ENCLOSURE 3

BRUNSWICK STEAM ELECTRIC PLANT, UNITS 1 AND 2
NRC DOCKET NOS. 50-325 & 50-324
OPERATING LICENSE NOS. DPR-71 & DPR-62
REQUEST FOR LICENSE AMENDMENT
SERVICE WATER SYSTEM

EER 91-0450

UNIT 2 SERVICE WATER OPERABILITY

FOR INFORMATION ONLY

FORM

Not to be [illegible] documents, document activities, or [illegible] changes.

ENGINEERING EVALUATION REPORT

EER No. 91-045D
Rev. No. 0
Page No. 1

1. Reference ACR, LER, WR/JO, etc. N/A File No. 4060

2. Brief description of item/activity Unit 2 Service Water Operability

☒ Class A (Q-List)
☐ Class B-3 (FP-Q)
☐ Other

3. Disposition
   - ☒ a. Use/acceptable as is
   - ☐ b. Permanent repair/rework
   - ☐ c. Temporary change; Expiration date _____
     - ☐ Temporary repair
     - ☐ Temporary condition
     - ☐ OA/STSI (☐ Preliminary)
   - ☐ d. Other _____

4. Final Resolution
   - ☒ a. Complies with FSAR, design, drawing, code, and quality requirements.
   - ☐ b. Acceptable deviation from FSAR, design, drawing, code, or quality requirements. Safety review (AI-109) required.

5. Follow-up Requirements
   - ☐ a. Surveillance activities, responsible group(s) _____
   - ☐ b. Action items, responsible group(s) _____
   - ☒ c. None

6. Review/Approval

| | | | |
|---|---|---|---|
| | Responsible Engineer | Gary W Prater | Date 11/30/91 |
| | | *Richard G Casey | Date 11-30-91 |
| ☒ Yes ☐ No | Technical Review | *David C Fran | Date 12/2/91 |
| | Engineering Supervisor | JW Wagoner | Date 12/2/91 |
| ☐ Yes ☒ No | EQ Review | NA | Date NA |
| ☒ Yes ☐ No | QA Review | RC Patterson | Date 12/2/91 |
| ☐ Yes ☒ No | ANII Review | NA | Date NA |
| ☐ Yes ☒ No | NAD Review | NA | Date NA |
| ☐ Yes ☒ No | PNSC Review | NA | Date NA |
| | Approved | S A Bishop | Date 12/3/91 |

7. Distribution:
   - Document Control (EER File)
   - NED BESS Section Manager
   - Manager - Maintenance
   - Supervisor - ISI
   - Responsible Engineer
   - Q-List/EDBS Coordinator - PEC
   - Operations Principal Engineer
   - Nuclear Engineering Department (NED-Raleigh)
   - Specialist - Regulatory Compliance
   - NED EQ Group - Raleigh
   - EDC - Technical Support
   - QA Engineering

   Other:

*Qualified Technical Reviewer if Quality Class A and box 4b checked

Archive Copy

LIST OF EFFECTIVE PAGES

| PAGE | REVISION |
|---|---|
| 1-14 | 0 |

TABLE OF CONTENTS

## 1.0 EXECUTIVE SUMMARY

Data from the Service Water System hydraulic PT for Unit 2 outage B210R1 was analyzed by NED and the system was determined to be within the system design basis for operability.

## 2.0 PROBLEM DESCRIPTION

Performance Test 2-PT-24.6.4, "Service Water System Hydraulic Performance Test," was completed on November 26, 1991, for the Unit 2 outage B210R1. The purpose of this test is to demonstrate the Service Water System (SWS) is hydraulically capable of meeting the design basis flow requirements to safety related components. The purpose of this evaluation is to analyze the data collected by the PT and determine if system capabilities are within the design basis.

## 3.0 EVALUATION SUMMARY

The data produced by the PT was first reviewed for consistency. Questionable data was identified and discussed with test personnel. A review of similar data from past PT's was made. Reasonable explanations of inconsistencies were derived and appropriate adjustments and allowances were made.

The appropriate system configuration was then simulated with the KYPIPE model for the Unit 2 SWS and the model results were compared to the test data. Several minor adjustments were made to improve the accuracy of the model. Comparisons showed that, with certain exceptions, the model's predictions agreed with the data within the 5% tolerance for the model. Explanations for the exceptions (see Section 4.1) were judged to be reasonable. The model was then run for the appropriate limiting cases for design basis events. The appropriate cases were determined by reviews of Calc. G0050A-12 and the revisions made to the Unit 2 SWS model (see Section 4.2). Evaluation of the results concluded that the Unit 2 Service Water System is within the system design basis for operability.

The following sections explain the steps in this evaluation in detail.

## 4.0 EVALUATION

### 4.1 Review of Data

Since there were only minor modifications and some maintenance work (see details below) on the SWS, the PT results were expected to closely agree with the existing KYPIPE model for Unit 2. The data was reviewed and the model predictions were found to be consistent with the exceptions described below.

#### 4.1.1 Modifications and Maintenance

There were no piping modifications to the SWS during this outage. The RHR Pump Seal Coolers were replaced with direct replacements of the same size and type under preventive maintenance route numbers 91-RFK-381 and 91-RFL-381. Maintenance work on the service water piping for the diesel generators was performed to remove clam shells and fouling. The 18" header and approximately 75% of the 6" piping for DG #3 were hydrolased. The 6" piping for

DG #4 was flushed for a total of two days. All equipment coolers and heat exchangers were inspected and cleaned as deemed necessary.

Both nuclear pump motors were rebuilt by GE in 1989. Nuclear pump 2A was rebuilt this outage and put in service in November, 1991. Nuclear pump 2B has not been rebuilt recently.

4.1.2 Nuclear Service Water Pump Flows

The nuclear service water pump flow measurements did not match as would normally be expected (see table below). The pumps are essentially identical and the discharge strainer differential pressures did not differ greatly. The performance of the pumps would have been expected to be close. However, nuclear pump 2A was recently rebuilt and nuclear pump 2B has been in service for some time which could mean that there is a noticeable difference between the two pumps. The following information will demonstrate that the pumps are essentially identical and the indicated pump flow differences are not reliable.

TABLE 1 - PUMP FLOW DATA COMPARED TO SYSTEM FLOW DATA FOR 2-PT-24.6.4

| STEP NO. | PUMP PT DATA | | | | FLOW DIFF. BTWEEN PUMPS | PUMP FLOW TOTAL | SYSTEM PT DATA | | EST'D. X-HDR. LKG.[3] | TOTAL SYSTEM FLOW | FLOW DIFF= SYSTEM -PUMP TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | PUMP 2A[1] | | PUMP 2B[1] | | | | NUC. HEADER PRES.[2] | SYSTEM FLOW TOTAL[2] | | | |
| | FLOW | PRESS | FLOW | PRESS | | | | | | | |
| 9.3.29 | 5700 | 58 | 4610 | 61 | 1090 | 10310 | 63 | 10550 | ≈120 | 10670 | 360 |
| 9.3.33 | 5940 | 58 | 4620 | 60 | 1320 | 10560 | 61 | 10340 | ≈110 | 10450 | -110 |
| 9.3.42 | 5940 | 57 | 4600 | 60 | 1340 | 10540 | 62 | 10250 | ≈400 | 10650 | 110 |

NOTES:

1. Data taken from Data Sheet 3, Att. 7.3.
2. Data taken from Data Sheets 1 and 2, Att. 7.3. System flow total includes estimated 150 gpm for the RHRSW Pump Motor Coolers not measured by this PT.
3. Cross header leakage estimates are based on the calibrated KYPIPE model.

A similar mismatch was noticed for the previous Unit 1 PT, 1-PT-24.6.4. Further tests were conducted on Unit 1 (SP-91-006) which found that, when run individually, both pumps performed equally well and approximately equal to their pump curve. The differences for Unit 1 were attributed to different losses in the pump discharge strainers and inaccuracies in the installed and test instrumentation. EER 91-0039 for Unit 1 concluded that the Controlotron flow readings for the nuclear service water pumps were inaccurate and not to be relied on for this test.

For the Unit 2 PT, the strainer differential pressures are not a significant contributing factor to different flow rates because their differences are small. However, as shown in the results of SP 91-006 for Unit 1, there are significant inaccuracies to be

expected for the Controlotron instrument readings. The only available location for the Controlotron instruments is not a good location. The turbulence and the vertical pipe contribute to non-uniform flows and inaccurate readings.

A review of the ISI data (Att. 7.8) taken on November 15, 1991, for the Unit 2 nuclear pumps after the 2A nuclear pump was put in service shows that both pumps are operating very close to each other. This data was taken with each pump operating individually at 5600 gpm. The flow reading is based on the flow orifice for the RBCCW which is an established and reliable flow measurement point. The resulting pressure readings are within 1 psi of each other. This is a reliable indication that the two pumps are operating on essentially the same curve.

The pump vendor conducted a pump performance test for the rebuilt pump and produced a pump performance curve. The ISI test data does not appear to agree with the vendor's performance curve. However, since the ISI test data was taken on site after the pump was installed, it is considered to be the most applicable to this evaluation.

The individual pump flow measurements are not significant for this evaluation. As shown in Table 1, the total for the pump flows agrees within 3.5% of the total for the system flows. The close agreement of the total system flows, with the fact that Unit 1 testing for a similar mismatch determined there was no problem with the pumps, and the ISI testing data that shows the two pumps are on the same curve, are sufficient for considering the measured pump flow differences to be invalid. Therefore, the differences in the nuclear pump flows may be discounted for this evaluation.

4.1.3 Diesel Generator #4 Flow for Step 9.3.29

The flow measured for Diesel Generator #4 in Step 9.3.29 appears to be extraordinarily high. No flow measurement for any DG in any previous test has been nearly this high. This measurement also does not appear to be in proportion to the flows measured in the other steps.* Since there was no change in the DG supply configuration in any of these steps it would be expected that the flow would change in proportion to the change for DG #3. On questioning test personnel about this inconsistency, it was found that the test setup for DG #4 was reset after the first step because of questionable initial readings for step 9.3.33. This provides reason to believe that the reading for DG #4 in step 9.3.29 was inaccurate. For purposes of this evaluation, a new flow quantity will be established for this data point based on the flow relationship between DG #3 and DG #4 in the other steps.

TABLE 2: DIESEL GENERATOR FLOWS[1]

| STEP NO. | DG #3 FLOW | DG #4 FLOW | PROPORTION | NEW DG#4 FLOW |
|---|---|---|---|---|
| 9.3.29 | 1496 | 1936[2] | 0.89[3] | 1330 |
| 9.3.33 | 1362 | 1253 | 0.92 | NA |
| 9.3.42 | 1365 | 1172 | 0.86 | NA |

NOTES:

1. Data taken from Data Sheet 2, Att. 7.3.
2. DG #4 flow data for step 9.3.29 is apparently incorrect.
3. Proportion for step 9.3.29 is the average of the proportions for steps 9.3.33 and 9.3.42.

4.1.4 Diesel Generator Flow Balance

When comparing the two DG flows, the flow balance shows that DG #3 flows are approximately 10% higher than DG #4 flows. However, the model predicts that DG #4 would have flows approximately 10% higher than DG #3. The hydraulic balance of the model was based on testing completed in 1989. This balance would be affected by changes in the resistance of the flow paths for the DG's. The resistance would have been significantly changed by the maintenance described earlier. The resultant change in the flow balance is consistent with the maintenance performed. The majority of the flow path to DG #3 was hydrolased which would have reduced the flow restrictions and increased the flow rate. No hydrolasing was accomplished for DG #4. The flushing that was performed would not be expected to cause as great a reduction in the flow resistance. Therefore, it is concluded that this change in the flow balance is consistent with changes in the flow paths. Note that the testing showed that the total flow to the DG's was essentially unchanged.

## 4.2 Adjustments to KYPIPE Model

The existing Unit 2 SWS KYPIPE model, Calc. G0050A-12, was used to simulate the SWS configurations tested during PT-24.6.4. The initial results pointed out several areas which could be revised to provide better agreement with the PT data. These areas and the changes incorporated into the Unit 2 model are discussed in the following sections.

### 4.2.1 "B" Loop Vital Header Flow

The existing model over predicted "B" loop flow approximately 10%. To provide a better match to actual field conditions, the K factor for the supply line to the "B" loop was increased to reduce "B" loop vital header flow.

### 4.2.2 Diesel Generator Flows

The existing model shows DG #4 as the higher flow DG. Since test data shows the flows to DG's 3 & 4 are almost exactly reversed from the model predictions, the model has been revised to show DG #3 as the DG with the higher flow. This was accomplished by simply switching the K factors for DG's 3 & 4 in the model. An important note is that total flow through these two DG's has hardly changed at all based on the PT data.

### 4.2.3 NSWP Discharge Line Differential Pressure

The existing model predicts less friction loss between the NSWP strainer discharge and the NSW header than was indicated by the test data. Accordingly, the K factors for lines 3 and 6 have been increased to more closely approximate the actual differential pressure in the field.

### 4.2.4 Other Adjustments

Other adjustments made to the existing Unit 2 model are specific to the test configurations (bay level, strainer DP, cross-header leakage, etc.) and are varied according to actual test data.

4.3 Comparison of Test and Model Data

The final calibrated Unit 2 SWS model is "U2CALBN2". This model includes the changes discussed above in Section 4.2. As can be seen from the following table, the revised model generally provides agreement with test data within the 5% tolerance currently utilized. The diesel generator flows vary as much as 6% but have an overall average less than 5%. Since the DG's receive much more flow than required this greater variation is acceptable. Therefore, the file "U2CALBN2" is considered to be acceptable for analysis of the U2 SWS.

**TABLE 3: COMPARISON OF FLOW DATA FROM 2-PT-24.6.4 TEST AND CALIBRATED KYPIPE MODEL "U2CALBN2" (All flows in gpm)**

| COMPONENT | STEP 9.3.29 | | STEP 9.3.33 | | STEP 9.3.42 | |
|---|---|---|---|---|---|---|
| | TEST | MODEL | TEST | MODEL | TEST | MODEL |
| NSWPs 2A & 2B Combined Flow | 10310 | 10505 | 10560 | 10483 | 10540 | 10725 |
| SW Lube Water[1] | 0 | 0 | 0 | 0 | 0 | 0 |
| DG #3 SW | 1496 | 1408 | 1362 | 1400 | 1365 | 1386 |
| DG #4 SW | 1330[2] | 1258 | 1253 | 1251 | 1172 | 1238 |
| RBCCW SW | 3500 | 3500 | 3500 | 3500 | 3500 | 3500 |
| RHR SW A Loop | 3000 | 3000 | 0 | 0 | 3000 | 3000 |
| RHRSW Pump A Motor Cooler[3] | -- | 79 | 0 | 0 | -- | 79 |
| RHRSW Pump C Motor Cooler[3] | -- | 72 | 0 | 0 | -- | 70 |
| RHR SW B Loop | 0 | 0 | 3000 | 3000 | 0 | 0 |
| RHRSW Pump B Motor Cooler[3] | 0 | 0 | -- | 81 | 0 | 0 |
| RHRSW Pump D Motor Cooler[3] | 0 | 0 | -- | 78 | 0 | 0 |
| VITAL HDR - A LOOP | 520 | 516 | 520 | 513 | 510 | 507 |
| VITAL HDR - B LOOP | 555 | 553 | 550 | 547 | 550 | 543 |
| CROSS HEADER LEAKAGE[4] | -- | 118 | -- | 113 | -- | 402 |

NOTES:

1. Service Water Lube Water was supplied by Unit 1 for this test.
2. See Section 4.1.3 for derivation of the flow value for DG #4 in step 9.3.29.
3. These values were not measured by the PT.
4. Assumption for cross header leakage K-factor was based on a review of the test data.

File "U2CALBN2" was used to create a new master file for U2, "U2MASTR1" which incorporated the conservative K-factor for cross header leakage currently used in Calc. G0050A-12. This master was then used to create "U2SCNRIO," which was used to examine the impact of the changes on performance of the SWS during limiting DBA's. Since the changes to the model actually result in an increase in the total system resistance, all maximum flow cases would result in less pump flow and therefore are considered to be acceptable. However, the minimum pump flow and component cooling cases must be examined to ensure the greater resistance does not cause an unacceptable decrease in flow. The most limiting DBA cases are taken from Calculation G0050A-12 and are listed below.

TABLE 4: WORST CASE ACCIDENT SCENARIOS: FILE NAMES

| BAY LEVEL | ELEVATION | FILE NAME & CHANGE NOs. |
|---|---|---|
| Low | -6.0' | U2@POWER Change 4 (Component cooling)<br>U2NOPOWR Change 4 (Component cooling) |
| Extreme Low | -8.63' | U2TYFOON Change 6 (Minimum flow)<br>U2TYFOON Change 2 (Component cooling) |

The minimum allowable pump flow is 1500 gpm. As can be seen from the results for minimum pump flow (U2SCNRIO Change 0, Att. 7.5), the minimum predicted flow is 1812 gpm. With an allowance of 5% for model accuracy, the minimum pump flow predicted is 1722 gpm. The results of the three component cooling cases are also acceptable as shown by data in Tables 5, 6, and 7.

TABLE 5: COMPARISON OF AFTER 10 MINUTE HEAT EXCHANGER FLOWS: KYPIPE WORST-CASE SCENARIO FLOWS VERSUS MINIMUM HEAT EXCHANGER FLOWS FOR U2SCNRIO, CHANGE 1: MODES 1,2,3 LOW WATER LEVEL
(all flows in gpm)

| HEAT EXCHANGER | KYPIPE OUTPUT FLOW | 95% OF KYPIPE OUTPUT FLOW | HEAT EXCHANGER REQUIRED FLOW[1] |
|---|---|---|---|
| SW Lube Water | 124 | 118 | 95 |
| DG 1 SW | 788 | 749 | 350 |
| DG 2 SW | 815 | 774 | 350 |
| DG 3 SW | 889 | 845 | 350 |
| DG 4 SW | 852 | 809 | 350 |
| RHR (A Loop) | 4850 | 4608 | 4500 |
| RHRSW Pump A Motor Cooler | 60 | 57 | 38 |
| RHRSW Pump C Motor Cooler | 54 | 51 | 38 |
| Vital Header - A Loop[2] | 393 | 373 | 233 |
| Vital Header - B Loop[2] | 422 | 401 | 233 |
| RHR Pump Room Cooler A | 316 | 300 | 186 |
| CS Pump Room Cooler A | 51 | 48 | 47 |
| RHR Pump Seal Coolers A & C | 26 | 25 | 0 |
| RHR Pump Room Cooler B | 331 | 314 | 186 |
| CS Pump Room Cooler B | 63 | 60 | 47 |
| RHR Pump Seal Coolers B & D | 28 | 27 | 0 |

NOTES:

1. All minimum flow requirements assume 90°F Service Water.
2. Vital header minimum flow requirements established from previously accepted minimum flows for the vital header components.

TABLE 6: COMPARISON OF AFTER 10 MINUTE HEAT EXCHANGER FLOWS: KYPIPE WORST-CASE SCENARIO FLOWS VERSUS MINIMUM HEAT EXCHANGER FLOWS FOR U2SCNRIO, CHANGE 2: MODES 4,5 LOW WATER LEVEL (all flows in gpm)

| HEAT EXCHANGER | KYPIPE OUTPUT FLOW | 95% OF KYPIPE OUTPUT FLOW | HEAT EXCHANGER REQUIRED FLOW[1] |
|---|---|---|---|
| SW Lube Water | 113 | 107 | 95 |
| DG 1 SW | 590 | 561 | 350 |
| DG 2 SW | 600 | 570 | 350 |
| DG 3 SW | 626 | 595 | 350 |
| DG 4 SW | 614 | 583 | 350 |
| RHR (B Loop) | 2635 | 2503 | 2500 |
| RHRSW Pump B Motor Cooler | 63 | 60 | 38 |
| RHRSW Pump D Motor Cooler | 60 | 57 | 38 |
| Vital Header - A Loop[2] | 395 | 375 | 233 |
| Vital Header - B Loop[2] | 420 | 399 | 233 |
| RHR Pump Room Cooler A | 318 | 302 | 186 |
| CS Pump Room Cooler A | 51 | 48 | 47 |
| RHR Pump Seal Coolers A & C | 26 | 25 | 0 |
| RHR Pump Room Cooler B | 330 | 314 | 186 |
| CS Pump Room Cooler B | 63 | 60 | 47 |
| RHR Pump Seal Coolers B & D | 28 | 27 | 0 |

NOTES:

1. All minimum flow requirements assume 90°F Service Water.
2. Vital header minimum flow requirements established from previously accepted minimum flows for the vital header components.

TABLE 7: COMPARISON OF AFTER 10 MINUTE HEAT EXCHANGER FLOWS: KYPIPE WORST-CASE SCENARIO FLOWS VERSUS MINIMUM HEAT EXCHANGER FLOWS FOR U2SCNRIO, CHANGE 3: MODES 4,5 EXTREME LOW WATER LEVEL (all flows in gpm)

| HEAT EXCHANGER | KYPIPE OUTPUT FLOW | 95% OF KYPIPE OUTPUT FLOW | HEAT EXCHANGER REQUIRED FLOW[1] |
|---|---|---|---|
| SW Lube Water | 113 | 107 | 95 |
| DG 1 SW[3] | -- | -- | 350 |
| DG 2 SW[3] | -- | -- | 350 |
| DG 3 SW | 1111 | 1055 | 350 |
| DG 4 SW | 993 | 943 | 350 |
| RHR (A Loop) | 2800 | 2660 | 2500 |
| RHRSW Pump A Motor Cooler | 62 | 59 | 38 |
| RHRSW Pump C Motor Cooler | 60 | 57 | 38 |
| Vital Header - A Loop[2] | 398 | 378 | 233 |
| Vital Header - B Loop[2] | 424 | 403 | 233 |
| RHR Pump Room Cooler A | 321 | 305 | 186 |
| CS Pump Room Cooler A | 51 | 48 | 47 |
| RHR Pump Seal Coolers A & C | 26 | 25 | 0 |
| RHR Pump Room Cooler B | 332 | 315 | 186 |
| CS Pump Room Cooler B | 63 | 60 | 47 |
| RHR Pump Seal Coolers B & D | 28 | 27 | 0 |

NOTES:

1. All minimum flow requirements assume 90°F Service Water.
2. Vital header minimum flow requirements established from previously accepted minimum flows for the vital header components.
3. Diesel Generators 1 and 2 are supplied by Unit 1 under this scenario.

4.4 Conclusions

Based on the above discussion, "U2MASTR1" accurately represents the Unit 2 SWS (with the exception of the assumed K-factors used for conservative cross header leakage estimates) and can be used for all U2 design analyses. Subsequent U2 files generated from "U2MASTR1" for the appropriate worst case scenarios show that all required heat exchanger flows will be provided. The model also shows that pump flows will remain above the minimum pump flow required. The maximum pump flow cases are bounded by previous model predictions since the changes to the model added more resistance to the system.

This evaluation concludes that the Service Water System remains within its design basis and is fully capable of performing its safety related function. Therefore, based on the data from the performance test 2-PT-24.6.4 completed on November 26, 1991, the Unit 2 Service Water System is confirmed as fully operable.

5.0 ACTION ITEMS

No corrective actions, acceptance testing, or Action Item notifications are required by this EER. However, it is noted that the inconsistencies between individual pump flow measurements have been difficult to resolve for this EER and for EER 91-0039. It is recommended that BNP Technical Support and NED work to improve the system measurements so that this situation is not repeated each time this PT is performed. Because this recommendation is not a system operability concern, it is not being assigned as an action item.

6.0 REFERENCES

6.1 Technical Specification Interpretation, TSI 90-03, Rev. 0
6.2 Calculation G0050A-12, Rev. 3, BSEP Unit 2 Service Water System Operating Limits
6.3 Service Water System Hydraulic Analysis Report For BSEP Units 1 & 2, dated 12/28/89
6.4 EER 91-0039, Rev. 0, "Evaluation of Service Water Design Basis Capability" (for Unit 1)
6.5 SP-91-006, Unit 1 Special Procedure, "Nuclear Service Water Pump Performance Verification"
6.6 2-PT-24.1-2, Service Water Pump and Discharge Valve Operability Test
6.7 2-PT-24.6.4, Service Water System Hydraulic Performance Test

7.0 ATTACHMENTS LIST

7.1 10CFR50.59 Safety Review
7.2 Environmental Qualification Impact Form
7.3 2-PT-24.6.4 Data, 11/26/91 (19 pages)
7.4 Analysis Results for "U2CALBN2" (9 pages)
7.5 Analysis Results for "U2SCNRIO" (12 pages)
7.6 Data File for "U2CALBN2" (12 pages)
7.7 Data File for "U2SCNRIO" (12 pages)
7.8 ISI Pump Performance Log from 2-PT-24.1-2 for 2A-NUC-SW and 2B-NUC-SW pumps (2 pages)

REVISION 2

10CFR50.59 PROGRAM MANUAL
ATTACHMENT A
CP&L SAFETY REVIEW PACKAGE



Page 1 of 9

## SAFETY REVIEW COVER SHEET

DOCUMENT NO. EER 91-0450 REV. NO. 0

DESCRIPTION OF TITLE: Unit 2 Service Water Operability

1. Assigned Responsibilities:

Safety Analysis Preparer: Garry W. Prater
Lead 1st Safety Reviewer: Garry W. Prater
2nd Safety Reviewer: DAVID C FURR

2. Safety Analysis Preparer: Complete PART I. SAFETY ANALYSIS

Safety Analysis Preparer Garry W. Prater (SIGNATURE) 11/29/91 (DATE)

3. Lead 1st Safety Reviewer: Complete Part II. Item Classification.

4. Lead 1st Safety Reviewer: Part III may be completed. If either question 1 or 2 is "yes," then Part IV is not required.

5. Lead 1st Safety Reviewer: Determine which DISCIPLINES are required for review of this item (including own) and mark the appropriate block(s) below.

| DISCIPLINES Required: | (Print Name) | Signature/Date (Step 7) |
|---|---|---|
| [ ] Nuclear Plant Operations | | |
| [ ] Nuclear Engineering | | |
| [X] Mechanical | Garry W. Prater | Garry W. Prater 11/29/91 |
| [ ] Electrical | | |
| [ ] Instrumentation & Control | | |
| [ ] Structural | | |
| [ ] Metallurgy | | |
| [ ] Chemistry/Radiochemistry | | |
| [ ] Health Physics | | |
| [ ] Administrative Controls | | |

6. A QUALIFIED SAFETY REVIEWER will be assigned for each DISCIPLINE marked in step 5 and his/her name printed in the space provided. Each person listed shall perform a SAFETY REVIEW and provide input into the Safety Review Package.

7. The Lead 1st Safety Reviewer will assure that a Part III or Part IV is completed (see step 4 above) and a Part VI if required (see 9.b of Part II). Each person listed in step 5 shall sign and date next to his/her name in step 5, indicating completion of a SAFETY REVIEW.

8. 2nd Safety Reviewer: Perform a SAFETY REVIEW in accordance with Section 8.0.

2nd Safety Reviewer DISCIPLINE: David C Furr MECH. Date 12/2/91

9. PNSC review required? If "yes" attach Part V and mark reason below:

Yes [ ] No [X]

- [ ] Potential UNREVIEWED SAFETY QUESTION
- [ ] Question 9 of Part IV answered "Yes"
- [ ] Other (specify): _____

## PART I: SAFETY ANALYSIS

(See instructions in Section 8.4.1)
(Attach additional sheets as necessary)

DOCUMENT NO. EER 91-0450 REV. NO. 0

DESCRIPTION OF CHANGE: See attached

ANALYSIS: See attached

REFERENCES: See attached

PART I: SAFETY ANALYSIS, Attached

Description: This EER analyzes and evaluates the data taken by 2-PT-24.6.4 on 11/26/91. The purpose is to determine if any modification, maintenance, or equipment degradation has affected the Service Water System so that it can no longer be assured of meeting its safety related functions. The design basis parameters required to meet the safety related functions have been previously identified in Calculation G0050A-12, Rev. 3.

This evaluation uses the data taken from the PT to recalibrate the previously verified hydraulic analysis KYPIPE Program model for the Service Water System. The calibrated model was then used to run several worst case accident scenarios. The results of these scenarios were compared with the allowable limits for the Service Water System (the allowed nuclear service water pump flows and the required diesel generator flows for the 0-10 minute phase of a design basis accident; and the required component heat exchanger flows for the after 10 minute phase). This comparison verified that the system is capable of operating within the design basis limitations and supplying the required design basis component cooling flows.

Analysis: This EER has concluded that the Service Water System is within the design basis and is fully capable of meeting its safety related function. All credible failure modes have been analyzed and documented in Calc. G0050A-12. This evaluation shows that the SWS remains within the maximum and minimum flow limitations documented by G0050A-12. Since no changes are proposed and the system remains within the design basis requirements, there is no safety impact for this EER.

