Modeling Ice Passage Through Submergible and Non-submergible Tainter Gates

Gordon Gooch, John Rand, Ben Hanamoto and Jon Zufelt

November 1990

This report is printed on paper that contains a minimum of 50% recycled material.

**U.S. Army Corps
of Engineers**
Cold Regions Research &
Engineering Laboratory

Modeling Ice Passage Through Submergible and Non-submergible Tainter Gates

Gordon Gooch, John Rand, Ben Hanamoto and John Zufelt

November 1990

Prepared for
U.S. ARMY ENGINEER DISTRICT, ROCK ISLAND

Approved for public release; distribution is unlimited.

PREFACE

This report was prepared by Gordon Gooch, Civil Engineering Technician, John Rand, Research General Engineer, Ben Hanamoto, Research General Engineer, and Jon Zufelt, Research Hydraulic Engineer, all of the Ice Engineering Research Branch, Experimental Engineering Division, U.S. Army Cold Regions Research and Engineering Laboratory. Funding for this research was provided by the U.S. Army Engineer District, Rock Island.

Dr. Jean-Claude Tatinclaux and Dr. James Lever technically reviewed the manuscript of this report.

The contents of this report are not to be used for advertising or promotional purposes. Citation of brand names does not constitute an official endorsement or approval of the use of such commercial products.

CONVERSION FACTORS: U.S.CUSTOMARY TO METRIC (SI) UNITS OF MEASUREMENT

These conversion factors include all the significant digits given in the conversion tables in the ASTM *Metric Practice Guide* (E 380), which has been approved for use by the Department of Defense. Converted values should be rounded to have the same precision as the original (see E 380).

<i>Multiply</i>	<i>By</i>	<i>To obtain</i>
inch	25.4	millimeter
foot	0.3048	meter
foot ³ /second	0.02831685	meter ³ /second
gallon/minute	0.00006309020	meter ³ /second
degrees Fahrenheit	$t^{\circ}\text{C}=(t^{\circ}\text{F}-32)/1.8$	degrees Celsius

Modeling Ice Passage Through Submergible and Non-submergible Tainter Gates

GORDON GOOCH, JOHN RAND,
BEN HANAMOTO AND JON ZUFELT

INTRODUCTION

This study examined ice passage through two types of tainter gates using CRREL's Starved Rock Lock and Dam model (Fig. 1). Our objectives were to model the flow of ice through the existing tainter gates and through submergible tainter gates in the same location (Fig. 2), to move the submergible gates to a location closer to the lock chamber and model the ice passage at that new location, and finally to compare, when possible, plastic ice and real ice and to observe the effect of each.

All tests simulated typical low flow conditions of approximately 6000 ft³/s with normal winter ice conditions of 6 to 18 in. of brash ice in the ship track. Near-surface water velocities were obtained with each gate setting to evaluate any changes in the flow pattern and velocity.

Each test was documented by still photographs and 1/2-in. VHS video. A summary of the video is available from CRREL. Reference photographs are included here as Appendix A.

Throughout this report, submergible tainter gates will be called just that, while the normal tainter gates will be simply tainter gates.

SCALE MODEL HYDRAULIC DESIGN

The Starved Rock Lock and Dam physical model, built in the refrigerated research area of CRREL's Ice Engineering Facility, is an undistorted Froude model, constructed at a length scale ratio of 25:1.

Ice conveyance and transport can be studied as a two-dimensional process in either an undistorted or distorted model. The passage of ice over and under gates, however, is inherently a three-dimensional process. To maintain model similarity near the gate structures, it was necessary to ensure

that the vertical and horizontal scales be equal and thus we used an undistorted model.

In a Froude model, the Froude number of the model and the full-scale structure must be equal.

$$(Fr)_r = \frac{(Fr)_p}{(Fr)_m} = \frac{V_r}{\sqrt{g_r h_r}} = 1$$

where

- Fr = Froude number
- V = velocity
- g = acceleration due to gravity
- h = depth
- V_r = velocity ratio = V_p/V_m
- r = ratio full scale/model scale
- p = prototype (full scale)
- m = model.

The scale of a model is often represented by means of its length ratio L_r , which is equal to the characteristic horizontal length ratio L_p/L_m , the flow depth ratio $h_r = h_p/h_m$, discharge Q and area of cross section A . Since the acceleration due to gravity is the same in the model and in the prototype, g_r (the gravity ratio) = $g_p/g_m = 1$, and since $h_r = L_r$ in an undistorted model, we see that $V_r = (L_r)^{1/2}$. Since $Q_r = A_r V_r$ and $A_r = L_r$, then $Q_r = L_r^{5/2}$.

The mean winter discharge at Starved Rock Lock and Dam is approximately 6300 ft³/s, with a minimum shipping channel depth of 12 ft. The maximum scale for a model (large model) is dependent on the space and pumping capacity available and the minimum scale (small model) is dependent on measurement accuracy and the requirement to avoid viscous and surface tension scale effects. Based on these requirements, a length scale ratio of 25:1 was chosen, which resulted in a mean winter model discharge of approximately 900 gal./min (about mid-range of the facility's

Figure 1. Starved Rock Lock and Dam model. Lock approach on right; submergible gates at site 2 in center; existing tainter gates, site 1, on left.

Figure 2. Model submergible gates.

pumping capacity). With this model scale, the model depths would range from 0.1 ft (over submerged Leopold Island) upstream of the dam to approximately 1.0 ft in the deepest sections, which are suitable to retain measurement accuracy.

At this scale, though, a model covering the full river width would be too large to fit in the refrigerated research area. However, during the winter months, when ice passage is a problem at Starved Rock Lock and Dam, only the first one or two tainter gates are operated, with an average total opening of about 4.0 ft. The entire river freezes over except for the continually rebroken shipping lane hugging the right bank. The areas of interest when the river is ice covered are the shipping channel and the portion of the river extending over to the first two tainter gates of the dam. Submerged Leopold Island also forms somewhat of a separation line down the center of the river. Based on this information, we decided to build the model for only a portion of the river and to calibrate the model to the mean winter discharge, velocities and ice conditions.

The model is 40 ft wide by 130 ft long, which is a full-scale size of 1000 by 3250 ft (Fig. 3). It includes the lock approach guide wall, the upper miter gates and three of the ten tainter gates on the dam. Since only the first two tainter gates are operated during the winter (ice problem periods), no adjustments were necessary to the model discharge. The use of a partial model, however, reduced the flow area and made it possible that the

Table 1. Tainter gate openings for January and February 1989.

January	Average 24-hour total gate opening (ft)	February	Average 24-hour total gate opening (ft)
1	8.0	1	6.8
2	7.0	2	6.2
3	6.6	3	6.6
4	5.7	4	5.3
5	6.2	5	4.3
6	7.6	6	3.7
7	8.2	7	4.3
8	12.6	8	4.6
9	13.6	9	4.5
10	11.9	10	3.9
11	12.1	11	4.0
12	10.3	12	4.6
13	9.1	13	3.6
14	8.3	14	4.2
15	7.3	15	5.0
16	7.1	16	4.7
17	6.9	17	5.5
18	6.2	18	4.2
19	6.2	19	4.8
20	6.0	20	4.6
21	5.7	21	4.4
22	5.3	22	4.4
23	5.3	23	4.2
24	5.1	24	4.1
25	5.5	25	4.2
26	6.0	26	4.0
27	6.2	27	4.3
28	5.9	28	3.7
29	6.7	Average	4.5
30	6.5		
31	7.3		
Average	7.2

Figure 3. Model limits.

model velocities could be too high and thus not be representative of full-scale conditions. A detailed field survey of two-dimensional water velocities was conducted to calibrate the model velocities. We used flow dividers, aligners and roughness elements to adjust the model velocities to match the full-scale measurements (at $V_r = 5$).

The entire series of tests was based on the typical winter-time hydraulic conditions experienced at Starved Rock. Monthly flow records were provided by the lockmaster and are shown in Appendix B. From these data, we found that the average 24-hour gate opening for Starved Rock for the month of February 1989 was 4.5 ft. The record of the various daily settings is provided in Table 1. According to the USGS stage-discharge rating

Table 2. USGS stage–discharge curve for Starved Rock Dam. After USGS (1981) Stage discharge relationships at dams on the Illinois and Des Plaines rivers in Illinois. U.S. Geological Survey Report 81-1009.

Gate opening (ft)	Discharge (ft ³ /s) for downstream pool elevations of:								
	442	444	446	448	450	452	454	456	458*
0.0	0	0	0	0	0	0	0	0	0
0.5	781	686	594	521	454	387	315	231	102
1.0	1,560	1,490	1,290	1,130	987	841	686	502	221
1.5	2,340	2,340	2,030	1,780	1,550	1,330	1,080	791	348
2.0	3,110	3,110	2,820	2,470	2,150	1,830	1,490	1,090	481
2.5	3,880	3,880	3,630	3,180	2,770	2,360	1,910	1,400	617
3.0	4,620	4,620	4,460	3,910	3,400	2,900	2,360	1,720	757
3.5	5,340	5,340	5,340	4,660	4,060	3,460	2,810	2,040	899
4.0	6,020	6,020	6,020	5,430	4,730	4,030	3,280	2,400	1,040
4.5	6,540	6,540	6,540	6,220	5,410	4,610	3,760	2,750	1,190
5.0	7,210	7,210	7,210	7,030	6,120	5,210	4,240	3,100	1,340
5.5	7,780	7,780	7,780	7,780	6,840	5,830	4,740	3,470	1,490
6.0	8,320	8,320	8,320	8,320	7,590	6,460	5,260	3,840	1,640
6.5	8,860	8,860	8,860	8,860	8,380	7,110	5,780	4,230	1,800
7.0	9,380	9,380	9,380	9,380	9,170	7,800	6,320	4,620	1,950
7.5	9,880	9,880	9,880	9,880	9,880	8,500	6,870	5,030	2,110
8.0	10,400	10,400	10,400	10,400	10,400	9,220	7,490	5,440	2,390
8.5	10,800	10,800	10,800	10,800	10,800	9,960	8,040	5,860	2,580
9.0	11,300	11,300	11,300	11,300	11,300	10,700	8,710	6,360	2,770
9.5	11,800	11,800	11,800	11,800	11,800	11,500	9,360	6,830	2,970
10.0	12,200	12,200	12,200	12,200	12,200	12,200	10,000	7,320	3,170
10.5	12,700	12,700	12,700	12,700	12,700	12,700	10,700	7,820	3,380
11.0	13,100	13,100	13,100	13,100	13,100	13,100	11,500	8,350	3,590
11.5	13,500	13,500	13,500	13,500	13,500	13,500	12,300	8,900	3,810
12.0	13,900	13,900	13,900	13,900	13,900	13,900	13,100	9,550	4,030
12.5	14,300	14,300	14,300	14,300	14,300	14,300	14,300	10,200	4,260
13.0	14,500	14,500	14,500	14,500	14,500	14,500	submerged weir flow		
13.5	14,500	14,500	14,500	14,500	14,500				

* Feet above mean sea level.

curve for a tainter gate at Starved Rock (Table 2), a discharge rate of 6020 to 6540 ft³/s corresponds to a gate setting between 4 and 4.5 ft and a downstream pool elevation of 446 ft above mean sea level.

Information obtained from the daily navigation report and from personal conversations with the Lockmaster disclosed that the ice that typically forms in the ship tracks is broken floating ice about 6 to 18 in. thick.

GATE HYDRAULICS

We assessed the hydraulics and ice passage capabilities of two types of gates during this model study: standard tainter gates and submergible gates. The hydraulics of the two gate types are quite different, with the tainter operating in a pressure flow situation while the submergible operates in the gravity-free overfall condition.

Consequently, the heads across the gates and their effects on the discharge are also quite different. The tainter is raised to allow flow to pass beneath it, resulting in a high head (the difference between the water surface elevations above and below the gate), forcing flow through an orifice beneath the gate. Discharge is generally given by a formula relating orifice area and the head across the gate

$$Q_t = C_t A_g (2gH)^{1/2}$$

where

- Q_t = discharge under the tainter gate
- C_t = discharge coefficient for a tainter gate
- A_g = area of the gate opening
- H = head across the gate, i.e., the difference in water surface elevations between the upstream and downstream pools.
- g = acceleration due to gravity.

For the tainter gates at Starved Rock, the discharge coefficient C_t was 0.78 for winter conditions and the area of the gate opening A_g is the width of the gate (60 ft) times the gate lift. Thus, for a tainter gate, the discharge varies with the head to the $1/2$ power. Experience at Starved Rock has shown that a tainter gate must be raised at least 4 ft before ice will begin to be drawn under the gate and passed downstream. At this opening, however, ice passage is slow and ice bridges typically form at the gate opening, requiring repeated assistance from tow boats to break them up.

A submergible gate is operated by lowering the gate below the water surface and allowing flow to pass over its crest. This type of gate is similar to an ogee crest overfall spillway and thus the head is measured as the difference between the water surface elevation upstream and the top of the submerged gate. Discharge is generally given by a formula relating this head, gate width and a discharge coefficient

$$Q_s = C_s B H^{3/2}$$

where

Q_s = discharge over the submergible gate

C_s = discharge coefficient for the submergible gate

B = gate width

H = head on the gate or gate opening.

