.7
	6:00:00	2115	4.4
	12:00:00	2115	4.1
	18:00:00	2097	3.2
22-Jun-02	0:00:00	2078	2.7
	6:00:00	2078	2.8
	12:00:00	2078	3.9
	18:00:00	2069	3.2
23-Jun-02	0:00:00	2060	3.7
	6:00:00	2051	4
	12:00:00	2060	6.2
	18:00:00	2060	4.3
24-Jun-02	0:00:00	2051	2.7
	6:00:00	2042	4
	12:00:00	2051	1.5
	18:00:00	2051	3.7
25-Jun-02	0:00:00	2033	2.5
	6:00:00	2033	3.4
	12:00:00	2051	3.4
	18:00:00	2060	0.9
26-Jun-02	0:00:00	2042	1.2
	6:00:00	2042	
	12:00:00	2069	7.6
	18:00:00	2069	2.8
27-Jun-02	0:00:00	2060	2.4

	6:00:00	2060	2.6
	12:00:00	2069	4
	18:00:00	2152	3
28-Jun-02	0:00:00	2170	2.1
	6:00:00	2133	2.8
	12:00:00	2124	3.9
	18:00:00	2207	2.6
29-Jun-02	0:00:00	2834	2.6
	6:00:00	3349	21.5
	12:00:00	3605	24.7
	18:00:00	3752	
30-Jun-02	0:00:00	3810	15.2
	6:00:00	3821	26.6
	12:00:00	3844	30.1
	18:00:00	3856	19.4
1-Jul-02	0:00:00	3879	22.4
	6:00:00	3856	19.5
	12:00:00	3856	18.5
	18:00:00	3879	24.2
2-Jul-02	0:00:00	3821	23.1
	6:00:00	3856	19
	12:00:00	3879	21.4
	18:00:00	3913	17.8
3-Jul-02	0:00:00	3925	15.9
	6:00:00	3902	16.7
	12:00:00	3925	21.7
	18:00:00	3948	28.8
4-Jul-02	0:00:00	3948	19.2
	6:00:00	3948	15.9
	12:00:00	3948	21.4
	18:00:00	3983	15.7
5-Jul-02	0:00:00	3936	15.5
	6:00:00	3936	17
	12:00:00	3925	17.7
	18:00:00	3925	15.1
6-Jul-02	0:00:00	3913	21.8
	6:00:00	3913	17.7
	12:00:00	3925	15.9
	18:00:00	3936	30.3
7-Jul-02	0:00:00	3925	14.7
	6:00:00	3925	13.6
	12:00:00	3948	18.1
	18:00:00	3936	13.6
8-Jul-02	0:00:00	3925	10.8
	6:00:00	3925	13.1
	12:00:00	3936	13.1
	18:00:00	3925	12.7
9-Jul-02	0:00:00	3913	11.2
	6:00:00	3902	9.7
	12:00:00	3913	14.1

	18:00:00	3960	16.7
10-Jul-02	0:00:00	3925	11.2
	6:00:00	3913	11.1
	12:00:00	3902	12.9
	18:00:00	3925	13.6
11-Jul-02	0:00:00	3925	12.2
	6:00:00	3902	11.4
	12:00:00	3913	12.6
	18:00:00	3902	12.7
12-Jul-02	0:00:00	3879	17.6
	6:00:00	3879	14.1
	12:00:00	3902	18.9
	18:00:00	3867	14.8
13-Jul-02	0:00:00	3902	10.2
	6:00:00	3948	10.1
	12:00:00	4041	22.7
	18:00:00	4100	29.6
14-Jul-02	0:00:00	4123	20
	6:00:00	4147	25.4
	12:00:00	4135	30.5
	18:00:00	4100	38.9
15-Jul-02	0:00:00	4029	28.3
	6:00:00	4006	17.3
	12:00:00	4029	19.2
	18:00:00	4053	16.6
16-Jul-02	0:00:00	4041	16.9
	6:00:00	4018	16.2
	12:00:00	4041	21.2
	18:00:00	4053	20.2
17-Jul-02	0:00:00	4053	17.2
	6:00:00	4018	18.5
	12:00:00	4029	16.7
	18:00:00	4182	19.3
18-Jul-02	0:00:00	4385	18.5
	6:00:00	4566	15.9
	12:00:00	4652	16.1
	18:00:00	4628	19.8
19-Jul-02	0:00:00	4652	17.1
	6:00:00	4652	14.7
	12:00:00	4652	17.8
	18:00:00	4554	16.4
20-Jul-02	0:00:00	4554	14.1
	6:00:00	4591	13.9
	12:00:00	4579	19.5
	18:00:00	4566	19.5
21-Jul-02	0:00:00	4481	18.6
	6:00:00	4469	17.9
	12:00:00	4469	22.9
	18:00:00	4481	19.2
22-Jul-02	0:00:00	4469	15.3

