A.9 FUEL STORAGE SYSTEM HEAT TRANSFER

A.9.1 INTRODUCTION

A physical test was performed in the GE Morris Operation (GE-MO) Fuel Basins to determine how long the Basin Water could perform its safety function without the aid of any support systems operating, and devoid of any License Specification infractions.

A.9.2 Initial Conditions

Prior to commencing the test, baseline temperature and conductivity readings were taken at various locations in both fuel basins, transfer isle and unloading pit (see attached fuel basin map). Data was also recorded at three different elevations in each of those locations.

Elevation[1] (feet)	45	35	25	5
Distance above basin/transfer isle floor	23’ 6”	13’ 6”	3’ 6”	n/a
Distance above unloading pit floor	45’	Not recorded	25’	5’

[1] Zero (0) foot elevation corresponds to the bottom of the unloading pit.

The initial readings revealed consistent results of equal temperature and similar conductivity at all locations where data was taken. This indicates there is uniform mixing of basin water in all locations. Numerically, the initial basin water temperature was 77°F with a mean conductivity reading of 1.06 $\pm$0.05µmho/cm.

The basin support systems, utilized to maintain basin water temperature and water quality, were shut down. Specifically both basin evaporator chiller units and their respective chiller (circulation) pumps and the basin filter system.

The Basin Leak detection system was left in operation so it could be monitored independently of the ongoing basin study. To better simulate loss of all support systems the basin leak detection system pumpout was realigned to a holding tank.

To guarantee there would be no violation of any license requirements, one of the plant ventilation exhaust blowers was left in operation to insure there was positive air flow through the sand filter and out the stack.

A.9.3 Evaluation

For the purpose of this evaluation, figures have been provided depicting the elevations of components within the fuel basin and the locations where conductivity and temperature measurements were taken.

Additionally provided information include; bar graphs depicting basin conductivity, level and temperature for the basin water at the beginning of the test and the last day of the test as well as line graphs depicting same information for entire duration of test.

A.9.3.1 Fuel Basin Conductivity

For comparative purposes, all the conductivity readings for all locations were averaged to get the mean conductivity for each day. The greatest variance observed between all locations where data was taken was only 0.02μmho/cm.

As basin water temperature increased conductivity decreased (from 1.06μmho/cm) at an average rate of 0.013μmho/cm per day for the first nineteen days down to 0.81μmho/cm. For the next twenty-one days, conductivity increased at an average rate of 0.012μmho/cm per day. During the final ten days of the test slightly less than a 0.02μmho/cm per day increase in conductivity was observed. The highest conductivity (1.23μmho/cm) was measured on the forty-ninth day, the day before the conclusion of the test. The average conductivity at the conclusion of the test, day fifty, was 1.22μmho/cm.

A.9.3.2 Fuel Basin Level (See Figure 1 depicting various basin elevations)

At the start of the test, Basin level was recorded to be at the 50'el. which is the normal operating level of the basin water. Level decreased about 0.1"/day for the first 6 days. The next 9 days increased in even increments until the level was decreasing almost an inch a day. Level continued decreasing slightly less than an inch per day for the next 16 days. For the final 19 days basin level decreased slightly more than an inch per day. At the end of fifty days the final basin water level was at the 46' 9" elevation mark having dropped a total of 3' 3". The final level was still more than six inches above the licensing requirement that the basin level cannot be less than 9' above the upper most portion of the fuel bundle.

A.9.3.3 Fuel Basin Temperature

Normal basin water temperature is maintained at 77ºF±2º and basin temperature was 77ºF at the start of the test. During the first seven days, basin temperature increased at the rate of three degrees a day. The next twelve days temperature in rose on the average of slightly over one degree per day, followed by twenty one days where temperature was increasing a little less than one-half (0.5) degree daily. For the final ten days of the test there was no temperature change and the basin remained at a constant 123ºF.