For the model, the discharge coefficient C_s was found to be about 3.4 for the range of winter flows associated with ice passage problems. The submergible gates were slightly narrower than the tainter gates (52 ft, full-scale) because of the gate lowering mechanism. Therefore, the discharge for a submergible gate varies with the head to the $3/2$ power.

What we see from these formulae for the discharge through the two types of gates is that, for a given discharge, the submergible gate must have a greater opening. This is beneficial in times of low flow when ice passage is difficult. For example, for the mean winter discharge of $6300 \text{ ft}^3/\text{s}$, one tainter gate must be raised 4.1 ft. At this opening, the tainter will pass ice. For the same discharge, a submergible gate of the same width must be, or more aptly expressed, can be lowered 9.7 ft. Similarly, one could lower two submergible gates 6.1 ft each to accommodate the same flow. With submergible gates, ice passage is not a problem at these openings. Experience at other facilities with submergible gates has shown adequate ice passage at gate openings of 3 ft (which would corre-

Figure 4. Plot of gate opening vs discharge and the zones of ice passage.

spond to a discharge of about $1100 \text{ ft}^3/\text{s}$ for a 60-ft-wide gate). Figure 4 is a plot of gate openings vs discharge for the two types of gates. The zones of ice passage are also marked for each type of gate. The most appropriate position of submergible gates at Starved Rock Lock and Dam, as well as the probability of ice bridging, are discussed later.

MODEL CALIBRATION

The Starved Rock model was calibrated by matching the model water surface elevation and velocities to the measured full-scale elevation and velocities at a full-scale mean winter discharge of $6300 \text{ ft}^3/\text{s}$. As stated above, for an undistorted Froude model, the discharge scale ratio is $Q_r = L_r^{5/2}$ or for the Starved Rock Lock and Dam model $(25)^{5/2} = 3125$. Since $Q_r = Q_p/Q_m$, for a full-scale discharge of $6300 \text{ ft}^3/\text{s}$

$$3125 = \frac{6300 \text{ ft}^3/\text{s}}{Q_m}$$

or

$$Q_m = 2.01 \text{ ft}^3/\text{s} \times 449 (\text{gal./min})/(\text{ft}^3/\text{s}) = 902 \text{ gal./min}$$

To be assured of standard conditions for the model flow calibration, we maintained runs of 900 gal./min and an upper pool elevation of 458.75 with a single tainter gate opening of 4 ft (full scale). Similar tests with the submergible gates provided

individual full-scale gate settings of 6.75 ft for each of two submergible gates.

TESTING SEQUENCE

The test sequence is summarized in Table 3. As previously stated, the model flow conditions were 900 gal./min (6300 ft³/s full scale) and for the last two tests we used a lower flow of 315 gal./min (1972 ft³/s full scale). The locations of the gates for the various tests are identified as position 1 and position 2. Position 1 is the location of the existing tainter gates at Starved Rock Lock and Dam. Position 2 is a new location, which is proposed as an alternate site for the construction of two new submergible tainter gates. The location of the position 2 is at headgate 8, which is 151 ft from the ramp up to the headgates (Fig. 3).

Another variable in the test sequence was the type of ice used. Our initial tests were conducted with 4-in. squares of 1/4-in.-thick low density polyethylene plastic ice. The scaled thickness of this ice was 0.5 ft. In addition, freshwater ice was used for a number of tests. Its scaled thickness ranged from 0.5 to 1.3 ft.

Test 1 is the open water calibration test in which

a constant pool elevation of 458.75 ft was maintained with a model flow of 900 gal./min. In this test, gate openings that corresponded to full-scale settings for low flow, winter conditions were used for both the tainter gate and the submergible gates. The full-scale gate openings were 4 ft for a single tainter gate or 6.75 ft for each of two submergible gates. As a comparison to later tests, the water velocities near the surface were obtained with two tainter gates open to a 2-ft depth each. Figure 5 shows the flow pattern that developed with this latter condition.

Test 2 was the first of three tests using the plastic ice with the tainter gates in position 1. Two tainter gates were each opened 2 ft (full scale). The plastic ice was placed in the model at mid-pool and allowed to float down to the dam. It was unable to pass under the tainter gates with the 2-ft setting. It should be noted that experience at Starved Rock Lock and Dam shows that they are unable to pass ice with a single gate opening less than 4 ft.

Test 3 was our first test with the submergible gates. Plastic ice was pooled upstream of the dam. As expected, with the increased opening required for the submergible gates and the flow being over the gate, the ice quickly passed. This run was also used to calibrate the submergible gates. The total

Table 3. Test summary.

Test	Q (gal./ min)	Gate	Position	Ice type	Total gate opening (ft)	Average ice thickness (ft)	Temp. (°F)	Date (1989)
1	900	Standard	1	None	4*	open water calibration	50	27 June
2	900	Standard	1	Plastic	4*	0.5	50	28 June
3	900	Submergible	1	Plastic	11.6*	0.5	50	29 June
4	900	Submergible	1	None	13.5*	velocity measurements	50	6 July
5	900	Submergible	1	Plastic	13.5*	0.5; boom test	50	8 July
6	900	Submergible	2	Natural	13.5*	0.6	25	3 Aug
7	900	Submergible	2	Natural	13.5*	1.3	25	4 Aug
8	900	Submergible	2	Natural	13.5*	1.2	25	7 Aug
9	900	Submergible	2	Natural	13.5*	1.2	15	8 Aug
10S	900	Submergible	2	Natural	13.5*	0.6	25	9 Aug
10T	900	Standard	1	Natural	4**	0.6	25	9 Aug
11S	900	Submergible	2	Natural	13.5*	1.3	25	10 Aug
11T	900	Standard	1	Natural	4**	1.3	25	10 Aug
12A	315	Submergible	2	Natural	6.75*	1.1	20	11 Aug
12B	315	Submergible	2	Plastic	6.75*	0.5	20	11 Aug

*Two gates

**One gate

Figure 5. Velocity profile (ft/s) with two tainter gates open to a 2-ft depth (full scale).

gate setting needed to maintain the constant pool elevation was 13.5 ft full scale (6.75 ft $\times$ 2 gates).

Test 4 was used to document the flow patterns around the two submergible gates with a total gate opening of 13.5 ft. The flow pattern developed in open water around the submergible gates in position 1 is shown in Figure 6.

Test 5 analyzed how the submergible gates in position 1 passed plastic ice with ice booms placed

so that they extended from the gates to the area between the second and third mooring cell, simulating the channel. The area in back of the booms was filled with irregularly shaped pieces of plastic ice. The area between the booms was filled with the 4-in. uniform squares of plastic ice. During the test, all of the model ice cleared the channel, partly because the ice booms were flexible enough to prevent the ice blocks from arching and stopping the ice flow. Had the channel remained rigid, arching might have been experienced.

Test 6 was the first with the gates in the new location, and the first using randomly shaped freshwater ice. The gate settings were established at a total opening of 13.5 ft (full scale). An ice channel was broken out that was approximately 120 ft wide (full scale) in front of the submergible gates and extended to an area between the first and second mooring cell. After the initial conditions were set, the irregularly shaped, broken ice was allowed to pass. The ice arched in the channel approximately 700 ft upstream from the gates. This arch was easily broken by the passage of a model barge in the ship track. Once the initial arch was broken, the flow in the ice channel was such that a second arch never formed. Figure 7 shows the resulting velocity profile.

Test 7 was conducted with an equivalent full-scale ice thickness of 1.3 ft. This test indicates that, with simulated barge traffic, a clear passage can be

Figure 6. Velocity profile (ft/s) with two submergible gates, each with a 6.7-ft opening (full scale) in position 1.

Figure 7. Velocity profile (ft/s) with two submergible gates, each with a 6.7-ft opening and a 120-ft ice channel (all full scale) at position 2.

maintained to the submergible tainters in position 2.

Test 8 was the initial test to compare how well ice passed through a channel of half the width of that used in test 6. Both submergibles were set at the standard 6.75 ft but the ice channel was only broken out to a width of approximately 60 ft (full scale). In the initial period of the test, the ice arched closer to the gates than previously noted, and arching continued even after the initial arch was broken. The ice passed freely again once the channel was widened to 120 ft.

Test 9 was conducted at a lower room temperature, which caused some difficulties. First, we noted that once the ice had been broken it would quickly knit back together. Also, we noticed that the barge had a much harder time maneuvering in the ship track. The ice was more inclined to form larger pancakes, yet would be broken into smaller floes upon impact with the dam piers and could pass over the gates easily.

Test 10 was a comparison test between the submergible tainters in position 2 and the tainter gates in position 1. After the ice test, surface velocity measurements were taken for the submergible tainter (Fig. 7) and the tainter gate in position 1 (Fig. 8).

Test 11 was conducted with Donald Bycznski, Lockmaster, and Edward Leuch, Assistant Chief, Project Operations, Rock Island District, present.

Figure 8. Velocity profile (ft/s) of a single tainter gate with a 4-ft gate opening (full scale) and an ice channel open to the third mooring cell.

Figure 9. Velocity profile (ft/s) with two submergible gates, each with a 3.3-ft opening (full scale) at position 2.

The room temperature was 25°F, which was typical of most of the tests. A sequence identical to test series 10 was conducted. Initially, the submergible gates in position 2 were operated after the ice was broken. The barge made several trips up and down the river to simulate normal traffic. After the ice had cleared from part of the ship track, a channel was broken to the tainter gate in position 1, which was opened after the two submergible gates were closed. We noticed that flow velocities were much lower and the ice could not pass as freely as when the submergible gates were open in position 2.

Test 12 examined a reduced flow of 315 gal./min (1972 ft³/s full scale). Our primary purpose was to monitor the ice passage over a full-scale submergible gate opening of 3.4 ft per gate. Ice continued to pass over in spite of the reduced velocities (Fig. 9).

SUMMARY

Our first five tests were conducted at location 1, the existing location of the tainter gates at Starved Rock Lock and Dam. Tests 6–12 moved the submergible gates to location 2. Ice flushing improved greatly with the submergible gates at this location. Velocities more than doubled, and a 30% decrease in the broken ice surface area would result if a clear channel was maintained for ice passage. The final test reduced the two submergible gate openings to a total of 6.75 ft. The flow was reduced to 315 gal./min (1972 ft³/s full-scale). The tainter gate open-

ing for this flow would be about 1 ft. Even with this reduced flow, ice could pass over the crest of the submergible gates.

A model tow barge simulated the effect of river traffic on fragmented ice. This disruption of the ice helped heavy ice concentrations move toward the gates. We did not simulate the propeller wash effect that would go along with barge and tow boat traffic, but this additional flushing would only improve ice conveyance. We evaluated ice passage through a previously cut 60-ft channel. Because of the arching of the broken ice in this channel, this width had to be increased to 120 ft to allow efficient and continued ice passage.

CONCLUSIONS AND RECOMMENDATIONS

The model study of Starved Rock Lock and Dam has shown conclusively that submergible gates will effectively pass more ice than the exist-

ing tainter gates. Flow velocities immediately upstream of each gate type showed no appreciable difference from one gate style to another. The major advantage of the submergible gate is that it provides three times the flow depth for the same discharge and pool elevation, allowing for easier ice passage. This in turn would mean less icebreaking requirements from the shipping channel to the dam gates, more ice removal from the shipping channel lock approach area and an overall improvement in ice management for winter navigation. Gate icing problems may also be reduced with the use of submergible dam gates. Simulated barge traffic increased ice movement towards the dam gates, resulting in an ice-free channel from the shipping lane to the dam gate.

We feel that submergible gates located at the second location, which is closer to the lock chamber, will prevent ice problems in the lock approach and allow efficient and timely winter operations at Starved Rock Lock and Dam.

APPENDIX A: REFERENCE PHOTOGRAPHS

Figure A1. Submergible gates before installation.

Figure A2. Installed submergible gates, site 2, with unbroken ice cover.

Figure A3. Submergible gates at site 1, with plastic ice.

Figure A4. Submergible gates at site 1, gates submerged, plastic ice.

Figure A5. Open-water flow calibration, submersible gates at site 2.

Figure A6. Ice cover intact; shipping channel on left, mooring cells in center, submersible gate pier at bottom center, flow diversion with blocks between cells.

Figure A7. Ice cover broken in shipping channel and in ice clearing channel from shipping channel to dam gates, before testing.

Figure A8. Ice passage over submergible gates at site 2.

a.

b.

Figure A9. Arching of broken ice cover above dam gates, low-flow winter conditions.

Figure A10. Tow boat Capt. "Buz" simulating one-barge traffic.

Figure A11. Simulated two-barge traffic.

Figure A12. Simulated air bubblers in clearing channel above dam gates; ice-free conditions during ice cover buildup prior to testing.