	6:00:00	4469	23.9
	12:00:00	4469	17.8
	18:00:00	4397	18.4
23-Jul-02	0:00:00	4409	18.4
	6:00:00	4385	18.5
	12:00:00	4373	20.4
	18:00:00	4385	17.2
24-Jul-02	0:00:00	4397	17.9
	6:00:00	4385	16.6
	12:00:00	4397	14.5
	18:00:00	4006	20.1
25-Jul-02	0:00:00	3925	14.4
	6:00:00	4170	15.1
	12:00:00	4385	32.9
	18:00:00	4469	18.3
26-Jul-02	0:00:00	4506	20.3
	6:00:00	4506	18.6
	12:00:00	4566	22.9
	18:00:00	4554	22.9
27-Jul-02	0:00:00	4506	37.4
	6:00:00	4554	36.9
	12:00:00	4542	45.3
	18:00:00	4170	72.2
28-Jul-02	0:00:00	3349	79.7
	6:00:00	2775	38.3
	12:00:00	2467	3.5
	18:00:00	2308	2.3
29-Jul-02	0:00:00	2198	2.5
	6:00:00	2180	2.2
	12:00:00	2170	4.5
	18:00:00	2124	3.5
30-Jul-02	0:00:00	2133	3.1
	6:00:00	2124	2.9
	12:00:00	2106	4.6
	18:00:00	2106	4
31-Jul-02	0:00:00	2106	3.6
	6:00:00	2078	5.5
	12:00:00	2106	4.4
	18:00:00	2078	4.2
1-Aug-02	0:00:00	2060	3.6
	6:00:00	2051	3.1
	12:00:00	2060	4.3
	18:00:00	2051	4.3
2-Aug-02	0:00:00	2051	3.6
	6:00:00	2051	3.4
	12:00:00	2069	4.8
	18:00:00	1997	3.8
3-Aug-02	0:00:00	1802	3.2
	6:00:00	1630	2.9
	12:00:00	1529	

	18:00:00	1464	12.5
4-Aug-02	0:00:00	1480	
	6:00:00	1512	
	12:00:00	1512	8.4
	18:00:00	1521	5.4
5-Aug-02	0:00:00	1537	12.2
	6:00:00	1537	10
	12:00:00	1571	11.5
	18:00:00	1562	12.4
6-Aug-02	0:00:00	1529	20.4
	6:00:00	1504	13
	12:00:00	1496	8.3
	18:00:00	1448	5.9
7-Aug-02	0:00:00	1394	5.3
	6:00:00	1325	3.4
	12:00:00	1287	0.7
	18:00:00	1257	0.7
8-Aug-02	0:00:00	1242	0.5
	6:00:00	1242	0.5
	12:00:00	1242	0.9
	18:00:00	1242	0.9
9-Aug-02	0:00:00	1257	1.2
	6:00:00	1234	6.6
	12:00:00	1257	1.5
	18:00:00	1272	2.6
10-Aug-02	0:00:00	1279	1.2
	6:00:00	1257	0.4
	12:00:00	1242	0.8
	18:00:00	1234	0.9
11-Aug-02	0:00:00	1227	0.9
	6:00:00	1212	0.7
	12:00:00	1204	0.9
	18:00:00	1204	1.3
12-Aug-02	0:00:00	1212	2
	6:00:00	1204	1.9
	12:00:00	1197	1.1
	18:00:00	1182	0.9
13-Aug-02	0:00:00	1182	1
	6:00:00	1182	5
	12:00:00	1190	0.7
	18:00:00	1197	
14-Aug-02	0:00:00	1219	4
	6:00:00	1219	0.3
	12:00:00	1219	1.2
	18:00:00	1219	1.4
15-Aug-02	0:00:00	1219	1.3
	6:00:00	1212	1.2
	12:00:00	1219	1.3
	18:00:00	1257	
16-Aug-02	0:00:00	1279	0.6

	6:00:00	1279	1.4
	12:00:00	1264	0.9
	18:00:00	1234	1.5
17-Aug-02	0:00:00	1234	2.2
	6:00:00	1234	1
	12:00:00	1219	1.8
	18:00:00	1197	1.9
18-Aug-02	0:00:00	1190	1.7
	6:00:00	1190	1.5
	12:00:00	1197	1.8
	18:00:00	1175	1.9
19-Aug-02	0:00:00	1145	1.7
	6:00:00	1138	1.4
	12:00:00	1182	1.7
	18:00:00	1215	1.8
20-Aug-02	0:00:00	1219	1.7
	6:00:00	1234	1.5
	12:00:00	1234	1.7
	18:00:00	1204	1.8
21-Aug-02	0:00:00	1204	1.6
	6:00:00	1190	1.5
	12:00:00	1219	1.8
	18:00:00	1219	1.7
22-Aug-02	0:00:00	1219	1.6
	6:00:00	1227	1.5
	12:00:00	1234	1.8
	18:00:00	1234	0.9
23-Aug-02	0:00:00	1242	0.9
	6:00:00	1257	0.7
	12:00:00	1264	1.3
	18:00:00	1257	1.7
24-Aug-02	0:00:00	1257	1.6
	6:00:00	1234	1.5
	12:00:00	1234	1.7
	18:00:00	1227	1.8
25-Aug-02	0:00:00	1219	1.7
	6:00:00	1219	1.6
	12:00:00	1234	1.8
	18:00:00	1227	1.8
26-Aug-02	0:00:00	1227	1.8
	6:00:00	1219	1.7
	12:00:00	1234	1.8
	18:00:00	1234	1.8
27-Aug-02	0:00:00	1234	0.7
	6:00:00	1234	0.8
	12:00:00	1257	1.3
	18:00:00	1257	1.7
28-Aug-02	0:00:00	1272	1.6
	6:00:00	1272	1.5
	12:00:00	1287	1.6