References:

1. Tech. Spec. 3/4.7.1.2
2. TSI 90-03, Rev. 0
3. BSEP FSAR Chapters 9 & 15
4. Calculation G0050A-12, Rev. 3

REVISION 2

10CFR50.59 PROGRAM MANUAL
ATTACHMENT A
CP&L SAFETY REVIEW PACKAGE



## PART II: ITEM CLASSIFICATION

DOCUMENT NO. EER 91-0450 REV. NO. 0

| | | Yes | No |
|---|---|---|---|
| 1. | Does this item represent: | | |
| | a. A change to the facility as described in the SAFETY ANALYSIS REPORT? | [] | X |
| | b. A change to the procedures as described in the SAFETY ANALYSIS REPORT? | [] | X |
| | c. A test or experiment not described in the SAFETY ANALYSIS REPORT? | [] | X |
| 2. | Does this item involve a change to the individual plant Operating License or to its Technical Specifications? | [] | X |
| 3. | Does this item require a revision to the FSAR? | [] | X |
| 4. | Does this item involve a change to the Offsite Dose Calculation Manual? | [] | X |
| 5. | Does this item constitute a change to the Process Control Program? | [] | X |
| 6. | Does this item involve a major change to a Radwaste Treatment System? | [] | X |
| 7. | Does this item involve a change to the Technical Specification Equipment List? | [] | X |
| 8. | Does this item impact the NPDES Permit (all 3 sites) or constitute an "unreviewed environmental question" (SHNPP Environmental Plan, Section 3.1) or a "significant environmental impact" (BSEP)? | [] | X |
| 9. | Does this item involve a change to a previously accepted: | | |
| | a. Quality Assurance Program | [] | X |
| | b. Security Plan (including Training, Qualification, and Contingency Plans)? | [] | X |
| | c. Emergency Plan? | [] | X |
| | d. Independent Spent Fuel Storage Installation license? (If "yes," refer to Section 8.4.2, "Question 9," for special considerations. Complete Part VI in accordance with Section 8.4.6) | [] | X |

SEE SECTION 8.4.2 FOR INSTRUCTIONS FOR EACH "YES" ANSWER.

REFERENCES. List FSAR and Technical Specification references used to answer questions 1-9 above. Identify specific reference sections used for any "Yes" answer.

Tech Spec 3/4.7.1.2
TSI 40-03
FSAR Chapters 4 & 15

REVISION 2

10CFR50.59 PROGRAM MANUAL
ATTACHMENT A
CP&L SAFETY REVIEW PACKAGE



## PART III: UNREVIEWED SAFETY QUESTION DETERMINATION SCREEN

DOCUMENT NO. EER 91-0450 REV. NO. 0

| | Yes | No |
|---|---|---|
| 1. Is this change fully addressed by another completed UNREVIEWED SAFETY QUESTION determination? (See Sections 7.2.1, 7.2.2.5, and 7.9.1.1) | [] | [X] |

REFERENCE DOCUMENT: _____ REV. ____

| | Yes | No |
|---|---|---|
| 2. For procedures, is the change a non-intent change which only (check all that apply): (See Section 7.2.2.3) | [] | [X] |

[] Corrects typographical errors which do not alter the meaning or intent of the procedure; or,

[] Adds or revises steps for clarification (provided they are consistent with the original purpose or applicability of the procedure); or,

[] Changes the title of an organizational position; or,

[] Changes names, addresses, or telephone numbers of persons; or,

[] Changes the designation of an item of equipment where the equipment is the same as the original equipment or is an authorized replacement; or,

[] Changes a specified tool or instrument to an equivalent substitute; or,

[] Changes the format of a procedure without altering the meaning, intent, or content; or

[] Deletes a part or all of a procedure, the deleted portions of which are wholly covered by approved plant procedures?

If the answer to either Question 1 or Question 2 in PART III is "Yes," then PART IV need not be completed.

REVISION 2

10CFR50.59 PROGRAM MANUAL
ATTACHMENT A
CP&L SAFETY REVIEW PACKAGE



## PART IV: UNREVIEWED SAFETY QUESTION DETERMINATION

DOCUMENT NO. EER 91-0450 REV. NO. 0

Using the SAFETY ANALYSIS developed for the change, test or experiment, as well as other required references (LICENSING BASIS DOCUMENTATION, Design Drawings, Design Basis Documents, codes, etc.), the preparer of the Unreviewed Safety Question Determination must directly answer each of the following seven questions and make a determination of whether an UNREVIEWED SAFETY QUESTION exists.

A WRITTEN BASIS IS REQUIRED FOR EACH ANSWER

| | | Yes | No |
|---|---|---|---|
| 1. | May the proposed activity increase the probability of occurrence of an accident evaluated previously in the SAFETY ANALYSIS REPORT? See attached | ☐ | ☒ |
| 2. | May the proposed activity increase the consequences of an accident evaluated previously in the SAFETY ANALYSIS REPORT? See attached | ☐ | ☒ |
| 3. | May the proposed activity increase the probability of occurrence of a malfunction of equipment important to safety evaluated previously in the SAFETY ANALYSIS REPORT? See attached | ☐ | ☒ |
| 4. | May the proposed activity increase the consequence of a malfunction of equipment important to safety evaluated previously in the SAFETY ANALYSIS REPORT? See attached | ☐ | ☒ |
| 5. | May the proposed activity create the possibility of an accident of a different type than any evaluated previously in the SAFETY ANALYSIS REPORT? See attached | ☐ | ☒ |

REVISION 2

10CFR50.59 PROGRAM MANUAL
ATTACHMENT A
CP&L SAFETY REVIEW PACKAGE
PART IV: (Continued)



| | | Yes | No |
|---|---|---|---|
| 6. | May the proposed activity create the possibility of a malfunction of equipment important to safety of a different type than any evaluated previously in the SAFETY ANALYSIS REPORT? See attached | ☐ | ☒ |
| 7. | Does the proposed activity reduce the margin of safety as defined in the basis of any Technical Specification? See attached | ☐ | ☒ |
| 8. | Based on the answers to questions 1 - 7, does this item result in an UNREVIEWED SAFETY QUESTION? If the answer to any of the questions 1-7 is "Yes", then the item is considered to constitute an UNREVIEWED SAFETY QUESTION. | ☐ | ☒ |
| 9. | Is PNSC review required for any of the following reasons? | ☐ | ☒ |

If, in answering question 1 or 3 "No," it was determined that the probability increase was small relative to the uncertainties; or, in answering question 2 or 4 "No," it was determined that the doses increased, but the dose was still less than the NRC ACCEPTANCE LIMIT; or, in answering question 7 "No," a parameter would be closer to the NRC ACCEPTANCE LIMIT, but the end result was still within the NRC ACCEPTANCE LIMIT; then PNSC review is required.

REFERENCES: See attached

This Unreviewed Safety Question Determination is for the following DISCIPLINE(s): (Additional Part IV forms may be included as appropriate.)

- ☐ Nuclear Plant Operations
- ☐ Nuclear Engineering
- ☒ Mechanical
- ☐ Electrical
- ☐ Instrumentation & Control
- ☐ Structural
- ☐ Metallurgy
- ☐ Chemistry/Radiochemistry
- ☐ Health Physics
- ☐ Administrative Controls

PART IV: UNREVIEWED SAFETY QUESTION DETERMINATION, Attached

DISCUSSIONS

1. May the proposed activity increase the probability of occurrence of an accident evaluated previously in the SAFETY ANALYSIS REPORT?

   The Service Water System is designed to mitigate the consequences of an accident and is not directly capable of initiating any design basis accident. However, the system supports other systems that are capable of initiating a design basis accident. There were no design changes that affected the safety related function of the system. The subject EER concludes that the Service Water System remains within the design basis and remains fully capable of performing it's safety related function. Therefore, the proposed activity will not increase the probability of occurrence of an accident evaluated previously in the SAFETY ANALYSIS REPORT.

2. May the proposed activity increase the consequences of an accident evaluated previously in the SAFETY ANALYSIS REPORT?

   The Service Water System is designed to mitigate the consequences of an accident. The subject EER concludes that the Service Water System remains within the design basis and remains fully capable of performing it's safety related function. Therefore, the proposed activity will not increase the consequences of an accident evaluated previously in the SAFETY ANALYSIS REPORT.

3. May the proposed activity increase the probability of occurrence of a malfunction of equipment important to safety evaluated previously in the SAFETY ANALYSIS REPORT?

   The Service Water System is designed to support the cooling requirements of equipment important to safety. The subject EER concludes that the Service Water System remains within the design basis and remains fully capable of performing it's safety related function. Therefore, the proposed activity will not increase the probability of occurrence of a malfunction of equipment important to safety evaluated previously in the SAFETY ANALYSIS REPORT.

4. May the proposed activity increase the consequence of a malfunction of equipment important to safety evaluated previously in the SAFETY ANALYSIS REPORT?

   The Service Water System is designed to support the cooling requirements of equipment important to safety. The subject EER concludes that the Service Water System remains within the design basis and remains fully capable of performing it's safety related function. Therefore, the proposed activity will not increase the consequence of a malfunction of equipment important to safety evaluated previously in the SAFETY ANALYSIS REPORT.

5. May the proposed activity create the possibility of an accident of a different type than any evaluated previously in the SAFETY ANALYSIS REPORT?

   The Service Water System is designed to mitigate the consequences of an accident and is not capable of initiating any design basis accident. There were no design changes that affected the safety related function of the system. The subject EER concludes that the Service Water System remains within the design basis and remains fully capable of performing it's safety related function. Therefore, the proposed activity will not create the possibility of an accident of a different type than any evaluated previously in the SAFETY ANALYSIS REPORT.

6. May the proposed activity create the possibility of a malfunction of equipment important to safety of a different type than any evaluated previously in the SAFETY ANALYSIS REPORT?

   The Service Water System is designed to support the cooling requirements of equipment important to safety. There were no design changes that affected the safety related function of the system. The subject EER concludes that the Service Water System remains within the design basis and remains fully capable of performing it's safety related function. Therefore, the proposed activity will not create the possibility of a malfunction of equipment important to safety of a different type than any evaluated previously in the SAFETY ANALYSIS REPORT.

7. Does the proposed activity reduce the margin of safety as defined in the basis of any Technical Specification?

   The subject EER concludes that the Service Water System remains within the design basis and remains fully capable of performing it's safety related function. No Technical Specification is affected by the EER. Therefore, the proposed activity will not reduce the margin of safety as defined in the basis of any Technical Specification.

References:

1. Tech. Spec. 3/4.7.1.2
2. TSI 90-03, Rev. 0
3. BSEP FSAR Chapters 9 & 15
4. Calculation G0050A-12, Rev. 3

EER No. 91-0450 Rev. No. 0

FORM 3

ENGINEERING EVALUATION REPORT
ENVIRONMENTAL QUALIFICATION IMPACT FORM (EER-EQIF)

Will the evaluation, on either a temporary or permanent basis:

1. Justify the deletion of equipment/common components from the BSEP EQ program?

☐ Yes ☒ No

2. Justify the addition of (already existing) equipment/common components to the BSEP EQ program?

☐ Yes ☒ No

3. Authorize the repair of EQ equipment/common components with other than qualified like-in-kind equipment/component parts?

☐ Yes ☒ No

4. Affect the existing installation or interface (of EQ equipment/common component applications) as may be designated in EDBS and/or in the qualification data package (including changing the type of interface/ installation)?

☐ Yes ☒ No

5. Justify the (quality class) upgrade of equipment/common components or component parts which could be utilized in EQ applications?

☐ Yes ☒ No

6. (Re)Define qualification parameters (e.g., normal or LOCA/HELB environmental conditions, postaccident operating time requirements, essential passive/active postaccident operating requirements, qualified life assumptions/results, etc.) for specific EQ equipment?

☐ Yes ☒ No

7. Provide an EQ-related justification for continued operation (as required per PLP-02, Section 4.4.3.3 or 4.4.4)?

☐ Yes ☒ No

8. Provide the resolution of a qualification problem (as required per PLP-02, Section 4.4.4)?

☐ Yes ☒ No

NOTES:
1. If all no, then no further EQ consideration is required. Mark the EER Traveler accordingly as required by ENP-12 and include this completed EER-EQIF within the EER package. An EQ Technical Review is not required.
2. If any yes, an EQ impact assessment (per Section 5.3) must be performed during the evaluation process. Mark the EER Traveler accordingly and include this completed EER-EQIF within the EER package. An EQ technical review is required.

DATA SHEET 1

CONTROL ROOM

| STEP NO. | TIME | CANAL TEMP COMP POINT C382 | CANAL LEVEL 2-SCW-LR-285 | NUC HDR PRESS 2-SW-PI -143-1 | CONV HDR PRESS 2-SW-PI -131-1 | RHRSW A(B)-LOOP FLOW 2-E11 -FI- R602A(B) * (gpm) | RBCCW SW FLOW 2-SW -FI- 1158-1 (gpm) | VITAL HDR FLOW A-LOOP 2-SW-FI -5114 (gpm) | VITAL HDR FLOW B-LOOP 2-SW-FI -5115 (gpm) |
|---|---|---|---|---|---|---|---|---|---|
| 9.3.29 | 13:30 | 55.4°F | +1.0 | 63 psi | 60 psi | 3000 - A Loop | 3500 | 520 | 555 |
| 9.3.33 | 15:27 | 54.6°F | -0.8 | 61 " | 59.5 " | 3000 - B Loop | 3500 | 520 | 550 |
| 9.3.42 | 16:25 | 54.5°F | -1.9 | 62 " | 12 " | 3000 - A Loop | 3500 | 510 | 550 |

* Note the operating RHR SW LOOP (A or B) with the recorded data.



EER No. 91-0450
REVISION No. 0
Att. 7.3, Page 1 of 19

UNIT 2
PT-24.6.4

DATA SHEET 2

DIESEL GENERATORS
SERVICE WATER FLOWS

| STEP NO. | DIESEL GENERATOR #3 JACKET WATER COOLER SW FLOW | DIESEL GENERATOR #4 JACKET WATER COOLER SW FLOW |
|---|---|---|
| 9.3.29 | 1.996 Kgal/min | 1.936 Kgal/min |
| 9.3.33 | 1.362 Kgal/min | 1.253 Kgal/min |
| 9.3.42 | ~~1.375~~ 1.363 Kgal/min | 1.172 Kgal/min |

4% tolerance

UNIT 2
PT-24.6.4

DATA SHEET 5

DATA ACQUISITION SHEET

ATTACHMENT NO.: 4

SITE NAME: 3~~4~~DGJKT GKT 11/26/91

STEP NO.: 9.3.29

DATE: 11/26/91

| TIME | Vs | VALC | FLOW TOTAL | FLOW TOTAL DIFFERENCE |
|---|---|---|---|---|
| 1332 | 1387.1 | 50 | 3191.45K | |
| 1333 | 1387.0 | 50 | 3192.94K | 1.49K |
| 1334 | 1387.1 | 50 | 3194.44K | 1.50K |
| 1335 | 1387.0 | 50 | 3195.94K | 1.50K |
| 1336 | 1387.0 | 50 | 3197.43K | 1.49K |
| 1337 | 1387.0 | 50 | 3198.93K | 1.50K |
| 1338 | 1387.0 | 50 | 3200.43K | 1.50K |
| | | | | |
| | | | | Average ~~1.42K~~ |

GKT 11/26/91
1.496K#/min

UNIT 2
FT-24.6.4

DATA SHEET 5

DATA ACQUISITION SHEET

ATTACHMENT NO.: 3

SITE NAME: 3DGJKT

STEP NO.: 9.3.33

DATE: 11/26/91

| TIME | Vs | VALC | FLOW TOTAL | FLOW TOTAL DIFFERENCE |
|---|---|---|---|---|
| 1530 | 1347.1 | 50 | 3365.22K | |
| 1531 | 1347.1 | 50 | 3366.58K | 1.36K |
| 1532 | 1347.2 | 50 | 3367.94K | 1.36K |
| 1533 | 1347.2 | 50 | 3369.30K | 1.36K |
| 1534 | 1347.2 | 50 | 3370.67K | 1.37K |
| 1535 | 1347.2 | 50 | 3372.03K | 1.36K |
| 1536 | 1347.0 | 49 | 3373.39K | 1.36K |
| | | | | |
| | | | | Average 1.362Kg/min |

UNIT 2
PT-24.6.4

DATA SHEET 5

DATA ACQUISITION SHEET

ATTACHMENT NO.: 3

SITE NAME: 3DGJKT

STEP NO.: 9.3.92

DATE: 11/26/91

| TIME | Vs | VALC | FLOW TOTAL | FLOW TOTAL DIFFERENCE |
|---|---|---|---|---|
| 1627 | 1347.0 | 50 | 3443.50K | |
| 1628 | 1347.0 | 50 | 3444.86K | 1.36 K |
| 1629 | 1347.0 | 50 | 3446.23K | 1.37 K |
| 1630 | 1346.7 | 50 | 3447.59K | 1.36 K |
| 1631 | 1346.8 | 50 | 3448.96K | 1.37 K |
| 1632 | 1346.7 | 50 | 3450.32K | 1.36 K |
| 1633 | 1346.6 | 50 | 3451.69 K | 1.37 K |
| | | | | |
| | | | | Average 1.375K g/min |

1.365

SR
11-26-91

UNIT 2
PT-24.6.4

DATA SHEET 5

DATA ACQUISITION SHEET

ATTACHMENT NO.: 3

SITE NAME: 4 ZDGJKT QRT 11/26/91

STEP NO.: 9.3.29

DATE: 11/26/91

| TIME | Vs | VALC | FLOW TOTAL | FLOW TOTAL DIFFERENCE |
|---|---|---|---|---|
| 1333 | 1420.5 | 70 | 117.64 K | |
| 1334 | 1420.4 | 70 | 119.58 K | 1.94 K |
| 1335 | 1420.5 | 70 | 121.51 K | 1.93 K |
| 1336 | 1420.5 | 70 | 123.45 K | 1.94 K |
| 1337 | 1420.5 | 70 | 125.39 K | 1.94 K |
| 1338 | 1420.5 | 70 | 127.32 K | 1.93 K |
| 1339 | 1420.5 | 70 | 129.26 K | 1.94 K |
| | | | | |
| | | | | Average 1.936K g/min |

UNIT 2
PT-24.6.4

DATA SHEET 5

DATA ACQUISITION SHEET

ATTACHMENT NO.: 9

SITE NAME: 4DG, JKT

STEP NO.: 9.3.33

DATE: 11/26/91

| TIME | Vs | VALC | FLOW TOTAL | FLOW TOTAL DIFFERENCE |
|---|---|---|---|---|
| 1544 | 1439.0 | 69 | 0.95K | |
| 1545 | 1441.7 | 61 | 2.16K | 1.21K |
| 1546 | 1439.0 | 61 | 3.42K | 1.26K |
| 1547 | 1440.3 | 61 | 4.69K | 1.27K |
| 1548 | 1441.7 | 61 | 5.95K | 1.26K |
| 1549 | 1441.7 | 61 | 7.21K | 1.26K |
| 1550 | 1441.7 | 61 | 8.47K | 1.26K |
| | | | | |
| | | | | Average 1.253K g/min |

UNIT 2
PT-24.6.4

DATA SHEET 5

DATA ACQUISITION SHEET

ATTACHMENT NO.: 4

SITE NAME: ADGJKT

STEP NO.: 9.3.42

DATE: 11/26/91

| TIME | Vs | VALC | FLOW TOTAL | FLOW TOTAL DIFFERENCE |
|---|---|---|---|---|
| 1627 | 1438.6 | 69 | 52.69 K | ~~1.17K~~ GKT 11/26/91 |
| 1628 | 1439.0 | 69 | 53.86 K | 1.17K |
| 1629 | 1438.7 | 69 | 55.04 K | 1.18 K |
| 1630 | 1438.7 | 69 | 56.21 K | 1.17K |
| 1631 | 1438.7 | 70 | 57.38 K | 1.17K |
| 1632 | 1438.6 | 69 | 58.55 K | 1.17K |
| 1633 | 1438.7 | 69 | 59.72 K | 1.17K |
| | | | | |
| | | | | Average 1.172K gal/min |

UNIT 2
PT-24.6.4

DATA SHEET 3

SERVICE WATER BUILDING

| STEP NO. | NSW PUMP 2A FLOW | NSW PUMP 2B FLOW | CONV HDR PRESS TEST GAUGE#1 at PS-3213 | NUC HDR PRESS TEST GAUGE #2 at PS-3214 | NSW PMP A DISCH PRESS PI-144 | NSW PMP B DISCH PRESS PI-145 | NSW PMP A DISCH STRN ΔP PDIC-138 | NSW PMP A DISCH STRN ΔP PDIC-140 |
|---|---|---|---|---|---|---|---|---|
| 9.3.29 | 5.7 KGAL MIN | 4.61 KGAL MIN | 60.2 psi | ~~63~~ psi | 58 psi | 60 psi | 0.6 psi | 0.3 psi |
| 9.3.33 | 5.94 KGAL MIN | 4.68 KGAL MIN | 59.6 psi | 60 psi | 58 psi | 60 psi | 0.6 psi | 0.3 psi |
| 9.3.42 | ~~5.93~~ 5.94 KGAL MIN | 4.60 KGAL MIN | 10.4 psi | 61.8 psi | 57 psi | 60 psi | 0.6 psi | 0.4 psi |

FR 11-26-91

Test Gauge #1 Data:

CP&L No. G136 Range: 0-150 psi Installed El.: 6'0"

Cal Date: 11-20-91 Cal. Due Date: 12/16/91

Test Gauge #2 Data:

CP&L No. G125 Range: 0-150 psi Installed El.: 6'-0"

Cal Date: 11-20-91 Cal. Due Date: 12/16/91

UNIT 2
PT-24.6.4

DATA SHEET 5

DATA ACQUISITION SHEET

ATTACHMENT NO.: 1

SITE NAME: ZANPMP

STEP NO.: 9.3.29

DATE: 11/26/91

| TIME | Vs | VALC | FLOW TOTAL | FLOW TOTAL DIFFERENCE |
|---|---|---|---|---|
| 13:31 | 1444.4 M/S | 49 | 237.61 KGAL | 5.67 KGAL/MIN |
| 13:32 | 1444.4 | 49 | 243.28 | 5.67 |
| 13:33 | 1444.4 | 49 | 248.95 | 5.69 |
| 13:34 | 1444.4 | 49 | 254.64 | 5.70 |
| 13:35 | 1444.4 | 49 | 260.34 | 5.72 |
| 13:36 | 1444.4 | 49 | 266.06 | 5.74 |
| 13:37 | 1444.4 | 50 | 271.80 | |
| | | | | |
| | | | | Average 5.70 KGAL/MIN |

UNIT 2
PT-24.6.4

DATA SHEET 5

DATA ACQUISITION SHEET

ATTACHMENT NO.: 1

SITE NAME: ZANPMP

STEP NO.: 9.3.33

DATE: 11/26/91

| TIME | Vs | VALC | FLOW TOTAL | FLOW TOTAL DIFFERENCE |
|---|---|---|---|---|
| 15:28 | 1443.5 | 49 | 967.07 Kgal | ~~5.95~~ Kgal/min |
| 15:29 | 1443.6 | 48 | 973.02 | ~~5.97~~ |
| 15:30 | 1443.5 | 49 | 978.99 | ~~5.92~~ |
| 15:31 | 1443.5 | 48 | 984.91 | ~~5.93~~ |
| 15:32 | 1443.5 | 49 | 990.84 | ~~6.01~~ |
| 15:33 | 1443.4 | 48 | 996.85 | ~~5.93~~ |
| 15:34 | 1443.4 | 49 | 402.78 | ~~6.03~~ |
| 1535 | 1443.5 | 48 | 408.71 | |
| | | | | Average 5.94 Kgal/min |

UNIT 2
PT-24.6.4

DATA SHEET 5

DATA ACQUISITION SHEET

ATTACHMENT NO.: 1

SITE NAME: 2AN PMP

STEP NO.: 9.3.92

DATE: 11/26/91

| TIME | Vs | VALC | FLOW TOTAL | FLOW TOTAL DIFFERENCE |
|---|---|---|---|---|
| 1624 | 1443.1 | 49 | 184.05 | ~~5.98~~ |
| 1625 | 1443.1 | 49 | 190.03 | ~~5.95~~ |
| 1626 | 1443.1 | 48 | 195.98 | ~~5.90~~ |
| 1627 | 1443.2 | 49 | 201.88 | ~~5.96~~ |
| 1628 | 1443.2 | 49 | 207.84 | ~~5.97~~ |
| 1629 | 1443.2 | 49 | 213.81 | ~~5.86~~ 5.88 TR 11-26-91 |
| 1630 | 1443.2 | 49 | 219.69 | ~~5.92~~ |
| 1631 | 1443.1 | 49 | 225.61 | |
| | | | | Average ~~5.93~~ 5.94 Kgal/min |

92
11-26-91

UNIT 2
PT-24.6.6

DATA SHEET 5

DATA ACQUISITION SHEET

ATTACHMENT NO.: 2

SITE NAME: 2BNPMP

STEP NO.: 9.3.29

DATE: 11/26/91

| TIME | Vs | VALC | FLOW TOTAL | FLOW TOTAL DIFFERENCE |
|---|---|---|---|---|
| 13:55 | 1444.3 | 74 | 35.06 KGM | 4.61 |
| 13:56 | 1444.3 | 74 | 39.67 | 4.63 |
| 13:57 | 1444.4 | 74 | 44.30 | 4.64 |
| 13:58 | 1444.3 | 74 | 48.94 | 4.60 |
| 13:59 | 1444.3 | 74 | 53.54 | 4.62 |
| 14:00 | 1444.3 | 74 | 58.16 | 4.61 |
| 14:01 | 1444.5 | 74 | 62.77 | |
| | | | | |
| | | | | Average 4.61 KGM/min |

UNIT 2
PT-24.6.4

DATA SHEET 5

DATA ACQUISITION SHEET

ATTACHMENT NO.: 2

SITE NAME: 2BNPMP

STEP NO.: 9.3.33

DATE: 11/26/91

| TIME | Vs | VALC | FLOW TOTAL | FLOW TOTAL DIFFERENCE |
|---|---|---|---|---|
| 15:39 | 1443.5 | 74 | 10.29 KGAL | ~~4.66~~ KGAL/MIN |
| 1540 | 1443.7 | 74 | 14.95 | ~~4.63~~ |
| 1541 | 1443.6 | 74 | 19.58 | ~~4.69~~ |
| 1542 | 1443.6 | 74 | 24.17 | ~~4.62~~ |
| 1543 | 1443.6 | 74 | 28.79 | ~~4.65~~ |
| 1544 | 1443.6 | 74 | 33.44 | ~~4.60~~ |
| 1545 | 1443.6 | 74 | 38.04 | ~~4.64~~ |
| 1546 | 1443.7 | 74 | 42.68 | |
| | | | | Average 4.62 KGal/min |

UNIT 2
PT-24.6.4

DATA SHEET 5

DATA ACQUISITION SHEET

ATTACHMENT NO.: 2

SITE NAME: ZENPMP

STEP NO.: 9.3.42

DATE: 11/26/91

| TIME | Vs | VALC | FLOW TOTAL | FLOW TOTAL DIFFERENCE |
|---|---|---|---|---|
| 1634 | 1443.2 | 74 | 12.23 | ~~4.63~~ |
| 1635 | 1443.2 | 74 | 16.86 | ~~4.65~~ |
| 1636 | 1443.1 | 74 | 21.51 | ~~4.61~~ |
| 1637 | 1443.2 | 74 | 26.92 | ~~4.55~~ |
| 1638 | 1443.2 | 74 | 30.71 | ~~4.58~~ |
| 1639 | 1443.1 | 74 | 35.29 | ~~4.64~~ |
| 1640 | 1443.2 | 74 | 39.93 | ~~4.59~~ |
| 1641 | 1443.1 | 74 | 44.52 | |
| | | | | Average 4.60 |

kg/min

DATA SHEET 4

REACTOR BUILDING EL. -17'

| STEP NO. | VITAL HDR SW FLOW (Kgal/min) | VITAL HDR A LOOP PRESS TEST GAUGE #3 at PI-821 (psi) | VITAL HDR B LOOP PRESS TEST GAUGE #4 at PI-819 (psi) |
|---|---|---|---|
| 9.3.29 | 1.0467 | 63½ | 66 |
| 9.3.33 | 1.054 | 63 | 65 |
| 9.3.42 | 1.067 | 63 | 64½ |

Test Gauge #3 Data:

CP&L No. G179 Range: 0-100 psi Installed El.: (-)12.625

Cal Date: 11-19-91 Cal. Due Date: 12/16/91

Test Gauge #4 Data:

CP&L No. G-207 Range: 0-100 psi Installed El.: (-) 13.0

Cal Date: 11-11-91 Cal. Due Date: 12/9/91

UNIT 2
PT-24.6.4

DATA SHEET 5

DATA ACQUISITION SHEET

ATTACHMENT NO.: 5

SITE NAME: VITHOR

STEP NO.: 9.3.29

DATE: 11/26/91

| TIME | Vs | VALC | FLOW TOTAL | FLOW TOTAL DIFFERENCE |
|---|---|---|---|---|
| 13:30 | 1433.7 | 85 | 334.61 | |
| 13:31 | 1433.8 | 85 | 335.65 | 1.04 |
| 13:32 | 1434.0 | 85 | 336.70 | 1.05 |
| 13:33 | 1433.8 | 85 | 337.75 | 1.05 |
| 13:34 | 1433.5 | 85 | 338.80 | 1.05 |
| 13:35 | 1433.5 | 85 | 339.85 | 1.05 |
| 13:36 | 1433.8 | 84 | 340.89 | 1.04 |
| | | | | |
| | | | | |
| | | | | Average 1.046 Kgal/min |

UNIT 2
PT-24.6.4

DATA SHEET 5

DATA ACQUISITION SHEET

ATTACHMENT NO.: 5

SITE NAME: VITHOR

STEP NO.: 9.3.33

DATE: 11/26/91

| TIME | Vs | VALC | FLOW TOTAL | FLOW TOTAL DIFFERENCE |
|---|---|---|---|---|
| 1528 | 1433.2 | 85 | 0.490 KG | 1.06 |
| 1529 | 1433.1 | 85 | 1.55 | 1.04 |
| 1530 | 1432.8 | 85 | 2.59 | 1.05 |
| 1531 | 1433.0 | 84 | 3.64 | 1.06 |
| 1532 | 1432.9 | 85 | 4.70 | 1.06 |
| 1533 | 1432.6 | 85 | 5.76 | |
| | | | | |
| | | | | |
| | | | | Average 1.054 KG/min |

UNIT 2
PT-24.6.4

DATA SHEET 5

DATA ACQUISITION SHEET

ATTACHMENT NO.: 5

SITE NAME: VITHDR

STEP NO.: 9.3.42

DATE: 11/26/91

| TIME | Vs | VALC | FLOW TOTAL | FLOW TOTAL DIFFERENCE |
|---|---|---|---|---|
| 1624 | 1432.7 | 85 | 2.24 | ——— |
| 1625 | 1432.4 | 85 | 3.30 | 1.06 KG PER MIN |
| 1626 | 1432.4 | 85 | 4.37 | 1.07 |
| 1627 | 1432.6 | 85 | 5.44 | 1.07 |
| 1628 | 1432.4 | 85 | 6.50 | 1.06 |
| 1629 | 1432.3 | 85 | 7.56 | 1.06 |
| 1630 | 1432.4 | 85 | 8.64 | 1.08 |
| | | | | |
| | | | | Average 1.067 KG PER MIN |

# ANALYSIS RESULTS FOR "U2CALBN2"

FLOWRATE IS EXPRESSED IN GPM AND PRESSURE IN PSIG

THE DARCY WEISBACH HEAD LOSS EQUATION IS USED, THE KINEMATIC VIS. = .0000070

THE SPECIFIC GRAVITY OF THIS LIQUID = 1.03

A SUCCESSFUL GEOMETRIC VERIFICATION HAS BEEN COMPLETED

OUTPUT SELECTION: THE FOLLOWING RESULTS ARE OUTPUT
RESULTS ARE OUTPUT FOR ALL PIPES WITH PUMPS - CLOSED PIPES ARE NOTED
RESULTS ARE OUTPUT FOR THE FOLLOWING PIPES : 5 2 16 31 34 38 41 47 50 57 62 79 88 92 97 101 105 109 116 120
RESULTS ARE OUTPUT FOR THE FOLLOWING PIPES : 128 134 146 152 168 176 182 188 198 501 503 32 58 63 110 117 121 218 224 234
RESULTS ARE OUTPUT FOR THE FOLLOWING PIPES : 59 111 235 197 233
RESULTS ARE OUTPUT FOR THE FOLLOWING JUNCTION NODES : 1 2 14 15 16 27 28 36 37 49 50 66 70 74 75
RESULTS ARE OUTPUT FOR THE FOLLOWING JUNCTION NODES : 90 91 100 101 109 110 143 144 156 157 18 23 98 165 302
RESULTS ARE OUTPUT FOR THE FOLLOWING JUNCTION NODES : 204 205

THIS SYSTEM HAS 247 PIPES WITH 212 JUNCTIONS , 31 LOOPS AND 5 FGNS

THE RESULTS ARE OBTAINED AFTER 6 TRIALS WITH AN ACCURACY = .00102

U2CALBN2 - CHANGE 0: SIMULATES STEP 9.3.29 OF PT-24.6.4
A LOOP RHRSW IN SERVICE AT 3000 GPM (2 RHRSWP'S)-RBCCW AT 3500 GPM-2 NSWP'S
VITAL HDR IN SERVICE-DG'S 3 & 4 IN SERVICE-NO LUBE WATER

| PIPE NO. | NODE NOS. | | FLOWRATE | HEAD LOSS | PUMP HEAD | MINOR LOSS | VELOCITY | HL/1000 |
|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 1 | 5233.66 | .02 | 156.74 | .00 | 7.73 | 18.55 |
| 2 | 1 | 2 | 5233.66 | .18 | .00 | 1.98 | 7.73 | 18.55 |
| 4 | 0 | 4 | 5270.63 | .02 | 156.12 | .00 | 7.78 | 18.81 |
| 5 | 4 | 5 | 5270.63 | .18 | .00 | 1.30 | 7.78 | 18.81 |
| 16 | 12 | 13 | .00 | .00 | .00 | .00 | .00 | .00 |
| 31 | 27 | 28 | 82.51 | .06 | .00 | 8.83 | 6.26 | 64.48 |
| 32 | 28 | 29 | 82.51 | 9.97 | .00 | 54.76 | 11.66 | 316.40 |
| 34 | 304 | 305 | 553.19 | .97 | .00 | 3.13 | 15.48 | 202.53 |
| 38 | 36 | 37 | 109.56 | .11 | .00 | 31.88 | 8.31 | 111.43 |
| 41 | 38 | 39 | 107.58 | .11 | .00 | 30.74 | 8.16 | 107.55 |
| 47 | 41 | 42 | 109.50 | .11 | .00 | 31.84 | 8.31 | 111.30 |
| 50 | 43 | 44 | 107.18 | .11 | .00 | 30.51 | 8.13 | 106.79 |

## ANALYSIS RESULTS FOR "U2CALBN2"

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 57 | 49 | 50 | 18.52 | .33 | .00 | 47.41 | 8.21 | 328.45 |
| 58 | 50 | 51 | 18.52 | 5.65 | .00 | 17.79 | 8.21 | 328.45 |
| 59 | 51 | 52 | 36.86 | .20 | .00 | .82 | 7.68 | 179.45 |
| 62 | 53 | 54 | 18.33 | .32 | .00 | 46.44 | 8.13 | 321.93 |
| 63 | 54 | 51 | 18.33 | 2.90 | .00 | 17.94 | 8.13 | 321.93 |
| LINE | 79 IS | CLOSED | | | | | | |
| 88 | 74 | 75 | 103.54 | .10 | .00 | 28.47 | 7.86 | 99.88 |
| 92 | 76 | 77 | 104.26 | .10 | .00 | 28.87 | 7.91 | 101.24 |
| 97 | 81 | 82 | 104.88 | .10 | .00 | 29.21 | 7.96 | 102.40 |
| 101 | 83 | 84 | 103.13 | .10 | .00 | 28.24 | 7.83 | 99.11 |
| 105 | 88 | 68 | 515.97 | 1.34 | .00 | 5.28 | 5.72 | 16.65 |
| 109 | 90 | 91 | 16.87 | .27 | .00 | 39.34 | 7.48 | 274.32 |
| 110 | 91 | 92 | 16.87 | 6.58 | .00 | 33.24 | 7.48 | 274.32 |
| 111 | 92 | 93 | 33.89 | .14 | .00 | .17 | 7.06 | 152.66 |
| 116 | 96 | 97 | 17.02 | .28 | .00 | 40.02 | 7.54 | 278.91 |
| 117 | 97 | 92 | 17.02 | 3.12 | .00 | 33.57 | 7.54 | 278.91 |
| 120 | 100 | 101 | 66.26 | .04 | .00 | 5.69 | 5.03 | 42.35 |
| 121 | 101 | 88 | 66.26 | 1.46 | .00 | 89.63 | 5.03 | 42.35 |
| LINE | 128 IS | CLOSED | | | | | | |
| LINE | 134 IS | CLOSED | | | | | | |
| 146 | 125 | 126 | 1408.25 | .03 | .00 | 25.34 | 9.03 | 28.90 |
| 152 | 131 | 132 | 1257.91 | .02 | .00 | 45.49 | 8.07 | 23.22 |
| LINE | 166 IS | CLOSED | | | | | | |
| 168 | 145 | 146 | .00 | .00 | .00 | .00 | .00 | .00 |
| LINE | 174 IS | CLOSED | | | | | | |
| 176 | 158 | 146 | .00 | .00 | .00 | .00 | .00 | .00 |
| LINE | 179 IS | CLOSED | | | | | | |
| 182 | 151 | 152 | .00 | .00 | .00 | .00 | .00 | .00 |
| LINE | 185 IS | CLOSED | | | | | | |
| 188 | 163 | 164 | .00 | .00 | .00 | .00 | .00 | .00 |
| 197 | 170 | 171 | .00 | .00 | .00 | .00 | .00 | .00 |
| 198 | 302 | 165 | .00 | .00 | .00 | .00 | .00 | .00 |
| 205 | 177 | 178 | 1498.62 | .03 | 749.29 | .00 | 9.61 | 32.61 |
| 213 | 185 | 186 | 1501.38 | .03 | 749.19 | .00 | 9.63 | 32.73 |
| 218 | 189 | 190 | 79.32 | 13.48 | .00 | 7.17 | 16.53 | 797.57 |
| 224 | 195 | 196 | 71.72 | 10.74 | .00 | 5.86 | 14.95 | 654.77 |
| 233 | 203 | 204 | 3000.00 | .01 | .00 | .00 | 5.27 | 4.69 |
| LINE | 234 IS | CLOSED | | | | | | |
| 235 | 70 | 205 | 3500.00 | .00 | .00 | .28 | 6.15 | 6.30 |
| 501 | 86 | 301 | 415.81 | .03 | .00 | 63.09 | 4.61 | 11.01 |
| 503 | 46 | 303 | 433.82 | .07 | .00 | 51.90 | 4.81 | 11.94 |
| LINE | 700 IS | CLOSED | | | | | | |
| LINE | 701 IS | CLOSED | | | | | | |
| LINE | 702 IS | CLOSED | | | | | | |
| LINE | 703 IS | CLOSED | | | | | | |

| JUNCTION NUMBER | DEMAND | GRADE LINE | ELEVATION | PRESSURE |
|---|---|---|---|---|
| 1 | .00 | 177.72 | 43.10 | 60.09 |
| 2 | .00 | 175.57 | 42.40 | 59.44 |
| 14 | .00 | 170.88 | 26.50 | 64.44 |
| 15 | .00 | 171.33 | 26.50 | 64.64 |
| 16 | .00 | 171.33 | 26.50 | 64.64 |

## ANALYSIS RESULTS FOR "U2CALBN2"

| | | | | |
|---|---|---|---|---|
| 18 | .00 | 168.23 | 36.30 | 58.88 |
| 23 | .00 | 142.30 | 12.50 | 57.93 |
| 27 | .00 | 121.60 | 11.00 | 49.37 |
| 28 | .00 | 112.71 | 10.80 | 45.49 |
| 36 | .00 | 138.95 | 17.50 | 54.21 |
| 37 | .00 | 106.96 | 17.50 | 39.93 |
| 49 | .00 | 125.08 | 8.30 | 52.12 |
| 50 | .00 | 77.34 | 8.30 | 30.82 |
| 66 | 3500.00 | 161.80 | 77.20 | 37.76 |
| 70 | -3500.00 | 42.75 | 74.10 | -13.99 |
| 74 | .00 | 153.05 | 17.50 | 60.50 |
| 75 | .00 | 124.48 | 17.50 | 47.75 |
| 90 | .00 | 140.26 | 31.60 | 48.50 |
| 91 | .00 | 100.65 | 31.60 | 30.82 |
| 98 | .00 | 156.63 | 16.80 | 62.41 |
| 100 | .00 | 144.10 | 11.40 | 59.23 |
| 101 | .00 | 138.37 | 28.50 | 49.04 |
| 109 | .00 | 165.82 | 44.40 | 54.19 |
| 110 | .00 | 31.13 | 44.40 | -5.92 |
| 143 | .00 | 167.87 | 72.80 | 42.43 |
| 144 | .00 | 40.41 | 74.20 | -15.08 |
| 156 | .00 | 167.84 | 72.80 | 42.42 |
| 157 | .00 | 40.41 | 74.20 | -15.08 |
| 165 | .00 | 40.41 | 58.80 | -8.21 |
| 204 | 3000.00 | 911.33 | 33.10 | 391.98 |
| 205 | -3000.00 | 42.46 | 71.90 | -13.14 |
| 302 | .00 | 40.41 | 34.20 | 2.77 |

THE NET SYSTEM DEMAND = .00

SUMMARY OF INFLOWS(+) AND OUTFLOWS(-) FROM FIXED GRADE NODES

| PIPE NUMBER | FLOWRATE |
|---|---|
| 1 | 5233.66 |
| 4 | 5270.63 |
| 158 | -2666.16 |
| 161 | -7720.20 |
| 600 | -117.93 |

THE NET FLOW INTO THE SYSTEM FROM FIXED GRADE NODES = 10504.29
THE NET FLOW OUT OF THE SYSTEM INTO FIXED GRADE NODES = -10504.29

A SUMMARY OF CONDITIONS SPECIFIED FOR THE NEXT SIMULATION FOLLOWS

THE FOLLOWING SPECIFIC DEMAND CHANGES ARE MADE :

| JUNCTION NUMBER | DEMAND |
|---|---|
| 204 | .00 |
| 205 | .00 |
| 302 | 3000.00 |

## ANALYSIS RESULTS FOR "U2CALBN2"

```
      165              -3000.00
LINE  166 IS OPEN
LINE  174 IS OPEN
LINE  179 IS OPEN
LINE  185 IS OPEN
LINE  205 IS CLOSED
LINE  213 IS CLOSED
LINE  218 IS CLOSED
LINE  224 IS CLOSED
LINE  234 IS OPEN
LINE  198 IS CLOSED

THE FOLLOWING CHANGES IN PIPE DATA ARE SPECIFIED

FOR PIPE NUMBER   1 THE VALUE OF THE FIXED GRADE IS CHANGED TO   19.2

FOR PIPE NUMBER   4 THE VALUE OF THE FIXED GRADE IS CHANGED TO   19.2

FOR PIPE NUMBER 600 THE VALUE OF THE FIXED GRADE IS CHANGED TO  160.0
```

| PIPE NO. | NODE NOS. | | LENGTH | DIAMETER | ROUGHNESS | MINOR LOSS K | FIXED GRADE |
|---|---|---|---|---|---|---|---|
| 2 | 1 | 2 | 9.7 | 16.6 | 5.0 | 2.15 | .00 |
| 5 | 4 | 5 | 9.7 | 16.6 | 5.0 | 1.40 | .00 |

```
THE RESULTS ARE OBTAINED AFTER  6 TRIALS WITH AN ACCURACY =  .00020

U2CALBN2 - CHANGE 1: SIMULATES STEP 9.3.33 OF PT-24.6.4
B LOOP RHRSW NOW IN SERVICE AT 3000 GPM
REST OF LINEUP IS THE SAME
```

| PIPE NO. | NODE NOS. | | FLOWRATE | HEAD LOSS | PUMP HEAD | MINOR LOSS | VELOCITY | HL/1000 |
|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 1 | 5222.99 | .02 | 156.92 | .00 | 7.71 | 18.47 |
| 2 | 1 | 2 | 5222.99 | .18 | .00 | 1.99 | 7.71 | 18.47 |
| 4 | 0 | 4 | 5259.88 | .02 | 156.30 | .00 | 7.77 | 18.73 |
| 5 | 4 | 5 | 5259.88 | .18 | .00 | 1.31 | 7.77 | 18.73 |
| 16 | 12 | 13 | .00 | .00 | .00 | .00 | .00 | .00 |
| 31 | 27 | 28 | 81.63 | .06 | .00 | 8.64 | 6.19 | 63.16 |
| 32 | 28 | 29 | 81.63 | 9.76 | .00 | 53.59 | 11.54 | 309.82 |
| 34 | 304 | 305 | 547.28 | .95 | .00 | 3.06 | 15.32 | 198.31 |
| 38 | 36 | 37 | 108.39 | .11 | .00 | 31.20 | 8.23 | 109.14 |
| 41 | 38 | 39 | 106.43 | .11 | .00 | 30.08 | 8.08 | 105.34 |
| 47 | 41 | 42 | 108.33 | .11 | .00 | 31.16 | 8.22 | 109.01 |
| 50 | 43 | 44 | 106.04 | .10 | .00 | 29.86 | 8.05 | 104.59 |
| 57 | 49 | 50 | 18.33 | .32 | .00 | 46.40 | 8.12 | 321.70 |
| 58 | 50 | 51 | 18.33 | 5.53 | .00 | 17.41 | 8.12 | 321.70 |
| 59 | 51 | 52 | 36.46 | .19 | .00 | .81 | 7.60 | 175.76 |
| 62 | 53 | 54 | 18.14 | .32 | .00 | 45.45 | 8.04 | 315.31 |
| 63 | 54 | 51 | 18.14 | 2.84 | .00 | 17.56 | 8.04 | 315.31 |
| LINE 79 IS CLOSED | | | | | | | | |
| 88 | 74 | 75 | 102.98 | .10 | .00 | 28.16 | 7.82 | 98.84 |

## ANALYSIS RESULTS FOR "U2CALBN2"

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 92 | 76 | 77 | 103.70 | .10 | .00 | 28.56 | 7.87 | 100.18 |
| 97 | 81 | 82 | 104.32 | .10 | .00 | 28.90 | 7.92 | 101.34 |
| 101 | 83 | 84 | 102.57 | .10 | .00 | 27.94 | 7.78 | 98.08 |
| 105 | 88 | 68 | 513.18 | 1.32 | .00 | 5.23 | 5.69 | 16.47 |
| 109 | 90 | 91 | 16.78 | .27 | .00 | 38.91 | 7.44 | 271.46 |
| 110 | 91 | 92 | 16.78 | 6.51 | .00 | 32.88 | 7.44 | 271.46 |
| 111 | 92 | 93 | 33.71 | .14 | .00 | .17 | 7.03 | 151.07 |
| 116 | 96 | 97 | 16.93 | .28 | .00 | 39.59 | 7.50 | 276.01 |
| 117 | 97 | 92 | 16.93 | 3.09 | .00 | 33.21 | 7.50 | 276.01 |
| 120 | 100 | 101 | 65.91 | .04 | .00 | 5.63 | 5.00 | 41.91 |
| 121 | 101 | 88 | 65.91 | 1.45 | .00 | 88.66 | 5.00 | 41.91 |
| LINE 128 IS CLOSED | | | | | | | | |
| LINE 134 IS CLOSED | | | | | | | | |
| 146 | 125 | 126 | 1400.16 | .03 | .00 | 25.05 | 8.98 | 28.58 |
| 152 | 131 | 132 | 1250.69 | .02 | .00 | 44.97 | 8.02 | 22.96 |
| 166 | 143 | 144 | 1501.71 | .03 | 749.18 | .00 | 9.63 | 32.74 |
| 168 | 145 | 146 | 1501.71 | .07 | .00 | .26 | 4.26 | 4.15 |
| 174 | 156 | 157 | 1498.29 | .03 | 749.30 | .00 | 9.61 | 32.60 |
| 176 | 158 | 146 | 1498.29 | .13 | .00 | .30 | 4.25 | 4.14 |
| 182 | 151 | 152 | 80.65 | 16.40 | .00 | 10.61 | 16.81 | 823.91 |
| 188 | 163 | 164 | 77.58 | 15.19 | .00 | 8.97 | 16.17 | 763.49 |
| 197 | 170 | 171 | 3000.00 | .02 | .00 | .21 | 5.27 | 4.69 |
| LINE 198 IS CLOSED | | | | | | | | |
| LINE 205 IS CLOSED | | | | | | | | |
| LINE 213 IS CLOSED | | | | | | | | |
| LINE 218 IS CLOSED | | | | | | | | |
| LINE 224 IS CLOSED | | | | | | | | |
| 233 | 203 | 204 | .00 | .00 | .00 | .00 | .00 | .00 |
| 234 | 204 | 205 | .00 | .00 | .00 | .00 | .00 | .00 |
| 235 | 70 | 205 | 3500.00 | .00 | .00 | .28 | 6.15 | 6.30 |
| 501 | 86 | 301 | 413.57 | .03 | .00 | 62.41 | 4.58 | 10.89 |
| 503 | 46 | 303 | 429.19 | .07 | .00 | 50.80 | 4.76 | 11.69 |
| LINE 700 IS CLOSED | | | | | | | | |
| LINE 701 IS CLOSED | | | | | | | | |
| LINE 702 IS CLOSED | | | | | | | | |
| LINE 703 IS CLOSED | | | | | | | | |

| JUNCTION NUMBER | DEMAND | GRADE LINE | ELEVATION | PRESSURE |
|---|---|---|---|---|
| 1 | .00 | 176.10 | 43.10 | 59.36 |
| 2 | .00 | 173.93 | 42.40 | 58.71 |
| 14 | .00 | 169.27 | 26.50 | 63.72 |
| 15 | .00 | 169.27 | 26.50 | 63.72 |
| 16 | .00 | 169.27 | 26.50 | 63.72 |
| 18 | .00 | 166.62 | 36.30 | 58.17 |
| 23 | .00 | 141.20 | 12.50 | 57.44 |
| 27 | .00 | 120.94 | 11.00 | 49.07 |
| 28 | .00 | 112.24 | 10.80 | 45.28 |
| 36 | .00 | 137.92 | 17.50 | 53.75 |
| 37 | .00 | 106.61 | 17.50 | 39.77 |
| 49 | .00 | 124.35 | 8.30 | 51.80 |
| 50 | .00 | 77.63 | 8.30 | 30.94 |
| 6[illegible] | 3500.00 | 160.19 | 77.20 | 37.04 |

## ANALYSIS RESULTS FOR "U2CALBN2"

| | | | | |
|---|---|---|---|---|
| 70 | -3500.00 | 41.28 | 74.10 | -14.65 |
| 74 | .00 | 151.65 | 17.50 | 59.88 |
| 75 | .00 | 123.39 | 17.50 | 47.26 |
| 90 | .00 | 139.00 | 31.60 | 47.93 |
| 91 | .00 | 99.81 | 31.60 | 30.45 |
| 98 | .00 | 155.19 | 16.80 | 61.77 |
| 100 | .00 | 142.79 | 11.40 | 58.65 |
| 101 | .00 | 137.12 | 28.50 | 48.48 |
| 109 | .00 | 164.25 | 44.40 | 53.49 |
| 110 | .00 | 31.11 | 44.40 | -5.93 |
| 143 | .00 | 165.47 | 72.80 | 41.36 |
| 144 | .00 | 914.62 | 74.20 | 375.11 |
| 156 | .00 | 165.44 | 72.80 | 41.35 |
| 157 | .00 | 914.71 | 74.20 | 375.15 |
| 165 | -3000.00 | 41.62 | 58.80 | -7.67 |
| 204 | .00 | 40.99 | 33.10 | 3.52 |
| 205 | .00 | 40.99 | 71.90 | -13.80 |
| 302 | 3000.00 | 909.67 | 34.20 | 390.75 |

THE NET SYSTEM DEMAND = .00

SUMMARY OF INFLOWS(+) AND OUTFLOWS(-) FROM FIXED GRADE NODES

| PIPE NUMBER | FLOWRATE |
|---|---|
| 1 | 5222.99 |
| 4 | 5259.88 |
| 158 | -2650.85 |
| 161 | -7718.68 |
| 600 | -113.34 |

THE NET FLOW INTO THE SYSTEM FROM FIXED GRADE NODES = 10482.86
THE NET FLOW OUT OF THE SYSTEM INTO FIXED GRADE NODES = -10482.87

A SUMMARY OF CONDITIONS SPECIFIED FOR THE NEXT SIMULATION FOLLOWS

LINE 166 IS CLOSED
LINE 174 IS CLOSED
LINE 179 IS CLOSED
LINE 185 IS CLOSED
LINE 205 IS OPEN
LINE 213 IS OPEN
LINE 218 IS OPEN
LINE 224 IS OPEN
LINE 198 IS OPEN
LINE 234 IS CLOSED

THE FOLLOWING CHANGES IN PIPE DATA ARE SPECIFIED

FOR PIPE NUMBER 600 THE VALUE OF THE FIXED GRADE IS CHANGED TO 49.8

## ANALYSIS RESULTS FOR "U2CALBN2"

FOR PIPE NUMBER 1 THE VALUE OF THE FIXED GRADE IS CHANGED TO 18.6

FOR PIPE NUMBER 4 THE VALUE OF THE FIXED GRADE IS CHANGED TO 18.6

| PIPE NO. | NODE NOS. | | LENGTH | DIAMETER | ROUGHNESS | MINOR LOSS K | FIXED GRADE |
|---|---|---|---|---|---|---|---|
| 2 | 1 | 2 | 9.7 | 16.6 | 5.0 | 1.90 | .00 |
| 5 | 4 | 5 | 9.7 | 16.6 | 5.0 | 1.48 | .00 |

THE RESULTS ARE OBTAINED AFTER 5 TRIALS WITH AN ACCURACY = .00126

U2CALBN2 - CHANGE 2: SIMULATES STEP 9.3.42 OF PT-24.6.4
CONVENTIONAL SW HEADER DEPRESSURIZED-A LOOP RHRSW IN SERVICE
REST OF LINEUP IS SAME AS CHANGE 0

| PIPE NO. | NODE NOS. | | FLOWRATE | HEAD LOSS | PUMP HEAD | MINOR LOSS | VELOCITY | HL/1000 |
|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 1 | 5351.63 | .02 | 154.74 | .00 | 7.90 | 19.39 |
| 2 | 1 | 2 | 5351.63 | .19 | .00 | 1.84 | 7.90 | 19.39 |
| 4 | 0 | 4 | 5373.01 | .02 | 154.38 | .00 | 7.94 | 19.54 |
| 5 | 4 | 5 | 5373.01 | .19 | .00 | 1.45 | 7.94 | 19.54 |
| 16 | 12 | 13 | .00 | .00 | .00 | .00 | .00 | .00 |
| 31 | 27 | 28 | 81.05 | .06 | .00 | 8.52 | 6.15 | 62.30 |
| 32 | 28 | 29 | 81.05 | 9.63 | .00 | 52.83 | 11.46 | 305.58 |
| 34 | 304 | 305 | 543.43 | .94 | .00 | 3.02 | 15.21 | 195.58 |
| 38 | 36 | 37 | 107.63 | .11 | .00 | 30.77 | 8.17 | 107.66 |
| 41 | 38 | 39 | 105.68 | .10 | .00 | 29.66 | 8.02 | 103.92 |
| 47 | 41 | 42 | 107.57 | .11 | .00 | 30.73 | 8.16 | 107.53 |
| 50 | 43 | 44 | 105.29 | .10 | .00 | 29.44 | 7.99 | 103.18 |
| 57 | 49 | 50 | 18.20 | .32 | .00 | 45.75 | 8.07 | 317.33 |
| 58 | 50 | 51 | 18.20 | 5.46 | .00 | 17.17 | 8.07 | 317.33 |
| 59 | 51 | 52 | 36.21 | .19 | .00 | .80 | 7.55 | 173.38 |
| 62 | 53 | 54 | 18.01 | .31 | .00 | 44.81 | 7.98 | 311.03 |
| 63 | 54 | 51 | 18.01 | 2.80 | .00 | 17.31 | 7.98 | 311.03 |
| LINE 79 IS CLOSED | | | | | | | | |
| 88 | 74 | 75 | 101.70 | .10 | .00 | 27.47 | 7.72 | 96.49 |
| 92 | 76 | 77 | 102.42 | .10 | .00 | 27.86 | 7.77 | 97.80 |
| 97 | 81 | 82 | 103.03 | .10 | .00 | 28.19 | 7.82 | 98.93 |
| 101 | 83 | 84 | 101.30 | .10 | .00 | 27.25 | 7.69 | 95.75 |
| 105 | 88 | 68 | 506.83 | 1.29 | .00 | 5.10 | 5.62 | 16.08 |
| 109 | 90 | 91 | 16.57 | .26 | .00 | 37.95 | 7.35 | 264.99 |
| 110 | 91 | 92 | 16.57 | 6.36 | .00 | 32.07 | 7.35 | 264.99 |
| 111 | 92 | 93 | 33.29 | .13 | .00 | .16 | 6.94 | 147.48 |
| 116 | 96 | 97 | 16.72 | .27 | .00 | 38.61 | 7.41 | 269.44 |
| 117 | 97 | 92 | 16.72 | 3.02 | .00 | 32.39 | 7.41 | 269.44 |
| 120 | 100 | 101 | 65.09 | .04 | .00 | 5.49 | 4.94 | 40.93 |
| 121 | 101 | 88 | 65.09 | 1.41 | .00 | 86.48 | 4.94 | 40.93 |
| LINE 128 IS CLOSED | | | | | | | | |
| LINE 134 IS CLOSED | | | | | | | | |
| 146 | 125 | 126 | 1385.66 | .03 | .00 | 24.53 | 8.89 | 28.01 |
| 152 | 131 | 132 | 1237.73 | .02 | .00 | 44.04 | 7.94 | 22.50 |
| LINE 166 IS CLOSED | | | | | | | | |