APPENDIX B. DATA

LOCKMASTER'S DAILY REPORT STARVED ROCK LOCKDATE 1 JAN 1989

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER	WIND	
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT
12 M	458.78	443.32	3'	4'	0	0	0	0	0	0	0	0	7'		FG		CLM
1 AM	58.84	43.29													FG		CLM
2	58.89	43.29												OPENED #1-1' @ 0210 AM	FG		CLM
3	58.90	43.45	4'										8'		FG		CLM
4	58.90	43.46													FG		CLM
5	58.94	43.50												OPENED #1 1' @ 555 AM	FG		CLM
6	58.94	43.60	5'										9'		FG		CLM
7	58.95	43.68													FG		CLM
8	58.95	43.73													FG		CLM
9	58.94	43.78													FG		CLM
10	58.93	43.80													FG	SW	L
11	58.92	43.81													FG	S	L
12	58.90	43.83													LT. FG	S	L-4
1 PM	58.90	43.85													FA	S	L
2	58.91	43.85													FA	S	L
3	58.90	43.87													FA	S	L
4	458.88	443.27	3'	4	0	0	0	0	0	0	0	0	9'		FA	SW	L
5	58.87	43.88													PC		CLM
6	58.85	43.91													PC	SW	L-3
7	58.86	43.92													PC	SW	L
8	58.77	43.92												CLOSED #1-2' @ 8:55 AM	PC	W	L
9	58.82	43.82	3'										7'		MIST	W	L
10	58.82	43.65													MIST	W	L
11	58.82	43.63													MIST	W	L
24 Hour Temp.			PRECIPITATION			MEN ON DUTY								REMARKS			
MAX.			Start	End	Am.	12 to 8				BOTTOMLEY SWARTZ				V. to trap, yd @ 7:10 AM - SK V. to trap, yd @ 3:15 PM - SK greased gate pulleys - SK (WT 35 ICE 1A Y 4CX)			
MIN.						8 to 4				KOSARSKI SADNICK							
6 AM																	
23°			24 Hour FP	Pretp. 6 AM	0	4 to 12				GALLUP GERANT							

LOCKMASTER'S DAILY REPORT STARVED ROCK LOCK

 DATE 2 JAN 1989

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER	WIND		
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT	
12 M	458.90	473.52	3'	4'	0	0	0	0	0	0	0	0	7'		MIST	W	L	
1 AM	58.83	43.51													LT MIST	W	L	
2	58.90	43.49														W	M	
3	58.90	43.48														W	M	
4	58.87	43.44														W	M	
5	58.91	43.38														W	M	
6	58.98	43.48	4'										8' 8"	OPENED #1 1' @ 5:40 AM	CL	W	M-14	
7	58.95	43.60		5'									9'	OPENED #2 1' @ 6:50 AM	PC	W	L	
8	58.95	43.68													PC	NW	L-8	
9	58.82	43.73													CL	NW	L	
10	58.77	43.76												closed #2 - 2' @ 10:15 AM	CL	NW	L	
11	58.80	43.50	3'										7'		PC	NW	L	
12	58.84	43.43													PC	W	L-6	
1 PM	58.85	43.38													PC	W	L	
2	58.83	43.35													CL	SW	L	
3	58.81	43.29													CL	SW	L	
4	458.28	443.29	4'	3'	0	0	0	0	0	0	0	0	2'		CL		clm	
5	58.25	43.23													CL		clm	
6	58.68	43.18											50	CLOSED #1 & #2 - 1' @ 6:00 AM	CL		clm	
7	58.20	42.80	3'	2'									4'		CL		clm	
8	58.76	42.63													CL		clm	
9	58.87	42.47												12 OPENED #1 & #2 @ 9:30 AM	CL		clm	
10	58.92	42.60	4'										6' 6"		CL	S	L	
11	59.00	42.75	4'										8' 8"	OPENED #2 - 2' @ 11:05	CL	S	L	
24 Hour Temp.	PRECIPITATION			MEN ON DUTY										REMARKS				
MAX.	Start	End	Am.	AUG 7'										✓ storage y.d. @ 9:50 AM ✓ storage y.d. @ 3:15 PM (150)				
MIN.				12 to 8	BOTTOMLEY		SWARTZ											
				8 to 4	PORTER		SPILERS											
				4 to 12														
6 AM																		
21°	24 Hour Ppt.	6 AM	T	4 to 12	GALLUP		GEHANT		(WT 34 ICE 0) GR PLOTS									

LOCKMASTER'S DAILY REPORT STARVED ROCK LOCK

 DATE 3 JAN 1989

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER	WIND					
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT				
12 M	58.99	44.94	4'	4'	0	0	0	0	0	0	0	0	8' 8"	OPENED #1 1' @ 12:10 A	CL	SW	L				
1 AM	58.97	43.21	5'										9'		CL	S	L				
2	58.95	43.36													CL	S	L				
3	58.89	43.43													CL	S	L				
4	58.81	43.49											36	CLOSED #1 1' @ 4:55 A	CL	SW	L				
5	58.78	43.38	4'										8' 8"	CLOSED #1 1' @ 5:10 A	MIST	S	L				
6	58.78	43.24	3'										7' 7"	CLOSED #2 1' @ 6:35 A	MIST	SW	L-5				
7	58.73	43.09		3'									6' 6"	CLOSED #1 1' @ 7:05 A	MIST	WSW	L				
8	58.74	42.90	2'										5'		CL	W	L				
9	58.77	42.80													CL	NW	L				
10	58.77	42.82											15'	CLOSED #2-2' @ 11:43	PC	W	M				
11	58.74	42.65		1'									3'		CL	NW	M				
12	58.75	42.60													CL	NW	M-24				
1 PM	58.90	42.51											9'	OPENED #2-2' @ 1:25	CL	NW	M				
2	58.88	42.67		3'									5'		CL	NW	M				
3	59.00	42.78											10'	OPENED #1-1' @ 3:25	CL	NW	M				
4	59.00	42.90	4'	3'	0	0	0	0	0	0	0	0	6' 6"	OPENED #1-1' @ 3:40 PM	CL	NW	M-16				
5	59.00	43.00		4'									7' 7"	OPENED #2-1' @ 4:45 AM	CL	NW	M				
6	58.96	43.25											15'		CL	NW	L-6				
7	58.90	43.26													CL	NW	L				
8	58.85	43.23													CL	NW	L				
9	58.87	43.30													CL	NW	L				
10	58.82	43.31											40		CL	NW	L				
11	58.78	43.33	3'										7' 7"	CLOSED #1-1' @ 11:15 PM	CL	NW	L				
24 Hour Temp.	PRECIPITATION			MEN ON DUTY										REMARKS							
MAX.	Start	End	Ant.																		
MIN.																					
6 AM	24 Hour Ppt	6 AM	T	4 to 12											GR Puffies (WT 34° ICE RPT 3FY4CX) (FREEZING MIST)						
30°																					

LOCKMASTER'S DAILY REPORT STARVED ROCK LOCKDATE 4 JAN 1989

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER	WIND		
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT	
-12 M	458.79	443.12	3'	4'	0	0	0	0	0	0	0	0	7'		CL	NW	L	
1 AM	58.80	43.07													PC	NW	L	
2	58.81	43.00													PC	NW	L	
3	58.77	42.97													PC	NW	L	
4	58.76	42.93	3'										35	CLOSED #2-1' @ 4:15A	PC	NW	L	
5	58.80	42.83											6'		PC	NW	L	
6	58.83	42.74													PC	NW	L-3	
7	58.85	42.73													PC	NW	L	
8	58.93	42.72													FA	NW	L	
9	58.89	42.69													PC	W	L	
10	58.87	42.67													PC	W	L	
11	58.94	42.66												REARRANGED GATES	FA	SE	L	
12	58.80	42.64	5'	1'									6'		FA	S	L	
1 PM	58.81	42.60													FA	S	L	
2	58.79	42.56													FA	SE	L	
3	58.90	42.50													FA	S	L	
4	458.74	442.50	5'	1'	0	0	0	0	0	0	0	0	6' 7"	CLOSED #1-1' @ 5:45 PM	FA	S	L	
5	58.71	42.37	4'										5'		FA	S	L	
6	58.70	42.32												10	CLOSED #1-1' @ 7:50 PM	FA	SE	L-10
7	58.73	42.22	3'										4'		FA	SE	L	
8	58.77	42.10													FA	S	L	
9	58.82	42.00													FA	S	L	
10	58.90	41.98												16	OPENED #1-1' @ 10:30 PM	FA		CLW
11	58.97	42.08	4'										5' 5"	OPENED #1-1' @ 11:05 PM	FA		CLW	
24 Hour Temp.	PRECIPITATION			MEN ON DUTY										REMARKS				
MAX.	Start	End	Am.	12 80	KOSARSKI					PORTER								
33°				8	WITALKA					SPIRES								
MIN.				to	PORTER													
12°				4														
6 AM																		
13°	24 Hour FPrecip.	6 AM	T	4 to 12	GALLUP					GEHANT								
										WT-34° ICE RPT Ø								

V storage yd @ 11:00 AM - 9K

V storage yd @ 7:25 AM - 11K

V storage yd @ 3:15 PM - 60

LOCKMASTER'S DAILY REPORT STARVED ROCK LOCKDATE 5 JAN 1989

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER	WIND		
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT	
12 M	459.00	442.24	5'	1'	0	0	0	0	0	0	0	0	0	6' 6"	OPENED #2-1' @ 12:30 A	PC	SW	L
1 AM	58.98	42.46		2'										7' 7"	OPENED #2-1' @ 1:35 A	PC	SW	L
2	58.96	42.75		3'										8' 8"		PC	SW	L
3	58.91	42.87														PC	SW	L
4	58.87	42.94												24	closed #2-1' @ 4:30	FA	SW	L
5	58.87	42.82		2'										7'		FA	SW	L
6	58.80	42.83														PC	W	L-3
7	58.80	42.81														PC	W	L
8	58.79	42.70												20	Closed #2-1' @ 8:34	PC	S	L
9	58.70	42.65		1'										6' 6"	Closed #1-2' @ 9:10	PC	SW	L
10	58.82	42.35	3'											4'		PC	SW	L
11	58.88	42.18												0	OPENED #1-1' @ 11:45	PC	SW	L
12	58.93	42.14	4'											5'		PC	SSG	L-7
1 PM	58.97	42.17												10	OPENED #1-1' @ 1:58	PC	SE	L
2	58.97	42.12	5'											6'		LT.W	SE	L
3	58.92	42.01														RN	E	L
4	58.93	442.30	5'	1'	0	0	0	0	0	0	0	0	0	6'		RN	E	L
5	58.90	42.34														RN	E	L
6	58.89	42.37														RN	E	L-6
7	58.87	42.25														RN	E	M
8	58.86	42.30														RN	SE	L-10
9	58.81	42.34														RN	SE	L
10	58.86	42.37												54		RN	SE	L
11	58.90	42.26		2'										7' 7"	OPENED #2-1' @ 11:55 P	RN	E	L
24 Hour Temp.	PRECIPITATION			MEN ON DUTY										REMARKS				
MAX.	Start	End	Ant.	12 to 8	AUG=6.2													
30°	1340			8	KOSARSKI		SADNICK											
MIN.				8	SPIRES		Petre											
9°				to	KATOLKA		Porter											
6 AM				4														
29°	24 Hour FPrecip.	6 AM	0	4 to 12	GALLUP		GELANT											
							WT-34° ICE RPT IF 1/2 L.5											

✓ storage 4L @ 11:00 AM - BK

✓ storage 2L @ 3:15 PM @

WT-34° ICE RPT IF 1/2 L.5

LOCKMASTER'S DAILY REPORT STARVED ROCK LOCK

DATE 6 JAN 1989

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER	WIND		
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT	
12 M	458.95	442.35	5'	2'	0	0	0	0	0	0	0	0	7'		LT RN / FG		CLM	
1 AM	58.96	42.42											14	OPENED #2-1' @ 1:05	LT RN / FG		CLM	
2	58.99	42.61		3'									8'		FG		CLM	
3	58.99	42.70													FG		CLM	
4	58.99	42.79													FG		CLM	
5	58.98	42.85													FG		CLM	
6	58.95	42.90													FG		CLM	
7	58.89	42.95													LT FG		CLM	
8	58.91	42.96													LT FG	NE	L	
9	58.85	42.97													LT FG	N	L	
10	58.80	42.98													FG	N	L	
11	58.76	43.00											90	CLOSED #2-1' @ 11:23	FG	N	L	
12	58.76	42.89		2'									7'	CLOSED #1-1' @ 12:50	LT FG	N	L-4	
1 PM	58.80	42.82	4'										6'		LT FG	NE	L	
2	58.79	42.59													LT FG	NE	L	
3	58.79	42.53													LT FG	NE	L	
4	458.86	442.47													LT FG	NE	L	
5	58.90	42.42											30	OPENED #2-1' @ 5:30 P	LT FG	NE	L	
6	58.93	42.54		3'									7'		LT FG	E	L-3	
7	58.95	42.60													CL	E	L	
8	58.96	42.63											21	OPENED #2-1' @ 8:05 P	CL	E	L-	
9	58.96	42.75		4'									8		MIST	E	L	
10	58.96	42.88													MIST	E	L	
11	58.93	42.89											24		MIST	E	L	
24 Hour Temp.	PRECIPITATION			MEN ON DUTY										REMARKS				
MAX.	Start	End	Amt.	AUG 7.6										V.otalage yd @ 11:00 AM - 2K				
370	8:45 P	11:10 A		12	KOSARSKI					SADNICK								
		11:30 P		8	SPIRES					Pe-re								
MIN.				to	W. + L. Ka					M. T. C. P.								
27°				4														
6 AM														21P				
34°	24 Hour FPretpp. 6 AM .55"			4 to 12	BOTTOMLEY					SWARTZ					WT-34° ICERPT 6			