	18:00:00	1294	1.8
29-Aug-02	0:00:00	1294	1.8
	6:00:00	1294	1.6
	12:00:00	1302	1.9
	18:00:00	1294	1.9
30-Aug-02	0:00:00	1287	1.7
	6:00:00	1287	1.7
	12:00:00	1302	1.8
	18:00:00	1294	1.8
31-Aug-02	0:00:00	1257	1.7
	6:00:00	1227	1.6
	12:00:00	1287	1.8
	18:00:00	1302	1.9
1-Sep-02	0:00:00	1325	1.7
	6:00:00	1332	1.7
	12:00:00	1348	1.8
	18:00:00	1340	1.8
2-Sep-02	0:00:00	1346	1.7
	6:00:00	1348	1.6
	12:00:00	1371	1.7
	18:00:00	1355	1.8
3-Sep-02	0:00:00	1371	1.7
	6:00:00	1371	1.5
	12:00:00	1378	1.7
	18:00:00	1378	1.7
4-Sep-02	0:00:00	1378	1.6
	6:00:00	1332	1.5
	12:00:00	1272	1.8
	18:00:00	1242	1.8
5-Sep-02	0:00:00	1234	1.7
	6:00:00	1234	1.7
	12:00:00	1264	1.8
	18:00:00	1272	2
6-Sep-02	0:00:00	1272	1.8
	6:00:00	1302	1.7
	12:00:00	1386	2.1
	18:00:00	1448	1.6
7-Sep-02	0:00:00	1160	3.1
	6:00:00	1219	1
	12:00:00	1182	0.6
	18:00:00	1175	1.5
8-Sep-02	0:00:00	1153	1.3
	6:00:00	1249	23.1
	12:00:00	1579	137.8
	18:00:00	2151	81.7
9-Sep-02	0:00:00	2216	79.5
	6:00:00	2189	58.5
	12:00:00	2152	40.9
	18:00:00	2060	41.4
10-Sep-02	0:00:00	1925	55.5

	6:00:00	1819	41.6
	12:00:00	1741	55.7
	18:00:00	1672	1.4
11-Sep-02	0:00:00	1504	0.9
	6:00:00	1472	0.6
	12:00:00	1456	1.7
	18:00:00	1433	2.4
12-Sep-02	0:00:00	1409	2.3
	6:00:00	1394	6.8
	12:00:00	1386	1.6
	18:00:00	1363	1.1
13-Sep-02	0:00:00	1348	0.4
	6:00:00	1332	0.4
	12:00:00	1325	1
	18:00:00	1302	1.1
14-Sep-02	0:00:00	1302	0.6
	6:00:00	1294	0.4
	12:00:00	1294	0.9
	18:00:00	1279	1
15-Sep-02	0:00:00	1272	0.6
	6:00:00	1264	0.4
	12:00:00	1257	0.6
	18:00:00	1257	
16-Sep-02	0:00:00	1257	0.1
	6:00:00	1264	0.1
	12:00:00	1272	2
	18:00:00	1264	1.1
17-Sep-02	0:00:00	1227	
	6:00:00	1167	1.1
	12:00:00	1204	
	18:00:00	1234	
18-Sep-02	0:00:00	1279	
	6:00:00	1402	13.5
	12:00:00	1706	20.3
	18:00:00	1837	18.7
19-Sep-02	0:00:00	1698	
	6:00:00	1579	14.2
	12:00:00	1554	
	18:00:00	1529	
20-Sep-02	0:00:00	1655	
	6:00:00	2060	33.1
	12:00:00	2234	34.1
	18:00:00	2143	47.6
21-Sep-02	0:00:00	2015	84.2
	6:00:00	1881	82.7
	12:00:00	1793	
	18:00:00	1724	2
22-Sep-02	0:00:00	1681	0.4
	6:00:00	1638	0.2
	12:00:00	1604	1

	18:00:00	1562	1.5
23-Sep-02	0:00:00	1529	1.2
	6:00:00	1504	1.3
	12:00:00	1496	1.4
	18:00:00	1472	1.4
24-Sep-02	0:00:00	1448	1.3
	6:00:00	1425	1.4
	12:00:00	1417	1.4
	18:00:00	1402	1.4
25-Sep-02	0:00:00	1363	1.4
	6:00:00	1287	1.4
	12:00:00	1294	1.4
	18:00:00	1348	1.3
26-Sep-02	0:00:00	1340	1.3
	6:00:00	1348	1.2
	12:00:00	1363	1.4
	18:00:00	1363	1.2
27-Sep-02	0:00:00	1363	1
	6:00:00	1355	1.1
	12:00:00	1363	1.2
	18:00:00	1363	
28-Sep-02	0:00:00	1355	5.4
	6:00:00	1363	3.7
	12:00:00	1371	1.4
	18:00:00	1371	1.9
29-Sep-02	0:00:00	1371	1.4
	6:00:00	1363	1.4
	12:00:00	1371	1
	18:00:00	1371	1
30-Sep-02	0:00:00	1363	1.4
	6:00:00	1363	1.9
	12:00:00	1363	0.9
	18:00:00	1371	1.5
1-Oct-02	0:00:00	1325	7.2
	6:00:00	1204	5
	12:00:00	1109	3.7
	18:00:00	1066	2.1
2-Oct-02	0:00:00	1030	1
	6:00:00	1016	1.1
	12:00:00	1016	1
	18:00:00	1009	2.1
3-Oct-02	0:00:00	1016	1.6
	6:00:00	1016	1.4
	12:00:00	995	2.1
	18:00:00	952	2.1
4-Oct-02	0:00:00	931	4.7
	6:00:00	917	0.7
	12:00:00	924	1.8
	18:00:00	917	2
5-Oct-02	0:00:00	910	1.8