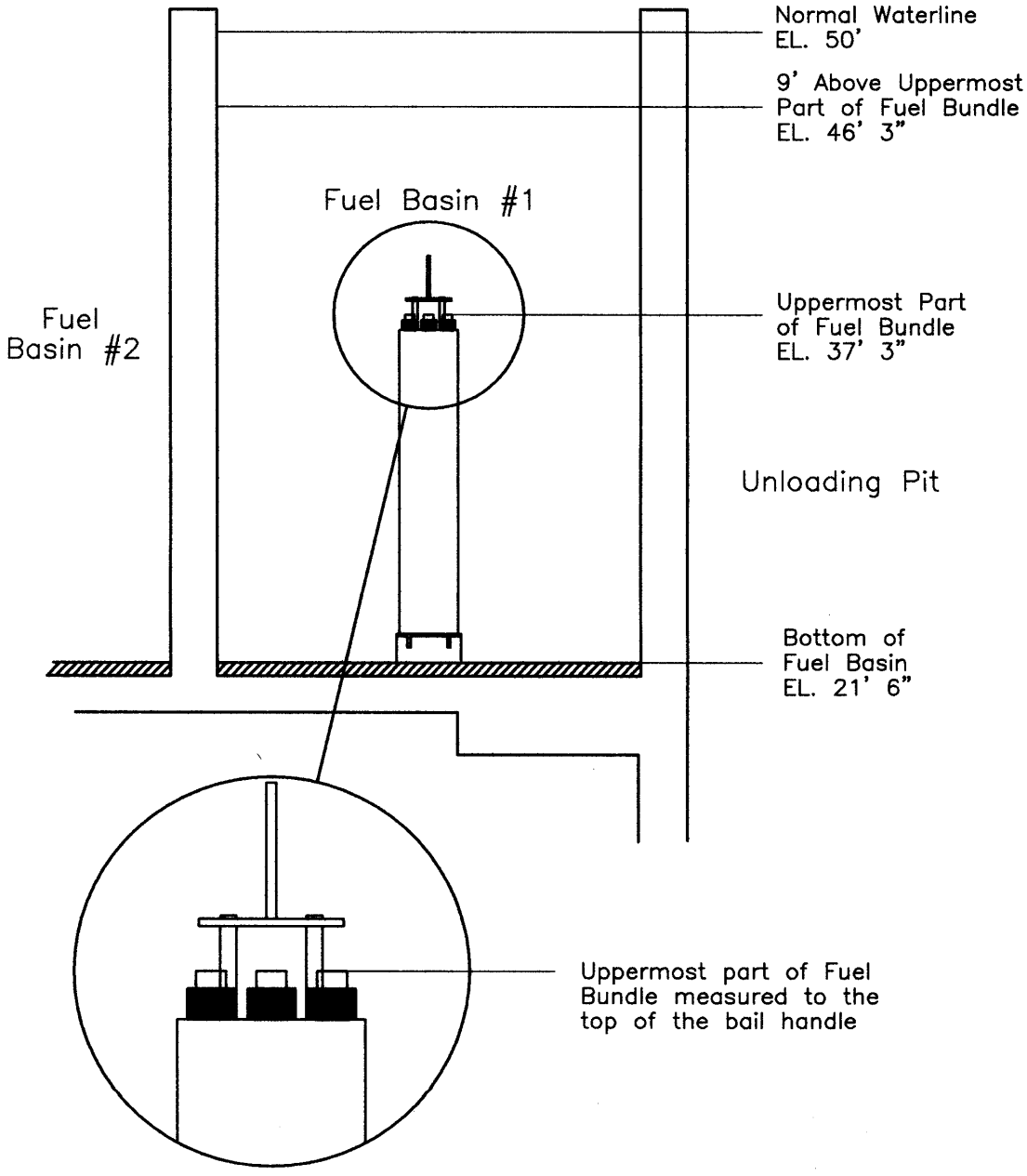
A.9.4 Summary

A review of the data presented proves the GE-MO Fuel Storage Basins can fulfill their intended function of maintaining water conductivity and level without violation of any license specifications for a minimum of fifty days without any support system in operation.