## ANALYSIS RESULTS FOR "U2CALBN2"

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 168 | 145 | 146 | .00 | .00 | .00 | .00 | .00 | .00 |
| LINE | 174 IS | CLOSED | | | | | | |
| 176 | 158 | 146 | .00 | .00 | .00 | .00 | .00 | .00 |
| LINE | 179 IS | CLOSED | | | | | | |
| 182 | 151 | 152 | .00 | .00 | .00 | .00 | .00 | .00 |
| LINE | 185 IS | CLOSED | | | | | | |
| 188 | 163 | 164 | .00 | .00 | .00 | .00 | .00 | .00 |
| 197 | 170 | 171 | .00 | .00 | .00 | .00 | .00 | .00 |
| 198 | 302 | 165 | .00 | .00 | .00 | .00 | .00 | .00 |
| 205 | 177 | 178 | 1498.62 | .03 | 749.29 | .00 | 9.61 | 32.61 |
| 213 | 185 | 186 | 1501.38 | .03 | 749.19 | .00 | 9.63 | 32.73 |
| 218 | 189 | 190 | 78.51 | 13.21 | .00 | 7.02 | 16.36 | 781.53 |
| 224 | 195 | 196 | 70.48 | 10.38 | .00 | 5.66 | 14.69 | 632.69 |
| 233 | 203 | 204 | 3000.00 | .01 | .00 | .00 | 5.27 | 4.69 |
| LINE | 234 IS | CLOSED | | | | | | |
| 235 | 70 | 205 | 3500.00 | .00 | .00 | .28 | 6.15 | 6.30 |
| 501 | 86 | 301 | 408.45 | .02 | .00 | 60.88 | 4.53 | 10.64 |
| 503 | 46 | 303 | 426.17 | .07 | .00 | 50.09 | 4.72 | 11.54 |
| LINE | 700 IS | CLOSED | | | | | | |
| LINE | 701 IS | CLOSED | | | | | | |
| LINE | 702 IS | CLOSED | | | | | | |
| LINE | 703 IS | CLOSED | | | | | | |

| JUNCTION | NUMBER | DEMAND | GRADE LINE | ELEVATION | PRESSURE |
|---|---|---|---|---|---|
| 1 | | .00 | 173.32 | 43.10 | 58.12 |
| 2 | | .00 | 171.29 | 42.40 | 57.53 |
| 14 | | .00 | 166.39 | 26.50 | 62.44 |
| 15 | | .00 | 166.39 | 26.50 | 62.44 |
| 16 | | .00 | 166.39 | 26.50 | 62.44 |
| 18 | | .00 | 163.77 | 36.30 | 56.89 |
| 23 | | .00 | 138.74 | 12.50 | 56.35 |
| 27 | | .00 | 118.76 | 11.00 | 48.10 |
| 28 | | .00 | 110.18 | 10.80 | 44.36 |
| 36 | | .00 | 135.51 | 17.50 | 52.67 |
| 37 | | .00 | 104.64 | 17.50 | 38.89 |
| 49 | | .00 | 122.13 | 8.30 | 50.80 |
| 50 | | .00 | 76.06 | 8.30 | 30.24 |
| 66 | | 3500.00 | 157.34 | 77.20 | 35.77 |
| 70 | | -3500.00 | 42.75 | 74.10 | -13.99 |
| 74 | | .00 | 149.12 | 17.50 | 58.75 |
| 75 | | .00 | 121.55 | 17.50 | 46.44 |
| 90 | | .00 | 136.77 | 31.60 | 46.94 |
| 91 | | .00 | 98.56 | 31.60 | 29.89 |
| 98 | | .00 | 152.57 | 16.80 | 60.60 |
| 100 | | .00 | 140.47 | 11.40 | 57.61 |
| 101 | | .00 | 134.94 | 28.50 | 47.51 |
| 109 | | .00 | 161.47 | 44.40 | 52.25 |
| 110 | | .00 | 31.06 | 44.40 | -5.95 |
| 143 | | .00 | 163.41 | 72.80 | 40.44 |
| 144 | | .00 | 40.41 | 74.20 | -15.08 |
| 156 | | .00 | 163.38 | 72.80 | 40.43 |
| 157 | | .00 | 40.41 | 74.20 | -15.08 |

## ANALYSIS RESULTS FOR "U2CALBN2"

| | | | | |
|---|---|---|---|---|
| 165 | .00 | 40.41 | 58.80 | -8.21 |
| 204 | 3000.00 | 906.87 | 33.10 | 389.99 |
| 205 | -3000.00 | 42.46 | 71.90 | -13.14 |
| 302 | .00 | 40.41 | 34.20 | 2.77 |

THE NET SYSTEM DEMAND = .00

SUMMARY OF INFLOWS(+) AND OUTFLOWS(-) FROM FIXED GRADE NODES

| PIPE NUMBER | FLOWRATE |
|---|---|
| 1 | 5351.63 |
| 4 | 5373.01 |
| 158 | -2623.39 |
| 161 | -7699.24 |
| 600 | -402.02 |

THE NET FLOW INTO THE SYSTEM FROM FIXED GRADE NODES = 10724.64
THE NET FLOW OUT OF THE SYSTEM INTO FIXED GRADE NODES = -10724.64

ANALYSIS RESULTS FOR "U2SCNRIO"

FLOWRATE IS EXPRESSED IN GPM AND PRESSURE IN PSIG

THE DARCY WEISBACH HEAD LOSS EQUATION IS USED, THE KINEMATIC VIS. = .0000070

THE SPECIFIC GRAVITY OF THIS LIQUID = 1.03

A SUCCESSFUL GEOMETRIC VERIFICATION HAS BEEN COMPLETED

OUTPUT SELECTION: THE FOLLOWING RESULTS ARE OUTPUT
RESULTS ARE OUTPUT FOR ALL PIPES WITH PUMPS - CLOSED PIPES ARE NOTED
RESULTS ARE OUTPUT FOR THE FOLLOWING PIPES : 5 2 16 31 34 38 41 47 50 57 62 79 88 92 97 101 105 109 116 120
RESULTS ARE OUTPUT FOR THE FOLLOWING PIPES : 128 134 146 152 168 176 182 188 198 501 503 32 58 63 110 117 121 218 224 234
RESULTS ARE OUTPUT FOR THE FOLLOWING PIPES : 59 111 235 197 233
RESULTS ARE OUTPUT FOR THE FOLLOWING JUNCTION NODES : 1 2 14 15 16 27 28 36 37 49 50 66 70 74 75
RESULTS ARE OUTPUT FOR THE FOLLOWING JUNCTION NODES : 90 91 100 101 109 110 143 144 156 157 18 23 98 165 302
RESULTS ARE OUTPUT FOR THE FOLLOWING JUNCTION NODES : 204 205

THIS SYSTEM HAS 247 PIPES WITH 212 JUNCTIONS , 31 LOOPS AND 5 FGNS

THE RESULTS ARE OBTAINED AFTER 5 TRIALS WITH AN ACCURACY = .00003

U2SCNRIO CHANGE 0: VERIFIES RESULTS OF U2TYFOON CH. 6 ARE STILL VALID

| PIPE NO. | NODE NOS. | | FLOWRATE | HEAD LOSS | PUMP HEAD | MINOR LOSS | VELOCITY | HL/1000 |
|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 1 | 1812.66 | .00 | 194.94 | .00 | 2.68 | 2.24 |
| 2 | 1 | 2 | 1812.66 | .02 | .00 | 10.04 | 2.68 | 2.24 |
| 4 | 0 | 4 | 1812.75 | .00 | 194.94 | .00 | 2.68 | 2.24 |
| 5 | 4 | 5 | 1812.75 | .02 | .00 | 10.04 | 2.68 | 2.24 |
| 16 | 12 | 13 | 208.00 | 1.28 | .00 | .71 | 6.82 | 112.87 |
| LINE | 31 IS | CLOSED | | | | | | |
| 32 | 28 | 29 | .00 | .00 | .00 | .00 | .00 | .00 |
| 34 | 304 | 305 | 512.91 | .84 | .00 | 2.69 | 14.36 | 174.66 |
| 38 | 36 | 37 | 129.54 | .15 | .00 | 44.57 | 9.83 | 154.19 |
| 41 | 38 | 39 | 127.19 | .15 | .00 | 42.96 | 9.65 | 148.81 |
| 47 | 41 | 42 | 129.46 | .15 | .00 | 44.51 | 9.82 | 154.00 |
| 50 | 43 | 44 | 126.72 | .15 | .00 | 42.65 | 9.62 | 147.73 |
| LINE | 57 IS | CLOSED | | | | | | |
| 58 | 50 | 51 | .00 | .00 | .00 | .00 | .00 | .00 |
| 59 | 51 | 52 | .00 | .00 | .00 | .00 | .00 | .00 |

ANALYSIS RESULTS FOR "U2SCNRIO"

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| LINE | 62 | IS | CLOSED | | | | | |
| 63 | | 54 | 51 | .00 | .00 | .00 | .00 | .00 | .00 |
| LINE | 72 | IS | CLOSED | | | | | |
| LINE | 73 | IS | CLOSED | | | | | |
| LINE | 74 | IS | CLOSED | | | | | |
| 79 | | 66 | 70 | .00 | .00 | .00 | .00 | .00 | .00 |
| LINE | 88 | IS | CLOSED | | | | | |
| LINE | 92 | IS | CLOSED | | | | | |
| LINE | 97 | IS | CLOSED | | | | | |
| LINE | 101 | IS | CLOSED | | | | | |
| 105 | | 88 | 68 | .00 | .00 | .00 | .00 | .00 | .00 |
| LINE | 109 | IS | CLOSED | | | | | |
| 110 | | 91 | 92 | .00 | .00 | .00 | .00 | .00 | .00 |
| 111 | | 92 | 93 | .00 | .00 | .00 | .00 | .00 | .00 |
| LINE | 116 | IS | CLOSED | | | | | |
| 117 | | 97 | 92 | .00 | .00 | .00 | .00 | .00 | .00 |
| LINE | 120 | IS | CLOSED | | | | | |
| 121 | | 101 | 88 | .00 | .00 | .00 | .00 | .00 | .00 |
| LINE | 128 | IS | CLOSED | | | | | |
| LINE | 134 | IS | CLOSED | | | | | |
| 146 | | 125 | 126 | 1534.15 | .03 | .00 | 30.07 | 9.84 | 34.13 |
| 152 | | 131 | 132 | 1370.36 | .03 | .00 | 53.98 | 8.79 | 27.41 |
| LINE | 166 | IS | CLOSED | | | | | |
| 168 | | 145 | 146 | .00 | .00 | .00 | .00 | .00 | .00 |
| LINE | 174 | IS | CLOSED | | | | | |
| 176 | | 158 | 146 | .00 | .00 | .00 | .00 | .00 | .00 |
| LINE | 179 | IS | CLOSED | | | | | |
| 182 | | 151 | 152 | .00 | .00 | .00 | .00 | .00 | .00 |
| LINE | 185 | IS | CLOSED | | | | | |
| 188 | | 163 | 164 | .00 | .00 | .00 | .00 | .00 | .00 |
| 197 | | 170 | 171 | .00 | .00 | .00 | .00 | .00 | .00 |
| 198 | | 302 | 165 | .00 | .00 | .00 | .00 | .00 | .00 |
| LINE | 205 | IS | CLOSED | | | | | |
| LINE | 213 | IS | CLOSED | | | | | |
| LINE | 218 | IS | CLOSED | | | | | |
| LINE | 224 | IS | CLOSED | | | | | |
| 233 | | 203 | 204 | .00 | .00 | .00 | .00 | .00 | .00 |
| 234 | | 204 | 205 | .00 | .00 | .00 | .00 | .00 | .00 |
| 235 | | 70 | 205 | .00 | .00 | .00 | .00 | .00 | .00 |
| 501 | | 86 | 301 | .00 | .00 | .00 | .00 | .00 | .00 |
| 503 | | 46 | 303 | 512.91 | .10 | .00 | 72.55 | 5.69 | 16.46 |
| LINE | 600 | IS | CLOSED | | | | | |
| LINE | 700 | IS | CLOSED | | | | | |
| LINE | 701 | IS | CLOSED | | | | | |
| LINE | 702 | IS | CLOSED | | | | | |
| LINE | 703 | IS | CLOSED | | | | | |

| JUNCTION NUMBER | DEMAND | GRADE LINE | ELEVATION | PRESSURE |
|---|---|---|---|---|
| 1 | .00 | 206.31 | 43.10 | 72.84 |
| 2 | .00 | 196.24 | 42.40 | 68.66 |
| 14 | .00 | 195.68 | 26.50 | 75.51 |
| 15 | .00 | 195.68 | 26.50 | 75.51 |
| 16 | .00 | 195.68 | 26.50 | 75.51 |
| 18 | .00 | 195.50 | 36.30 | 71.06 |
| 23 | .00 | 178.19 | 12.50 | 73.95 |

ANALYSIS RESULTS FOR "U2SCNRIO"

| | | | | |
|---|---|---|---|---|
| 27 | .00 | 178.19 | 11.00 | 74.62 |
| 28 | .00 | 45.33 | 10.80 | 15.41 |
| 36 | .00 | 173.53 | 17.50 | 69.64 |
| 37 | .00 | 128.80 | 17.50 | 49.68 |
| 49 | .00 | 178.19 | 8.30 | 75.83 |
| 50 | .00 | 50.29 | 8.30 | 18.74 |
| 66 | .00 | 40.00 | 77.20 | -16.60 |
| 70 | .00 | 40.00 | 74.10 | -15.22 |
| 74 | .00 | 193.65 | 17.50 | 78.62 |
| 75 | .00 | 40.00 | 17.50 | 10.04 |
| 90 | .00 | 193.65 | 31.60 | 72.33 |
| 91 | .00 | 40.00 | 31.60 | 3.75 |
| 98 | .00 | 193.65 | 16.80 | 78.94 |
| 100 | .00 | 193.65 | 11.40 | 81.35 |
| 101 | .00 | 40.00 | 28.50 | 5.13 |
| 109 | .00 | 191.38 | 44.40 | 65.60 |
| 110 | .00 | 31.55 | 44.40 | -5.74 |
| 143 | .00 | 195.50 | 72.80 | 54.77 |
| 144 | .00 | 40.02 | 74.20 | -15.25 |
| 156 | .00 | 195.50 | 72.80 | 54.77 |
| 157 | .00 | 40.02 | 74.20 | -15.25 |
| 165 | .00 | 40.02 | 58.80 | -8.38 |
| 204 | .00 | 40.00 | 33.10 | 3.08 |
| 205 | .00 | 40.00 | 71.90 | -14.24 |
| 302 | .00 | 40.02 | 34.20 | 2.60 |

THE NET SYSTEM DEMAND = 208.00

SUMMARY OF INFLOWS(+) AND OUTFLOWS(-) FROM FIXED GRADE NODES

| PIPE NUMBER | FLOWRATE |
|---|---|
| 1 | 1812.66 |
| 4 | 1812.75 |
| 158 | -2904.51 |
| 161 | -512.91 |

THE NET FLOW INTO THE SYSTEM FROM FIXED GRADE NODES = 3625.42
THE NET FLOW OUT OF THE SYSTEM INTO FIXED GRADE NODES = -3417.42

A SUMMARY OF CONDITIONS SPECIFIED FOR THE NEXT SIMULATION FOLLOWS

THE FOLLOWING SPECIFIC DEMAND CHANGES ARE MADE :

| JUNCTION NUMBER | DEMAND |
|---|---|
| 13 | 124.00 |
| 204 | 4850.00 |
| 205 | -4850.00 |

LINE 31 IS OPEN
LINE 57 IS OPEN
LINE 62 IS OPEN
LINE 72 IS OPEN
LINE 73 IS OPEN
LINE 74 IS OPEN

ANALYSIS RESULTS FOR "U2SCNRIO"

LINE 88 IS OPEN
LINE 92 IS OPEN
LINE 97 IS OPEN
LINE 101 IS OPEN
LINE 109 IS OPEN
LINE 116 IS OPEN
LINE 120 IS OPEN
LINE 128 IS OPEN
LINE 134 IS OPEN
LINE 205 IS OPEN
LINE 213 IS OPEN
LINE 218 IS OPEN
LINE 224 IS OPEN
LINE 234 IS CLOSED
LINE 600 IS OPEN

THE FOLLOWING CHANGES IN PIPE DATA ARE SPECIFIED

FOR PIPE NUMBER 1 THE VALUE OF THE FIXED GRADE IS CHANGED TO 14.0

FOR PIPE NUMBER 4 THE VALUE OF THE FIXED GRADE IS CHANGED TO 14.0

FOR PIPE NUMBER 600 THE VALUE OF THE FIXED GRADE IS CHANGED TO 26.5

| PIPE NO. | NODE NOS. | | LENGTH | DIAMETER | ROUGHNESS | MINOR LOSS K | FIXED GRADE |
|---|---|---|---|---|---|---|---|
| 2 | 1 | 2 | 9.7 | 16.6 | 5.0 | 6.67 | .00 |
| 5 | 4 | 5 | 9.7 | 16.6 | 5.0 | 6.67 | .00 |
| 24 | 20 | 55 | 24.1 | 19.3 | .2 | 210.38 | .00 |
| 79 | 66 | 70 | 29.5 | 15.3 | .2 | 18.38 | .00 |
| 130 | 111 | 112 | 79.0 | 5.6 | 5.0 | 13.28 | .00 |
| 136 | 117 | 118 | 100.4 | 5.6 | 5.0 | 13.61 | .00 |
| 148 | 127 | 128 | 74.8 | 5.6 | 5.0 | 12.68 | .00 |
| 154 | 133 | 134 | 75.7 | 5.6 | 5.0 | 13.28 | .00 |

THE RESULTS ARE OBTAINED AFTER 7 TRIALS WITH AN ACCURACY = .00087

U2SCNRIO CHANGE 1: VERIFIES RESULTS OF U2@POWER CH.4 ARE STILL VALID

| PIPE NO. | NODE NOS. | | FLOWRATE | HEAD LOSS | PUMP HEAD | MINOR LOSS | VELOCITY | HL/1000 |
|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 1 | 6905.85 | .03 | 124.18 | .00 | 10.20 | 32.26 |
| 2 | 1 | 2 | 6905.85 | .31 | .00 | 10.77 | 10.20 | 32.26 |
| 4 | 0 | 4 | 6906.46 | .03 | 124.17 | .00 | 10.20 | 32.26 |
| 5 | 4 | 5 | 6906.46 | .31 | .00 | 10.78 | 10.20 | 32.26 |
| 16 | 12 | 13 | 124.00 | .45 | .00 | .25 | 4.06 | 40.25 |
| 31 | 27 | 28 | 62.81 | .04 | .00 | 5.12 | 4.77 | 38.23 |
| 32 | 28 | 29 | 62.81 | 5.87 | .00 | 31.73 | 8.88 | 186.22 |
| 34 | 304 | 305 | 421.56 | .57 | .00 | 1.82 | 11.80 | 119.06 |
| 38 | 36 | 37 | 83.51 | .07 | .00 | 18.52 | 6.34 | 65.99 |
| 41 | 38 | 39 | 82.00 | .06 | .00 | 17.86 | 6.22 | 63.71 |
| 47 | 41 | 42 | 83.46 | .07 | .00 | 18.50 | 6.33 | 65.92 |
| 50 | 43 | 44 | 81.70 | .06 | .00 | 17.73 | 6.20 | 63.27 |

ANALYSIS RESULTS FOR "U2SCNRIO"

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 57 | 49 | 50 | 14.11 | .19 | .00 | 27.50 | 6.25 | 194.41 |
| 58 | 50 | 51 | 14.11 | 3.34 | .00 | 10.32 | 6.25 | 194.41 |
| 59 | 51 | 52 | 28.07 | .12 | .00 | .48 | 5.85 | 106.26 |
| 62 | 53 | 54 | 13.96 | .19 | .00 | 26.93 | 6.19 | 190.58 |
| 63 | 54 | 51 | 13.96 | 1.72 | .00 | 10.40 | 6.19 | 190.58 |
| 79 | 66 | 70 | 3619.71 | .20 | .00 | 11.53 | 6.36 | 6.73 |
| 88 | 74 | 75 | 78.67 | .06 | .00 | 16 44 | 5.97 | 58.84 |
| 92 | 76 | 77 | 79.22 | .06 | .00 | 16.67 | 6.01 | 59.63 |
| 97 | 81 | 82 | 79.70 | .06 | .00 | 16.87 | 6.05 | 60.32 |
| 101 | 83 | 84 | 78.37 | .06 | .00 | 16.31 | 5.95 | 58.40 |
| 105 | 88 | 68 | 393.30 | .79 | .00 | 3.07 | 4.36 | 9.90 |
| 109 | 90 | 91 | 12.91 | .16 | .00 | 23.02 | 5.72 | 163.95 |
| 110 | 91 | 92 | 12.91 | 3.93 | .00 | 19.45 | 5.72 | 163.95 |
| 111 | 92 | 93 | 25.92 | .08 | .00 | .10 | 5.40 | 91.24 |
| 116 | 96 | 97 | 13.01 | .17 | .00 | 23.40 | 5.77 | 166.58 |
| 117 | 97 | 92 | 13.01 | 1.87 | .00 | 19.63 | 5.77 | 166.58 |
| 120 | 100 | 101 | 51.41 | .03 | .00 | 3.43 | 3.90 | 26.12 |
| 121 | 101 | 88 | 51.41 | .90 | .00 | 53.96 | 3.90 | 26.12 |
| 128 | 109 | 110 | 814.56 | .01 | .00 | 19.22 | 5.95 | 13.93 |
| 134 | 115 | 116 | 788.13 | .01 | .00 | 15.42 | 5.75 | 13.07 |
| 146 | 125 | 126 | 888.63 | .01 | .00 | 10.09 | 5.70 | 11.87 |
| 152 | 131 | 132 | 851.96 | .01 | .00 | 20.87 | 5.46 | 10.95 |
| LINE 16 | IS | CLOSED | | | | | | |
| 168 | 145 | 146 | .00 | .00 | .00 | .00 | .00 | .00 |
| LINE 174 | IS | CLOSED | | | | | | |
| 176 | 158 | 146 | .00 | .00 | .00 | .00 | .00 | .00 |
| LINE 179 | IS | CLOSED | | | | | | |
| 182 | 151 | 152 | .00 | .00 | .00 | .00 | .00 | .00 |
| LINE 185 | IS | CLOSED | | | | | | |
| 188 | 163 | 164 | .00 | .00 | .00 | .00 | .00 | .00 |
| 197 | 170 | 171 | .00 | .00 | .00 | .00 | .00 | .00 |
| 198 | 302 | 165 | .00 | .00 | .00 | .00 | .00 | .00 |
| 205 | 177 | 178 | 2422.88 | .08 | 705.71 | .00 | 15.54 | 83.33 |
| 213 | 185 | 186 | 2427.12 | .08 | 705.46 | .00 | 15.57 | 83.61 |
| 218 | 189 | 190 | 60.06 | 7.82 | .00 | 4.11 | 12.52 | 462.94 |
| 224 | 195 | 196 | 54.28 | 6.23 | .00 | 3.36 | 11.31 | 380.12 |
| 233 | 203 | 204 | 4850.00 | .03 | .00 | .00 | 8.52 | 11.85 |
| LINE 234 | IS | CLOSED | | | | | | |
| 235 | 70 | 205 | 3619.71 | .00 | .00 | .30 | 6.36 | 6.73 |
| 501 | 86 | 301 | 315.97 | .02 | .00 | 36.43 | 3.50 | 6.52 |
| 503 | 46 | 303 | 330.68 | .04 | .00 | 30.16 | 3.67 | 7.11 |
| LINE 700 | IS | CLOSED | | | | | | |
| LINE 701 | IS | CLOSED | | | | | | |
| LINE 702 | IS | CLOSED | | | | | | |
| LINE 703 | IS | CLOSED | | | | | | |

| JUNCTION | NUMBER | DEMAND | GRADE LINE | ELEVATION | PRESSURE |
|---|---|---|---|---|---|
| 1 | | .00 | 138.15 | 43.10 | 42.42 |
| 2 | | .00 | 127.06 | 42.40 | 37.79 |
| 14 | | .00 | 118.90 | 26.50 | 41.24 |
| 15 | | .00 | 118.90 | 26.50 | 41.24 |
| 16 | | .00 | 118.90 | 26.50 | 41.24 |
| 18 | | .00 | 114.94 | 36.30 | 35.10 |
| 23 | | .00 | 99.86 | 12.50 | 38.99 |
| 27 | | .00 | 87.74 | 11.00 | 34.25 |

ANALYSIS RESULTS FOR "U2SCNRIO"

| | | | | |
|---|---|---|---|---|
| 28 | .00 | 82.59 | 10.80 | 32.04 |
| 36 | .00 | 97.90 | 17.50 | 35.88 |
| 37 | .00 | 79.31 | 17.50 | 27.59 |
| 49 | .00 | 89.83 | 8.30 | 36.39 |
| 50 | .00 | 62.13 | 8.30 | 24.03 |
| 66 | .00 | 56.11 | 77.20 | -9.42 |
| 70 | .00 | 44.37 | 74.10 | -13.27 |
| 74 | .00 | 106.09 | 17.50 | 39.54 |
| 75 | .00 | 89.59 | 17.50 | 32.18 |
| 90 | .00 | 99.43 | 31.60 | 30.28 |
| 91 | .00 | 76.25 | 31.60 | 19.93 |
| 98 | .00 | 110.81 | 16.80 | 41.96 |
| 100 | .00 | 103.19 | 11.40 | 40.97 |
| 101 | .00 | 99.73 | 28.50 | 31.79 |
| 109 | .00 | 87.89 | 44.40 | 19.41 |
| 110 | .00 | 68.66 | 44.40 | 10.83 |
| 143 | .00 | 114.22 | 72.80 | 18.49 |
| 144 | .00 | 40.58 | 74.20 | -15.01 |
| 156 | .00 | 114.15 | 72.80 | 18.46 |
| 157 | .00 | 40.58 | 74.20 | -15.01 |
| 165 | .00 | 40.57 | 58.80 | -8.14 |
| 204 | 4850.00 | 804.83 | 33.10 | 344.45 |
| 205 | -4850.00 | 44.07 | 71.90 | -12.42 |
| 302 | .00 | 40.57 | 34.20 | 2.84 |

THE NET SYSTEM DEMAND = 124.00

SUMMARY OF INFLOWS(+) AND OUTFLOWS(-) FROM FIXED GRADE NODES

| PIPE NUMBER | FLOWRATE |
|---|---|
| 1 | 6905.85 |
| 4 | 6906.46 |
| 158 | -3343.28 |
| 161 | -9398.91 |
| 600 | -946.14 |

THE NET FLOW INTO THE SYSTEM FROM FIXED GRADE NODES = 13812.31
THE NET FLOW OUT OF THE SYSTEM INTO FIXED GRADE NODES = -13688.33

A SUMMARY OF CONDITIONS SPECIFIED FOR THE NEXT SIMULATION FOLLOWS

THE FOLLOWING SPECIFIC DEMAND CHANGES ARE MADE :

| JUNCTION NUMBER | DEMAND |
|---|---|
| 13 | 113.00 |
| 302 | 2635.00 |
| 165 | -2635.00 |
| 204 | .00 |
| 205 | .00 |

LINE 4 IS CLOSED
LINE 72 IS CLOSED
LINE 73 IS CLOSED
LINE 74 IS CLOSED

## ANALYSIS RESULTS FOR "U2SCNRIO"

LINE 166 IS OPEN
LINE 174 IS OPEN
LINE 179 IS OPEN
LINE 185 IS OPEN
LINE 205 IS CLOSED
LINE 213 IS CLOSED
LINE 218 IS CLOSED
LINE 224 IS CLOSED
LINE 198 IS CLOSED
LINE 234 IS OPEN