	6:00:00	903	1.7
	12:00:00	896	1.9
	18:00:00	903	2
6-Oct-02	0:00:00	889	1.7
	6:00:00	896	1.7
	12:00:00	896	2
	18:00:00	896	1.4
7-Oct-02	0:00:00	903	1
	6:00:00	910	1.4
	12:00:00	903	1.4
	18:00:00	917	2
8-Oct-02	0:00:00	952	1.7
	6:00:00	966	1.8
	12:00:00	960	1.9
	18:00:00	945	2
9-Oct-02	0:00:00	924	0.8
	6:00:00	924	3.4
	12:00:00	924	2.3
	18:00:00	938	1.3
10-Oct-02	0:00:00	945	1.8
	6:00:00	960	1
	12:00:00	960	0.6
	18:00:00	960	1.4
11-Oct-02	0:00:00	952	0.9
	6:00:00	938	0.6
	12:00:00	945	1.4
	18:00:00	952	1.5
12-Oct-02	0:00:00	952	0.7
	6:00:00	952	1.1
	12:00:00	966	0.8
	18:00:00	960	1.7
13-Oct-02	0:00:00	960	0.7
	6:00:00	952	1
	12:00:00	960	1.3
	18:00:00	952	1.8
14-Oct-02	0:00:00	960	1.5
	6:00:00	1596	2
	12:00:00	2884	22.2
	18:00:00	3527	23.8
15-Oct-02	0:00:00	3775	20
	6:00:00	3856	15.3
	12:00:00	3925	31.5
	18:00:00	3948	27.1
16-Oct-02	0:00:00	3948	18.3
	6:00:00	3948	26.7
	12:00:00	3971	19.3
	18:00:00	3983	28.8
17-Oct-02	0:00:00	3971	28
	6:00:00	3971	26.5
	12:00:00	4006	29.2

	18:00:00	3673	
18-Oct-02	0:00:00	2844	
	6:00:00	2161	
	12:00:00	1681	
	18:00:00	1355	
19-Oct-02	0:00:00	1204	7
	6:00:00	1123	2.6
	12:00:00	1131	2.6
	18:00:00	1145	2.5
20-Oct-02	0:00:00	1167	2.3
	6:00:00	1249	2.2
	12:00:00	1287	2.1
	18:00:00	1409	2.2
21-Oct-02	0:00:00	2486	42.2
	6:00:00	3605	94.8
	12:00:00	4159	112.3
	18:00:00	4397	92
22-Oct-02	0:00:00	4530	97
	6:00:00	4775	124
	12:00:00	5138	151.1
	18:00:00	6835	156.6
23-Oct-02	0:00:00	9450	157.8
	6:00:00	11087	160.4
	12:00:00	11775	250.5
	18:00:00	11901	103.8
24-Oct-02	0:00:00	11955	103.9
	6:00:00	12448	80.2
	12:00:00	12688	92.1
	18:00:00	14651	128.2
25-Oct-02	0:00:00	16353	89.4
	6:00:00	17458	80.5
	12:00:00	18180	73.1
	18:00:00	20031	76.5
26-Oct-02	0:00:00	22619	85.5
	6:00:00	24184	118.9
	12:00:00	24877	94.4
	18:00:00	25343	77.1
27-Oct-02	0:00:00	25317	60.7
	6:00:00	24928	50.4
	12:00:00	25110	44.3
	18:00:00	25032	42.7
28-Oct-02	0:00:00	25006	37.9
	6:00:00	24722	41
	12:00:00	24748	36.6
	18:00:00	24568	37.4
29-Oct-02	0:00:00	25788	46.8
	6:00:00	27409	41.2
	12:00:00	29768	88.3
	18:00:00	30118	81.1
30-Oct-02	0:00:00	29450	93

	6:00:00	28602	66.6
	12:00:00	27673	45.5
	18:00:00	26940	37.4
31-Oct-02	0:00:00	25620	33.3
	6:00:00	24361	31.4
	12:00:00	23386	29.1
	18:00:00	22458	24.1
1-Nov-02	0:00:00	20334	24
	6:00:00	18082	24.2
	12:00:00	16577	21.9
	18:00:00	14720	24.5
2-Nov-02	0:00:00	12731	24.2
	6:00:00	11217	27.9
	12:00:00	10465	26
	18:00:00	9070	26.5
3-Nov-02	0:00:00	7787	24.9
	6:00:00	6928	28.2
	12:00:00	7074	38.3
	18:00:00	8925	124.5
4-Nov-02	0:00:00	12624	244.3
	6:00:00	19963	296.9
	12:00:00	25769	314.2
	18:00:00	29514	220.6
5-Nov-02	0:00:00	35922	195.5
	6:00:00	46966	161.6
	12:00:00	56561	188.7
	18:00:00	63360	174.9
6-Nov-02	0:00:00	68625	190.1
	6:00:00	72775	157.8
	12:00:00	74623	125.9
	18:00:00	76665	233.2
7-Nov-02	0:00:00	76944	105.2
	6:00:00	77558	98.8
	12:00:00	77894	88
	18:00:00	76888	83.1
8-Nov-02	0:00:00	77614	80.3
	6:00:00	77000	74.8
	12:00:00	76944	78
	18:00:00	76777	69.6
9-Nov-02	0:00:00	74428	66
	6:00:00	71283	54.6
	12:00:00	67780	46.8
	18:00:00	62681	49.3
10-Nov-02	0:00:00	55961	41
	6:00:00	49035	49.6
	12:00:00	43371	48.8
	18:00:00	38535	52.8
11-Nov-02	0:00:00	34682	47.7
	6:00:00	31573	50.7
	12:00:00	28260	43