LOCKMASTER'S DAILY REPORT STARVED ROCK LOCK

 DATE 7 JAN 1989

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER	WIND					
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT				
12 M	458.95	442.96	4'	4'	0	0	0	0	0	0	0	0	8'		FG		CLM				
1 AM	58.97	42.98													FG		CLM				
2	58.99	43.02													FG/DRIZZLE	E	L				
3	58.94	43.00		5'										32	OPENED #2-1' @ 3:50 P	LT. FG	E	L			
4	58.94	43.08												9'		CL	E	L			
5	58.93	43.12														CL	E	L			
6	58.90	43.15														FG	E	L			
7	58.88	43.28														FG	SE	L			
8	58.83	43.30														FG	SE	L			
9	58.81	43.29												54	CLOSED #2-2' @ 9:30	MIST/LT FG	SE	L			
10	58.84	43.11		3'										7'		MIST/LT FG	SE	L			
11	58.85	42.95														MIST/LT FG	SE	L			
12	58.88	42.98														FOG	SE	L-4			
1 PM	58.97	42.95													28	OPEN #2-1' @ 1:20	LT FOG	S	L		
2	58.95	43.08		4'											8'	OPEN #1-1' @ 2:55	FOG	S	L		
3	58.95	43.07	5'												9'		FOG	S	L		
4	458.90	443.88														FOG	SW	L			
5	58.85	43.36													27	CLOSED #1-1' @ 1:50 AM.	RN/FOG	W	L		
6	58.66	43.49	4'											8'		PC	W	M			
7	58.69	43.44														PC	W	M			
8	58.70	43.48														CL	W	M			
9	58.73	43.47														CL	W	M			
10	58.74	43.63														CL	W	M			
11	58.72	43.65												48		CL	W	M			
24 Hour Temp.			PRECIPITATION			MEN ON DUTY										REMARKS					
MAX.			Start	End	Amt.																
36°			2:15A	2:35A		12	KOSARSKI					SADNICK					V storage yd @ 11:05 AM - OK V storage yd @ 7:20 AM MW				
			8:10A	11:15A		8	WITALKA					PETRE									
MIN.			4:40P	5:15P		to															
33°						4															
6 AM																					
35°			24 Hour P.Precip. 6 AM			.02"	4 to 12	BOTTOMLEY					SWARTZ					WT-34° ICE RPT @ 11:05 AM THUNDER			

LOCKMASTER'S DAILY REPORT STARVED ROCK LOCK

 DATE 8 JAN 1989

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER	WIND														
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT													
12 M	458.76	443.64	4'	4'	0	0	0	0	0	0	0	0	8'		CL	W	M													
1 AM	58.88	43.66													LT.SN	W	M													
2	58.87	43.69		6'									24	OPENED #2-2' @ 2:50 A	LT.SN	W	M													
3	58.83	43.79											10'		CL	W	M													
4	58.82	44.00	6'										20	OPENED #1-2' @ 4:20 A	CL	W	M													
5	58.86	44.28											12'		CL	W	M													
6	58.86	44.43													LT.SN (W)	SW	M-34													
7	58.78	44.56													PC	SW	M													
8	58.80	44.61													PC	SW	M													
9	58.87	44.75													PC	WSW	M													
10	58.88	44.87													PC	SW	M													
11	58.95	44.98													LT.SN	SW	M													
12	58.95	44.92													PC	SW	M													
1 PM	58.99	45.05											10.8	OPENED #1-1' @ 1:10	PC	W	M													
2	58.96	45.13	7'										13'		PC	W	M													
3	59.00	45.38											20	OPENED #2-1' @ 1545 PM	PC	W	M													
4	59.00	45.28	7'										14' 15	OPENED #2-2' @ 1630	PC	W	M													
5	58.93	45.48	9'										16'		PC	W	M													
6	58.91	45.55													PC	W	M-18													
7	58.90	45.59													PC	W	M													
8	58.88	45.62													PC	W	M													
9	58.79	45.68											80	CLOSED #2 1' @ 21:15	PC	W	M													
10	58.86	45.61	8'										15' 15		PC	W	M													
11	58.98	45.63	9'										17' 17	OPENED #1-2' @ 11:50 P	PC	W	M													
24 Hour Temp.	PRECIPITATION			MEN ON DUTY AUG = 12.6										REMARKS V storage yd @ 11:05 AM - BK V storage yd @ 7:20 AM MW WT-34° ICE RPT @																
MAX.	Start	End	Amt.	12	KOSARSKI		SADNICK																							
51°	12:45A	2:30A		8																										
MIN.	10:45	11:15		8	WITALKA		PETRE																							
13°				to																										
6 AM				4																										
13°	24 Hour FPretpp. 6 AM		.02"	4 to 12																										
					BOTTOMLEY		SWARTZ																							

LOCKMASTER'S DAILY REPORT STARVED ROCK LOCK

 DATE 9 JAN 1989

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN	GATE CHANGES	WEATHER	WIND		
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT	
12 M	458.91	445.77	9'	8'	0	0	0	0	0	0	0	0	0	17'		FA	W	L
1 AM	58.85	45.81														FA	W	L
2	58.79	45.94														FA	W	L
3	58.75	46.00	7'	7'												FA	W	L
4	58.79	45.96														FA	W	L
5	58.79	45.80														FA	W	L
6	58.81	45.65														FA	W	L-6
7	58.82	45.59														FA	SW	L
8	58.82	45.56														FA	SW	L-5
9	58.80	45.58														FA	SW	L
10	58.77	45.57														FA	SW	L
11	58.81	45.50	6'													FA	SW	L
12	58.84	45.47														FA	S	1M-14
1 PM	58.85	45.45														FA	SW	M
2	58.82	45.42														FA	S	M
3	58.80	45.42														FA	S	M
4	58.76	45.37														FA	S	M
5	58.71	45.39														FA	SE	L
6	58.73	45.27	6'													FA	SE	L-14
7	58.70	45.25														FA	SE	L
8	58.69	45.19	5'													CL	SE	L
9	58.74	45.11														CL	SE	L
10	58.79	45.01														CL	S	L
11	58.83	45.08	7'													CL	S	L

24 Hour TEMP.	PRECIPITATION			MEN ON DUTY	REMARKS
	Start	End	Am.		
MAX. 18°	5:15A	5:35A		KOSARSKI	SADNICK
MIN. 9°				SPIRES	Gebert
6 AM 9°					
	24 Hour FPrecip. 6 AM		T	BOTTOMLEY	SWARTZ

WT-33° ICE RPT 2F 1/2CX

LOCKMASTER'S DAILY REPORT STARVED ROCK LOCK

DATE 10 JAN 1989

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER	WIND				
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT			
12 M	458.86	445.23	7'	6'	0	0	0	0	0	0	0	0	13'		CL	S	M			
1 AM	58.89	45.29													CL	S	M			
2	58.90	45.35													PC	S	M			
3	58.91	45.39												52	OPENED #2-1' @ 3:45	PC	S	M		
4	58.84	45.45		7'									14'		PC	S	M			
5	58.83	45.52													PC	S	M			
6	58.76	45.60	6'	6'										42	CLOSED #1 + #2-1' @ 6:20 A	PC	SW	L-6		
7	58.75	45.44											12'		PC	SW	L			
8	458.78	445.40	6'	6'	0	0	0	0	0	0	0	0	12' 24"	CLOSED #2-1' @ 8:43 AM	PC	SW	L-6			
9	58.80	45.24		5'									11'		PC	SW	L			
10	58.89	45.19													PC	SW	L			
11	58.85	45.14													PC	SW	L			
12	58.80	45.18													PC	SW	L-10			
1 PM	58.84	45.49													PC	SW	L			
2	58.89	45.14												60	OPENED #2-1' @ 2:35 PM	PC	W	L		
3	58.84	45.24		6'									12'		PC	W	L			
4	458.74	445.25													PC	W	L			
5	58.70	45.20											30	CLOSED #1-1' @ 7:50 PM	PC	W	L			
6	58.71	45.17	5'										11'		PC	W	L			
7	58.76	45.14													CL		CLM			
8	58.80	45.13													CL		CLM			
9	58.85	45.05													CL		CLM			
10	58.84	45.03													CL		CLM			
11	58.92	45.04													PC	ENE	L			
24 Hour Temp.			PRECIPITATION			MEN ON DUTY								REMARKS						
MAX.			Start	End	Am.	AUG = 11.9								V Storage yd @ 11:05 PM - OK V Storage yd @ 7:10 AM - OK						
32°						12 to 8	KOSARSKI				SADNICK									
MIN.						8	Gallup				SPIRES									
9°						to 4	Porter				Gehant									
6 AM																				
31°			24 Hour P.Precip. 6 AM			0	4 to 12	BOTTOMLEY				SWARTZ				WT = 34° ICE RPT Ø				

LOCKMASTER'S DAILY REPORT STARVED ROCK LOCK

DATE 11 JAN 1989

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER	WIND	
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT
12 M	458.99	445.03	5'	6'	0	0	0	0	0	0	0	0	11'	OPENED #1-2' @ 12:35AM	PC	NE	L
1 AM	59.01	45.10	7'										13' 13	OPENED #2-1' @ 1:45AM	PC	E	L
2	58.99	45.18		7									14' 14	OPENED #1-1' @ 2:50AM	PC	E	L
3	58.98	45.47	8'										15'		FA	E	L
4	58.96	45.58													PC	E	L
5	58.94	45.66													PC	E	L
6	58.85	45.68											60	CLOSED #1-2' @ 6:20	PC	E	L-8
7	58.85	45.53	6'										13'		FA	E	M
8	458.84	445.50	6'	7'	0	0	0	0	0	0	0	0	13'		FA	E	1-10
9	58.81	45.46											39	CLOSED #2-1' @ 9:03	FA	SE	M
10	58.83	45.35		6'									12'		FA	SE	M
11	58.85	45.35													FA	SE	M
12	58.83	45.32													PC	SE	17-15
1 PM	58.83	45.31													CL	SE	M
2	58.79	45.28											60	CLOSED #2-1' @ 2:39	CL	SE	M
3	58.72	45.20		5'									11'		CL	SE	M
4	58.73	45.14													CL	SE	M
5	58.71	45.10													MIST	SE	M
6	58.71	45.12											44	CLOSED #1-1' @ 18:40 AM.	LTRN	SE	M-20
7	58.70	44.98	5'										10'		LTRN	S	M
8	58.69	44.93													LTRN	S	M
9	58.69	44.90													MIST	SSW	M
10	58.68	44.94													CL	SW	L
11	58.69	44.85											50		CL	WSW	L
24 Hour Temp.	PRECIPITATION			MEN ON DUTY AUG. 12, 1										REMARKS ✓ storage yd @ 11:20 PM ALL ✓ storage yd @ 07:10 AM GSS WT 34° Ice Apt - D			
MAX.	Start	End	Ant.	12 to 8	WITALKA		PETRE										
MIN.				8 to 4	GALLUP		SPIRES										
					PORTER		GEHANT										
6 AM																	
	24 Hour FPrecip.	6 AM	0"	4 to 12	BOTTOMLEY		SWARTZ										

LOCKMASTER'S DAILY REPORT STARVED ROCK LOCK

DATE 12 JAN 1989

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER	WIND	
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT
12 M	458.72	444.82	5'	5'	0	0	0	0	0	0	0	0	10'		CL	W	L
1 AM	58.70	44.78													LT Fg	W	L
2	58.69	44.85												30 CLOSED #1 & 2 - 1' @ 2:20 AM	LT Fg	W	L
3	58.68	44.70	4'	4'									8'		LT Fg	NW	M
4	58.79	44.65													CL	NW	M
5	58.85	44.52													PC	NW	M
6	58.91	44.42												32 OPENED #1 & 2 - 1' @ 6:45	PC	NW	M
7	58.98	44.63	5'	5'									10'10	OPENED #1 - 1' @ 7:10	PC	NW	M
8	58.97	44.69	6'	5'	0	0	0	0	0	0	0	0	11'		PC	W	M
9	58.99	44.86												27 OPENED #2 - 1' @ 9:20 AM	PC	W	M
10	58.92	45.14	6'										12'		PC	NW	M
11	58.89	45.12													PC	W	M
12	58.87	45.17													PC	NW	M-13
1 PM	58.84	45.24													PC	NW	M
2	58.80	45.29												60 CLOSED #1 - 1' @ 2:20 PM	PC	NW	M
3	58.76	45.17	5'										11'		PC	NW	M
4	58.76	45.10													PC	NW	M
5	58.76	45.05													FA	NW	M
6	58.76	45.00													FA	NW	M
7	58.73	44.95												55 CLOSED #2 - 1' @ 1:51 PM	FA	NW	L
8	58.77	44.94	5'										10'		FA	NW	L
9	58.73	44.80													FA	W	L
10	58.72	44.79													FA	W	L
11	58.73	44.78											40		FA	W	L
24 Hour Temp.	PRECIPITATION			MEN ON DUTY										REMARKS			
MAX.	42°	Start	End	Am.	12 to 8	WITALKA		PETRE			✓ Storage yd @ 11:20 PM 11:14 ✓ Storage yd @ 7:05 AM @ WT-34° ICE FA-O						
MIN.	29°				8 to 4	GALLUP		SPIRES									
						PORTER		GEHANT									
6 AM	29°																
		24 Hour Precip.	6 AM	.01"	4 to 12	BOTTOMLEY		SWARTZ									