THE FOLLOWING CHANGES IN PIPE DATA ARE SPECIFIED

| PIPE NO. | NODE NOS. | | LENGTH | DIAMETER | ROUGHNESS | MINOR LOSS K | FIXED GRADE |
|---|---|---|---|---|---|---|---|
| 2 | 1 | 2 | 9.7 | 16.6 | 5.0 | 6.30 | .00 |
| 5 | 4 | 5 | 9.7 | 16.6 | 5.0 | 6.30 | .00 |
| 130 | 111 | 112 | 79.0 | 5.6 | 5.0 | 53.28 | .00 |
| 136 | 117 | 118 | 100.4 | 5.6 | 5.0 | 53.61 | .00 |
| 148 | 127 | 128 | 74.8 | 5.6 | 5.0 | 52.68 | .00 |
| 154 | 133 | 134 | 75.7 | 5.6 | 5.0 | 53.28 | .00 |

THE RESULTS ARE OBTAINED AFTER 5 TRIALS WITH AN ACCURACY = .00186

U2SCNRIO CHANGE 2: VERIFIES RESULTS OF U2NOPOWR CH. 4 ARE STILL VALID

| PIPE NO. | NODE NOS. | | FLOWRATE | HEAD LOSS | PUMP HEAD | MINOR LOSS | VELOCITY | HL/1000 |
|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 1 | 7044.53 | .03 | 121.07 | .00 | 10.40 | 33.56 |
| 2 | 1 | 2 | 7044.53 | .33 | .00 | 10.59 | 10.40 | 33.56 |
| LINE 4 IS CLOSED | | | | | | | | |
| 5 | 4 | 5 | .00 | .00 | .00 | .00 | .00 | .00 |
| 16 | 12 | 13 | 113.00 | .38 | .00 | .21 | 3.70 | 33.45 |
| 31 | 27 | 28 | 62.63 | .04 | .00 | 5.09 | 4.75 | 38.02 |
| 32 | 28 | 29 | 62.63 | 5.83 | .00 | 31.55 | 8.85 | 185.18 |
| 34 | 304 | 305 | 420.34 | .57 | .00 | 1.81 | 11.77 | 118.39 |
| 38 | 36 | 37 | 83.27 | .07 | .00 | 18.41 | 6.32 | 65.62 |
| 41 | 38 | 39 | 81.76 | .06 | .00 | 17.75 | 6.21 | 63.36 |
| 47 | 41 | 42 | 83.22 | .07 | .00 | 18.39 | 6.32 | 65.55 |
| 50 | 43 | 44 | 81.47 | .06 | .00 | 17.63 | 6.18 | 62.92 |
| 57 | 49 | 50 | 14.07 | .19 | .00 | 27.34 | 6.23 | 193.33 |
| 58 | 50 | 51 | 14.07 | 3.33 | .00 | 10.26 | 6.23 | 193.33 |
| 59 | 51 | 52 | 27.99 | .12 | .00 | .48 | 5.83 | 105.67 |
| 62 | 53 | 54 | 13.92 | .19 | .00 | 26.78 | 6.17 | 189.53 |
| 63 | 54 | 51 | 13.92 | 1.71 | .00 | 10.34 | 6.17 | 189.53 |
| LINE 72 IS CLOSED | | | | | | | | |
| LINE 73 IS CLOSED | | | | | | | | |
| LINE 74 IS CLOSED | | | | | | | | |
| 79 | 66 | 70 | .00 | .00 | .00 | .00 | .00 | .00 |
| 88 | 74 | 75 | 79.17 | .06 | .00 | 16.65 | 6.01 | 59.56 |
| 92 | 76 | 77 | 79.73 | .06 | .00 | 16.88 | 6.05 | 60.36 |
| 97 | 81 | 82 | 80.21 | .06 | .00 | 17.09 | 6.09 | 61.06 |
| 101 | 83 | 84 | 78.86 | .06 | .00 | 16.52 | 5.99 | 59.11 |

ANALYSIS RESULTS FOR "U2SCNRIO"

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 105 | 88 | 68 | 394.55 | .80 | .00 | 3.09 | 4.37 | 9.96 |
| 109 | 90 | 91 | 12.89 | .16 | .00 | 22.95 | 5.71 | 163.49 |
| 110 | 91 | 92 | 12.89 | 3.92 | .00 | 19.39 | 5.71 | 163.49 |
| 111 | 92 | 93 | 25.89 | .08 | .00 | .10 | 5.40 | 91.03 |
| 116 | 96 | 97 | 13.00 | .17 | .00 | 23.36 | 5.76 | 166.26 |
| 117 | 97 | 92 | 13.00 | 1.86 | .00 | 19.59 | 5.76 | 166.26 |
| 120 | 100 | 101 | 50.69 | .03 | .00 | 3.33 | 3.85 | 25.42 |
| 121 | 101 | 88 | 50.69 | .88 | .00 | 52.44 | 3.85 | 25.42 |
| 128 | 109 | 110 | 600.09 | .01 | .00 | 10.43 | 4.38 | 7.75 |
| 134 | 115 | 116 | 589.88 | .01 | .00 | 8.64 | 4.31 | 7.50 |
| 146 | 125 | 126 | 626.24 | .01 | .00 | 5.01 | 4.02 | 6.07 |
| 152 | 131 | 132 | 614.08 | .01 | .00 | 10.84 | 3.94 | 5.85 |
| 166 | 143 | 144 | 1319.02 | .03 | 755.24 | .00 | 8.46 | 25.45 |
| 168 | 145 | 146 | 1319.02 | .05 | .00 | .20 | 3.74 | 3.24 |
| 174 | 156 | 157 | 1315.98 | .03 | 755.34 | .00 | 8.44 | 25.34 |
| 176 | 158 | 146 | 1315.98 | .10 | .00 | .23 | 3.73 | 3.23 |
| 182 | 151 | 152 | 62.58 | 9.98 | .00 | 6.39 | 13.04 | 501.53 |
| 188 | 163 | 164 | 59.55 | 9.06 | .00 | 5.29 | 12.41 | 455.34 |
| 197 | 170 | 171 | 2635.00 | .02 | .00 | .16 | 4.63 | 3.65 |
| LINE 198 IS CLOSED | | | | | | | | |
| LINE 205 IS CLOSED | | | | | | | | |
| LINE 213 IS CLOSED | | | | | | | | |
| LINE 218 IS CLOSED | | | | | | | | |
| LINE 224 IS CLOSED | | | | | | | | |
| 233 | 203 | 204 | .00 | .00 | .00 | .00 | .00 | .00 |
| 234 | 204 | 205 | .00 | .00 | .00 | .00 | .00 | .00 |
| 235 | 70 | 205 | .00 | .00 | .00 | .00 | .00 | .00 |
| 501 | 86 | 301 | 317.97 | .02 | .00 | 36.89 | 3.53 | 6.60 |
| 503 | 46 | 303 | 329.72 | .04 | .00 | 29.98 | 3.66 | 7.07 |
| LINE 700 IS CLOSED | | | | | | | | |
| LINE 701 IS CLOSED | | | | | | | | |
| LINE 702 IS CLOSED | | | | | | | | |
| LINE 703 IS CLOSED | | | | | | | | |

| JUNCTION NUMBER | DEMAND | GRADE LINE | ELEVATION | PRESSURE |
|---|---|---|---|---|
| 1 | .00 | 135.04 | 43.10 | 41.03 |
| 2 | .00 | 124.12 | 42.40 | 36.47 |
| 14 | .00 | 115.63 | 26.50 | 39.78 |
| 15 | .00 | 115.63 | 26.50 | 39.78 |
| 16 | .00 | 115.63 | 26.50 | 39.78 |
| 18 | .00 | 114.86 | 36.30 | 35.06 |
| 23 | .00 | 99.84 | 12.50 | 38.98 |
| 27 | .00 | 87.79 | 11.00 | 34.27 |
| 28 | .00 | 82.66 | 10.80 | 32.08 |
| 36 | .00 | 97.89 | 17.50 | 35.88 |
| 37 | .00 | 79.41 | 17.50 | 27.63 |
| 49 | .00 | 89.86 | 8.30 | 36.40 |
| 50 | .00 | 62.33 | 8.30 | 24.11 |
| 66 | .00 | 40.08 | 77.20 | -16.57 |
| 70 | .00 | 40.08 | 74.10 | -15.18 |
| 74 | .00 | 105.95 | 17.50 | 39.48 |
| 75 | .00 | 89.24 | 17.50 | 32.02 |
| 90 | .00 | 98.45 | 31.60 | 29.84 |
| 91 | .00 | 75.34 | 31.60 | 19.52 |
| 98 | .00 | 108.06 | 16.80 | 40.73 |

ANALYSIS RESULTS FOR "U2SCNRIO"

| | | | | |
|---|---|---|---|---|
| 100 | .00 | 100.65 | 11.40 | 39.83 |
| 101 | .00 | 97.29 | 28.50 | 30.70 |
| 109 | .00 | 99.64 | 44.40 | 24.66 |
| 110 | .00 | 89.21 | 44.40 | 20.00 |
| 143 | .00 | 114.10 | 72.80 | 18.43 |
| 144 | .00 | 869.31 | 74.20 | 354.89 |
| 156 | .00 | 114.07 | 72.80 | 18.42 |
| 157 | .00 | 869.39 | 74.20 | 354.92 |
| 165 | -2635.00 | 41.00 | 58.80 | -7.94 |
| 204 | .00 | 40.08 | 33.10 | 3.12 |
| 205 | .00 | 40.08 | 71.90 | -14.20 |
| 302 | 2635.00 | 865.49 | 34.20 | 371.03 |

THE NET SYSTEM DEMAND = 113.00

SUMMARY OF INFLOWS(+) AND OUTFLOWS(-) FROM FIXED GRADE NODES

| PIPE NUMBER | FLOWRATE |
|---|---|
| 1 | 7044.53 |
| 158 | -2430.28 |
| 161 | -3572.02 |
| 600 | -929.23 |

THE NET FLOW INTO THE SYSTEM FROM FIXED GRADE NODES = 7044.53
THE NET FLOW OUT OF THE SYSTEM INTO FIXED GRADE NODES = -6931.53

A SUMMARY OF CONDITIONS SPECIFIED FOR THE NEXT SIMULATION FOLLOWS

THE FOLLOWING SPECIFIC DEMAND CHANGES ARE MADE :

| JUNCTION NUMBER | DEMAND |
|---|---|
| 13 | 113.00 |
| 302 | 2800.00 |
| 165 | -2800.00 |
| 204 | .00 |
| 205 | .00 |

LINE 128 IS CLOSED
LINE 134 IS CLOSED

THE FOLLOWING CHANGES IN PIPE DATA ARE SPECIFIED

FOR PIPE NUMBER 1 THE VALUE OF THE FIXED GRADE IS CHANGED TO 11.4

FOR PIPE NUMBER 4 THE VALUE OF THE FIXED GRADE IS CHANGED TO 11.4

| PIPE NO. | NODE NOS. | | LENGTH | DIAMETER | ROUGHNESS | MINOR LOSS K | FIXED GRADE |
|---|---|---|---|---|---|---|---|
| 2 | 1 | 2 | 9.7 | 16.6 | 5.0 | 6.48 | .00 |
| 5 | 4 | 5 | 9.7 | 16.6 | 5.0 | 6.48 | .00 |
| 130 | 111 | 112 | 79.0 | 5.6 | 5.0 | 3.28 | .00 |
| 136 | 117 | 118 | 100.4 | 5.6 | 5.0 | 3.61 | .00 |
| 148 | 127 | 128 | 74.8 | 5.6 | 5.0 | 2.68 | .00 |
| 154 | 133 | 134 | 75.7 | 5.6 | 5.0 | 3.28 | .00 |

## ANALYSIS RESULTS FOR "U2SCNRIO"

THE RESULTS ARE OBTAINED AFTER 3 TRIALS WITH AN ACCURACY = .00100

U2SCNRIO CHANGE 3: VERIFIES RESULTS OF U2TYFOON CH. 2 ARE STILL VALID

| PIPE NO. | NODE NOS. | | FLOWRATE | HEAD LOSS | PUMP HEAD | MINOR LOSS | VELOCITY | HL/1000 |
|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 1 | 6895.96 | .03 | 124.40 | .00 | 10.19 | 32.17 |
| 2 | 1 | 2 | 6895.96 | .31 | .00 | 10.44 | 10.19 | 32.17 |
| LINE | 4 IS | CLOSED | | | | | | |
| 5 | 4 | 5 | .00 | .00 | .00 | .00 | .00 | .00 |
| 16 | 12 | 13 | 113.00 | .38 | .00 | .21 | 3.70 | 33.45 |
| 31 | 27 | 28 | 63.11 | .04 | .00 | 5.16 | 4.79 | 38.58 |
| 32 | 28 | 29 | 63.11 | 5.92 | .00 | 32.03 | 8.92 | 187.94 |
| 34 | 304 | 305 | 423.55 | .58 | .00 | 1.83 | 11.86 | 120.16 |
| 38 | 36 | 37 | 83.91 | .07 | .00 | 18.70 | 6.37 | 66.59 |
| 41 | 38 | 39 | 82.39 | .06 | .00 | 18.03 | 6.25 | 64.29 |
| 47 | 41 | 42 | 83.86 | .07 | .00 | 18.68 | 6.36 | 66.52 |
| 50 | 43 | 44 | 82.09 | .06 | .00 | 17.90 | 6.23 | 63.84 |
| 57 | 49 | 50 | 14.17 | .20 | .00 | 27.76 | 6.28 | 196.18 |
| 58 | 50 | 51 | 14.17 | 3.37 | .00 | 10.42 | 6.28 | 196.18 |
| 59 | 51 | 52 | 28.20 | .12 | .00 | .48 | 5.88 | 107.23 |
| 62 | 53 | 54 | 14.03 | .19 | .00 | 27.19 | 6.22 | 192.32 |
| 63 | 54 | 51 | 14.03 | 1.73 | .00 | 10.50 | 6.22 | 192.32 |
| LINE | 72 IS | CLOSED | | | | | | |
| LINE | 73 IS | CLOSED | | | | | | |
| LINE | 74 IS | CLOSED | | | | | | |
| 79 | 66 | 70 | .00 | .00 | .00 | .00 | .00 | .00 |
| 88 | 74 | 75 | 79.82 | .06 | .00 | 16.92 | 6.06 | 60.50 |
| 92 | 76 | 77 | 80.38 | .06 | .00 | 17.16 | 6.10 | 61.31 |
| 97 | 81 | 82 | 80.87 | .06 | .00 | 17.37 | 6.14 | 62.03 |
| 101 | 83 | 84 | 79.51 | .06 | .00 | 16.79 | 6.03 | 60.05 |
| 105 | 88 | 68 | 397.78 | .81 | .00 | 3.14 | 4.41 | 10.11 |
| 109 | 90 | 91 | 12.99 | .17 | .00 | 23.33 | 5.76 | 166.08 |
| 110 | 91 | 92 | 12.99 | 3.99 | .00 | 19.71 | 5.76 | 166.08 |
| 111 | 92 | 93 | 26.10 | .08 | .00 | .10 | 5.44 | 92.46 |
| 116 | 96 | 97 | 13.11 | .17 | .00 | 23.74 | 5.81 | 168.89 |
| 117 | 97 | 92 | 13.11 | 1.89 | .00 | 19.92 | 5.81 | 168.89 |
| 120 | 100 | 101 | 51.10 | .03 | .00 | 3.39 | 3.88 | 25.82 |
| 121 | 101 | 88 | 51.10 | .89 | .00 | 53.31 | 3.88 | 25.82 |
| LINE | 128 IS | CLOSED | | | | | | |
| LINE | 134 IS | CLOSED | | | | | | |
| 146 | 125 | 126 | 1111.20 | .02 | .00 | 15.78 | 7.13 | 18.26 |
| 152 | 131 | 132 | 992.57 | .01 | .00 | 28.32 | 6.37 | 14.69 |
| 166 | 143 | 144 | 1401.60 | .03 | 752.61 | .00 | 8.99 | 28.63 |
| 168 | 145 | 146 | 1401.60 | .06 | .00 | .23 | 3.98 | 3.64 |
| 174 | 156 | 157 | 1398.40 | .03 | 752.71 | .00 | 8.97 | 28.51 |
| 176 | 158 | 146 | 1398.40 | .11 | .00 | .26 | 3.97 | 3.63 |
| 182 | 151 | 152 | 62.31 | 9.90 | .00 | 6.34 | 12.99 | 497.35 |
| 188 | 163 | 164 | 59.96 | 9.18 | .00 | 5.36 | 12.49 | 461.38 |
| 197 | 170 | 171 | 2800.00 | .02 | .00 | .18 | 4.92 | 4.10 |
| LINE | 198 IS | CLOSED | | | | | | |
| LINE | 205 IS | CLOSED | | | | | | |

## ANALYSIS RESULTS FOR "U2SCNRIO"

LINE 213 IS CLOSED
LINE 218 IS CLOSED
LINE 224 IS CLOSED

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 233 | 203 | 204 | .00 | .00 | .00 | .00 | .00 | .00 |
| 234 | 204 | 205 | .00 | .00 | .00 | .00 | .00 | .00 |
| 235 | 70 | 205 | .00 | .00 | .00 | .00 | .00 | .00 |
| 501 | 86 | 301 | 320.58 | .02 | .00 | 37.50 | 3.55 | 6.71 |
| 503 | 46 | 303 | 332.24 | .04 | .00 | 30.44 | 3.68 | 7.18 |

LINE 700 IS CLOSED
LINE 701 IS CLOSED
LINE 702 IS CLOSED
LINE 703 IS CLOSED

| JUNCTION | NUMBER | DEMAND | GRADE LINE | ELEVATION | PRESSURE |
|---|---|---|---|---|---|
| 1 | | .00 | 135.74 | 43.10 | 41.35 |
| 2 | | .00 | 124.99 | 42.40 | 36.86 |
| 14 | | .00 | 116.85 | 26.50 | 40.33 |
| 15 | | .00 | 116.85 | 26.50 | 40.33 |
| 16 | | .00 | 116.85 | 26.50 | 40.33 |
| 18 | | .00 | 116.09 | 36.30 | 35.61 |
| 23 | | .00 | 100.83 | 12.50 | 39.43 |
| 27 | | .00 | 88.60 | 11.00 | 34.64 |
| 28 | | .00 | 83.40 | 10.80 | 32.40 |
| 36 | | .00 | 98.86 | 17.50 | 36.31 |
| 37 | | .00 | 80.09 | 17.50 | 27.94 |
| 49 | | .00 | 90.71 | 8.30 | 36.78 |
| 50 | | .00 | 62.75 | 8.30 | 24.30 |
| 66 | | .00 | 40.09 | 77.20 | -16.56 |
| 70 | | .00 | 40.09 | 74.10 | -15.18 |
| 74 | | .00 | 107.04 | 17.50 | 39.96 |
| 75 | | .00 | 90.06 | 17.50 | 32.38 |
| 90 | | .00 | 99.41 | 31.60 | 30.27 |
| 91 | | .00 | 75.92 | 31.60 | 19.78 |
| 98 | | .00 | 109.18 | 16.80 | 41.23 |
| 100 | | .00 | 101.65 | 11.40 | 40.28 |
| 101 | | .00 | 98.24 | 28.50 | 31.13 |
| 109 | | .00 | 114.17 | 44.40 | 31.14 |
| 110 | | .00 | 30.29 | 44.40 | -6.30 |
| 143 | | .00 | 115.23 | 72.80 | 18.94 |
| 144 | | .00 | 867.81 | 74.20 | 354.21 |
| 156 | | .00 | 115.20 | 72.80 | 18.93 |
| 157 | | .00 | 867.89 | 74.20 | 354.25 |
| 165 | | -2800.00 | 41.11 | 58.80 | -7.90 |
| 204 | | .00 | 40.09 | 33.10 | 3.12 |
| 205 | | .00 | 40.09 | 71.90 | -14.20 |
| 302 | | 2800.00 | 863.49 | 34.20 | 370.14 |

THE NET SYSTEM DEMAND = 113.00

SUMMARY OF INFLOWS(+) AND OUTFLOWS(-) FROM FIXED GRADE NODES

| PIPE NUMBER | FLOWRATE |
|---|---|
| 1 | 6895.96 |
| 158 | -2103.77 |
| 161 | -3743.60 |

ANALYSIS RESULTS FOR "U2SCNRIO"

600 -935.59

THE NET FLOW INTO THE SYSTEM FROM FIXED GRADE NODES = 6895.96
THE NET FLOW OUT OF THE SYSTEM INTO FIXED GRADE NODES = -6782.96

# DATA FILE FOR "U2CALBN2"

FLOWRATE IS EXPRESSED IN GPM ANT PRESSURE IN PSIG

A SUMMARY OF THE ORIGINAL DATA FOLLOWS

THE DARCY WEISBACH HEAD LOSS EQUATION IS USED, THE KINEMATIC VIS. = .0000070

THE SPECIFIC GRAVITY OF THIS LIQUID = 1.03

| PIPE NO. | NODE NOS. | | LENGTH (FEET) | DIAMETER (INCHES) | ROUGHNESS | MINOR LOSS K | FIXED GRADE |
|---|---|---|---|---|---|---|---|
| 1 | 0 | 1 | 1.0 | 16.6 | 5.0 | .00 | 21.00 |
| LINE 1 PUMP DATA (HEAD-FLOW): | | | 200.0 | .0 | 135.0 | 6400.0 | 90.0 8300.0 |
| 2 | 1 | 2 | 9.7 | 16.6 | 5.0 | 2.13 | |
| 3 | 2 | 3 | 15.9 | 18.6 | 5.0 | 7.68 | |
| 4 | 0 | 4 | 1.0 | 16.6 | 5.0 | .00 | 21.00 |
| LINE 4 PUMP DATA (HEAD-FLOW): | | | 200.0 | .0 | 135.0 | 6400.0 | 90.0 8300.0 |
| 5 | 4 | 5 | 9.7 | 16.6 | 5.0 | 1.38 | |
| 6 | 5 | 6 | 15.9 | 18.6 | 5.0 | 7.68 | |
| 7 | 3 | 6 | 6.0 | 28.5 | 5.0 | .06 | |
| 8 | 6 | 7 | 6.0 | 28.5 | 5.0 | 06 | |
| 9 | 7 | 8 | 308.8 | 28.5 | 5.0 | .48 | |
| 10 | 8 | 18 | 371.0 | 28.5 | 5.0 | .84 | |
| 11 | 8 | 9 | 2.7 | 16.6 | 5.0 | .33 | |
| 12 | 9 | 10 | 63.7 | 17.3 | .2 | .60 | |
| 13 | 10 | 103 | 124.3 | 16.6 | 5.0 | .52 | |
| 14 | 7 | 11 | 1.4 | 3.5 | 5.0 | .71 | |
| 15 | 11 | 12 | 3.8 | 3.5 | 5.0 | 3.69 | |
| 16 | 12 | 13 | 11.3 | 3.5 | 5.0 | .99 | |
| 17 | 14 | 3 | 7.0 | 28.5 | 5.0 | .06 | |
| 18 | 15 | 14 | 6.1 | 28.5 | 5.0 | .06 | |
| 19 | 16 | 15 | 7.0 | 28.5 | 5.0 | .06 | |
| 20 | 17 | 16 | 2.3 | 28.5 | 5.0 | .00 | |
| 21 | 306 | 19 | 2.3 | 29.3 | .2 | .07 | |
| 22 | 19 | 21 | 9.1 | 22.5 | 5.0 | .79 | |
| 23 | 19 | 20 | 11.4 | 29.3 | .2 | 1.49 | |
| 24 | 20 | 55 | 24.1 | 19.3 | .2 | .68 | |
| 25 | 18 | 22 | 28.1 | 6.1 | .2 | 2.76 | |
| 26 | 22 | 23 | 15.5 | 6.1 | .2 | 30.30 | |
| 27 | 23 | 24 | 6.5 | 6.1 | .2 | .18 | |
| 28 | 24 | 25 | 111.6 | 6.1 | .2 | 2.63 | |
| 29 | 25 | 26 | 67.3 | 3.8 | .2 | .22 | |
| 30 | 26 | 27 | 40.8 | 1.7 | .2 | 3.46 | |
| 31 | 27 | 28 | 1.0 | 2.3 | .2 | 14.50 | |
| 32 | 28 | 29 | 31.5 | 1.7 | .2 | 25.93 | |

# DATA FILE FOR "U2CALBN2"

| | | | | | | |
|---|---|---|---|---|---|---|
| 33 | 29 | 30 | 1.2 | 3.8 | .2 | 17.02 |
| 34 | 304 | 305 | 4.8 | 3.8 | .2 | .84 |
| 35 | 23 | 32 | 13.1 | 6.1 | .2 | .81 |
| 36 | 33 | 34 | 1.3 | 3.0 | .2 | .54 |
| 37 | 34 | 36 | 8.2 | 2.3 | .2 | .74 |
| 38 | 36 | 37 | 1.0 | 2.3 | .2 | 29.70 |
| 39 | 37 | 40 | 7.0 | 2.3 | .2 | 1.13 |
| 40 | 34 | 38 | 7.2 | 2.3 | .2 | 1.17 |
| 41 | 38 | 39 | 1.0 | 2.3 | .2 | 29.70 |
| 42 | 39 | 40 | 7.1 | 2.3 | .2 | 2.03 |
| 43 | 40 | 45 | 5.0 | 3.0 | .2 | .69 |
| 44 | 32 | 33 | 5.0 | 6.1 | .2 | .48 |
| 45 | 33 | 35 | 2.8 | 3.0 | .2 | .79 |
| 46 | 35 | 41 | 9.2 | 2.3 | .2 | .74 |
| 47 | 41 | 42 | 1.0 | 2.3 | .2 | 29.70 |
| 48 | 42 | 45 | 7.0 | 2.3 | .2 | 2.06 |
| 49 | 35 | 43 | 7.9 | 2.3 | .2 | 1.76 |
| 50 | 43 | 44 | 1.0 | 2.3 | .2 | 29.70 |
| 51 | 44 | 46 | 8.0 | 2.3 | .2 | 2.60 |
| 52 | 45 | 46 | 1.5 | 6.1 | .2 | .12 |
| 53 | 303 | 47 | 20.8 | 6.1 | .2 | .93 |
| 54 | 47 | 30 | 200.0 | 6.1 | .2 | 3.33 |
| 55 | 24 | 48 | 3.5 | 1.4 | .2 | .85 |
| 56 | 48 | 49 | 11.0 | 1.0 | .2 | 11.64 |
| 57 | 49 | 50 | 1.0 | 1.0 | .2 | 45.30 |
| 58 | 50 | 51 | 17.2 | 1.0 | .2 | 17.00 |
| 59 | 51 | 52 | 1.1 | 1.4 | .2 | .90 |
| 60 | 52 | 47 | 2.9 | 1.4 | .2 | 1.73 |
| 61 | 48 | 53 | 19.0 | 1.0 | .2 | 12.94 |
| 62 | 53 | 54 | 1.0 | 1.0 | .2 | 45.30 |
| 63 | 54 | 51 | 9.0 | 1.0 | .2 | 17.50 |
| 64 | 31 | 139 | 47.4 | 18.6 | 5.0 | .08 |
| 65 | 22 | 71 | 125.1 | 6.1 | .2 | 3.02 |
| 66 | 55 | 56 | 104.2 | 18.6 | 5.0 | 12.71 |
| 67 | 56 | 57 | 14.9 | 18.6 | 5.0 | .60 |
| 68 | 57 | 58 | 5.0 | 18.6 | 5.0 | .30 |
| 69 | 57 | 59 | 16.1 | 14.6 | 5.0 | .67 |
| 70 | 58 | 60 | 16.1 | 12.6 | 5.0 | .47 |
| 71 | 58 | 61 | 18.3 | 14.6 | 5.0 | 1.02 |
| 72 | 59 | 62 | 1.0 | 14.6 | .2 | 21.80 |
| 73 | 60 | 63 | 1.0 | 14.6 | .2 | 21.80 |
| 74 | 61 | 64 | 1.0 | 14.6 | .2 | 21.80 |
| 75 | 62 | 65 | 12.5 | 15.3 | .2 | .51 |
| 76 | 63 | 65 | 10.9 | 13.3 | .2 | .37 |
| 77 | 64 | 66 | 13.3 | 15.3 | .2 | .87 |
| 78 | 65 | 66 | 5.7 | 15.3 | .2 | .08 |
| 79 | 66 | 70 | 29.5 | 15.3 | .2 | 218.95 |
| LINE | 79 | IS CLOSED | | | | |
| 80 | 205 | 69 | 9.3 | 15.3 | .2 | .62 |
| 81 | 69 | 68 | 30.2 | 28.5 | 5.0 | 1.82 |
| 82 | 68 | 137 | 36.9 | 28.5 | 5.0 | .04 |
| 83 | 71 | 98 | 51.2 | 6.1 | .2 | 2.85 |
| 84 | 98 | 67 | 2.9 | 6.1 | .2 | .63 |