	18:00:00	23272	42.6
12-Nov-02	0:00:00	18309	49.7
	6:00:00	14834	56.4
	12:00:00	12795	62.8
	18:00:00	10484	54.2
13-Nov-02	0:00:00	8060	50.9
	6:00:00	6393	50.5
	12:00:00	5440	50.2
	18:00:00	4976	59.9
14-Nov-02	0:00:00	4533	56.6
	6:00:00	4184	56.7
	12:00:00	3996	52.5
	18:00:00	3885	53.6
15-Nov-02	0:00:00	3812	46.5
	6:00:00	3776	47.7
	12:00:00	3776	40.6
	18:00:00	3728	41.2
16-Nov-02	0:00:00	3680	50.2
	6:00:00	3632	34.9
	12:00:00	3573	42.8
	18:00:00	3538	42.4
17-Nov-02	0:00:00	3514	44.6
	6:00:00	3491	50.8
	12:00:00	3479	40.4
	18:00:00	3479	42.5
18-Nov-02	0:00:00	3445	48.5
	6:00:00	3422	49.4
	12:00:00	3410	56.7
	18:00:00	3422	68.9
19-Nov-02	0:00:00	3399	66.2
	6:00:00	3251	70.9
	12:00:00	3095	58.4
	18:00:00	2986	64.3
20-Nov-02	0:00:00	2826	55.6
	6:00:00	2649	62.6
	12:00:00	2568	55.2
	18:00:00	2498	50.2
21-Nov-02	0:00:00	2468	63.2
	6:00:00	2448	50.7
	12:00:00	2468	45.2
	18:00:00	2448	48.8
22-Nov-02	0:00:00	2322	41.9
	6:00:00	2124	41
	12:00:00	2006	51
	18:00:00	1917	44.1
23-Nov-02	0:00:00	1873	38.5
	6:00:00	1847	26.6
	12:00:00	1830	36.7
	18:00:00	1830	45.1
24-Nov-02	0:00:00	1822	44.1

	6:00:00	1804	30.5
	12:00:00	1813	35.8
	18:00:00	1813	28.9
25-Nov-02	0:00:00	1804	35.8
	6:00:00	1796	28.7
	12:00:00	1813	29.4
	18:00:00	1804	55.2
26-Nov-02	0:00:00	1796	31.8
	6:00:00	1787	27.9
	12:00:00	1813	35.9
	18:00:00	1813	29.8
27-Nov-02	0:00:00	1822	34.2
	6:00:00	1813	26.6
	12:00:00	1822	
	18:00:00	1813	
28-Nov-02	0:00:00	1813	
	6:00:00	1804	
	12:00:00	1813	
	18:00:00	1804	
29-Nov-02	0:00:00	1804	
	6:00:00	1796	
	12:00:00	1796	
	18:00:00	1804	
30-Nov-02	0:00:00	1804	
	6:00:00	1804	
	12:00:00	1804	
	18:00:00	1787	
1-Dec-02	0:00:00	1770	
	6:00:00	1754	
	12:00:00	1762	
	18:00:00	1754	
2-Dec-02	0:00:00	1745	
	6:00:00	1745	
	12:00:00	1754	
	18:00:00	1754	
3-Dec-02	0:00:00	1745	
	6:00:00	1745	
	12:00:00	1770	
	18:00:00	1787	
4-Dec-02	0:00:00	1813	
	6:00:00	1873	
	12:00:00	1891	
	18:00:00	2006	
5-Dec-02	0:00:00	2659	
	6:00:00	3364	
	12:00:00	3776	
	18:00:00	5087	
6-Dec-02	0:00:00	13379	
	6:00:00	20387	
	12:00:00	24015	

	18:00:00	26910
7-Dec-02	0:00:00	28915
	6:00:00	30086
	12:00:00	30729
	18:00:00	31020
8-Dec-02	0:00:00	30858
	6:00:00	30955
	12:00:00	31052
	18:00:00	30826
9-Dec-02	0:00:00	30858
	6:00:00	30826
	12:00:00	30890
	18:00:00	30503
10-Dec-02	0:00:00	28074
	6:00:00	24709
	12:00:00	22346
	18:00:00	21492
11-Dec-02	0:00:00	21085
	6:00:00	20654
	12:00:00	20735
	18:00:00	20440
12-Dec-02	0:00:00	19700
	6:00:00	17956
	12:00:00	17039
	18:00:00	18132
13-Dec-02	0:00:00	21139
	6:00:00	23785
	12:00:00	24943
	18:00:00	26849
14-Dec-02	0:00:00	27519
	6:00:00	26819
	12:00:00	26097
	18:00:00	25207
15-Dec-02	0:00:00	24651
	6:00:00	24390
	12:00:00	24274
	18:00:00	24216
16-Dec-02	0:00:00	24043
	6:00:00	23842
	12:00:00	23557
	18:00:00	23244
17-Dec-02	0:00:00	23188
	6:00:00	22849
	12:00:00	22597
	18:00:00	22485
18-Dec-02	0:00:00	21766
	6:00:00	20414
	12:00:00	19465
	18:00:00	18691
19-Dec-02	0:00:00	18563