LOCKMASTER'S DAILY REPORT STARVED ROCK LOCK

DATE 13 JAN 1989

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER	WIND		
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT	
12 M	458.69	444.72	5'	5'	0	0	0	0	0	0	0	0	0	10'		FA	W	L
1 AM	58.71	44.64														FA	W	L
2	58.69	44.68														FA	W	L
3	58.68	44.67														FA	W	L
4	58.71	44.53		4'										9'		FA	W	L
5	58.72	44.49														FA	W	L
6	58.71	44.44														FA	W	L-5
7	58.72	44.40														FA	W	L
8	458.73	444.89	5'	4'	0	0	0	0	0	0	0	0	0	9'		FA	NW	L
9	58.77	44.35														FA	NW	L
10	58.78	44.36														FA	W	L
11	58.85	44.36														FA	W	L
12	58.87	44.36														FA		clm
1 PM	58.87	44.40														FA	S	L
2	58.84	44.34														FA	S	L
3	58.83	44.35														FA	S	L
4	58.85	44.32														FA	SW	L
5	58.87	44.31														FA	SW	L
6	58.91	44.32														FA	SW	L-3
7	58.94	44.29														FA	SW	L
8	58.90	44.27														FA	SW	L
9	58.88	44.27														FA	S	L
10	58.87	44.25														FA	S	L
11	58.82	44.22												180		FA	S	L

24 Hour Temp.	PRECIPITATION			MEN ON DUTY	REMARKS
	Start	End	Amt.		
MAX. 31°				12 80	WITALKA PETRE
MIN. 21°				8	GALLUA SPIRES
				to	PORTER GEHANT
6 AM 21°				4	
	24 Hour Pprecip. 6 AM		0"	4 to 12	KOSARSKI SADNICK

AUG = 9.1
 V storage up @ 11:25 pm A/L
 V storage # @ 7:15 AM
 V storage up @ 3:00 PM - OK
 WIT 34° ICE FRT - 0

LOCKMASTER'S DAILY REPORT STARVED ROCK LOCK

DATE 14 JAN 1989

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER	WIND					
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT				
12 M	458.77	444.27	5'	4'	0	0	0	0	0	0	0	0	9'		FA	S	M				
1 AM	58.73	44.25													*FA	S	M				
2	58.70	44.04													FA	SE	L				
3	58.68	44.16												36	CLOSED #1-1' @ 3:25 AM	FA	SE	L			
4	58.74	44.04	4'										8'		FA	SE	L				
5	58.77	43.99													FA	SE	L				
6	58.83	43.94													FA	SE	L-8				
7	58.84	43.86													PC	SE	L				
8	458.89	443.81	4'	4'	0	0	0	0	0	0	0	0	8'		PC	SE	L				
9	58.95	43.83											48	OPENED #2-1' @ 9:55 AM	PC	SE	L				
10	58.94	43.89	5'										9'		PC	E	L				
11	58.94	43.94													SN	SE	L				
12	58.90	43.99													LT SW	SE	L-6				
1 PM	58.87	44.01													LT SW	SE	L				
2	58.85	44.05													LT SW	SW	L				
3	58.83	44.03													PC	S	L				
4	58.76	44.00	4'										63	CLOSED #2-1' @ 4:10 P	CL	S	L				
5	58.78	43.91											8'		CL	S	L				
6	58.74	43.86													CL	S	L-2				
7	58.77	43.82													CL	S	L				
8	58.75	43.79	3'										32	CLOSED #1-1' @ 8:20 P	PC	S	L				
9	58.80	43.68											7'		PC	SW	L				
10	58.81	43.53													PC	SW	L				
11	58.81	43.47											21		FA	SW	L				
24 Hour Temp.			PRECIPITATION			MEN ON DUTY										REMARKS					
MAX. 35°			Start 9:05 AM	End 2:45 PM	Ant.	406 = 8.3										V storage yd @ 11:20 PM MW					
MIN. 19°						12 to 8	WITALKA					PETRE					V storage yd @ 7:15 AM @				
6 AM						8 to 4	GALLUP					PORTER					V storage yd @ 3:00 AM - OK				
25			24 Hour P.P. 6 AM			0"	4 to 12	KOSARSKI					SADNICK					WT - 34° Ice Rpt - 0 J.P.B.			

LOCKMASTER'S DAILY REPORT STARVED ROCK LOCK

 DATE 15 JAN 1989

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER	WIND											
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT										
12 M	458.79	448.44	3'	4'	0	0	0	0	0	0	0	0	7'		PC	SW	L										
1 AM	58.87	43.47													PC	SW	L										
2	58.83	43.43													FA	SW	L										
3	58.84	43.42													FA	SW	L										
4	58.87	43.39													FA	SW	L										
5	58.88	43.38													FA	SW	L										
6	58.91	43.40												OPENED #1-1' @ 6:20	FA	W	L-6										
7	58.91	43.44													FA	W	L										
8	458.92	443.46	4'	4'	0	0	0	0	0	0	0	0	8'		FA	W	L										
9	58.90	43.50													CL	NW	L										
10	58.83	43.49													CL	NW	L										
11	58.85	43.52													CL	W	L										
12	58.77	43.60												Closed #2-1' @ 12:35	CL	NW	L-6										
1 PM	58.81	43.45	3'										7'		CL	W	L										
2	58.80	43.38													CL	W	L										
3	58.84	43.35													CL	W	L										
4	58.86	43.26													CL	W	L										
5	58.89	43.24													CL	W	L										
6	58.92	43.19													CL	W	L										
7	58.96	43.16	4'											OPENED #2-1' @ 7:05 P	CL	W	L										
8	58.92	43.27											8'		CL	W	L										
9	58.88	43.32													CL	W	L										
10	58.84	43.33													CL	W	L										
11	58.83	43.33													PC	W	L										
24 Hour Temp.	PRECIPITATION			MEN ON DUTY										REMARKS													
MAX.	Start	End	Ant.	AVG = 7.3										✓ Storage 4' @ 11:20 PM P.W. ✓ Storage 4' @ 7:20 AM @ ✓ Storage 4' @ 3:00 PM - X WT - 34° Ice Act - 0													
33°				12 to 8	WITALKA					PETRE																	
MIN.				8 to 4	GALLUP					PORTER																	
25°				4 to 12	KOSARSKI					SADNICK																	
6 AM	24 Hour Precip. 6 AM .02"																										
28°																											

LOCKMASTER'S DAILY REPORT STARVED ROCK LOCK

 DATE 16 JAN 1989

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER	WIND		
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT	
12 M	455.78	443.40	4'	4'	0	0	0	0	0	0	0	0	8'		FA	W	L	
1 AM	58.78	43.32													FA	SW	L	
2	58.70	43.34												24	CLOSED #2-1' @ 2:30 AM	FA	SW	L
3	58.72	43.22		3'									7'		FA	SW	L	
4	58.72	43.16													FA	SW	L	
5	58.73	43.09													FA	SW	L	
6	58.72	43.07													FA	SW	L - 4	
7	58.76	43.04													FA	SW	L	
8	458.79	443.00													FA	SW	L	
9	58.84	43.09													FA	SW	L	
10	58.86	43.98													FA	SW	L	
11	58.97	43.96												63	OPENED #2-1' @ 1:50 AM	PC	SW	L
12	58.91	43.06		4'									8'		PC	S	L - 9	
1 PM	58.91	43.14													PC	S	L	
2	58.89	43.15													PC	S	M	
3	58.85	43.21													PC	S	M	
4	58.83	43.26													PC	S	M	
5	58.75	43.28	3'	3'										48	CLOSED #1 + #2-1' @ 5:55 P	PC	S	M
6	58.70	43.22											6'		PC	S	M - 16	
7	58.73	42.98													PC	SW	M	
8	58.72	42.91													PC	SW	M	
9	58.80	42.86													PC	SW	M	
10	58.82	42.81													PC	SW	M	
11	58.78	42.80											30		PC	SW	M	
24 Hour Temp.	PRECIPITATION			MEN ON DUTY										REMARKS				
MAX.	Start	End	Ant.	A06 = 7.1										✓ storage yd @ 11:20 PM MW ✓ storage yd @ 3:05 PM BK WT -34 Ice RPT. 0				
33				12 to 8	WITALKA					PETRE								
MIN.				8 to 4	GRANT					SWARTZ								
20				4 to 12	KOSARSKI					SIADNICK								
6 AM	24 Hour P.Precip.	6 AM	0'															

LOCKMASTER'S DAILY REPORT STARVED ROCK LOCK

 DATE 17 JAN 1989

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER	WIND		
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT	
12 M	58.76	42.73	3'	3'	0	0	0	0	0	0	0	0	0	6'		FA	SW	M
1 AM	58.76	42.71													FA	SW	M	
2	58.78	42.68													FA	SW	M	
3	58.81	42.65													FA	SW	M	
4	58.82	42.63													FA	SW	M	
5	58.86	42.62													FA	SW	L	
6	58.90	42.64	4'										30	OPENED #1-1' @ 5:50 AM	FA	SW	L-10	
7	58.90	42.70											7'		FA	SW	L	
8	58.94	42.74											21	OPENED #2 1' @ 8:30 A	FA	SW	L	
9	58.96	42.89		4'									8'		PC	SW	L	
10	58.96	42.94													PC	SW	L	
11	58.98	43.00													PC	SW	L	
12	58.93	43.14		5'									9'		PC	SW	L-4	
1 PM	58.84	43.25													PC	SW	L	
2	58.80	43.27											27	CLOSED #1 & 2 1' @ 2:40 P	PC	S	L	
3	58.80	43.04	3	4									7'		PC	S	L	
4	58.77	42.95													PC	S	L	
5	58.75	42.87													PC	S	L	
6	58.71	42.80		3'									23	CLOSED #2-1' @ 6:05 P	CL	S	L-8	
7	58.71	42.59											6'		CL	S	L	
8	58.73	42.51													CL	S	L	
9	58.73	42.45													CL	S	L	
10	58.73	42.40													CL	S	L	
11	58.72	42.41											30		CL	S	L	

24 Hour TEMP.	PRECIPITATION			MEN ON DUTY		REMARKS
	Start	End	Am't.			
MAX. 45°				12 to 8	WITALKA PETRE	✓ storage yd @ 11:25 pm MW ✓ storage yd @ 3:05 PM JKL WT-34' Ice FRT. 6 CP.
MIN. 18°				8 to 4	BOTTOMLEY SWARTZ	
6 AM				4 to 12	GRHANT	
36°	24 Hour Precip. 6 AM	0			KOSARSKI SADNICK	

LOCKMASTER'S DAILY REPORT STARVED ROCK LOCK

 DATE 18 JAN 19 59

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER.	WIND		
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT	
12 M	458.72	442.39	3'	3'	0	0	0	0	0	0	0	0	6'		CL	SW	L	
1 AM	58.78	42.37													PC	SW	L	
2	58.81	42.37													PC	SW	L	
3	58.84	42.37													PC	SW	M	
4	58.86	42.36													PC	SW	L	
5	58.90	42.35											26	OPENED #2-1 @ 5:15 AM	PC	W	L	
6	58.87	42.43		4'									7'		PC	W	L-6	
7	58.84	42.52													FA	W	L	
8	58.84	42.53													FA	W	L	
9	58.77	42.60											28	Closed #2-1 @ 9:23	FA	W	L	
10	58.75	42.57	3'										6'		FA	W	M	
11	58.80	42.51													FA	W	M	
12	58.83	42.56													FA	W	M-15	
1 PM	58.80	42.57													FA	W	M	
2	58.80	42.55													PC	W	M	
3	58.80	42.47													CL	W	M	
4	58.76	42.41													CL	W	M	
5	58.80	42.39													CL	W	M	
6	58.79	42.33													PC	W	L-5	
7	58.87	42.29													PC	W	L	
8	58.89	42.27													PC	W	L	
9	58.89	42.24													FA	W	L	
10	58.92	42.20											70	OPENED #2-1 @ 11:05 P	FA	W	L	
11	58.94	42.19	4'										71.7		PC	W	L	
24 Hour Temp.	PRECIPITATION			MEN ON DUTY										REMARKS				
MAX.	Start	End	Amt.	AUG = 6.2										V. Low temp @ 11:10 AM @ V. Storage yd @ 3:00 PM - JK (WT 35°) (ICE RPT 0) 6P				
49				12 80	GALLUP					PORTER								
MIN.				8	BOTTOMLEY					SWARTZ								
33				to	SPIRES					GEHANT								
6 AM				4														
37	24 Hour Precip.	6 AM	0	4 to 12	KOSARSKI					SADNICK								