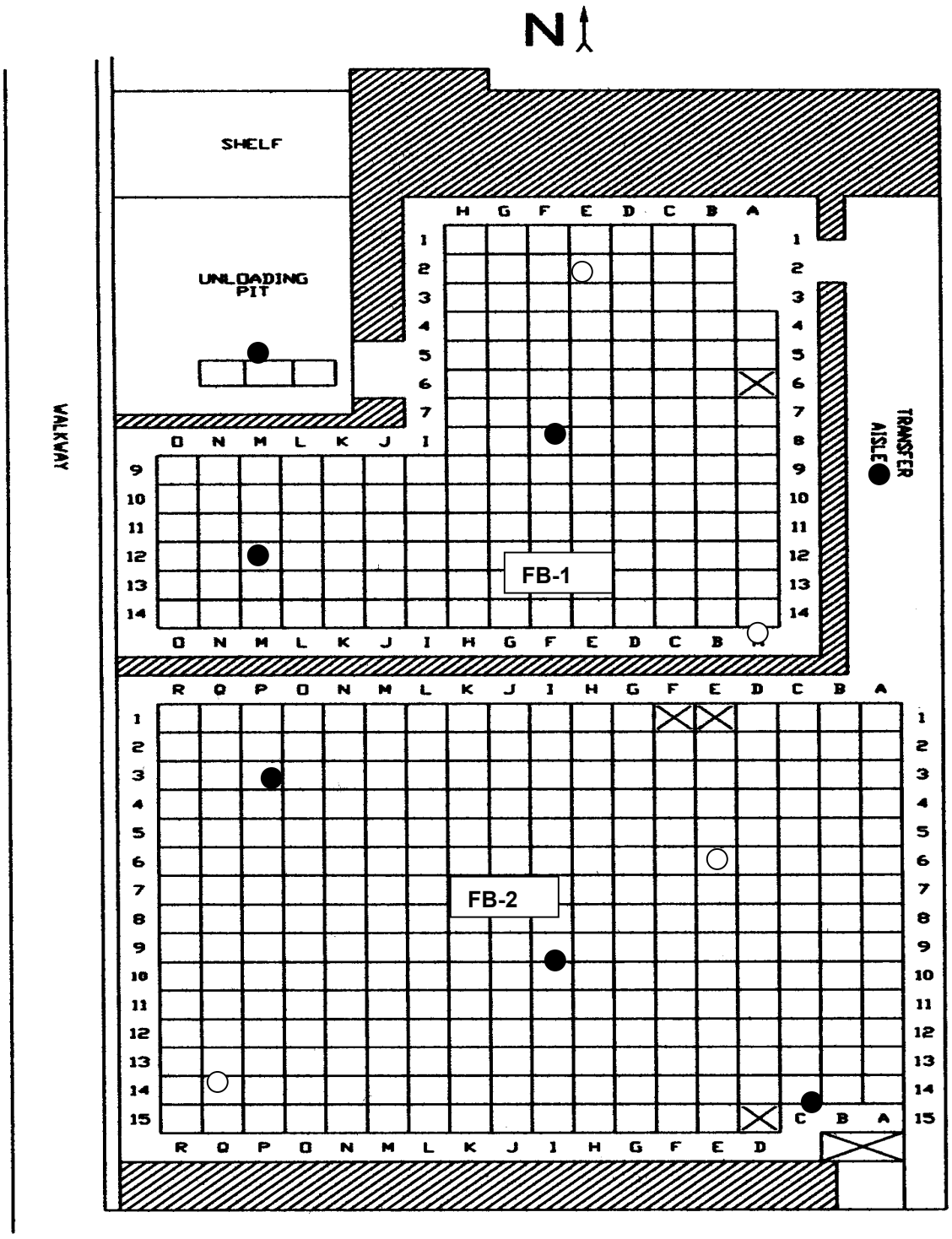
An important point to emphasize here is that basin temperature and conductivity readings, without any support systems operating, were fairly consistent at all locations in the basin for a particular day, throughout the entire testing period. This proves that there is a constant natural circulation of basin water and all equipment in the basin is exposed to water of the same quality and temperature.

The results also illustrate there is still a comfortable margin past the fifty day mark, upwards to an additional ten days, before the basin water level would reach the license specification elevation of 46’ 3”.