	6:00:00	18335
	12:00:00	18183
	18:00:00	16553
20-Dec-02	0:00:00	14743
	6:00:00	13554
	12:00:00	12923
	18:00:00	11480
21-Dec-02	0:00:00	11338
	6:00:00	11561
	12:00:00	11684
	18:00:00	10818
22-Dec-02	0:00:00	9624
	6:00:00	8781
	12:00:00	8373
	18:00:00	7702
23-Dec-02	0:00:00	6977
	6:00:00	6501
	12:00:00	6270
	18:00:00	6178
24-Dec-02	0:00:00	6209
	6:00:00	6705
	12:00:00	8164
	18:00:00	11766
25-Dec-02	0:00:00	17359
	6:00:00	22097
	12:00:00	24361
	18:00:00	25620
26-Dec-02	0:00:00	25858
	6:00:00	26037
	12:00:00	26067
	18:00:00	25769
27-Dec-02	0:00:00	26067
	6:00:00	25947
	12:00:00	25977
	18:00:00	25858
28-Dec-02	0:00:00	25828
	6:00:00	25739
	12:00:00	25739
	18:00:00	25531
29-Dec-02	0:00:00	25089
	6:00:00	25354
	12:00:00	25178
	18:00:00	25207
30-Dec-02	0:00:00	25001
	6:00:00	23957
	12:00:00	22625
	18:00:00	21275
31-Dec-02	0:00:00	20896
	6:00:00	21931
	12:00:00	23443

	18:00:00	24535
1-Jan-03	0:00:00	
	6:00:00	24564
	12:00:00	23586
	18:00:00	22598
2-Jan-03	0:00:00	21822
	6:00:00	21411
	12:00:00	21058
	18:00:00	21684
3-Jan-03	0:00:00	21904
	6:00:00	21932
	12:00:00	21849
	18:00:00	21602
4-Jan-03	0:00:00	21275
	6:00:00	21139
	12:00:00	20869
	18:00:00	20869
5-Jan-03	0:00:00	20521
	6:00:00	20308
	12:00:00	20441
	18:00:00	20574
6-Jan-03	0:00:00	21112
	6:00:00	21194
	12:00:00	21384
	18:00:00	21302
7-Jan-03	0:00:00	21438
	6:00:00	21275
	12:00:00	21302
	18:00:00	21194
8-Jan-03	0:00:00	21302
	6:00:00	21275
	12:00:00	21194
	18:00:00	21194
9-Jan-03	0:00:00	21085
	6:00:00	21058
	12:00:00	21112
	18:00:00	21139
10-Jan-03	0:00:00	20977
	6:00:00	21112
	12:00:00	20923
	18:00:00	20816
11-Jan-03	0:00:00	19622
	6:00:00	17582
	12:00:00	15204
	18:00:00	12902
12-Jan-03	0:00:00	10977
	6:00:00	9775
	12:00:00	9217
	18:00:00	8962
13-Jan-03	0:00:00	8944

	6:00:00	8944	
	12:00:00	8962	
	18:00:00	8944	
14-Jan-03	0:00:00	8925	
	6:00:00	8925	
	12:00:00	8871	
	18:00:00	8871	
15-Jan-03	0:00:00	8835	
	6:00:00	8889	
	12:00:00	8853	
	18:00:00	8781	
16-Jan-03	0:00:00	7753	
	6:00:00	7352	
	12:00:00	7336	
	18:00:00	8497	
17-Jan-03	0:00:00	8497	
	6:00:00	8060	
	12:00:00	7753	
	18:00:00	7602	
18-Jan-03	0:00:00	7074	
	6:00:00	6073	
	12:00:00	5369	
	18:00:00	5032	
19-Jan-03	0:00:00	4854	
	6:00:00	4759	
	12:00:00	4719	
	18:00:00	4679	50.7
20-Jan-03	0:00:00	4665	44.5
	6:00:00	4639	53.1
	12:00:00	4626	51.1
	18:00:00	4533	54.9
21-Jan-03	0:00:00	4197	47.1
	6:00:00	3959	45.8
	12:00:00	3812	7.2
	18:00:00	3728	33.8
22-Jan-03	0:00:00	3480	0.9
	6:00:00	3251	0.9
	12:00:00	3151	0.9
	18:00:00	3073	0.9
23-Jan-03	0:00:00	3041	1
	6:00:00	3019	1.1
	12:00:00	3019	1.2
	18:00:00	2933	1.2
24-Jan-03	0:00:00	2691	1.2
	6:00:00	2479	1.4
	12:00:00	2313	1.4
	18:00:00	2218	1.4
25-Jan-03	0:00:00	2171	1.4
	6:00:00	2162	1.4
	12:00:00	2143	1.2