LOCKMASTER'S DAILY REPORT STARVED ROCK LOCK

 DATE 19 JAN 1959

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER	WIND	
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT
12 M	458.87	442.35	3'	4'	0	0	0	0	0	0	0	0	7'		PC	NW	L
1 AM	58.89	42.39													PC	NW	L
2	58.80	42.43											2'	Closed #2-1' @ 2:05A	PC	NW	L
3	58.78	42.30	3'										6'		PC		CLM
4	58.80	42.25													PC		CLM
5	58.79	42.26													PC		CLM
6	58.78	42.24											3'	Closed #1-1' @ 6:10 AM	PC		CLM
7	58.83	42.20	2'										5'		PC	SE	L
8	58.88	42.02													PC	SE	L
9	58.94	41.96													PC	SW	L
10	58.98	41.99											20	OPENED #1 1' @ 11:00 AM	FA	SW	L
11	58.98	42.06	3'										6'	OPENED #1 1' @ 11:35 AM	FA	SW	M
12	58.97	42.32	4'										7'		FA	SW	M-14
1 PM	58.95	42.54													PC	SW	M
2	58.93	42.56													PC	SW	M
3	58.93	42.65													PC	SW	M
4	58.92	42.73													PC	SW	L
5	58.89	42.77													PC	SW	L
6	58.79	42.79													CL	SW	M-14
7	58.76	42.79													CL	SW	M
8	58.72	42.82	3'										6'	Closed #1-1' @ 8:10 P	CL	NW	M
9	58.72	42.73	2'										6'	Closed #1-1' @ 9:45 P	CL	NW	M
10	58.73	42.60											5'		PC	NW	M
11	58.74	42.47											10		PC	NW	M
24 Hour Temp.			PRECIPITATION			MEN ON DUTY							REMARKS				
MAX.			Start	End	Am.	12 to 6	GALLUP		PORTER		✓ 1st Temp. at 11:05 AM EC						
MIN.						8 to 4	BOTTOMLEY		SWARTZ								
24							SPIRES		GEHANT								
6 AM																	
27			24 Hour P.Precip. 6 AM			4 to 12					(WT. 34) (ICE PFT 0)						

LOCKMASTER'S DAILY REPORT STARVED ROCK LOCKDATE 20 JAN 19 89

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER	WIND		
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT	
12 M	458.80	42.29	2'	3'	0	0	0	0	0	0	0	0	0	0		PC	NW	M-16
1 AM	58.87	42.25														CL	NW	M
2	58.90	42.25														CL	NW	M
3	58.97	42.20														CL	NW	M
4	58.98	42.31	3'													CL	NNW	M
5	58.96	42.37		4'												CL	NW	M
6	58.97	42.53														CL	NW	M-16
7	58.94	42.55														CL	NW	M
8	58.89	42.53														CL	NW	L
9	58.81	42.56														CL	NW	L
10	58.82	42.33	2'													PC	N	L
11	58.82	42.21														PC	N	L
12	58.86	42.14														PC	NW	L-8
1 PM	58.87	42.10														PC	NW	L
2	58.90	42.06														PC	NNW	L
3	58.96	42.04														PC	N	L
4	58.96	42.13	3'													PC	N	L
5	58.97	42.20	4'													PC	N	L
6	58.97	42.36														FA	N	L
7	58.98	42.41														FA		clm
8	58.98	42.44														FA		clm
9	58.96	42.47														FA		clm
10	58.94	42.54														FA		clm
11	58.92	42.56														FA		clm
24 Hour Temp.	PRECIPITATION			MEN ON DUTY		REMARKS												
MAX.	Start	End	Amt.	12 to 8	GALLUP	REARER												
MIN.				8 to 4	BOTTOMLEY	SWARTZ												
6 AM					SPIRES	GAHANT												
33	24 Hour Precip.	6 AM	0	4 to 12	WITALKA	PETRE												

106 = 6.0

✓ Storage tank 11.15 PM '88

✓ Storage tank 3:20 PM '88

(1733) (1000) CP

LOCKMASTER'S DAILY REPORT STARVED ROCK LOCK

 DATE 22 JAN 1989

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER	WIND	
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT
12 M	458.82	442.71	3'	3'	0	0	0	0	0	0	0	0	6'		FA	SW	M - 14
1 AM	58.79	42.68											12	Closed #1 & 2 - 1' EA @ 1:55 A	FA	S	L
2	58.85	42.56	2'	2'									4'		FA	SW	L
3	58.93	42.22													FA	SW	M
4	58.80	42.14													FA	SW	M
5	58.84	42.00													FA	SW	M
6	58.84	41.95													FA	SW	M - 16
7	58.80	41.93													FA	SW	L
8	58.93	41.96													FA	SW	L
9	58.91	41.88													FA	SW	L
10	58.91	41.91											30	Opened #1-1' @ 11:10	FA	SW	L
11	58.97	41.99	3'										5'		FA	SW	L
12	58.97	42.04											10	Opened #2-1' @ 12:50	FA	SW	M - 13
1 PM	58.99	42.25		3'									6' 6	Opened #1-1' @ 1:30	FA	SW	M
2	58.97	42.48	4'										7'		FA	SW	M
3	58.91	42.60													FA	S	L
4	58.89	42.65													FA	S	M
5	58.84	42.69													FA	S	L
6	58.83	42.69											35	Closed #1-1' @ 6:45 PM	FA	S	L - 12
7	58.81	42.59	3'										6'		FA	S	L
8	58.78	42.54													FA	S	L
9	58.78	42.51													FA	S	L
10	58.78	42.53													FA	SW	L
11	58.77	42.51											30		FA	SW	L
24 Hour Temp.		PRECIPITATION			MEN ON DUTY								REMARKS				
MAX.		Start	End	Amt.	AUG = 5.3								✓ Storage yd @ 11:05 PM @ ✓ Storage yd @ 3:15 PM @				
38					12 to 8	GALLUP		PORTER									
MIN.					8 to 4	BOTTOMLEY		SPIRES									
21																	
6 AM					4 to 12	WITALKA		PETRE		(W.T. 34) (ICE REC: 0) CP							
30		24 Hour P.Precip.	6 AM	0													

LOCKMASTER'S DAILY REPORT STARVED ROCK LOCK

 DATE 23 JAN 1989

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER	WIND		
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT	
12 M	458.76	442.48	3'	3'	0	0	0	0	0	0	0	0	0	6'		FA	SW	L
1 AM	58.74	42.45												12	Closed #1-1 @ 1:25 A	FA	SW	L
2	58.80	42.25	2'											5'		FA	SW	L
3	58.82	42.24														FA	SW	L
4	58.84	42.20														FA	SW	L
5	58.85	42.21														FA	SW	L
6	58.88	42.25														FA	SW	L-4
7	58.89	42.22														FA	SW	L
8	458.89	442.20														FA	SW	L
9	58.95	42.13														FA	SW	L
10	58.95	42.14														FA	SW	L
11	58.95	42.12														FA	SW	L
12	58.99	42.11														PC	SW	L-3
1 PM	58.97	42.11														PC	SW	L
2	58.98	42.12														PC	SW	L
3	58.95	42.10														PC	S	L
4	58.99	42.06												75	OPEN #1-1 @ 4:30	CL	S	L
5	58.85	42.20	3'											6'		CL	S	L
6	58.84	42.19														CL	SE	L
7	58.79	42.30														CL	SE	L
8	55.50	42.31														PC	SE	L
9	58.75	42.35														PC	SE	L
10	58.66	42.31												30	CLOSED #1-1 @ 10:30 PM	PC	SE	L
11	58.66	42.27	2'											5'S		PC	S	L

24 Hour Temp.	PRECIPITATION			MEN ON DUTY	REMARKS
	Start	End	Am.		
MAX. 49				12 80 GALLUP PORTER	✓ Storage yd @ 11:10 PM @ ✓ Storage yd @ 3:25 PM MW
MIN. 30				8 to Sadnick SWARTZ	
6 AM 33				4 to WITALKA PETRE	
24 Hour FPretip. 6 AM	0			4 to 12	

(WT. 35) (ICE RPT 0) M.P.

LOCKMASTER'S DAILY REPORT STARVED ROCK LOCK

 DATE 24 JAN 1989

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER	WIND	
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT
12 M	42.62	41.20	2'	3'	0	0	0	0	0	0	0	0	5'		PC	S	L
1 AM	58.69	42.12											10	CLOSED #2-1' @ 1:45 AM	PC		CLM
2	58.74	42.08		2'									4'		PC		CLM
3	58.77	41.86													PC		CLM
4	58.80	41.83													PC		CLM
5	58.85	41.79													PC		CLM
6	58.89	41.74											20	OPENED #2-1' @ 6:50 A	PC		CLM
7	58.90	41.81		3'									5'		PC		CLM
8	58.95	41.88													PC		CLM
9	58.95	41.94											15	opened #1-1' @ 9:45	PC	E	L
10	58.91	42.04	3										6'		PC	E	L
11	58.91	42.19													PC	E	L
12	58.89	42.24													PC	E	L-2
1 PM	58.85	42.18													CL	E	L
2	58.82	42.19													CL	NE	L
3	58.76	42.21											30	Closed #1-1' @ 3:15	CL	NE	L
4	58.84	42.05	2'										5'		CL	NE	L
5	58.86	42.01													CL	N	L
6	58.88	41.93													CL	N	L-3
7	58.90	41.92													CL	N	L
8	58.91	41.94											25	OPENED #1-1' @ 8:30pm	CL	NE	L
9	58.90	42.03	3'										6'		CL	NE	L
10	58.89	42.13													CL	NE	L
11	58.84	42.14											10		CL	NE	L
24 Hour Temp.	PRECIPITATION			MEN ON DUTY #36 = 5.1										REMARKS			
MAX.	Start	End	Amt.	12 to 6	GALLUP		PORTER										
MIN.				8	KOSARSKI		SADNICK										
				to	GEHANT		SWARTZ										
6 AM				4													
	24 Hour Precip. 6 AM		0	4 to 12	WITALKA		PETRE										

✓ Storage of ice
 ✓ Storage of ice @ 7:00 AM - OK
 greased gate puntles - OK
 (WT 34) (ICE RT 0)

LOCKMASTER'S DAILY REPORT STARVED ROCK LOCK

 DATE 25 JAN 1989

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER	WIND		
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT	
12 M	458.85	442.16	3'	3'	0	0	0	0	0	0	0	0	0	6'		LT RN	E	L
1 AM	58.85	42.17														CL	ESE	L
2	58.80	42.22														CL	RNE	L
3	58.81	42.06	2'											5'		CL	E	L
4	58.86	42.03														CL	E	L
5	58.84	41.97														CL	E	L
6	58.86	41.55														CL	E	L
7	58.88	41.91														CL	E	L
8	458.92	441.90														CL	E	L
9	58.93	41.90														CL	E	L
10	58.94	41.91														CL	SE	L
11	58.94	41.91														CL	SE	L
12	58.99	41.90	3'											50	OPENED #1-1' @ 12:05 P	CL	SE	L-4
1 PM	58.95	42.07												6'		FG		CLM
2	58.95	42.12														FL		CLM
3	58.94	42.16														FG		CLM
4	58.92	42.20														RN	E	L
5	58.86	42.24														RN	E	L
6	58.85	42.25														RN / FG	E	L-4
7	58.84	42.30														FG / MIST		L-4
8	58.83	42.30														LT FG / MIST		L-4
9	58.82	42.34														CL	SW	L
10	58.79	42.40														CL	NW	L
11	58.80	42.38														CL	NW	L

24 Hour TEMP.	PRECIPITATION			MEN ON DUTY		REMARKS
	Start	End	Amt.			
MAX. 44°	11:50P	12:15A		12 to 8	BOTTOMLEY SPIRES	V. Starved @ 7:00AM -X
MIN. 32°	2:25P	5:15pm		8 to 4	KOSARSKI SARNICK	
	5:50pm	8:10pm			SWARTZ GENANT	
6 AM 38°	24 Hour P.Precip. 6 AM	T		4 to 12	W. TALKA PETRE	