DATA FILE FOR "U2CALBN2"

| | | | | | | |
|---|---|---|---|---|---|---|
| 85 | 71 | 72 | 8.2 | 6.1 | .2 | .36 |
| 86 | 72 | 300 | 37.1 | 6.1 | .2 | 1.17 |
| 87 | 73 | 74 | 9.8 | 2.3 | .2 | 1.35 |
| 88 | 74 | 75 | 1.0 | 2.3 | .2 | 29.70 |
| 89 | 75 | 78 | 7.2 | 2.3 | .2 | 1.76 |
| 90 | 73 | 79 | .9 | 6.1 | .2 | .12 |
| 91 | 79 | 76 | 8.5 | 2.3 | .2 | 1.08 |
| 92 | 76 | 77 | 1.0 | 2.3 | .2 | 29.70 |
| 93 | 77 | 78 | 8.6 | 2.3 | .2 | 1.51 |
| 94 | 78 | 85 | 4.7 | 3.0 | .2 | .57 |
| 95 | 79 | 80 | 1.2 | 3.0 | .2 | 1.13 |
| 96 | 80 | 81 | 9.1 | 2.3 | .2 | 1.01 |
| 97 | 81 | 82 | 1.0 | 2.3 | .2 | 29.70 |
| 98 | 82 | 85 | 7.5 | 2.3 | .2 | .81 |
| 99 | 85 | 86 | 4.2 | 6.1 | .2 | .42 |
| 100 | 80 | 83 | 9.2 | 2.3 | .2 | 1.35 |
| 101 | 83 | 84 | 1.0 | 2.3 | .2 | 29.70 |
| 102 | 84 | 86 | 8.4 | 2.3 | .2 | 1.62 |
| 103 | 301 | 87 | 27.5 | 6.1 | .2 | 1.17 |
| 104 | 87 | 88 | 606.1 | 6.1 | .2 | 4.82 |
| 105 | 88 | 68 | 80.2 | 6.1 | .2 | 10.40 |
| 106 | 72 | 102 | 12.5 | 1.7 | .2 | .60 |
| 107 | 102 | 89 | 2.9 | 1.4 | .2 | .73 |
| 108 | 89 | 90 | 13.0 | 1.0 | .2 | 12.28 |
| 109 | 90 | 91 | 1.0 | 1.0 | .2 | 45.30 |
| 110 | 91 | 92 | 24.0 | 1.0 | .2 | 38.28 |
| 111 | 92 | 93 | .9 | 1.4 | .2 | .22 |
| 112 | 93 | 94 | 2.9 | 1.4 | .2 | 1.35 |
| 113 | 94 | 95 | 18.7 | 1.7 | .2 | 1.20 |
| 114 | 95 | 87 | .9 | 1.7 | .2 | 1.67 |
| 115 | 89 | 96 | 20.3 | 1.0 | .2 | 12.46 |
| 116 | 96 | 97 | 1.0 | 1.0 | .2 | 45.30 |
| 117 | 97 | 92 | 11.2 | 1.0 | .2 | 38.00 |
| 118 | 98 | 99 | 101.9 | 3.8 | .2 | 1.46 |
| 119 | 99 | 100 | 35.0 | 1.7 | .2 | 3.57 |
| 120 | 100 | 101 | 1.0 | 2.3 | .2 | 14.50 |
| 121 | 101 | 88 | 34.5 | 2.3 | .2 | 228.27 |
| 122 | 120 | 104 | 31.0 | 16.6 | 5.0 | .89 |
| 123 | 104 | 105 | 5.4 | 16.6 | 5.0 | .89 |
| 124 | 105 | 106 | .8 | 16.6 | 5.0 | .00 |
| 125 | 104 | 107 | 56.3 | 5.6 | 5.0 | 4.01 |
| 126 | 107 | 108 | 12.7 | 5.6 | 5.0 | .73 |
| 127 | 108 | 109 | 1.9 | 7.5 | 5.0 | .76 |
| 128 | 109 | 110 | 1.0 | 7.5 | .2 | 35.00 |
| LINE 128 IS CLOSED | | | | | | |
| 129 | 110 | 111 | 1.9 | 7.5 | 5.0 | .98 |
| 130 | 111 | 112 | 79.0 | 5.6 | 5.0 | 3.28 |
| 131 | 105 | 113 | 79.8 | 5.6 | 5.0 | 4.34 |
| 132 | 113 | 114 | 12.0 | 5.6 | 5.0 | .73 |
| 133 | 114 | 115 | 1.9 | 7.5 | 5.0 | .76 |
| 134 | 115 | 116 | 1.0 | 7.5 | .2 | 30.00 |
| LINE 134 IS CLOSED | | | | | | |
| 135 | 116 | 117 | 1.9 | 7.5 | 5.0 | .98 |

# DATA FILE FOR "U2CALBN2"

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 136 | 117 | 118 | 100.4 | 5.6 | 5.0 | 3.61 | | | |
| 137 | 119 | 118 | .8 | 16.6 | 5.0 | .00 | | | |
| 138 | 118 | 112 | .8 | 16.6 | 5.0 | .07 | | | |
| 139 | 112 | 136 | 26.8 | 16.6 | 5.0 | .45 | | | |
| 140 | 103 | 120 | 18.9 | 16.6 | 5.0 | 35.41 | | | |
| 141 | 103 | 121 | 12.0 | 16.6 | 5.0 | 35.41 | | | |
| 142 | 121 | 122 | 3.1 | 5.6 | 5.0 | .00 | | | |
| 143 | 120 | 123 | 58.0 | 5.6 | 5.0 | 4.00 | | | |
| 144 | 123 | 124 | 13.7 | 5.6 | 5.0 | .73 | | | |
| 145 | 124 | 125 | 1.7 | 7.5 | 5.0 | .76 | | | |
| 146 | 125 | 126 | 1.0 | 8.0 | .2 | 20.00 | | | |
| 147 | 126 | 127 | 1.9 | 7.5 | 5.0 | 1.48 | | | |
| 148 | 127 | 128 | 74.8 | 5.6 | 5.0 | 2.68 | | | |
| 149 | 121 | 129 | 54.5 | 5.6 | 5.0 | 4.01 | | | |
| 150 | 129 | 130 | 16.3 | 5.6 | 5.0 | .91 | | | |
| 151 | 130 | 131 | 1.7 | 7.5 | 5.0 | .50 | | | |
| 152 | 131 | 132 | 1.0 | 8.0 | .2 | 45.00 | | | |
| 153 | 132 | 133 | 1.9 | 7.5 | 5.0 | .98 | | | |
| 154 | 133 | 134 | 75.7 | 5.6 | 5.0 | 3.28 | | | |
| 155 | 135 | 134 | 2.3 | 16.6 | 5.0 | .00 | | | |
| 156 | 134 | 128 | 30.8 | 16.6 | 5.0 | .07 | | | |
| 157 | 128 | 136 | 4.3 | 16.6 | 5.0 | .45 | | | |
| 158 | 136 | 0 | 414.1 | 16.6 | 5.0 | .96 | 28.90 | | |
| 159 | 137 | 138 | 16.4 | 28.5 | 5.0 | .92 | | | |
| 160 | 139 | 138 | 126.7 | 18.6 | 5.0 | .64 | | | |
| 161 | 138 | 0 | 286.2 | 34.5 | 5.0 | 1.13 | 40.00 | | |
| 162 | 21 | 140 | 27.2 | 22.5 | 5.0 | .20 | | | |
| 163 | 140 | 141 | 6.5 | 12.6 | 5.0 | .34 | | | |
| 164 | 141 | 142 | 4.3 | 12.6 | 5.0 | .12 | | | |
| 165 | 142 | 143 | 4.3 | 8.0 | .2 | .32 | | | |
| 166 | 143 | 144 | 1.0 | 8.0 | .2 | .00 | | | |
| LINE 166 PUMP DATA (HEAD-FLOW): | | | | 775.0 | .0 | 580.0 | 4000.0 | 500.0 | 4725.0 |
| LINE 166 IS CLOSED | | | | | | | | | |
| 167 | 144 | 145 | 9.9 | 12.0 | .2 | 3.76 | | | |
| 168 | 145 | 146 | 16.7 | 12.0 | .2 | .93 | | | |
| 169 | 140 | 153 | 16.0 | 22.5 | 5.0 | .06 | | | |
| 170 | 153 | 173 | 21.5 | 22.5 | 5.0 | .30 | | | |
| 171 | 153 | 154 | 6.5 | 12.6 | 5.0 | .44 | | | |
| 172 | 154 | 155 | 4.3 | 12.6 | 5.0 | .12 | | | |
| 173 | 155 | 156 | 4.3 | 8.0 | .2 | .32 | | | |
| 174 | 156 | 157 | 1.0 | 8.0 | .2 | .00 | | | |
| LINE 174 PUMP DATA (HEAD-FLOW): | | | | 775.0 | .0 | 580.0 | 4000.0 | 500.0 | 4725.0 |
| LINE 174 IS CLOSED | | | | | | | | | |
| 175 | 157 | 158 | 9.8 | 12.0 | .2 | 3.76 | | | |
| 176 | 158 | 146 | 31.4 | 12.0 | .2 | 1.07 | | | |
| 177 | 141 | 147 | .8 | 1.7 | .2 | .20 | | | |
| 178 | 147 | 148 | .5 | 1.7 | .2 | .07 | | | |
| 179 | 148 | 149 | 17.2 | 1.4 | .2 | 1.69 | | | |
| LINE 179 IS CLOSED | | | | | | | | | |
| 180 | 149 | 150 | .7 | 1.7 | .2 | 26.27 | | | |
| 181 | 150 | 151 | 2.2 | 1.4 | .2 | 2.12 | | | |
| 182 | 151 | 152 | 19.9 | 1.4 | .2 | 2.42 | | | |
| 183 | 154 | 159 | .8 | 1.7 | 5.0 | .69 | | | |

DATA FILE FOR "U2CALBN2"

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 184 | 159 | 160 | .5 | 1.7 | .2 | .07 | | | |
| 185 | 160 | 161 | 17.2 | 1.4 | .2 | 1.69 | | | |
| LINE 185 IS CLOSED | | | | | | | | | |
| 186 | 161 | 162 | 1.0 | 1.7 | .2 | 26.57 | | | |
| 187 | 162 | 163 | 2.7 | 1.4 | .2 | 3.70 | | | |
| 188 | 163 | 164 | 19.9 | 1.4 | .2 | 2.21 | | | |
| 189 | 193 | 164 | 21.2 | 3.0 | .2 | .32 | | | |
| 190 | 164 | 152 | 16.7 | 3.0 | .2 | .54 | | | |
| 191 | 152 | 165 | 17.8 | 3.0 | .2 | 4.45 | | | |
| 192 | 146 | 166 | 156.0 | 16.0 | .2 | 1.15 | | | |
| 193 | 166 | 167 | 18.7 | 16.0 | .2 | .44 | | | |
| 194 | 167 | 168 | 10.5 | 15.3 | .2 | .14 | | | |
| 195 | 168 | 169 | 2.5 | 15.3 | .2 | .00 | | | |
| 196 | 169 | 170 | 1.0 | 19.3 | .2 | 11.50 | | | |
| 197 | 170 | 171 | 5.0 | 15.3 | .2 | .48 | | | |
| 198 | 302 | 165 | 205.0 | 15.3 | .2 | 482.00 | | | |
| 199 | 165 | 172 | 7.5 | 19.3 | .2 | .00 | | | |
| 200 | 172 | 31 | 31.0 | 18.6 | 5.0 | .07 | | | |
| 201 | 173 | 174 | 1.0 | 12.6 | 5.0 | .00 | | | |
| 202 | 174 | 175 | 4.7 | 13.3 | .2 | .10 | | | |
| 203 | 175 | 176 | 4.3 | 13.3 | .2 | .12 | | | |
| 204 | 176 | 177 | 4.2 | 8.0 | .2 | .32 | | | |
| 205 | 177 | 178 | 1.0 | 8.0 | .2 | .00 | | | |
| LINE 205 PUMP DATA (HEAD-FLOW): | | | | 775.0 | .0 | 580.0 | 4000.0 | 500.0 | 4725.0 |
| 206 | 178 | 179 | 9.8 | 12.0 | .2 | 3.76 | | | |
| 207 | 179 | 180 | 27.9 | 12.0 | .2 | .46 | | | |
| 208 | 173 | 181 | 16.0 | 22.5 | 5.0 | .12 | | | |
| 209 | 181 | 182 | .4 | 12.6 | 5.0 | .00 | | | |
| 210 | 182 | 183 | 4.8 | 13.3 | .2 | .00 | | | |
| 211 | 183 | 184 | 4.4 | 13.3 | .2 | .12 | | | |
| 212 | 184 | 185 | 4.2 | 8.0 | .2 | .32 | | | |
| 213 | 185 | 186 | 1.0 | 8.0 | .2 | .00 | | | |
| LINE 213 PUMP DATA (HEAD-FLOW): | | | | 775.0 | .0 | 580.0 | 4000.0 | 500.0 | 4725.0 |
| 214 | 186 | 187 | 10.4 | 12.0 | .2 | 3.76 | | | |
| 215 | 187 | 180 | 17.4 | 12.0 | .2 | .29 | | | |
| 216 | 175 | 188 | 1.0 | 1.7 | .2 | .49 | | | |
| 217 | 188 | 189 | .3 | 1.4 | .2 | .07 | | | |
| 218 | 189 | 190 | 16.9 | 1.4 | .2 | 1.69 | | | |
| 219 | 190 | 191 | 1.0 | 1.7 | .2 | 26.85 | | | |
| 220 | 191 | 192 | 2.3 | 1.4 | .2 | 2.80 | | | |
| 221 | 192 | 193 | 19.5 | 1.4 | .2 | 2.44 | | | |
| 222 | 183 | 194 | .4 | 1.7 | .2 | .49 | | | |
| 223 | 194 | 195 | .7 | 1.4 | .2 | .07 | | | |
| 224 | 195 | 196 | 16.4 | 1.4 | .2 | 1.69 | | | |
| 225 | 196 | 197 | 1.0 | 1.7 | .2 | 26.55 | | | |
| 226 | 197 | 198 | 2.9 | 1.4 | .2 | 2.41 | | | |
| 227 | 198 | 193 | 39.2 | 1.4 | .2 | 5.21 | | | |
| 228 | 180 | 199 | 212.5 | 15.3 | .2 | 1.33 | | | |
| 229 | 199 | 20C | 2.5 | 15.3 | .2 | .25 | | | |
| 230 | 200 | 201 | 2.5 | 19.3 | .2 | .00 | | | |
| 231 | 201 | 202 | 1.0 | 19.3 | .2 | 11.50 | | | |
| 232 | 202 | 203 | 2.5 | 19.3 | .2 | .19 | | | |
| 233 | 203 | 204 | 2.5 | 15.3 | .2 | .00 | | | |

# DATA FILE FOR "U2CALBN2"

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 234 | 204 | 205 | 235.1 | 15.3 | .2 | 1814.60 | |
| LINE 234 IS CLOSED | | | | | | | |
| 235 | 70 | 205 | .7 | 15.3 | .2 | .48 | |
| 500 | 300 | 73 | 4.8 | 6.1 | .2 | .76 | |
| 501 | 86 | 301 | 2.3 | 6.1 | .2 | 191.23 | |
| 502 | 171 | 302 | .4 | 15.3 | .2 | .00 | |
| 503 | 46 | 303 | 5.8 | 6.1 | .2 | 144.52 | |
| 504 | 30 | 304 | 1.5 | 3.8 | .2 | .00 | |
| 505 | 305 | 31 | 32.9 | 6.1 | .2 | 1.94 | |
| 506 | 18 | 306 | 103.8 | 28.5 | 5.0 | .08 | |
| 600 | 17 | 0 | 1.0 | 18.6 | 5.0 | 33547.00 | 161.30 |
| 700 | 140 | 146 | 58.0 | 11.3 | .2 | 6.24 | |
| LINE 700 IS CLOSED | | | | | | | |
| 701 | 153 | 146 | 58.0 | 11.3 | .2 | 6.24 | |
| LINE 701 IS CLOSED | | | | | | | |
| 702 | 173 | 180 | 58.0 | 11.3 | .2 | 6.24 | |
| LINE 702 IS CLOSED | | | | | | | |
| 703 | 181 | 180 | 58.0 | 11.3 | .2 | 6.24 | |
| LINE 703 IS CLOSED | | | | | | | |

A SUCCESSFUL GEOMETRIC VERIFICATION HAS BEEN COMPLETED

| JUNCTION NUMBER | DEMAND | ELEVATION | CONNECTING PIPES | | |
|---|---|---|---|---|---|
| 1 | .00 | 43.10 | 1 | 2 | |
| 2 | .00 | 42.40 | 2 | 3 | |
| 3 | .00 | 26.50 | 3 | 7 | 17 |
| 4 | .00 | 43.10 | 4 | 5 | |
| 5 | .00 | 42.40 | 5 | 6 | |
| 6 | .00 | 26.50 | 6 | 7 | 8 |
| 7 | .00 | 26.50 | 8 | 9 | 14 |
| 8 | .00 | 26.50 | 9 | 10 | 11 |
| 9 | .00 | 29.20 | 11 | 12 | |
| 10 | .00 | 31.80 | 12 | 13 | |
| 11 | .00 | 24.60 | 14 | 15 | |
| 12 | .00 | 24.60 | 15 | 16 | |
| 13 | .00 | 24.60 | 16 | | |
| 14 | .00 | 26.50 | 17 | 18 | |
| 15 | .00 | 26.50 | 18 | 19 | |
| 16 | .00 | 26.50 | 19 | 20 | |
| 17 | .00 | 26.50 | 20 | 600 | |
| 18 | .00 | 36.30 | 10 | 25 | 506 |
| 19 | .00 | 81.50 | 21 | 22 | 23 |
| 20 | .00 | 81.50 | 23 | 24 | |
| 21 | .00 | 81.50 | 22 | 162 | |
| 22 | .00 | 19.10 | 25 | 26 | 65 |
| 23 | .00 | 12.50 | 26 | 27 | 35 |
| 24 | .00 | 12.50 | 27 | 28 | 55 |
| 25 | .00 | 33.80 | 28 | 29 | |
| 26 | .00 | 34.50 | 29 | 30 | |
| 27 | .00 | 11.00 | 30 | 31 | |
| 28 | .00 | 10.80 | 31 | 32 | |
| 29 | .00 | 32.30 | 32 | 33 | |

DATA FILE FOR "U2CALBN2"

| | | | | | |
|---|---|---|---|---|---|
| 30 | .00 | 23.20 | 33 | 54 | 504 |
| 31 | .00 | 35.50 | 64 | 200 | 505 |
| 32 | .00 | 12.50 | 35 | 44 | |
| 33 | .00 | 12.50 | 36 | 44 | 45 |
| 34 | .00 | 12.50 | 36 | 37 | 40 |
| 35 | .00 | 12.50 | 45 | 46 | 49 |
| 36 | .00 | 17.50 | 37 | 38 | |
| 37 | .00 | 17.50 | 38 | 39 | |
| 38 | .00 | 17.50 | 40 | 41 | |
| 39 | .00 | 17.50 | 41 | 42 | |
| 40 | .00 | 14.20 | 39 | 42 | 43 |
| 41 | .00 | 17.40 | 46 | 47 | |
| 42 | .00 | 17.40 | 47 | 48 | |
| 43 | .00 | 17.40 | 49 | 50 | |
| 44 | .00 | 17.40 | 50 | 51 | |
| 45 | .00 | 14.20 | 43 | 48 | 52 |
| 46 | .00 | 14.20 | 51 | 52 | 503 |
| 47 | .00 | 10.80 | 53 | 54 | 60 |
| 48 | .00 | 12.50 | 55 | 56 | 61 |
| 49 | .00 | 8.30 | 56 | 57 | |
| 50 | .00 | 8.30 | 57 | 58 | |
| 51 | .00 | 10.80 | 58 | 59 | 63 |
| 52 | .00 | 10.80 | 59 | 60 | |
| 53 | .00 | 8.30 | 61 | 62 | |
| 54 | .00 | 8.30 | 62 | 63 | |
| 55 | .00 | 81.50 | 24 | 66 | |
| 56 | .00 | 81.50 | 66 | 67 | |
| 57 | .00 | 79.00 | 67 | 68 | 69 |
| 58 | .00 | 79.00 | 68 | 70 | 71 |
| 59 | .00 | 74.80 | 69 | 72 | |
| 60 | .00 | 74.80 | 70 | 73 | |
| 61 | .00 | 74.80 | 71 | 74 | |
| 62 | .00 | 74.80 | 72 | 75 | |
| 63 | .00 | 74.80 | 73 | 76 | |
| 64 | .00 | 74.80 | 74 | 77 | |
| 65 | .00 | 77.20 | 75 | 76 | 78 |
| 66 | 3500.00 | 77.20 | 77 | 78 | 79 |
| 67 | .00 | 16.80 | 84 | | |
| 68 | .00 | 35.50 | 81 | 82 | 105 |
| 69 | .00 | 65.80 | 80 | 81 | |
| 70 | -3500.00 | 74.10 | 79 | 235 | |
| 71 | .00 | .10 | 65 | 83 | 85 |
| 72 | .00 | .10 | 85 | 86 | 106 |
| 73 | .00 | 16.10 | 87 | 90 | 500 |
| 74 | .00 | 17.50 | 87 | 88 | |
| 75 | .00 | 17.50 | 88 | 89 | |
| 76 | .00 | 17.50 | 91 | 92 | |
| 77 | .00 | 17.50 | 92 | 93 | |
| 78 | .00 | 14.20 | 89 | 93 | 94 |
| 79 | .00 | 16.10 | 90 | 91 | 95 |
| 80 | .00 | 16.10 | 95 | 96 | 100 |
| 81 | .00 | 17.40 | 96 | 97 | |
| 82 | .00 | 17.60 | 97 | 98 | |

# DATA FILE FOR "U2CALBN2"

| | | | | | |
|---|---|---|---|---|---|
| 83 | .00 | 17.40 | 100 | 101 | |
| 84 | .00 | 17.60 | 101 | 102 | |
| 85 | .00 | 14.20 | 94 | 98 | 99 |
| 86 | .00 | 14.20 | 99 | 102 | 501 |
| 87 | .00 | 20.90 | 103 | 104 | 114 |
| 88 | .00 | 33.20 | 104 | 105 | 121 |
| 89 | .00 | 14.20 | 107 | 108 | 115 |
| 90 | .00 | 31.60 | 108 | 109 | |
| 91 | .00 | 31.60 | 109 | 110 | |
| 92 | .00 | 12.10 | 110 | 111 | 117 |
| 93 | .00 | 12.10 | 111 | 112 | |
| 94 | .00 | 23.00 | 112 | 113 | |
| 95 | .00 | 21.00 | 113 | 114 | |
| 96 | .00 | 8.30 | 115 | 116 | |
| 97 | .00 | 8.30 | 116 | 117 | |
| 98 | .00 | 16.80 | 83 | 84 | 118 |
| 99 | .00 | 34.50 | 118 | 119 | |
| 100 | .00 | 11.40 | 119 | 120 | |
| 101 | .00 | 28.50 | 120 | 121 | |
| 102 | .00 | 14.20 | 106 | 107 | |
| 103 | .00 | 34.50 | 13 | 140 | 141 |
| 104 | .00 | 34.50 | 122 | 123 | 125 |
| 105 | .00 | 34.50 | 123 | 124 | 131 |
| 106 | .00 | 34.50 | 124 | | |
| 107 | .00 | 43.80 | 125 | 126 | |
| 108 | .00 | 42.90 | 126 | 127 | |
| 109 | .00 | 44.40 | 127 | 128 | |
| 110 | .00 | 44.40 | 128 | 129 | |
| 111 | .00 | 44.50 | 129 | 130 | |
| 112 | .00 | 34.50 | 130 | 138 | 139 |
| 113 | .00 | 43.80 | 131 | 132 | |
| 114 | .00 | 42.90 | 132 | 133 | |
| 115 | .00 | 44.40 | 133 | 134 | |
| 116 | .00 | 44.40 | 134 | 135 | |
| 117 | .00 | 44.30 | 135 | 136 | |
| 118 | .00 | 34.50 | 136 | 137 | 138 |
| 119 | .00 | 34.50 | 137 | | |
| 120 | .00 | 34.50 | 122 | 140 | 143 |
| 121 | .00 | 34.50 | 141 | 142 | 149 |
| 122 | .00 | 34.50 | 142 | | |
| 123 | .00 | 47.30 | 143 | 144 | |
| 124 | .00 | 43.80 | 144 | 145 | |
| 125 | .00 | 44.40 | 145 | 146 | |
| 126 | .00 | 44.40 | 146 | 147 | |
| 127 | .00 | 43.80 | 147 | 148 | |
| 128 | .00 | 34.50 | 148 | 156 | 157 |
| 129 | .00 | 43.80 | 149 | 150 | |
| 130 | .00 | 43.80 | 150 | 151 | |
| 131 | .00 | 44.40 | 151 | 152 | |
| 132 | .00 | 44.40 | 152 | 153 | |
| 133 | .00 | 43.80 | 153 | 154 | |
| 134 | .00 | 34.50 | 154 | 155 | 156 |
| 135 | .00 | 34.50 | 155 | | |

# DATA FILE FOR "U2CALBN2"

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 136 | .00 | 34.50 | 139 | 157 | 158 | | |
| 137 | .00 | 19.30 | 82 | 159 | | | |
| 138 | .00 | 19.30 | 159 | 160 | 161 | | |
| 139 | .00 | 19.30 | 64 | 160 | | | |
| 140 | .00 | 81.50 | 162 | 163 | 169 | 700 | |
| 141 | .00 | 75.00 | 163 | 164 | 177 | | |
| 142 | .00 | 72.80 | 164 | 165 | | | |
| 143 | .00 | 72.80 | 165 | 166 | | | |
| 144 | .00 | 74.20 | 166 | 167 | | | |
| 145 | .00 | 77.50 | 167 | 168 | | | |
| 146 | .00 | 81.20 | 168 | 176 | 192 | 700 | 701 |
| 147 | .00 | 75.00 | 177 | 178 | | | |
| 148 | .00 | 75.00 | 178 | 179 | | | |
| 149 | .00 | 73.80 | 179 | 180 | | | |
| 150 | .00 | 73.90 | 180 | 181 | | | |
| 151 | .00 | 74.30 | 181 | 182 | | | |
| 152 | .00 | 63.50 | 182 | 190 | 191 | | |
| 153 | .00 | 81.50 | 169 | 170 | 171 | 701 | |
| 154 | .00 | 75.00 | 171 | 172 | 183 | | |
| 155 | .00 | 72.80 | 172 | 173 | | | |
| 156 | .00 | 72.80 | 173 | 174 | | | |
| 157 | .00 | 74.20 | 174 | 175 | | | |
| 158 | .00 | 77.50 | 175 | 176 | | | |
| 159 | .00 | 75.00 | 183 | 184 | | | |
| 160 | .00 | 75.00 | 184 | 185 | | | |
| 161 | .00 | 73.80 | 185 | 186 | | | |
| 162 | .00 | 73.90 | 186 | 187 | | | |
| 163 | .00 | 74.30 | 187 | 188 | | | |
| 164 | .00 | 63.50 | 188 | 189 | 190 | | |
| 165 | .00 | 58.80 | 191 | 198 | 199 | | |
| 166 | .00 | 46.80 | 192 | 193 | | | |
| 167 | .00 | 34.20 | 193 | 194 | | | |
| 168 | .00 | 34.20 | 194 | 195 | | | |
| 169 | .00 | 34.20 | 195 | 196 | | | |
| 170 | .00 | 34.20 | 196 | 197 | | | |
| 171 | .00 | 34.20 | 197 | 502 | | | |
| 172 | .00 | 51.00 | 199 | 200 | | | |
| 173 | .00 | 81.50 | 170 | 201 | 208 | 702 | |
| 174 | .00 | 79.60 | 201 | 202 | | | |
| 175 | .00 | 75.00 | 202 | 203 | 216 | | |
| 176 | .00 | 72.80 | 203 | 204 | | | |
| 177 | .00 | 72.80 | 204 | 205 | | | |
| 178 | .00 | 74.10 | 205 | 206 | | | |
| 179 | .00 | 77.50 | 206 | 207 | | | |
| 180 | .00 | 77.50 | 207 | 215 | 228 | 702 | 703 |
| 181 | .00 | 81.50 | 208 | 209 | 703 | | |
| 182 | .00 | 79.80 | 209 | 210 | | | |
| 183 | .00 | 75.00 | 210 | 211 | 222 | | |
| 184 | .00 | 72.80 | 211 | 212 | | | |
| 185 | .00 | 72.80 | 212 | 213 | | | |
| 186 | .00 | 74.10 | 213 | 214 | | | |
| 187 | .00 | 77.50 | 214 | 215 | | | |
| 188 | .00 | 75.00 | 216 | 217 | | | |