	18:00:00	2143	1.2
26-Jan-03	0:00:00	2134	1
	6:00:00	2143	1
	12:00:00	2171	3.6
	18:00:00	2171	0.8
27-Jan-03	0:00:00	2162	0.9
	6:00:00	2171	1
	12:00:00	2180	1.1
	18:00:00	2199	1.1
28-Jan-03	0:00:00	2303	1
	6:00:00	2380	0.9
	12:00:00	2400	0.9
	18:00:00	2429	327
29-Jan-03	0:00:00	2419	33.7
	6:00:00	2419	9.8
	12:00:00	2449	8.3
	18:00:00	2538	0.9
30-Jan-03	0:00:00	2933	0.9
	6:00:00	3274	0.9
	12:00:00	3434	0.9
	18:00:00	3503	0.9
31-Jan-03	0:00:00	3527	0.9
	6:00:00	3527	0.8
	12:00:00	3538	0.9
	18:00:00	3538	0.9
1-Feb-03	0:00:00	3515	0.7
	6:00:00	3503	0.7
	12:00:00	3492	0.9
	18:00:00	3492	1
2-Feb-03	0:00:00	3492	0.9
	6:00:00	3480	0.6
	12:00:00	3480	0.8
	18:00:00	3480	0.8
3-Feb-03	0:00:00	3445	0.7
	6:00:00	3457	0.8
	12:00:00	3457	0.7
	18:00:00	3480	0.8
4-Feb-03	0:00:00	3457	1
	6:00:00	3445	1.1
	12:00:00	3434	1
	18:00:00	3445	1.1
5-Feb-03	0:00:00	3422	1
	6:00:00	3422	1.1
	12:00:00	3422	1
	18:00:00	3422	1.1
6-Feb-03	0:00:00	3422	1
	6:00:00	3422	0.9
	12:00:00	3562	174.5
	18:00:00	3800	3.5
7-Feb-03	0:00:00	3984	75.1

	6:00:00	4059	77.6
	12:00:00	4046	95.3
	18:00:00	4096	95.8
8-Feb-03	0:00:00	4389	86.7
	6:00:00	4559	67.3
	12:00:00	4679	64.8
	18:00:00	4679	59.3
9-Feb-03	0:00:00	4665	55.3
	6:00:00	4639	62
	12:00:00	4626	60
	18:00:00	4626	54.6
10-Feb-03	0:00:00	4586	49.1
	6:00:00	4559	48.7
	12:00:00	4559	56.3
	18:00:00	4706	48.4
11-Feb-03	0:00:00	4991	48.4
	6:00:00	5185	53.7
	12:00:00	5312	51.8
	18:00:00	5340	49.1
12-Feb-03	0:00:00	5326	49.3
	6:00:00	5312	49.7
	12:00:00	5326	44.4
	18:00:00	5498	50.6
13-Feb-03	0:00:00	5819	55.7
	6:00:00	6012	52.3
	12:00:00	6118	47
	18:00:00	6133	53.3
14-Feb-03	0:00:00	6179	42.6
	6:00:00	6179	48.6
	12:00:00	6179	50.9
	18:00:00	6194	51.4
15-Feb-03	0:00:00	6163	51.2
	6:00:00	6194	52.8
	12:00:00	6240	52
	18:00:00	6240	48.7
16-Feb-03	0:00:00	6240	49.3
	6:00:00	6270	52.3
	12:00:00	6285	50.9
	18:00:00	6270	51.5
17-Feb-03	0:00:00	6240	50
	6:00:00	6224	55.3
	12:00:00	6240	56.5
	18:00:00	6209	70.1
18-Feb-03	0:00:00	6179	58.2
	6:00:00	6194	56
	12:00:00	6163	55.4
	18:00:00	6179	54.9
19-Feb-03	0:00:00	6163	50.3
	6:00:00	6163	48.5
	12:00:00	6133	49.2

	18:00:00	5397	47.4
20-Feb-03	0:00:00	5570	48.4
	6:00:00	6611	53.3
	12:00:00	7253	57.6
	18:00:00	8095	56.2
21-Feb-03	0:00:00	10426	65.6
	6:00:00	16626	92.7
	12:00:00	26698	127
	18:00:00	39256	246
22-Feb-03	0:00:00	45249	301.7
	6:00:00		223.5
	12:00:00		201.6
	18:00:00		179.2
23-Feb-03	0:00:00		169.4
	6:00:00		137
	12:00:00		126.5
	18:00:00		116.3
24-Feb-03	0:00:00		108.3
	6:00:00		114.1
	12:00:00	67407	107.8
	18:00:00	66941	110.6
25-Feb-03	0:00:00	66709	109
	6:00:00	66616	104.3
	12:00:00	66709	102.3
	18:00:00	66199	99.2
26-Feb-03	0:00:00	65783	97.4
	6:00:00	64361	89
	12:00:00	63678	83.6
	18:00:00	63224	79.6
27-Feb-03	0:00:00	62547	80.5
	6:00:00	62007	81.5
	12:00:00	61694	75.8
	18:00:00	61247	76.3
28-Feb-03	0:00:00	60358	72.4
	6:00:00	59607	71.4
	12:00:00	58642	72.3
	18:00:00	57381	79.2
1-Mar-03	0:00:00	56304	80.4
	6:00:00	55577	85
	12:00:00	54982	82.7
	18:00:00	54390	78.3
2-Mar-03	0:00:00	52756	73.5
	6:00:00	50289	67.3
	12:00:00	48036	63.7
	18:00:00	46613	61.6
3-Mar-03	0:00:00	43828	65.4
	6:00:00	41308	65
	12:00:00	39765	64.6
	18:00:00	39003	63.6
4-Mar-03	0:00:00	39256	63.9