LOCKMASTER'S DAILY REPORT STARVED FOCK LOCKDATE 26 JAN 1989

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER	WIND		
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT	
12 M	458.82	442.39	3'	3'	0	0	0	0	0	0	0	0	6'		CL	W	L	
1 AM	58.82	42.40													CL	W	L	
2	58.83	42.42													CL	WNW	L	
3	58.83	42.41													CL	W	L	
4	58.82	42.41													CL	NW	L	
5	58.81	42.44													CL	NW	L	
6	58.80	42.45													CL	WNW	L-8	
7	58.80	42.48													CL	WNW	L	
8	458.80	442.48													CL	NW	L	
9	58.83	42.42													FA	WNW	L	
10	58.80	42.48													FA	WNW	L	
11	58.78	42.50											72	Closed #1-1' @ 11:20	FA	WNW	L	
12	58.83	42.33	2										5'		FA	WNW	L-10	
1 PM	58.88	42.33											10	opened #1-1' @ 1:25	FA	WNW	L	
2	58.96	42.46	3'										6'		FA	W	L	
3	58.92	42.46													FA	W	L	
4	58.90	42.50													FA	W	L	
5	58.95	42.45													FA	W	L	
6	58.95	42.46													FA	W	L	
7	58.89	42.46													FA	W	L	
8	58.95	42.47											42	opened #1-1' @ 8:10	FA	W	L	
9	58.89	42.60	4'										7'		FA	W	L	
10	58.86	42.68													FA	W	L	
11	58.80	42.72											21	Closed #1-1' @ 11:54	FA	W	L	
24 Hour TEMP.	PRECIPITATION			MEN ON DUTY										REMARKS				
MAX.	Start	End	Am.	12 to 8	BOTTOMLEY		SPIRES											
MIN.				8 to 4	SADNICK		SWARTZ											
					LEHANT													
6 AM																		
37	24 Hour Precip.	6 AM	.16	4 to 12	WITALKA		PETRE		(WT37)(ICE RPT D) Sh. Pintelo									

LOCKMASTER'S DAILY REPORT STARVED ROCK LOCK

 DATE 27 JAN 1989

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER	WIND	
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT
12 M	58.74	42.68	3'	3'	0	0	0	0	0	0	0	0	6'		FA	W	L-8
1 AM	58.70	42.54													FA	W	L
2	58.71	42.52													FA	W	L
3	58.71	42.47													FA	W	L
4	58.71	42.46													FA	W	L
5	58.73	42.47													FA	W	L-2
6	58.76	42.40													FA	W	L
7	58.80	42.40													FA	SW	L
8	58.79	42.39													FA	SW	L
9	58.80	42.41													FA	SW	L
10	58.84	42.44													FA	W	L
11	58.90	42.45											12		FA	W	L
12	58.95	42.45		4'									7' 7"	OPENED #2-1' @ 12:15P	FA	W	L-3
1 PM	58.92	42.71	4'										8'	OPENED #1-1' @ 12:45P	FA	W	L
2	58.90	42.89													FA	W	L
3	58.89	42.94													FA	SW	L
4	58.87	443.03	4'	4'	0	0	0	0	0	0	0	0	8'		FA	SW	L-10
5	58.80	43.01											40	CLOSED #1-1' @ 5:10P	FA	SW	L
6	58.77	42.72	3'	3'									6'		FA	SW	L-4
7	58.77	42.65											5'	CLOSED #1-1' @ 7:50P	FA		CLM
8	58.75	42.55	2'												FA		CLM
9	58.75	42.37													FA	SW	L
10	58.75	42.29													FA	SW	L
11	58.75	42.22											20		FA	SW	L
24 Hour TEMP.			PRECIPITATION			MEN ON DUTY							REMARKS				
MAX. 40°			Start	End	Am't.	12 to 8	BOTTOMLEY		SPIRES				V storage yd @ 7:00 AM - JK V storage yd @ 5:10 PM @ JS				
MIN. 29°						8 to 4	KOSARSKI		SADNICK								
							GEHALT		SWARTZ								
6 AM 32°																	
			24 Hour Pprecip. 6 AM		0	4 to 12	CALLUP		PORTER				(WT 38°) (ICE MPT Ø) squared gate putter - JK				

LOCKMASTER'S DAILY REPORT STARVED ROCK LOCK

DATE 28 JAN 1989

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER	WIND		
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT	
12 M	458.74	442.18	2'	3'	0	0	0	0	0	0	0	0	5'		FA	SW	L	
1 AM	58.74	42.14													FA	W	L	
2	58.80	42.13													FA	W	L	
3	58.85	42.13													FA	W	L	
4	58.92	42.13												29	OPENED #1 2'-1" @ 7:40A	FA	W	L
5	58.97	42.34	4'										7'		FA	SW	L	
6	58.96	42.50													FA	SW	L	
7	58.97	42.59													PC	SW	L	
8	58.92	42.60													PC	SW	L	
9	58.87	42.64													PC	SW	L	
10	58.93	42.69	4'											42	OPENED #2 -1' @ 10:15A	FA	SW	L
11	58.86	42.86											9'		PC	SW	L	
12	58.74	42.98	3'	3'									10	CLOSED #1 + #2 -1' @ 12:30P	PC	SW	L-6	
1 PM	58.68	42.82											6'		PC	SW	L	
2	58.67	42.74	2'											12	CLOSED #1 -1' @ 2:40P	CL	SW	L
3	58.68	42.53											5'		LT, RN	SW	L	
4	58.71	42.41	2'	3'	0	0	0	0	0	0	0	0	5'		MIST	NW	L	
5	58.71	42.33													LT, RN	W	L	
6	58.77	42.26													RN		CLM	
7	58.80	42.23													RN	SW	L	
8	58.82	42.21													LT, RN	SW	L	
9	58.84	42.29													LT, RN	SW	L	
10	58.88	42.14												20	OPENED #1 + 2 -1' @ 10:20P	CL	S	L
11	58.87	42.44	3'	4'									7'		MIST	SW	L	
24 Hour Temp.	PRECIPITATION			MEN ON DUTY										REMARKS				
MAX. 48°	Start 8:35P	End 9:40P	Am't.	12 to 8	BOTTOMLEY		SPIRES		V storage yd @ 7:15 AM - 8/10 V storage yd @ 3:15 PM @ 50									
MIN. 29°	10:50P	11:20P		8 to 4	KOSARSKI		GEHANT											
6 AM 35°																		
	24 Hour Precip. 6 AM		0	4 to 12	GALLUP		PORTER		(WT 38° ICE RPT 6) ground gate another - 8/10									

LOCKMASTER'S DAILY REPORT STARVED ROCK LOCK

DATE 29 JAN 1989

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER	WIND	
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT
12 M	458.85	442.52	3'	4'	0	0	0	0	0	0	0	0	7'	OPENED #1-1'C 1255A	CL	WSW	L
1 AM	58.89	42.63	4'										8'		CL	WSW	L
2	58.85	42.78													CL	SIM	
3	58.81	42.88													LT FOG	CIM	
4	58.84	42.93													LT FOG	CIM	
5	58.82	42.95													LT FOG	CIM	
6	58.83	42.99													LT RAIN	N	L-2
7	58.82	43.02													LT RAIN	E	L
8	58.81	43.04													LT RAIN	SE	L
9	58.79	43.08													CL	SE	L
10	58.74	43.10	3'	3'									9'	CLOSED #1-4 #2-1' EA @ 10:05A	CL	SW	L
11	58.77	42.91											6'		CL	SW	L
12	58.81	42.75													CL	SW	L-7
1 PM	58.82	42.71													CL	SW	L
2	58.83	42.67													CL	SW	L
3	58.82	42.65													CL	SW	L
4	58.85	42.66	3'	3'	0	0	0	0	0	0	0	0	6'		CL	SW	L
5	58.80	42.61													CL	SW	L
6	58.79	42.60													CL	SW	L-6
7	58.77	42.66											4'	CLOSED #1-2-1' EA @ 7:20 AM	CL	SW	L
8	58.82	42.60	2'	2'									4'		MIST	SW	L
9	58.86	42.19											9'	OPENED #1-1'C 9:50 AM	MIST	SW	L
10	58.92	42.22	3'										5'	OPENED #2-2'C 10:50 AM	MIST	SW	L
11	58.99	42.48	5'	4'									7'	OPENED #1-2'C 11:20 AM	MIST	SW	L
24 Hour Temp.			PRECIPITATION			MEN ON DUTY							REMARKS				
MAX. 47°			Start	End	Am.	AUG 6.7							V storage up @ 7:05 AM - HK V storage up @ 3:20 PM - HK				
MIN. 34°			4:25	5:15		16	BOTTOMLEY		SPIRES								
			5:30 A	8:25		8	KOSAREK		GEHANT								
			7:10 P			to											
6 AM 38°			24 Hour P.Precip. 6 AM .22			4 to 12	GALLUP		PORTER				WT 38° ICE RPT @ closed gate. weather - HK				

LOCKMASTER'S DAILY REPORT STARVED ROCK LOCK

 DATE 30 JAN 1989

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER	WIND		
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT	
12 M	458.93	442.89	5"	4'	0	0	0	0	0	0	0	0	9'	CLOSED #1 @ 12:10	LT RN	W	L	
1 AM	58.92	42.92	4'										8'		LT RN	W	L	
2	58.96	42.99													LT RN	W	L	
3	58.95	443.06													CL	WSW	L	
4	58.91	43.10													CL	W	L	
5	58.86	43.14													CL	W	L	
6	58.84	43.17													CL	SW	L-8	
7	58.82	43.18													CL	SW	L	
8	458.82	443.17													CL	SW	L	
9	58.80	43.17											64	CLOSED #2-1' @ 9:45	CL	SW	L	
10	58.81	43.18		3'									7'		CL	SW	L	
11	58.82	43.11													PC	SW	L	
12	58.85	43.05													FA	W	L-6	
1 PM	58.83	43.00													FA	W	L	
2	58.72	43.05												35	CLOSED #1-1' @ 2:10	FA	W	L
3	58.72	42.95	3'										6'	CLOSED #2-1' @ 3:14	FA	W	L	
4	458.69	442.69	3'	2	0	0	0	0	0	0	0	0	5'		FA	SW	L	
5	58.77	43.53													FA	SW	L	
6	58.73	42.49													FA	SW	L-4	
7	58.83	42.35													FA	SW	L	
8	58.92	42.38													FA	SW	L	
9	58.93	42.25												30	OPENED #2-1' @ 9:40 PM	FA	S	L
10	58.94	42.42		3'									6'		FA	S	L	
11	58.97	42.44	4'											12	OPENED #1-1' @ 11:48 PM	FA	SW	L
24 Hour Temp.			PRECIPITATION			MEN ON DUTY							REMARKS					
MAX. 45°			Start	End	Amt.	12 to 8	BOTTOMLEY SPIRES						✓ 1st stage of @ 3:20 PM					
MIN. 35°						8 to 4	SADNICK PERRE											
6 AM 35°																		
			24 Hour Precip.	6 AM	.02	4 to 12	GALLUP PORTER						WT 41° 100 RPM & Mr. Pantaleo					

LOCKMASTER'S DAILY REPORT STARVED ROCK LOCKDATE 31 JAN 1989

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN	GATE CHANGES	WEATHER	WIND		
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT	
12 M	450.99	442.57	4'	3'	0	0	0	0	0	0	0	0	0	7'	OPENED #2 1' @ 100A	CL	SW	L
1 AM	59.00	42.66	4'	4'										8'	OPENED #1 1' @ 135A	CL	SW	L
2	58.97	42.97	5'											9'		PC	SW	L
3	58.90	43.08														PC	SW	L
4	58.96	43.20														PC	SW	L
5	58.80	43.30												30	CLOSED #1 2' @ 6:00AM	PC	S	L
6	58.73	43.37	3'											7'		PC	SW	L-5
7	58.78	43.11														FA	SW	L
8	58.77	43.07														FA	SW	L
9	58.78	43.06														FA	SW	L
10	58.79	43.05														FA	SW	M
11	58.80	43.07														FA	SW	M
12	58.80	43.10														FA	SW	M-13
1 PM	58.80	43.16														FA	SW	M
2	58.83	43.18														FA	SW	M
3	58.86	43.17														FA	SW	M
4	58.88	43.17	3'	4'	0	0	0	0	0	0	0	0	0	7'		FA	SW	M-22
5	58.87	43.14														FA	S	M
6	58.84	43.13														FA	SSW	M-14
7	58.88	43.13														FA	SW	L
8	58.89	43.10														FA	SW	L
9	58.89	43.12														FA	SW	L
10	58.88	43.11														FA	S	L
11	58.89	43.11												12W		FA	S	L

24 Hour Temp.	PRECIPITATION			MEN ON DUTY		REMARKS
	Start	End	Am.			
MAX. 50°				16	BOTTOMLEY SPIRES	✓ Storage 7/8 3:10 PM @
MIN. 35°				8	SADNICK PETRE	
				to	WATKA SWARTZ	
				4		
6 AM 41°	24 Hour Precip. 6 AM	0		4 to 12	GALLUP PORTER	WT 42° ICE RPT of La Pointe