Figure 1
Basin Water Elevations
for Condutivity Test
May–Jun 2004



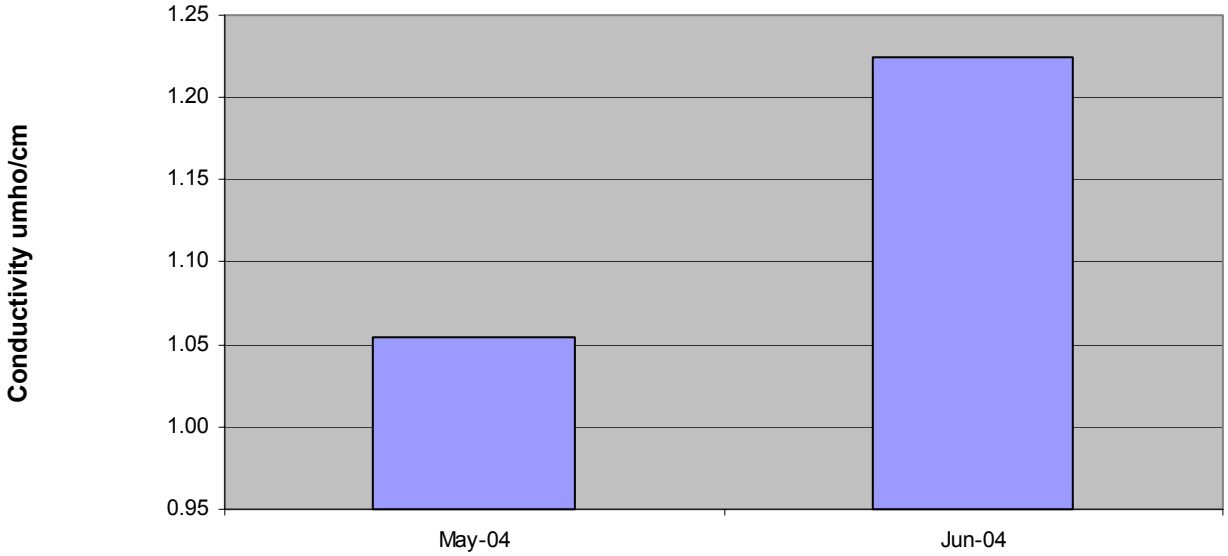
Fuel Basin Map



Legend: ● Denotes location where conductivity probe is lowered for data (7 places)

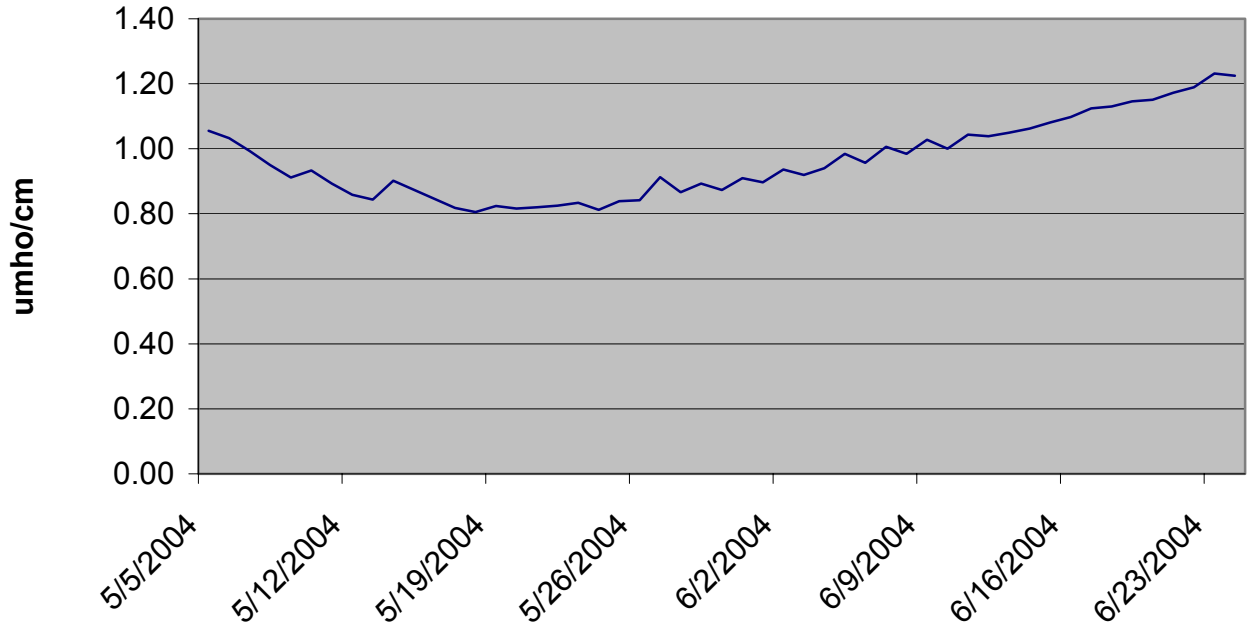
○ Denotes additional locations to take data at conclusion of test.