	6:00:00	39619	64.9
	12:00:00	39692	77.2
	18:00:00	40093	83.6
5-Mar-03	0:00:00	39911	75.3
	6:00:00	39510	65.7
	12:00:00	38643	64.7
	18:00:00	38679	65.4
6-Mar-03	0:00:00	38464	64
	6:00:00	38320	62.9
	12:00:00	38643	68.9
	18:00:00	38428	69.8
7-Mar-03	0:00:00	38607	70.8
	6:00:00	38428	73.9
	12:00:00	38177	70.9
	18:00:00	38070	70.1
8-Mar-03	0:00:00	38070	72.8
	6:00:00	37928	70.8
	12:00:00	38106	72.4
	18:00:00	37821	73.4
9-Mar-03	0:00:00	37750	71.2
	6:00:00	37643	70.9
	12:00:00	37430	69.1
	18:00:00	37643	69.5
10-Mar-03	0:00:00	36936	70
	6:00:00	35645	68.4
	12:00:00	34342	71.2
	18:00:00	33631	72.8
11-Mar-03	0:00:00	31737	72.2
	6:00:00	30119	70.7
	12:00:00	28509	68.1
	18:00:00	27001	69.5
12-Mar-03	0:00:00	25149	69.2
	6:00:00	24073	67
	12:00:00	21822	66
	18:00:00	18335	71
13-Mar-03	0:00:00	15955	69.8
	6:00:00	14584	71.3
	12:00:00	13842	68.9
	18:00:00	12603	71.1
14-Mar-03	0:00:00	11460	69.5
	6:00:00	10918	64.4
	12:00:00	10582	66.1
	18:00:00	10465	63.6
15-Mar-03	0:00:00	9700	63.1
	6:00:00	8251	61.2
	12:00:00	7303	64.5
	18:00:00	6769	66.8
16-Mar-03	0:00:00	6486	62.5
	6:00:00	6332	62.4
	12:00:00	6270	67.6

	18:00:00	6224	62.8
17-Mar-03	0:00:00	6194	63.3
	6:00:00	6163	62.6
	12:00:00	6163	54.8
	18:00:00	6163	54
18-Mar-03	0:00:00	6133	54.3
	6:00:00	6118	58.1
	12:00:00	6118	57.3
	18:00:00	6255	68.2
19-Mar-03	0:00:00	6255	114.3
	6:00:00	6255	57.2
	12:00:00	6240	65.4
	18:00:00	6270	64.5
20-Mar-03	0:00:00	6301	53.8
	6:00:00	6332	54.5
	12:00:00	6270	53.8
	18:00:00	6194	54.3
21-Mar-03	0:00:00	6502	54
	6:00:00	7221	49
	12:00:00	7702	55.8
	18:00:00	7872	54
22-Mar-03	0:00:00	7940	53.2
	6:00:00	7923	50.2
	12:00:00	7923	53.2
	18:00:00	7923	49.6
23-Mar-03	0:00:00	7906	48.7
	6:00:00	7872	48.8
	12:00:00	7889	48.5
	18:00:00	7838	42.9
24-Mar-03	0:00:00	7838	42.1
	6:00:00	7838	42.2
	12:00:00	7838	41.1
	18:00:00	7719	39.4
25-Mar-03	0:00:00	7369	37.5
	6:00:00	7074	37.8
	12:00:00	6945	39.4
	18:00:00	6833	37.7
26-Mar-03	0:00:00	6833	37.2
	6:00:00	6801	39.6
	12:00:00	6769	38.1
	18:00:00	6674	39.6
27-Mar-03	0:00:00	5923	40.4
	6:00:00	6073	38.4
	12:00:00	6424	38.6
	18:00:00	6627	37.5
28-Mar-03	0:00:00	6690	39.3
	6:00:00	6722	38.7
	12:00:00	6738	38.8
	18:00:00	6301	39.3
29-Mar-03	0:00:00	5570	38

X-Mailer: Novell GroupWise Internet Agent 6.0.2
Date: Tue, 20 May 2003 10:17:01 -0500
From: "Phyllis Thomas" <Phyllis.Thomas@twdb.state.tx.us>
To: <m.slattery@tcu.edu>
Cc: "Greg Malstaff" <Greg.Malstaff@twdb.state.tx.us>
Subject: 2002-438-440
X-OriginalArrivalTime: 20 May 2003 15:17:30.0656 (UTC) FILETIME=[EE55FA00:01C31EE2]

Regarding your question concerning the number of copies to be submitted, Amendment No. 2 to the above referenced contract states:

Item P. OTHER SPECIAL CONDITIONS AND EXCEPTIONS TO STANDARD AGREEMENT OF THIS CONTRACT - The CONTRACTOR(S) will **submit one (1) unbound single-sided camera-ready original, nine (9) bound double-sided copies, and one (1) electronic copy of the Interim Report and data to the EXECUTIVE ADMINISTRATOR no later than May 31, 2003 for work performed during the first year of this study.** The CONTRACTOR(S) will submit one (1) unbound single-sided camera-ready original, nine (9) bound double-sided copies, and one (1) electronic copy of the Interim Report and data to the EXECUTIVE ADMINISTRATOR no later than May 31 for each following year of the study until the final year at which time the draft and final report for the multi-year study will be due.

Please make sure that all comments on the draft interim report have been addressed in the Final Report before submittal. Please make note that the report we received with the latest billing was the same as the draft that was received earlier in the year. None of the Board's comments had been addressed.

Thanks

Phyllis Thomas
Director, Research and Planning Fund
Grants Management Division
(512) 463-3154