DATA FILE FOR "U2CALBN2"

| | | | | | |
|---|---|---|---|---|---|
| 189 | .00 | 75.00 | 217 | 218 | |
| 190 | .00 | 73.40 | 218 | 219 | |
| 191 | .00 | 73.40 | 219 | 220 | |
| 192 | .00 | 74.30 | 220 | 221 | |
| 193 | .00 | 63.50 | 189 | 221 | 227 |
| 194 | .00 | 75.00 | 222 | 223 | |
| 195 | .00 | 75.00 | 223 | 224 | |
| 196 | .00 | 73.40 | 224 | 225 | |
| 197 | .00 | 73.40 | 225 | 226 | |
| 198 | .00 | 74.08 | 226 | 227 | |
| 199 | .00 | 33.10 | 228 | 229 | |
| 200 | .00 | 33.10 | 229 | 230 | |
| 201 | .00 | 33.10 | 230 | 231 | |
| 202 | .00 | 33.10 | 231 | 232 | |
| 203 | .00 | 33.10 | 232 | 233 | |
| 204 | 3000.00 | 33.10 | 233 | 234 | |
| 205 | -3000.00 | 71.90 | 80 | 234 | 235 |
| 300 | .00 | 16.00 | 86 | 500 | |
| 301 | .00 | 14.20 | 103 | 501 | |
| 302 | .00 | 34.20 | 198 | 502 | |
| 303 | .00 | 12.50 | 53 | 503 | |
| 304 | .00 | 33.20 | 34 | 504 | |
| 305 | .00 | 33.20 | 34 | 505 | |
| 306 | .00 | 81.50 | 21 | 506 | |

OUTPUT SELECTION: THE FOLLOWING RESULTS ARE OUTPUT
RESULTS ARE OUTPUT FOR ALL PIPES WITH PUMPS - CLOSED PIPES ARE NOTED
RESULTS ARE OUTPUT FOR THE FOLLOWING PIPES : 5 2 16 31 34 38 41 47 50 57 62 79 88 92 97 101 105 109 116 120
RESULTS ARE OUTPUT FOR THE FOLLOWING PIPES : 128 134 146 152 168 176 182 188 198 501 503 32 58 63 110 117 121 218 224 234
RESULTS ARE OUTPUT FOR THE FOLLOWING PIPES : 59 111 235 197 233
RESULTS ARE OUTPUT FOR THE FOLLOWING JUNCTION NODES : 1 2 14 15 16 27 28 36 37 49 50 66 70 74 75
RESULTS ARE OUTPUT FOR THE FOLLOWING JUNCTION NODES : 90 91 100 101 109 110 143 144 156 157 18 23 98 165 302
RESULTS ARE OUTPUT FOR THE FOLLOWING JUNCTION NODES : 204 205

THIS SYSTEM HAS 247 PIPES WITH 212 JUNCTIONS , 31 LOOPS AND 5 FGNS

TERMINATION DUE EITHER TO THE DETECTION OF AN ERROR OR USER INSTRUCTIONS

A SUMMARY OF CONDITIONS SPECIFIED FOR THE NEXT SIMULATION FOLLOWS

# DATA FILE FOR "U2CALBN2"

THE FOLLOWING SPECIFIC DEMAND CHANGES ARE MADE :

| JUNCTION NUMBER | DEMAND |
|---|---|
| 204 | .00 |
| 205 | .00 |
| 302 | 3000.00 |
| 165 | -3000.00 |

LINE 166 IS OPEN
LINE 174 IS OPEN
LINE 179 IS OPEN
LINE 185 IS OPEN
LINE 205 IS CLOSED
LINE 213 IS CLOSED
LINE 218 IS CLOSED
LINE 224 IS CLOSED
LINE 234 IS OPEN
LINE 198 IS CLOSED

THE FOLLOWING CHANGES IN PIPE DATA ARE SPECIFIED

FOR PIPE NUMBER 1 THE VALUE OF THE FIXED GRADE IS CHANGED TO 19.2

FOR PIPE NUMBER 4 THE VALUE OF THE FIXED GRADE IS CHANGED TO 19.2

FOR PIPE NUMBER 600 THE VALUE OF THE FIXED GRADE IS CHANGED TO 160.0

| PIPE NO. | NODE NOS. | | LENGTH | DIAMETER | ROUGHNESS | MINOR LOSS K | FIXED GRADE |
|---|---|---|---|---|---|---|---|
| 2 | 1 | 2 | 9.7 | 16.6 | 5.0 | 2.15 | .00 |
| 5 | 4 | 5 | 9.7 | 16.6 | 5.0 | 1.40 | .00 |

A SUMMARY OF CONDITIONS SPECIFIED FOR THE NEXT SIMULATION FOLLOWS

LINE 166 IS CLOSED
LINE 174 IS CLOSED
LINE 179 IS CLOSED
LINE 185 IS CLOSED
LINE 205 IS OPEN
LINE 213 IS OPEN
LINE 218 IS OPEN
LINE 224 IS OPEN
LINE 198 IS OPEN
LINE 234 IS CLOSED

THE FOLLOWING CHANGES IN PIPE DATA ARE SPECIFIED

FOR PIPE NUMBER 600 THE VALUE OF THE FIXED GRADE IS CHANGED TO 49.8

FOR PIPE NUMBER 1 THE VALUE OF THE FIXED GRADE IS CHANGED TO 18.6

DATA FILE FOR "U2CALBN2"

FOR PIPE NUMBER 4 THE VALUE OF THE FIXED GRADE IS CHANGED TO 18.6

| PIPE NO. | NODE NOS. | | LENGTH | DIAMETER | ROUGHNESS | MINOR LOSS K | FIXED GRADE |
|---|---|---|---|---|---|---|---|
| 2 | 1 | 2 | 9.7 | 16.6 | 5.0 | 1.90 | .00 |
| 5 | 4 | 5 | 9.7 | 16.6 | 5.0 | 1.48 | .00 |

DATA FILE FOR "U2SCNRIO"

FLOWRATE IS EXPRESSED IN GPM AND PRESSURE IN PSIG

A SUMMARY OF THE ORIGINAL DATA FOLLOWS

THE DARCY WEISBACH HEAD LOSS EQUATION IS USED, THE KINEMATIC VIS. = .0000070

THE SPECIFIC GRAVITY OF THIS LIQUID = 1.03

| PIPE NO. | NODE NOS. | | LENGTH (FEET) | DIAMETER (INCHES) | ROUGHNESS | MINOR LOSS K | FIXED GRADE |
|---|---|---|---|---|---|---|---|
| 1 | 0 | 1 | 1.0 | 16.6 | 5.0 | .00 | 11.37 |
| LINE 1 PUMP DATA (HEAD-FLOW): | | | 200.0 | .0 | 135.0 | 6400.0 | 90.0 8300.0 |
| 2 | 1 | 2 | 9.7 | 16.6 | 5.0 | 90.25 | |
| 3 | 2 | 3 | 15.9 | 18.6 | 5.0 | 7.68 | |
| 4 | 0 | 4 | 1.0 | 16.6 | 5.0 | .00 | 11.37 |
| LINE 4 PUMP DATA (HEAD-FLOW): | | | 200.0 | .0 | 135.0 | 6400.0 | 90.0 8300.0 |
| 5 | 4 | 5 | 9.7 | 16.6 | 5.0 | 90.25 | |
| 6 | 5 | 6 | 15.9 | 18.6 | 5.0 | 7.68 | |
| 7 | 3 | 6 | 6.0 | 28.5 | 5.0 | .06 | |
| 8 | 6 | 7 | 6.0 | 28.5 | 5.0 | .06 | |
| 9 | 7 | 8 | 308.8 | 28.5 | 5.0 | .48 | |
| 10 | 8 | 18 | 371.0 | 28.5 | 5.0 | .84 | |
| 11 | 8 | 9 | 2.7 | 16.6 | 5.0 | .33 | |
| 12 | 9 | 10 | 63.7 | 17.3 | .2 | .60 | |
| 13 | 10 | 103 | 124.3 | 16.6 | 5.0 | .52 | |
| 14 | 7 | 11 | 1.4 | 3.5 | 5.0 | .71 | |
| 15 | 11 | 12 | 3.8 | 3.5 | 5.0 | 3.69 | |
| 16 | 12 | 13 | 11.3 | 3.5 | 5.0 | .99 | |
| 17 | 14 | 3 | 7.0 | 28.5 | 5.0 | .06 | |
| 18 | 15 | 14 | 6.1 | 28.5 | 5.0 | .06 | |
| 19 | 16 | 15 | 7.0 | 28.5 | 5.0 | .06 | |
| 20 | 17 | 16 | 2.3 | 28.5 | 5.0 | .00 | |
| 21 | 306 | 19 | 2.3 | 29.3 | .2 | .07 | |
| 22 | 19 | 21 | 9.1 | 22.5 | 5.0 | .79 | |
| 23 | 19 | 20 | 11.4 | 29.3 | .2 | 1.49 | |
| 24 | 20 | 55 | 24.1 | 19.3 | .2 | .68 | |
| 25 | 18 | 22 | 28.1 | 6.1 | .2 | 2.76 | |
| 26 | 22 | 23 | 15.5 | 6.1 | .2 | 30.30 | |
| 27 | 23 | 24 | 6.5 | 6.1 | .2 | .18 | |
| 28 | 24 | 25 | 111.6 | 6.1 | .2 | 2.63 | |
| 29 | 25 | 26 | 67.3 | 3.8 | .2 | .22 | |
| 30 | 26 | 27 | 40.8 | 1.7 | .2 | 3.46 | |
| 31 | 27 | 28 | 1.0 | 2.3 | .2 | 14.50 | |
| LINE 31 IS CLOSED | | | | | | | |
| 32 | 28 | 29 | 31.5 | 1.7 | .2 | 25.93 | |
| 33 | 29 | 30 | 1.2 | 3.8 | .2 | 17.02 | |
| 34 | 304 | 305 | 4.8 | 3.8 | .2 | .84 | |
| 35 | 23 | 32 | 13.1 | 6.1 | .2 | .81 | |
| 36 | 33 | 34 | 1.3 | 3.0 | .2 | .54 | |
| 37 | 34 | 36 | 8.2 | 2.3 | .2 | .74 | |
| 38 | 36 | 37 | 1.0 | 2.3 | .2 | 29.70 | |
| 39 | 37 | 40 | 7.0 | 2.3 | .2 | 1.13 | |
| 40 | 34 | 38 | 7.2 | 2.3 | .2 | 1.17 | |
| 41 | 38 | 39 | 1.0 | 2.3 | .2 | 29.70 | |
| 42 | 39 | 40 | 7.1 | 2.3 | .2 | 2.03 | |

DATA FILE FOR "U2SCNRIO"

| | | | | | | |
|---|---|---|---|---|---|---|
| 43 | 40 | 45 | 5.0 | 3.0 | .2 | .69 |
| 44 | 32 | 33 | 5.0 | 6.1 | .2 | .48 |
| 45 | 33 | 35 | 2.8 | 3.0 | .2 | .79 |
| 46 | 35 | 41 | 9.2 | 2.3 | .2 | .74 |
| 47 | 41 | 42 | 1.0 | 2.3 | .2 | 29.70 |
| 48 | 42 | 45 | 7.0 | 2.3 | .2 | 2.06 |
| 49 | 35 | 43 | 7.9 | 2.3 | .2 | 1.76 |
| 50 | 43 | 44 | 1.0 | 2.3 | .2 | 29.70 |
| 51 | 44 | 46 | 8.0 | 2.3 | .2 | 2.60 |
| 52 | 45 | 46 | 1.5 | 6.1 | .2 | .12 |
| 53 | 303 | 47 | 20.8 | 6.1 | .2 | .93 |
| 54 | 47 | 30 | 200.0 | 6.1 | .2 | 3.33 |
| 55 | 24 | 48 | 3.5 | 1.4 | .2 | .85 |
| 56 | 48 | 49 | 11.0 | 1.0 | .2 | 11.64 |
| 57 | 49 | 50 | 1.0 | 1.0 | .2 | 45.30 |
| LINE 57 IS CLOSED | | | | | | |
| 58 | 50 | 51 | 17.2 | 1.0 | .2 | 17.00 |
| 59 | 51 | 52 | 1.1 | 1.4 | .2 | .90 |
| 60 | 52 | 47 | 2.9 | 1.4 | .2 | 1.73 |
| 61 | 48 | 53 | 19.0 | 1.0 | .2 | 12.94 |
| 62 | 53 | 54 | 1.0 | 1.0 | .2 | 45.30 |
| LINE 62 IS CLOSED | | | | | | |
| 63 | 54 | 51 | 9.0 | 1.0 | .2 | 17.50 |
| 64 | 31 | 139 | 47.4 | 18.6 | 5.0 | .08 |
| 65 | 22 | 71 | 125.1 | 6.1 | .2 | 3.02 |
| 66 | 55 | 56 | 104.2 | 18.6 | 5.0 | 12.71 |
| 67 | 56 | 57 | 14.9 | 18.6 | 5.0 | .60 |
| 68 | 57 | 58 | 5.0 | 18.6 | 5.0 | .30 |
| 69 | 57 | 59 | 16.1 | 14.6 | 5.0 | .67 |
| 70 | 58 | 60 | 16.1 | 12.6 | 5.0 | .47 |
| 71 | 58 | 61 | 18.3 | 14.6 | 5.0 | 1.02 |
| 72 | 59 | 62 | 1.0 | 14.6 | .2 | 21.80 |
| LINE 72 IS CLOSED | | | | | | |
| 73 | 60 | 63 | 1.0 | 14.6 | .2 | 21.80 |
| LINE 73 IS CLOSED | | | | | | |
| 74 | 61 | 64 | 1.0 | 14.6 | .2 | 21.80 |
| LINE 74 IS CLOSED | | | | | | |
| 75 | 62 | 65 | 12.5 | 15.3 | .2 | .51 |
| 76 | 63 | 65 | 10.9 | 13.3 | .2 | .37 |
| 77 | 64 | 66 | 13.3 | 15.3 | .2 | .87 |
| 78 | 65 | 66 | 5.7 | 15.3 | .2 | .08 |
| 79 | 66 | 70 | 29.5 | 15.3 | .2 | 218.95 |
| 80 | 205 | 69 | 9.3 | 15.3 | .2 | .62 |
| 81 | 69 | 68 | 30.2 | 28.5 | 5.0 | 1.82 |
| 82 | 68 | 137 | 36.9 | 28.5 | 5.0 | .04 |
| 83 | 71 | 98 | 51.2 | 6.1 | .2 | 2.85 |
| 84 | 98 | 67 | 2.9 | 6.1 | .2 | .63 |
| 85 | 71 | 72 | 8.2 | 6.1 | .2 | .36 |
| 86 | 72 | 300 | 37.1 | 6.1 | .2 | 1.17 |
| 87 | 73 | 74 | 9.8 | 2.3 | .2 | 1.35 |
| 88 | 74 | 75 | 1.0 | 2.3 | .2 | 29.70 |
| LINE 88 IS CLOSED | | | | | | |
| 89 | 75 | 78 | 7.2 | 2.3 | .2 | 1.76 |
| 90 | 73 | 79 | .9 | 6.1 | .2 | .12 |
| 91 | 79 | 76 | 8.5 | 2.3 | .2 | 1.08 |

DATA FILE FOR *U2SCNRIO*

| | | | | | | |
|---|---|---|---|---|---|---|
| 92 | 76 | 77 | 1.0 | 2.3 | .2 | 29.70 |
| LINE 92 IS CLOSED | | | | | | |
| 93 | 77 | 78 | 8.6 | 2.3 | .2 | 1.51 |
| 94 | 78 | 85 | 4.7 | 3.0 | .2 | .57 |
| 95 | 79 | 80 | 1.2 | 3.0 | .2 | 1.13 |
| 96 | 80 | 81 | 9.1 | 2.3 | .2 | 1.01 |
| 97 | 81 | 82 | 1.0 | 2.3 | .2 | 29.70 |
| LINE 97 IS CLOSED | | | | | | |
| 98 | 82 | 85 | 7.5 | 2.3 | .2 | .81 |
| 99 | 85 | 86 | 4.2 | 6.1 | .2 | .42 |
| 100 | 80 | 83 | 9.2 | 2.3 | .2 | 1.35 |
| 101 | 83 | 84 | 1.0 | 2.3 | .2 | 29.70 |
| LINE 101 IS CLOSED | | | | | | |
| 102 | 84 | 86 | 8.4 | 2.3 | .2 | 1.62 |
| 103 | 301 | 87 | 27.5 | 6.1 | .2 | 1.17 |
| 104 | 87 | 88 | 606.1 | 6.1 | .2 | 4.82 |
| 105 | 88 | 68 | 80.2 | 6.1 | .2 | 10.40 |
| 106 | 72 | 102 | 12.5 | 1.7 | .2 | .60 |
| 107 | 102 | 89 | 2.9 | 1.4 | .2 | .73 |
| 108 | 89 | 90 | 13.0 | 1.0 | .2 | 12.28 |
| 109 | 90 | 91 | 1.0 | 1.0 | .2 | 45.30 |
| LINE 109 IS CLOSED | | | | | | |
| 110 | 91 | 92 | 24.0 | 1.0 | .2 | 38.28 |
| 111 | 92 | 93 | .9 | 1.4 | .2 | .22 |
| 112 | 93 | 94 | 2.9 | 1.4 | .2 | 1.35 |
| 113 | 94 | 95 | 18.7 | 1.7 | .2 | 1.20 |
| 114 | 95 | 87 | .9 | 1.7 | .2 | 1.67 |
| 115 | 89 | 96 | 20.3 | 1.0 | .2 | 12.46 |
| 116 | 96 | 97 | 1.0 | 1.0 | .2 | 45.30 |
| LINE 116 IS CLOSED | | | | | | |
| 117 | 97 | 92 | 11.2 | 1.0 | .2 | 38.00 |
| 118 | 98 | 99 | 101.9 | 3.8 | .2 | 1.46 |
| 119 | 99 | 100 | 35.0 | 1.7 | .2 | 3.57 |
| 120 | 100 | 101 | 1.0 | 2.3 | .2 | 14.50 |
| LINE 120 IS CLOSED | | | | | | |
| 121 | 101 | 88 | 34.5 | 2.3 | .2 | 228.27 |
| 122 | 120 | 104 | 31.0 | 16.6 | 5.0 | .89 |
| 123 | 104 | 105 | 5.4 | 16.6 | 5.0 | .89 |
| 124 | 105 | 106 | .8 | 16.6 | 5.0 | .00 |
| 125 | 104 | 107 | 56.3 | 5.6 | 5.0 | 4.01 |
| 126 | 107 | 108 | 12.7 | 5.6 | 5.0 | .73 |
| 127 | 108 | 109 | 1.9 | 7.5 | 5.0 | .76 |
| 128 | 109 | 110 | 1.0 | 7.5 | .2 | 35.00 |
| LINE 128 IS CLOSED | | | | | | |
| 129 | 110 | 111 | 1.9 | 7.5 | 5.0 | .98 |
| 130 | 111 | 112 | 79.0 | 5.6 | 5.0 | 3.28 |
| 131 | 105 | 113 | 79.8 | 5.6 | 5.0 | 4.34 |
| 132 | 113 | 114 | 12.0 | 5.6 | 5.0 | .73 |
| 133 | 114 | 115 | 1.9 | 7.5 | 5.0 | .76 |
| 134 | 115 | 116 | 1.0 | 7.5 | .2 | 30.00 |
| LINE 134 IS CLOSED | | | | | | |
| 135 | 116 | 117 | 1.9 | 7.5 | 5.0 | .98 |
| 136 | 117 | 118 | 100.4 | 5.6 | 5.0 | 3.61 |
| 137 | 119 | 118 | .8 | 16.6 | 5.0 | .00 |
| 138 | 118 | 112 | .8 | 16.6 | 5.0 | .07 |

DATA FILE FOR *U2SCNRIO*

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 139 | 112 | 136 | 26.8 | 16.6 | 5.0 | .45 | | |
| 140 | 103 | 120 | 18.9 | 16.6 | 5.0 | 35.41 | | |
| 141 | 103 | 121 | 12.0 | 16.6 | 5.0 | 35.41 | | |
| 142 | 121 | 122 | 3.1 | 5.6 | 5.0 | .00 | | |
| 143 | 120 | 123 | 58.0 | 5.6 | 5.0 | 4.00 | | |
| 144 | 123 | 124 | 13.7 | 5.6 | 5.0 | .73 | | |
| 145 | 124 | 125 | 1.7 | 7.5 | 5.0 | .76 | | |
| 146 | 125 | 126 | 1.0 | 8.0 | .2 | 20.00 | | |
| 147 | 126 | 127 | 1.9 | 7.5 | 5.0 | 1.48 | | |
| 148 | 127 | 128 | 74.8 | 5.6 | 5.0 | 2.68 | | |
| 149 | 121 | 129 | 54.5 | 5.6 | 5.0 | 4.01 | | |
| 150 | 129 | 130 | 16.3 | 5.6 | 5.0 | .91 | | |
| 151 | 130 | 131 | 1.7 | 7.5 | 5.0 | .50 | | |
| 152 | 131 | 132 | 1.0 | 8.0 | .2 | 45.00 | | |
| 153 | 132 | 133 | 1.9 | 7.5 | 5.0 | .98 | | |
| 154 | 133 | 134 | 75.7 | 5.6 | 5.0 | 3.28 | | |
| 155 | 135 | 134 | 2.3 | 16.6 | 5.0 | .00 | | |
| 156 | 134 | 128 | 30.8 | 16.6 | 5.0 | .07 | | |
| 157 | 128 | 136 | 4.3 | 16.6 | 5.0 | .45 | | |
| 158 | 136 | 0 | 414.1 | 16.6 | 5.0 | .96 | 28.90 | |
| 159 | 137 | 138 | 16.4 | 28.5 | 5.0 | .92 | | |
| 160 | 139 | 138 | 126.7 | 18.6 | 5.0 | .64 | | |
| 161 | 138 | 0 | 286.2 | 34.5 | 5.0 | 1.13 | 40.00 | |
| 162 | 21 | 140 | 27.2 | 22.5 | 5.0 | .20 | | |
| 163 | 140 | 141 | 6.5 | 12.6 | 5.0 | .34 | | |
| 164 | 141 | 142 | 4.3 | 12.6 | 5.0 | .12 | | |
| 165 | 142 | 143 | 4.3 | 8.0 | .2 | .32 | | |
| 166 | 143 | 144 | 1.0 | 8.0 | .2 | .00 | | |
| LINE 166 PUMP DATA (HEAD-FLOW): | | | | 775.0 | .0 | 580.0 | 4000.0 | 500.0 4725.0 |
| LINE 166 IS CLOSED | | | | | | | | |
| 167 | 144 | 145 | 9.9 | 12.0 | .2 | 3.76 | | |
| 168 | 145 | 146 | 16.7 | 12.0 | .2 | .93 | | |
| 169 | 140 | 153 | 16.0 | 22.5 | 5.0 | .06 | | |
| 170 | 153 | 173 | 21.5 | 22.5 | 5.0 | .30 | | |
| 171 | 153 | 154 | 6.5 | 12.6 | 5.0 | .44 | | |
| 172 | 154 | 155 | 4.3 | 12.6 | 5.0 | .12 | | |
| 173 | 155 | 156 | 4.3 | 8.0 | .2 | .32 | | |
| 174 | 156 | 157 | 1.0 | 8.0 | .2 | .00 | | |
| LINE 174 PUMP DATA (HEAD-FLOW): | | | | 775.0 | .0 | 580.0 | 4000.0 | 500.0 4725.0 |
| LINE 174 IS CLOSED | | | | | | | | |
| 175 | 157 | 158 | 9.8 | 12.0 | .2 | 3.76 | | |
| 176 | 158 | 146 | 31.4 | 12.0 | .2 | 1.07 | | |
| 177 | 141 | 147 | .8 | 1.7 | .2 | .20 | | |
| 178 | 147 | 148 | .5 | 1.7 | .2 | .07 | | |
| 179 | 148 | 149 | 17.2 | 1.4 | .2 | 1.69 | | |
| LINE 179 IS CLOSED | | | | | | | | |
| 180 | 149 | 150 | .7 | 1.7 | .2 | 26.27 | | |
| 181 | 150 | 151 | 2.2 | 1.4 | .2 | 2.12 | | |
| 182 | 151 | 152 | 19.9 | 1.4 | .2 | 2.42 | | |
| 183 | 154 | 159 | .8 | 1.7 | 5.0 | .69 | | |
| 184 | 159 | 160 | .5 | 1.7 | .2 | .07 | | |
| 185 | 160 | 161 | 17.2 | 1.4 | .2 | 1.69 | | |
| LINE 185 IS CLOSED | | | | | | | | |
| 186 | 161 | 162 | 1.0 | 1.7 | .2 | 26.57 | | |
| 187 | 162 | 163 | 2.7 | 1.4 | .2 | 3.70 | | |

DATA FILE FOR "U2SCNRIO"

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 188 | 163 | 164 | 19.9 | 1.4 | .2 | 2.21 | | | |
| 189 | 193 | 164 | 21.2 | 3.0 | .2 | .32 | | | |
| 190 | 164 | 152 | 16.7 | 3.0 | .2 | .54 | | | |
| 191 | 152 | 165 | 117.8 | 3.0 | .2 | 4.45 | | | |
| 192 | 146 | 166 | 156.0 | 16.0 | .2 | 1.15 | | | |
| 193 | 166 | 167 | 18.7 | 16.0 | .2 | .44 | | | |
| 194 | 167 | 168 | 10.5 | 15.3 | .2 | .14 | | | |
| 195 | 168 | 169 | 2.5 | 15.3 | .2 | .00 | | | |
| 196 | 169 | 170 | 1.0 | 19.3 | .2 | 11.50 | | | |
| 197 | 170 | 171 | 5.0 | 15.3 | .2 | .48 | | | |
| 198 | 302 | 165 | 205.0 | 15.3 | .2 | 482.00 | | | |
| 199 | 165 | 172 | 7.5 | 19.3 | .2 | .00 | | | |
| 200 | 172 | 31 | 31.0 | 18.6 | 5.0 | .07 | | | |
| 201 | 173 | 174 | 1.0 | 12.6 | 5.0 | .00 | | | |
| 202 | 174 | 175 | 4.7 | 13.3 | .2 | .10 | | | |
| 203 | 175 | 176 | 4.3 | 13.3 | .2 | .12 | | | |
| 204 | 176 | 177 | 4.2 | 8.0 | .2 | .32 | | | |
| 205 | 177 | 178 | 1.0 | 8.0 | .2 | .00 | | | |
| LINE 205 PUMP DATA (HEAD-FLOW): | | | | 775.0 | .0 | 580.0 | 4000.0 | 500.0 | 4725.0 |
| LINE 205 IS CLOSED | | | | | | | | | |
| 206 | 178 | 179 | 9.8 | 12.0 | .2 | 3.76 | | | |
| 207 | 179 | 180 | 27.9 | 12.0 | .2 | .46 | | | |
| 208 | 173 | 181 | 16.0 | 22.5 | 5.0 | .12 | | | |
| 209 | 181 | 182 | .4 | 12.6 | 5.0 | .00 | | | |
| 210 | 182 | 183 | 4.8 | 13.3 | .2 | .00 | | | |
| 211 | 183 | 184 | 4.4 | 13.3 | .2 | .12 | | | |
| 212 | 184 | 185 | 4.2 | 8.0 | .2 | .32 | | | |
| 213 | 185 | 186 | 1.0 | 8.0 | .2 | .00 | | | |
| LINE 213 PUMP DATA (HEAD-FLOW): | | | | 775.0 | .0 | 580.0 | 4000.0 | 500.0 | 4725.0 |
| LINE 213 IS CLOSED | | | | | | | | | |
| 214 | 186 | 187 | 10.4 | 12.0 | .2 | 3.76 | | | |
| 215 | 187 | 180 | 17.4 | 12.0 | .2 | .29 | | | |
| 216 | 175 | 188 | 1.0 | 1.7 | .2 | .49 | | | |
| 217 | 188 | 189 | .3 | 1.4 | .2 | .07 | | | |
| 218 | 189 | 190 | 16.9 | 1.4 | .2 | 1.69 | | | |
| LINE 218 IS CLOSED | | | | | | | | | |
| 219 | 190 | 191 | 1.0 | 1.7 | .2 | 26.85 | | | |
| 220 | 191 | 192 | 2.3 | 1.4 | .2 | 2.80 | | | |
| 221 | 192 | 193 | 19.5 | 1.4 | .2 | 2.44 | | | |
| 222 | 183 | 194 | .4 | 1.7 | .2 | .49 | | | |
| 223 | 194 | 195 | .7 | 1.4 | .2 | .07 | | | |
| 224 | 195 | 196 | 16.4 | 1.4 | .2 | 1.69 | | | |
| LINE 224 IS CLOSED | | | | | | | | | |
| 225 | 196 | 197 | 1.0 | 1.7 | .2 | 26.55 | | | |
| 226 | 197 | 198 | 2.9 | 1.4 | .2 | 2.41 | | | |
| 227 | 198 | 193 | 39.2 | 1.4 | .2 | 5.21 | | | |
| 228 | 180 | 199 | 212.5 | 15.3 | .2 | 1.33 | | | |
| 229 | 199 | 200 | 2.5 | 15.3 | .2 | .25 | | | |
| 230 | 200 | 201 | 2.5 | 19.3 | .2 | .00 | | | |
| 231 | 201 | 202 | 1.0 | 19.3 | .2 | 11.50 | | | |
| 232 | 202 | 203 | 2.5 | 19.3 | .2 | .19 | | | |
| 233 | 203 | 204 | 2.5 | 15.3 | .2 | .00 | | | |
| 234 | 204 | 205 | 235.1 | 15.3 | .2 | 1814.60 | | | |
| 235 | 70 | 205 | .7 | 15.3 | .2 | .48 | | | |
| 500 | 300 | 73 | 4.8 | 6.1 | .2 | .76 | | | |