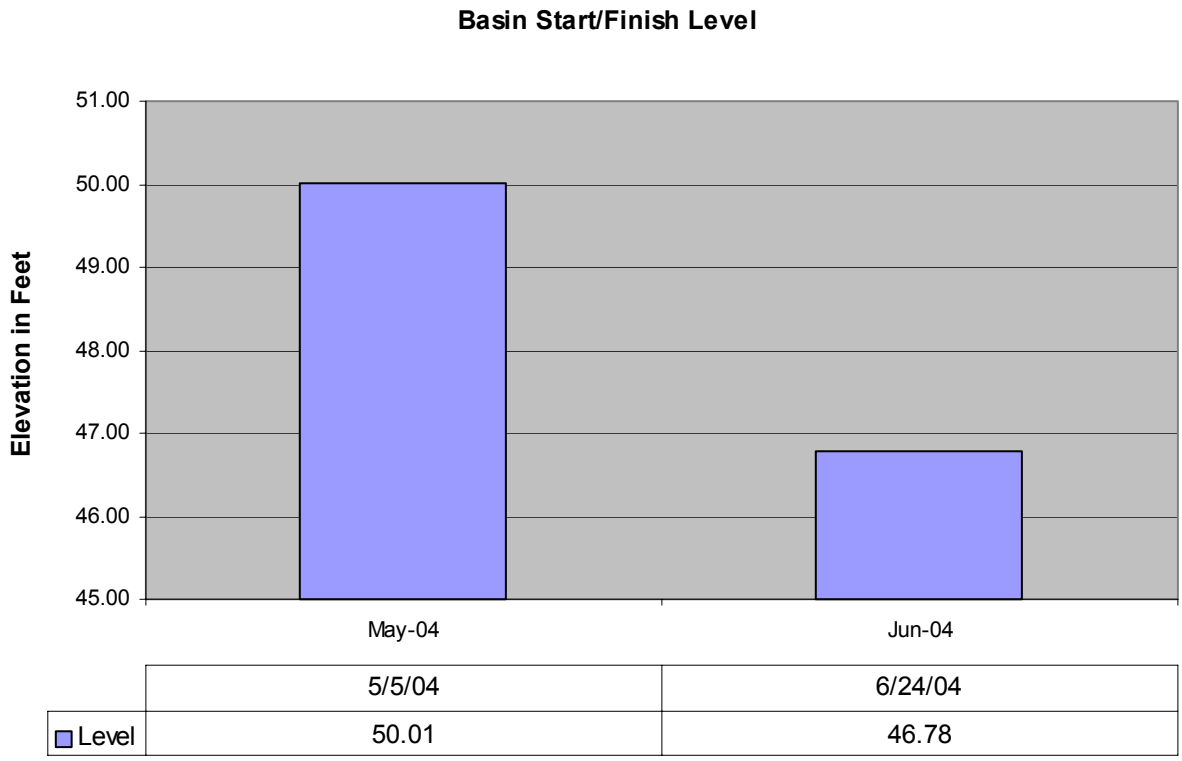
Basin Start/Finish Conductivity

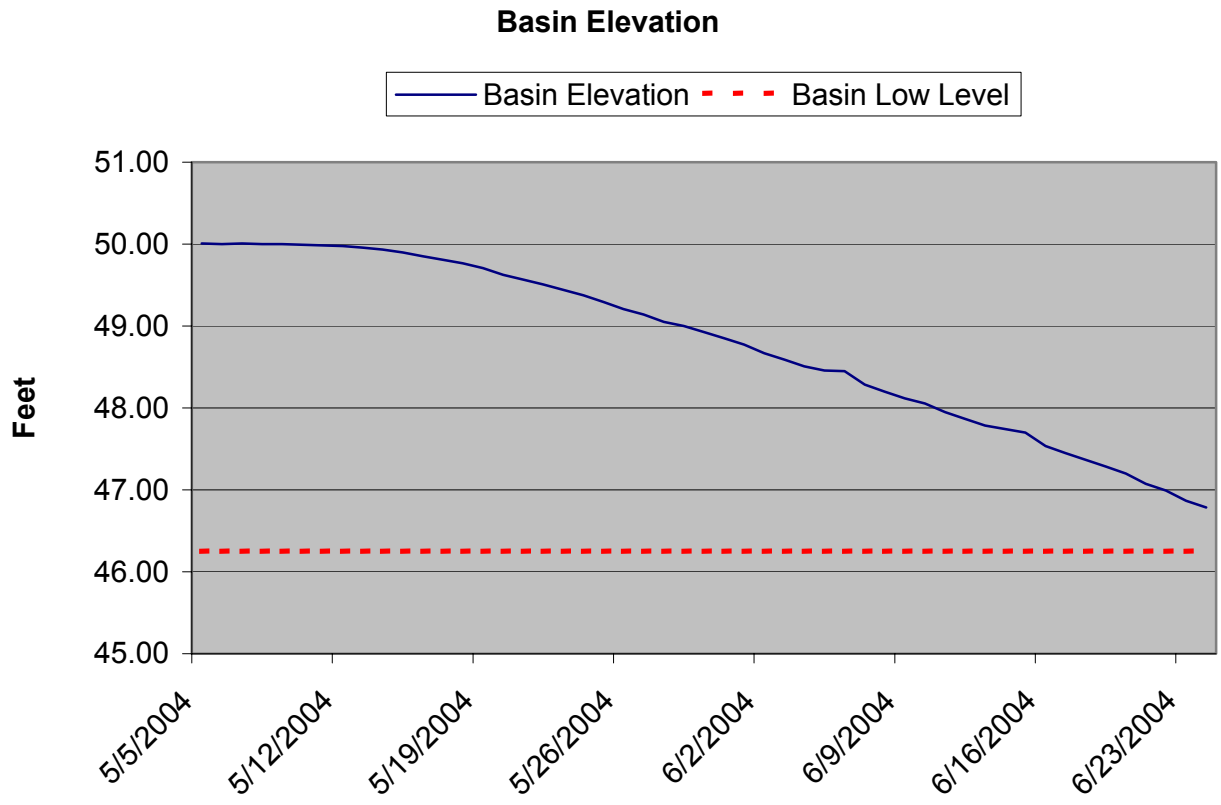


	5/5/04	6/24/04
Conductivity	1.06	1.22

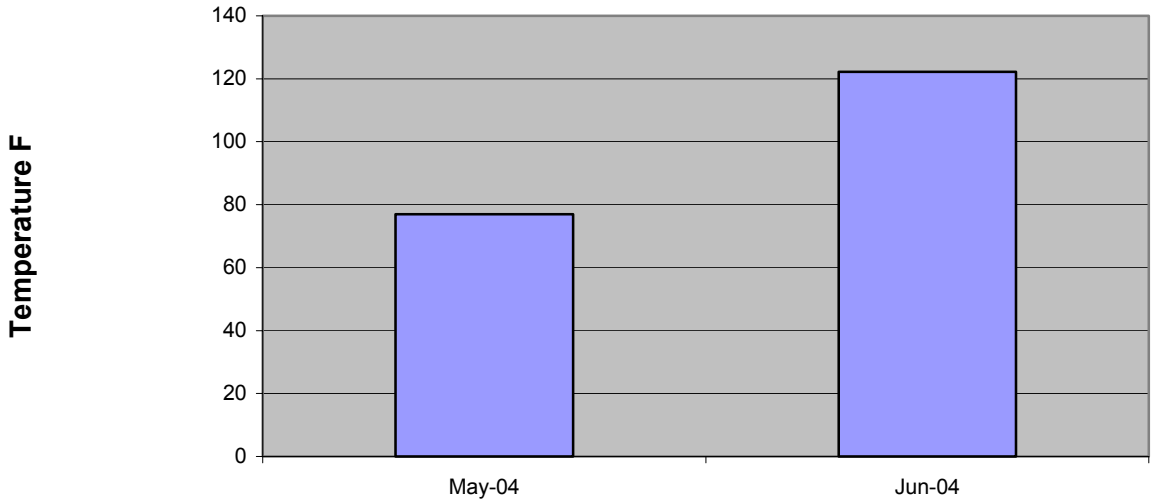
Basin Average Conductivity




Basin Start/Finish Level
Elevation in Feet
51.00
50.00
49.00
48.00
47.00
46.00
45.00
May-04
Jun-04
5/5/04
6/24/04
Level
50.01
46.78


Basin Elevation
Basin Elevation
Basin Low Level
Feet
51.00
50.00
49.00
48.00
47.00
46.00
45.00
5/5/2004
5/12/2004
5/19/2004
5/26/2004
6/2/2004
6/9/2004
6/16/2004
6/23/2004

Basin Start/Finish Temperature



	5/5/04	6/24/04
Temperature	77	122

Basin Average Temperature