DATA FILE FOR "U2SCNRIO"

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 501 | 86 | 301 | 2.3 | 6.1 | .2 | 191.23 | |
| 502 | 171 | 302 | .4 | 15.3 | .2 | .00 | |
| 503 | 46 | 303 | 5.8 | 6.1 | .2 | 144.52 | |
| 504 | 30 | 304 | 1.5 | 3.8 | .2 | .00 | |
| 505 | 305 | 31 | 32.9 | 6.1 | .2 | 1.94 | |
| 506 | 18 | 306 | 103.8 | 28.5 | 5.0 | .08 | |
| 600 | 17 | 0 | 1.0 | 18.6 | 5.0 | 4800.00 | 161.30 |
| LINE 600 IS CLOSED | | | | | | | |
| 700 | 140 | 146 | 58.0 | 11.3 | .2 | 6.24 | |
| LINE 700 IS CLOSED | | | | | | | |
| 701 | 153 | 146 | 58.0 | 11.3 | .2 | 6.24 | |
| LINE 701 IS CLOSED | | | | | | | |
| 702 | 173 | 180 | 58.0 | 11.3 | .2 | 6.24 | |
| LINE 702 IS CLOSED | | | | | | | |
| 703 | 181 | 180 | 58.0 | 11.3 | .2 | 6.24 | |
| LINE 703 IS CLOSED | | | | | | | |

A SUCCESSFUL GEOMETRIC VERIFICATION HAS BEEN COMPLETED

| JUNCTION NUMBER | DEMAND | ELEVATION | CONNECTING PIPES | | |
|---|---|---|---|---|---|
| 1 | .00 | 43.10 | 1 | 2 | |
| 2 | .00 | 42.40 | 2 | 3 | |
| 3 | .00 | 26.50 | 3 | 7 | 17 |
| 4 | .00 | 43.10 | 4 | 5 | |
| 5 | .00 | 42.40 | 5 | 6 | |
| 6 | .00 | 26.50 | 6 | 7 | 8 |
| 7 | .00 | 26.50 | 8 | 9 | 14 |
| 8 | .00 | 26.50 | 9 | 10 | 11 |
| 9 | .00 | 29.20 | 11 | 12 | |
| 10 | .00 | 31.80 | 12 | 13 | |
| 11 | .00 | 24.60 | 14 | 15 | |
| 12 | .00 | 24.60 | 15 | 16 | |
| 13 | 208.00 | 24.60 | 16 | | |
| 14 | .00 | 26.50 | 17 | 18 | |
| 15 | .00 | 26.50 | 18 | 19 | |
| 16 | .00 | 26.50 | 19 | 20 | |
| 17 | .00 | 26.50 | 20 | 600 | |
| 18 | .00 | 36.30 | 10 | 25 | 506 |
| 19 | .00 | 81.50 | 21 | 22 | 23 |
| 20 | .00 | 81.50 | 23 | 24 | |
| 21 | .00 | 81.50 | 22 | 162 | |
| 22 | .00 | 19.10 | 25 | 26 | 65 |
| 23 | .00 | 12.50 | 26 | 27 | 35 |
| 24 | .00 | 12.50 | 27 | 28 | 55 |
| 25 | .00 | 33.80 | 28 | 29 | |
| 26 | .00 | 34.50 | 29 | 30 | |
| 27 | .00 | 11.00 | 30 | 31 | |
| 28 | .00 | 10.80 | 31 | 32 | |
| 29 | .00 | 32.30 | 32 | 33 | |
| 30 | .00 | 23.20 | 33 | 54 | 504 |
| 31 | .00 | 35.50 | 64 | 200 | 505 |
| 32 | .00 | 12.50 | 35 | 44 | |
| 33 | .00 | 12.50 | 36 | 44 | 45 |
| 34 | .00 | 12.50 | 36 | 37 | 40 |

DATA FILE FOR "U2SCNRIO"

| | | | | | |
|---|---|---|---|---|---|
| 35 | .00 | 12.50 | 45 | 46 | 49 |
| 36 | .00 | 17.50 | 37 | 38 | |
| 37 | .00 | 17.50 | 38 | 39 | |
| 38 | .00 | 17.50 | 40 | 41 | |
| 39 | .00 | 17.50 | 41 | 42 | |
| 40 | .00 | 14.20 | 39 | 42 | 43 |
| 41 | .00 | 17.40 | 46 | 47 | |
| 42 | .00 | 17.40 | 47 | 48 | |
| 43 | .00 | 17.40 | 49 | 50 | |
| 44 | .00 | 17.40 | 50 | 51 | |
| 45 | .00 | 14.20 | 43 | 48 | 52 |
| 46 | .00 | 14.20 | 51 | 52 | 503 |
| 47 | .00 | 10.80 | 53 | 54 | 60 |
| 48 | .00 | 12.50 | 55 | 56 | 61 |
| 49 | .00 | 8.30 | 56 | 57 | |
| 50 | .00 | 8.30 | 57 | 58 | |
| 51 | .00 | 10.80 | 58 | 59 | 63 |
| 52 | .00 | 10.80 | 59 | 60 | |
| 53 | .00 | 8.30 | 61 | 62 | |
| 54 | .00 | 8.30 | 62 | 63 | |
| 55 | .00 | 81.50 | 24 | 66 | |
| 56 | .00 | 81.50 | 66 | 67 | |
| 57 | .00 | 79.00 | 67 | 68 | 69 |
| 58 | .00 | 79.00 | 68 | 70 | 71 |
| 59 | .00 | 74.80 | 69 | 72 | |
| 60 | .00 | 74.80 | 70 | 73 | |
| 61 | .00 | 74.80 | 71 | 74 | |
| 62 | .00 | 74.80 | 72 | 75 | |
| 63 | .00 | 74.80 | 73 | 76 | |
| 64 | .00 | 74.80 | 74 | 77 | |
| 65 | .00 | 77.20 | 75 | 76 | 78 |
| 66 | .00 | 77.20 | 77 | 78 | 79 |
| 67 | .00 | 16.80 | 84 | | |
| 68 | .00 | 35.50 | 81 | 82 | 105 |
| 69 | .00 | 65.80 | 80 | 81 | |
| 70 | .00 | 74.10 | 79 | 235 | |
| 71 | .00 | .10 | 65 | 83 | 85 |
| 72 | .00 | .10 | 85 | 86 | 106 |
| 73 | .00 | 16.10 | 87 | 90 | 500 |
| 74 | .00 | 17.50 | 87 | 88 | |
| 75 | .00 | 17.50 | 88 | 89 | |
| 76 | .00 | 17.50 | 91 | 92 | |
| 77 | .00 | 17.50 | 92 | 93 | |
| 78 | .00 | 14.20 | 89 | 93 | 94 |
| 79 | .00 | 16.10 | 90 | 91 | 95 |
| 80 | .00 | 16.10 | 95 | 96 | 100 |
| 81 | .00 | 17.40 | 96 | 97 | |
| 82 | .00 | 17.60 | 97 | 98 | |
| 83 | .00 | 17.40 | 100 | 101 | |
| 84 | .00 | 17.60 | 101 | 102 | |
| 85 | .00 | 14.20 | 94 | 98 | 99 |
| 86 | .00 | 14.20 | 99 | 102 | 501 |
| 87 | .00 | 20.90 | 103 | 104 | 114 |
| 88 | .00 | 33.20 | 104 | 105 | 121 |
| 89 | .00 | 14.20 | 107 | 108 | 115 |

DATA FILE FOR "U2SCNRIO"

| | | | | | | |
|---|---|---|---|---|---|---|
| 90 | .00 | 31.60 | 108 | 109 | | |
| 91 | .00 | 31.60 | 109 | 110 | | |
| 92 | .00 | 12.10 | 110 | 111 | 117 | |
| 93 | .00 | 12.10 | 111 | 112 | | |
| 94 | .00 | 23.00 | 112 | 113 | | |
| 95 | .00 | 21.00 | 113 | 114 | | |
| 96 | .00 | 8.30 | 115 | 116 | | |
| 97 | .00 | 8.30 | 116 | 117 | | |
| 98 | .00 | 16.80 | 83 | 84 | 118 | |
| 99 | .00 | 34.50 | 118 | 119 | | |
| 100 | .00 | 11.40 | 119 | 120 | | |
| 101 | .00 | 28.50 | 120 | 121 | | |
| 102 | .00 | 14.20 | 106 | 107 | | |
| 103 | .00 | 34.50 | 13 | 140 | 141 | |
| 104 | .00 | 34.50 | 122 | 123 | 125 | |
| 105 | .00 | 34.50 | 123 | 124 | 131 | |
| 106 | .00 | 34.50 | 124 | | | |
| 107 | .00 | 43.80 | 125 | 126 | | |
| 108 | .00 | 42.90 | 126 | 127 | | |
| 109 | .00 | 44.40 | 127 | 128 | | |
| 110 | .00 | 44.40 | 128 | 129 | | |
| 111 | .00 | 44.50 | 129 | 130 | | |
| 112 | .00 | 34.50 | 130 | 138 | 139 | |
| 113 | .00 | 43.80 | 131 | 132 | | |
| 114 | .00 | 42.90 | 132 | 133 | | |
| 115 | .00 | 44.40 | 133 | 134 | | |
| 116 | .00 | 44.40 | 134 | 135 | | |
| 117 | .00 | 44.30 | 135 | 136 | | |
| 118 | .00 | 34.50 | 136 | 137 | 138 | |
| 119 | .00 | 34.50 | 137 | | | |
| 120 | .00 | 34.50 | 122 | 140 | 143 | |
| 121 | .00 | 34.50 | 141 | 142 | 149 | |
| 122 | .00 | 34.50 | 142 | | | |
| 123 | .00 | 47.30 | 143 | 144 | | |
| 124 | .00 | 43.80 | 144 | 145 | | |
| 125 | .00 | 44.40 | 145 | 146 | | |
| 126 | .00 | 44.40 | 146 | 147 | | |
| 127 | .00 | 43.80 | 147 | 148 | | |
| 128 | .00 | 34.50 | 148 | 156 | 157 | |
| 129 | .00 | 43.80 | 149 | 150 | | |
| 130 | .00 | 43.80 | 150 | 151 | | |
| 131 | .00 | 44.40 | 151 | 152 | | |
| 132 | .00 | 44.40 | 152 | 153 | | |
| 133 | .00 | 43.80 | 153 | 154 | | |
| 134 | .00 | 34.50 | 154 | 155 | 156 | |
| 135 | .00 | 34.50 | 155 | | | |
| 136 | .00 | 34.50 | 139 | 157 | 158 | |
| 137 | .00 | 19.30 | 82 | 159 | | |
| 138 | .00 | 19.30 | 159 | 160 | 161 | |
| 139 | .00 | 19.30 | 64 | 160 | | |
| 140 | .00 | 81.50 | 162 | 163 | 169 | 700 |
| 141 | .00 | 75.00 | 163 | 164 | 177 | |
| 142 | .00 | 72.80 | 164 | 165 | | |
| 143 | .00 | 72.80 | 165 | 166 | | |
| 144 | .00 | 74.20 | 166 | 167 | | |

DATA FILE FOR "U2SCNRIO"

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 145 | .00 | 77.50 | 167 | 168 | | | |
| 146 | .00 | 81.20 | 168 | 176 | 192 | 700 | 701 |
| 147 | .00 | 75.00 | 177 | 178 | | | |
| 148 | .00 | 75.00 | 178 | 179 | | | |
| 149 | .00 | 73.80 | 179 | 180 | | | |
| 150 | .00 | 73.90 | 180 | 181 | | | |
| 151 | .00 | 74.30 | 181 | 182 | | | |
| 152 | .00 | 63.50 | 182 | 190 | 191 | | |
| 153 | .00 | 81.50 | 169 | 170 | 171 | 701 | |
| 154 | .00 | 75.00 | 171 | 172 | 183 | | |
| 155 | .00 | 72.80 | 172 | 173 | | | |
| 156 | .00 | 72.80 | 173 | 174 | | | |
| 157 | .00 | 74.20 | 174 | 175 | | | |
| 158 | .00 | 77.50 | 175 | 176 | | | |
| 159 | .00 | 75.00 | 183 | 184 | | | |
| 160 | .00 | 75.00 | 184 | 185 | | | |
| 161 | .00 | 73.80 | 185 | 186 | | | |
| 162 | .00 | 73.90 | 186 | 187 | | | |
| 163 | .00 | 74.30 | 187 | 188 | | | |
| 164 | .00 | 63.50 | 188 | 189 | 190 | | |
| 165 | .00 | 58.80 | 191 | 198 | 199 | | |
| 166 | .00 | 46.80 | 192 | 193 | | | |
| 167 | .00 | 34.20 | 193 | 194 | | | |
| 168 | .00 | 34.20 | 194 | 195 | | | |
| 169 | .00 | 34.20 | 195 | 196 | | | |
| 170 | .00 | 34.20 | 196 | 197 | | | |
| 171 | .00 | 34.20 | 197 | 502 | | | |
| 172 | .00 | 51.00 | 199 | 200 | | | |
| 173 | .00 | 81.50 | 170 | 201 | 208 | 702 | |
| 174 | .00 | 79.60 | 201 | 202 | | | |
| 175 | .00 | 75.00 | 202 | 203 | 216 | | |
| 176 | .00 | 72.80 | 203 | 204 | | | |
| 177 | .00 | 72.80 | 204 | 205 | | | |
| 178 | .00 | 74.10 | 205 | 206 | | | |
| 179 | .00 | 77.50 | 206 | 207 | | | |
| 180 | .00 | 77.50 | 207 | 215 | 228 | 702 | 703 |
| 181 | .00 | 81.50 | 208 | 209 | 703 | | |
| 182 | .00 | 79.80 | 209 | 210 | | | |
| 183 | .00 | 75.00 | 210 | 211 | 222 | | |
| 184 | .00 | 72.80 | 211 | 212 | | | |
| 185 | .00 | 72.80 | 212 | 213 | | | |
| 186 | .00 | 74.10 | 213 | 214 | | | |
| 187 | .00 | 77.50 | 214 | 215 | | | |
| 188 | .00 | 75.00 | 216 | 217 | | | |
| 189 | .00 | 75.00 | 217 | 218 | | | |
| 190 | .00 | 73.40 | 218 | 219 | | | |
| 191 | .00 | 73.40 | 219 | 220 | | | |
| 192 | .00 | 74.30 | 220 | 221 | | | |
| 193 | .00 | 63.50 | 189 | 221 | 227 | | |
| 194 | .00 | 75.00 | 222 | 223 | | | |
| 195 | .00 | 75.00 | 223 | 224 | | | |
| 196 | .00 | 73.40 | 224 | 225 | | | |
| 197 | .00 | 73.40 | 225 | 226 | | | |
| 198 | .00 | 74.08 | 226 | 227 | | | |
| 199 | .00 | 33.10 | 228 | 229 | | | |

DATA FILE FOR "U2SCNRIO"

| | | | | | |
|---|---|---|---|---|---|
| 200 | .00 | 33.10 | 229 | 230 | |
| 201 | .00 | 33.10 | 230 | 231 | |
| 202 | .00 | 33.10 | 231 | 232 | |
| 203 | .00 | 33.10 | 232 | 233 | |
| 204 | .00 | 33.10 | 233 | 234 | |
| 205 | .00 | 71.90 | 80 | 234 | 235 |
| 300 | .00 | 16.00 | 86 | 500 | |
| 301 | .00 | 14.20 | 103 | 501 | |
| 302 | .00 | 34.20 | 198 | 502 | |
| 303 | .00 | 12.50 | 53 | 503 | |
| 304 | .00 | 33.20 | 34 | 504 | |
| 305 | .00 | 33.20 | 34 | 505 | |
| 306 | .00 | 81.50 | 21 | 506 | |

OUTPUT SELECTION: THE FOLLOWING RESULTS ARE OUTPUT
RESULTS ARE OUTPUT FOR ALL PIPES WITH PUMPS - CLOSED PIPES ARE NOTED
RESULTS ARE OUTPUT FOR THE FOLLOWING PIPES : 5 2 16 31 34 38 41 47 50 57 62 79 88 92 97 101 105 109 116 120
RESULTS ARE OUTPUT FOR THE FOLLOWING PIPES : 128 134 146 152 168 176 182 188 198 501 503 32 58 63 110 117 121 218 224 234
RESULTS ARE OUTPUT FOR THE FOLLOWING PIPES : 59 111 235 197 233
RESULTS ARE OUTPUT FOR THE FOLLOWING JUNCTION NODES : 1 2 14 15 16 27 28 36 37 49 50 66 70 74 75
RESULTS ARE OUTPUT FOR THE FOLLOWING JUNCTION NODES : 90 91 100 101 109 110 143 144 156 157 18 23 98 165 302
RESULTS ARE OUTPUT FOR THE FOLLOWING JUNCTION NODES : 204 205

THIS SYSTEM HAS 247 PIPES WITH 212 JUNCTIONS , 31 LOOPS AND 5 FGNS

TERMINATION DUE EITHER TO THE DETECTION OF AN ERROR OR USER INSTRUCTIONS

A SUMMARY OF CONDITIONS SPECIFIED FOR THE NEXT SIMULATION FOLLOWS

THE FOLLOWING SPECIFIC DEMAND CHANGES ARE MADE :

| JUNCTION NUMBER | DEMAND |
|---|---|
| 13 | 124.00 |
| 204 | 4850.00 |
| 205 | -4850.00 |

LINE 31 IS OPEN
LINE 57 IS OPEN
LINE 62 IS OPEN
LINE 72 IS OPEN
LINE 73 IS OPEN
LINE 74 IS OPEN
LINE 88 IS OPEN

DATA FILE FOR "U2SCNRIO"

LINE 92 IS OPEN
LINE 97 IS OPEN
LINE 101 IS OPEN
LINE 109 IS OPEN
LINE 116 IS OPEN
LINE 120 IS OPEN
LINE 128 IS OPEN
LINE 134 IS OPEN
LINE 205 IS OPEN
LINE 213 IS OPEN
LINE 218 IS OPEN
LINE 224 IS OPEN
LINE 234 IS CLOSED
LINE 600 IS OPEN

THE FOLLOWING CHANGES IN PIPE DATA ARE SPECIFIED

FOR PIPE NUMBER 1 THE VALUE OF THE FIXED GRADE IS CHANGED TO 14.0

FOR PIPE NUMBER 4 THE VALUE OF THE FIXED GRADE IS CHANGED TO 14.0

FOR PIPE NUMBER 600 THE VALUE OF THE FIXED GRADE IS CHANGED TO 26.5

| PIPE NO. | NODE NOS. | | LENGTH | DIAMETER | ROUGHNESS | MINOR LOSS K | FIXED GRADE |
|---|---|---|---|---|---|---|---|
| 2 | 1 | 2 | 9.7 | 16.6 | 5.0 | 6.67 | .00 |
| 5 | 4 | 5 | 9.7 | 16.6 | 5.0 | 6.67 | .00 |
| 24 | 20 | 55 | 24.1 | 19.3 | .2 | 210.38 | .00 |
| 79 | 66 | 70 | 29.5 | 15.3 | .2 | 18.38 | .00 |
| 130 | 111 | 112 | 79.0 | 5.6 | 5.0 | 13.28 | .00 |
| 136 | 117 | 118 | 100.4 | 5.6 | 5.0 | 13.61 | .00 |
| 148 | 127 | 128 | 74.8 | 5.6 | 5.0 | 12.68 | .00 |
| 154 | 133 | 134 | 75.7 | 5.6 | 5.0 | 13.28 | .00 |

A SUMMARY OF CONDITIONS SPECIFIED FOR THE NEXT SIMULATION FOLLOWS

THE FOLLOWING SPECIFIC DEMAND CHANGES ARE MADE :

| JUNCTION NUMBER | DEMAND |
|---|---|
| 13 | 113.00 |
| 302 | 2635.00 |
| 165 | -2635.00 |
| 204 | .00 |
| 205 | .00 |

LINE 4 IS CLOSED
LINE 72 IS CLOSED
LINE 73 IS CLOSED
LINE 74 IS CLOSED
LINE 166 IS OPEN
LINE 174 IS OPEN
LINE 179 IS OPEN
LINE 185 IS OPEN

DATA FILE FOR "U2SCNRIO"

LINE 205 IS CLOSED
LINE 213 IS CLOSED
LINE 218 IS CLOSED
LINE 224 IS CLOSED
LINE 198 IS CLOSED
LINE 234 IS OPEN

THE FOLLOWING CHANGES IN PIPE DATA ARE SPECIFIED

| PIPE NO. | NODE NOS. | | LENGTH | DIAMETER | ROUGHNESS | MINOR LOSS K | FIXED GRADE |
|---|---|---|---|---|---|---|---|
| 2 | 1 | 2 | 9.7 | 16.6 | 5.0 | 6.30 | .00 |
| 5 | 4 | 5 | 9.7 | 16.6 | 5.0 | 6.30 | .00 |
| 130 | 111 | 112 | 79.0 | 5.6 | 5.0 | 53.28 | .00 |
| 136 | 117 | 118 | 100.4 | 5.6 | 5.0 | 53.61 | .00 |
| 148 | 127 | 128 | 74.8 | 5.6 | 5.0 | 52.68 | .00 |
| 154 | 133 | 134 | 75.7 | 5.6 | 5.0 | 53.28 | .00 |

A SUMMARY OF CONDITIONS SPECIFIED FOR THE NEXT SIMULATION FOLLOWS

THE FOLLOWING SPECIFIC DEMAND CHANGES ARE MADE :

| JUNCTION NUMBER | DEMAND |
|---|---|
| 13 | 113.00 |
| 302 | 2800.00 |
| 165 | -2800.00 |
| 204 | .00 |
| 205 | .00 |

LINE 128 IS CLOSED
LINE 134 IS CLOSED

THE FOLLOWING CHANGES IN PIPE DATA ARE SPECIFIED

FOR PIPE NUMBER 1 THE VALUE OF THE FIXED GRADE IS CHANGED TO 11.4

FOR PIPE NUMBER 4 THE VALUE OF THE FIXED GRADE IS CHANGED TO 11.4

| PIPE NO. | NODE NOS. | | LENGTH | DIAMETER | ROUGHNESS | MINOR LOSS K | FIXED GRADE |
|---|---|---|---|---|---|---|---|
| 2 | 1 | 2 | 9.7 | 16.6 | 5.0 | 6.48 | .00 |
| 5 | 4 | 5 | 9.7 | 16.6 | 5.0 | 6.48 | .00 |
| 130 | 111 | 112 | 79.0 | 5.6 | 5.0 | 3.28 | .00 |
| 136 | 117 | 118 | 100.4 | 5.6 | 5.0 | 3.61 | .00 |
| 148 | 127 | 128 | 74.8 | 5.6 | 5.0 | 2.68 | .00 |
| 154 | 133 | 134 | 75.7 | 5.6 | 5.0 | 3.28 | .00 |

EER No. 91-0450
Revision 0
Att. 7.8
Page 1 of 2

ATTACHMENT 7

Pump Performance Log

Pump Name 2A NNS SW Unit 2 PT No. 24-1-2 Rev. No. 1

Constants: Flow 5600 gpm Turbine/Pump Speed NA rpm

Reference Values

Differential pressure 67.4 psig Vibration 1.67 mil

| | Low Action | Low Alert | Acceptable | High Alert | High Action |
|---|---|---|---|---|---|
| dp | < 60.7 | 60.7 - < 62.7 | 62.7 - 72.1 | > 72.1 - 74.1 | > 74.1 |
| mils | | | 0 - 3.34 | > 3.34 - 5.01 | > 5.01 |

| Test Reasn | Test Date | Suct. Press Stop | Suct. Press Run | Disch Press | Diff Press | Disp Vel Mils | "/sec | Alrt (V/P) | Actn (V/P) | * | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| R | 8/11/91 | 5.4 | 5.4 | 53 | 63.7 | 4.0 | 0.2 | V | | | Increase Freq 1028 |
| O | 9/15/91 | 4.9 | 4.9 | 52 | 63.2 | 4.6 | 0.24 | V | | | SAIT DCN 91-1329 |
| PMR | 11/9/91 | 5.6 | 5.6 | 56.6 | 67.1 | 0.23 | | | | | Pump Rebuilt See FTS-WR00 |
| R | 11/14/91 | 5.8 | 5.8 | 56 | 66.3 | 0.45 | 084 | | | | |
| | / / | | | | | | | | | | |
| | / / | | | | | | | | | | |
| | / / | | | | | | | | | | |
| | / / | | | | | | | | | | |
| | / / | | | | | | | | | | |
| | / / | | | | | | | | | | |
| | / / | | | | | | | | | | |

*Increase frequency and request evaluation (if required).

EER No. 91-0450
Revision 0
Att. 7.8
Page 2 of 2

ATTACHMENT 2

Pump Performance Log

Pump Name A-NUC-SW Unit 2 PT No. 24.1-2 Rev. No. 8

Constants: Flow 5600 gpm Turbine/Pump Speed N/A rpm

Reference Values

Differential pressure 64.4 psig Vibration 2.5 mil

| | Low Action | Low Alert | Acceptable | High Alert | High Action |
|---|---|---|---|---|---|
| dp | < 58.0 | 58.0 - < 59.9 | 59.9 - 68.9 | > 68.9 - 70.8 | > 70.8 |
| mils | | | 0 - 4.5 | > 4.5 - 6.5 | > 6.5 |

| Test Reasn | Test Date | Suct. Press Stop | Suct. Press Run | Disch Press | Diff Press | Disp Vel Mils | Vel "/sec | Alrt (V/P) | Actn (V/P) | Note |
|---|---|---|---|---|---|---|---|---|---|---|
| O | 12/26/90 | 5.13 | 5.13 | 55 | 65.97 | 0.6 | 0.025 | — | — | R017 |
| A | 2/11/91 | 5.4 | 5.4 | 53 | 63.7 | 0.5 | 0.6 | — | — | |
| O | 3/26/91 | 5.8 | 5.8 | 56 | 65.3 | 1.5 | 0.2 | — | — | |
| A | 5/13/91 | 5.5 | 5.5 | 56 | 66.7 | 0.445 | 0.03 | — | — | R017 |
| R | 8/11/91 | 5.4 | 5.4 | 55.4 | 65.4 | 0.1 | 0.005 | — | — | |
| O | 10/11/91 | 5.0 | 5.0 | 55 | 66.1 | 0.46 | 0.03 | — | — | |
| R | 11/14/91 | 5.1 | 5.1 | 56 | 66.5 (67.0 mgc 12/19/91) | 0.67 | 0.192 | — | — | |
| — | __/__/__ | | | | | | | — | — | |
| — | __/__/__ | | | | | | | — | — | |
| — | __/__/__ | | | | | | | — | — | |
| — | __/__/__ | | | | | | | — | — | |

e)Increase frequency and request evaluation (if required).