LOCKMASTER'S DAILY REPORT STARVED ROCK LOCKDATE 1 FEB 19 89

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER	WIND			
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT		
12 M	458.88	443.10	3'	4'	0	0	0	0	0	0	0	0	7'		FA	S	L		
1 AM	58.89	43.08													FA	S	L		
2	58.89	43.08													FA	S	L		
3	58.89	43.06													PC	NW	L		
4	58.90	43.03													CL	NW	L		
5	58.91	43.04													CL	NW	L		
6	58.89	43.04													CL	N	L-5		
7	58.91	43.03													CL	N	L		
8	458.91	443.00													CL	N	L		
9	58.90	42.95													CL	N	L		
10	58.91	42.90													CL	N	L		
11	58.90	42.86													CL	N	L-10		
12	58.91	42.86													CL	N	L		
1 PM	58.89	42.80											98	CLOSED #2-1' @ 1:35	CL	N	L		
2	58.82	42.70	2'										6'		CL	N	L		
3	58.82	42.60													CL	N	L		
4	458.89	442.55	3'	3'	0	0	0	0	0	0	0	0	6'		CL	N	L		
5	58.80	42.51													CL	N	L		
6	58.82	42.47											30	OPENED #1-2-1' @ 6:15 PM	CL	N	L-10		
7	58.88	42.70	4'	4'									8'		CL	N	L		
8	58.82	42.77													LT RN	N	L		
9	58.75	42.82											24	Closed #1-1' @ 9:15 P	LT RN	N	L		
10	58.73	42.75	3'										7'	Closed #2-1' @ 10:50 P	LT RN	N	L		
11	58.76	42.62	3'										6'		LT RN	N	L		
24 Hour TEMP.	PRECIPITATION			MEN ON DUTY AUG 6.8										REMARKS					
MAX.	Start	End	Ant.	12 to 8	KOSARSKI					GENANT					V. Storage Pond @ 11:10 PM - 8K V. Storage Pond @ 3:20 PM @				
MIN.				8	Sadnick					PETRE									
				to	WITALKA					SWARTZ									
6 AM				4															
36°	24 Hour Precip. 6 AM			0"	4 to 12	GALLUP/KOSARSKI					PORTER					WT-45° 10 ERPT @ 2 Pistols			

LOCKMASTER'S DAILY REPORT STARVED ROCK LOCK

DATE 2 FEB 1989

43

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER	WIND		
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT	
12 M	458.78	442.58	2'	3'	0	0	0	0	0	0	0	0	6'		LT. SN	N	L	
1 AM	58.79	42.49													CL	N	L	
2	58.83	42.48													CL	N	L	
3	58.87	42.47													LT. SN	N	L	
4	58.89	42.44													CL	N	L	
5	58.90	42.42													CL	N	L	
6	58.91	42.40													CL	NE	L-3	
7	58.92	42.44	4'										48	OPENED #2-1' @ 6:55A	CL	NW	L	
8	458.92	442.49											7'		CL MIST	NE	L	
9	58.94	42.56													LT SN	E	L	
10	58.96	42.60													LT SN	E	L	
11	58.92	42.67													LT SN	NE	L	
12	58.90	42.68													LT SN	NE	L	
1 PM	58.90	42.66													LT SN	NE	L	
2	58.88	42.62													LT SN	NE	L	
3	58.88	42.67													LT SN	NE	L	
4	58.86	42.71													LT SN	NE	L	
5	58.79	42.70											70	CLOSED #2-2' @ 5:05	LT SN	N	L	
6	58.81	42.40	2'										5'		LT SN	N	L-6	
7	58.83	42.34													LT SN	N	L	
8	58.87	42.34													LT SN	N	L	
9	58.86	42.21													LT SN	N	L	
10	58.87	42.16											25		LT SN	N	L	
11	58.88	42.16	4'										7' 7	OPENED #2-2' @ 11:25 P	LT SN	N	L	
24 Hour TEMP.	PRECIPITATION			MEN ON DUTY										REMARKS				
	Start	End	Amt.															
MAX.	37°	2:25A	12:25A	12 8	KOSARSKI										V. Stolz 4d @ 11:55 PM - JK			
		2:25A	3:10A	8	WITALKA													
MIN.	26°	7:20A		to														
				4														
6 AM	28°	24 Hour Precip. 6 AM	T	4 to 12	SPARKS										WT- 43° ICE RT 8 J. P. Hines			
					PETER													

LOCKMASTER'S DAILY REPORT STARVED ROCK LOCKDATE 3 FEB 1989

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER	WIND	
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT
12 M	458.89	442.40	3'	4'	0	0	0	0	0	0	0	0	7'		LT. SN	N	L
1 AM	58.87	42.54													LT. SN	N	L
2	58.85	42.66													LT. SN	N	L
3	58.84	42.70													LT. SN	N	L
4	58.79	42.70													LT. SN	N	L
5	58.84	42.69													LT. SN	N	L
6	58.80	42.71													LT. SN	N	L-2
7	58.73	42.71		3'										5' CLOSED #2-1' @ 7:00A	LT. SN	N	L
8	58.76	42.59												6' 10" OPENED #1+2-1' @ 8:40AM	LT. SN	N	L
9	58.84	42.80	4'	4'										8'	SN	N	L
10	58.86	42.88													SN	N	L
11	58.88	42.97													LT. SN	NW	L
12	58.85	43.02													LT. SN	NW	L-12
1 PM	58.84	43.09													LT. SN	NW	L
2	58.85	43.08													LT. SN	NW	L
3	58.75	43.04													LT. SN	NW	L
4	58.72	42.86	3'											5' CLOSED #1-1' @ 3:10 7' 7" CLOSED #1+2-1' @ 4:40	LT. SN	NW	L
5	58.72	42.74	2'	3'										5'	LT. SN	N	L
6	58.74	42.49													LT. SN	N	L
7	58.81	42.30													LT. SN	N	L
8	58.79	42.26													LT. SN	N	L
9	58.83	42.17													LT. SN	N	L
10	58.83	42.11													LT. SN	N	L
11	58.87	42.05												35	LT. SN	N	L
24 Hour Temp.			PRECIPITATION			MEN ON DUTY AUG 6:0							REMARKS				
MAX.			Start	End	Amt.	16	KOSARSKI		GENANT		V storage yd @ 11:10AM - 8K V storage yd @ 7:15AM - 8K						
MIN.						8	WITALKA		PETRE								
						to	SADNICK		SWARTZ								
6 AM						4											
17°			24 Hour Pprecip.	6 AM	.01"	4 to 12	BOTTOMLEY		SPIRES		WT- 41° ICE RPT Ø M. Putter						

LOCKMASTER'S DAILY REPORT STARVED ROCK LOCK

 DATE 4 FEB 1989

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER	WIND	
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT
12 M	458.88	442.06	2'	3'	0	0	0	0	0	0	0	0	5'		LT. SN.	N	L
1 AM	58.89	42.02													LT. SN.	N	L
2	58.88	41.98													SN	N	L
3	58.92	41.95													SN	N	L
4	58.93	41.94													SN	N	L
5	58.94	42.06	3'										30	OPENED #1-1' @ 5:00 A	SN	N	L
6	58.94	42.09		4'									6' 10	OPENED #2-1' @ 6:50 A	SN	N	L-2
7	58.96	42.27											7'		SN	N	L
8	58.96	42.37													SN	N	L
9	58.90	42.47													SN	NW	L
10	58.80	42.54											20	CLOSED #1 & 2-1' @ 10:40 AM	SN	NW	L
11	58.82	42.42	2'	3'									5'		SN	NW	L
12	58.82	42.24													SN	NW	L
1 PM	58.81	42.18													SN	NW	L
2	58.85	42.13													SN	NW	L
3	58.86	42.09													SN	NW	L
4	58.87	42.06													SN	NW	L-5
5	58.89	42.03													SN	NW	L
6	58.89	42.02													SN	N	L-5
7	58.87	42.02													SN	N	L
8	58.90	42.02													SN	N	L
9	58.87	42.04													SN	N	L
10	58.84	42.03													SN	N	L
11	58.83	42.05											65		SN	NW	L
24 Hour TEMP.	PRECIPITATION			MEN ON DUTY										REMARKS			
MAX.	Start	End	Am.	1 to 8	KOSARSKI		GEHANT		V. Storage up @ 11:10 PM - 9K								
MIN.				8 to 4	WITALKA		SWARTZ										
6 AM																	
+1°	24 Hour Precip.	6 AM	.05"	4 to 12	BOTTUMLEY		SPIRES		WT- 38° ICE RPT @ 1" SNOW								

LOCKMASTER'S DAILY REPORT STARVED ROCK LOCK

 DATE 5 FEB 1989

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER	WIND			
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT		
12 M	458.83	442.04	2'	3'	0	0	0	0	0	0	0	0	5'		SN	NW	L		
1 AM	58.88	42.05													SN	NW	L		
2	58.87	42.03													LT SN	NW	L		
3	58.85	42.02													LT SN	NW	L		
4	58.83	42.01													LT SN	N	L		
5	58.80	42.00													LT SN	N	L		
6	58.78	42.01													LT SN	N	L-4		
7	58.76	42.00		2'									40 4'	CLOSED #2-1' @ 7:05 A	LT SN	N	L		
8	58.77	41.84													SN	N	L		
9	58.80	41.84													SN	N	L		
10	58.81	41.82													SN	N	L		
11	58.84	41.79													SN	N	L		
12	58.87	41.75													SN	NW	L		
1 PM	58.86	41.74													LT SN	NW	L		
2	58.90	41.71													LT SN	NW	L		
3	58.90	41.81													LT SN	NW	L		
4	58.87	41.80													LT SN	NW	L		
5	58.88	41.78													LT SN	N	L		
6	58.86	41.83													LT SN	NW	L-11		
7	58.87	41.84													LT SN	NW	L		
8	58.86	41.84													PC	NW	L		
9	58.84	41.87													PC	NW	L		
10	58.80	41.92													PC	NW	L		
11	58.81	41.95											6A		PC	N	L		
24 Hour Temp.			PRECIPITATION			MEN ON DUTY								REMARKS					
MAX.			Start	End	Am.	12 8	KOSARSKI		GERANT							V. Storage yd @ 11:15 PM - 8K			
MIN.						8	WITALIA		SWARTZ										
						to													
						4													
6 AM																WT-35° ICE 2PT Ø +3" SNOW			
2°			24 Hour Pprecip.	6 AM	.32"	4 to 12	BOTTOMLEY		SPIRES										

LOCKMASTER'S DAILY REPORT STARVED ROCK LOCK

 DATE 6 FEB 1989

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER	WIND	
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT
12 M	458.81	441.91	2'	2'	0	0	0	0	0	0	0	0	4'		PC	W	M
1 AM	58.80	41.92													PC	W	M
2	58.82	41.90													PC	W	L
3	58.78	41.87													PC	W	L
4	58.76	41.86	1'										20	CLOSED #1-1' @ 4:45A	CL	SW	L
5	58.78	41.80											3'		CL	SW	L
6	58.81	41.74													CL	W	L-7
7	58.82	41.71													CL	W	L
8	58.89	41.70											12	Opened #1-2' @ 8:45A	CL	W	L
9	58.89	41.92	3'										5'		CL	W	L
10	58.93	42.07													CL	W	L
11	58.85	42.15											15	CLOSED #1-1' @ 11:50A	CL	W	L
12	58.84	42.10	2'										4'		CL	SW	L-10
1 PM	58.82	42.04													CL	SW	L
2	58.85	42.02													CL	SW	L
3	58.80	41.96													CL	SW	L
4	58.78	41.97											20	CLOSED #1-1' @ 4:45	CL	W	L-10
5	58.76	41.78	1'										3'		CL	SW	L
6	58.75	41.71													CL	SW	L-9
7	58.73	41.62													CL	SW	L
8	58.84	41.69													CL	SW	L
9	58.88	41.61													CL	SW	L
10	58.85	41.63											18	Opened #1-1' @ 10:58	PC	W	L
11	58.98	41.63	2'										4' A		FA	SW	L
24 Hour Temp.			PRECIPITATION			MEN ON DUTY								REMARKS			
MAX.			Start	End	Am.	706 3.7								V. storage yd @ 11:15 AM - 8K			
7°						12 to 8	KOSARSKI		GENANT								
MIN.						8 to 4	PORTER		PETRE								
-3°																	
6 AM													GR. Pinnals WT - 33° ICE RPT & +2" SNOW				
-3°																	
24 Hour P.Precip.			6 AM		.13"	4 to 12	BOTTOMLEY		SPIRES								

LOCKMASTER'S DAILY REPORT STARVED ROCK LOCK

 DATE 7 FEB 1989

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER	WIND	
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT
12 M	458.98	441.77	2'	2'	0	0	0	0	0	0	0	0	4' 4"	OPENED #1-1' @ 12:30 A	FA	SW	L
1 AM	58.99	42.01	3'										5' 5"	OPENED #1-1' @ 1:55 A	FA	SW	L
2	58.99	42.08	4'										6'		FA	SW	L
3	58.99	42.33													FA	SW	L
4	58.97	42.48													FA	SW	L
5	58.94	42.57													FA	W	L
6	58.87	42.68	3'										30	CLOSED #1-1' @ 6:35 A	FA	W	L-8
7	58.85	42.61											5'		FA	W	L
8	458.78	442.59	3'	2'	0	0	0	0	0	0	0	0	5'		FA	W	L-6
9	58.76	42.60													FA	W	L
10	58.80	42.63													FA	W	L
11	58.79	42.60											25	CLOSED #1-1' @ 11:45 A	FA	W	L
12	58.75	42.50	2'										4' 4"	CLOSED #2-1' @ 12:15 PM	FA	W	L-6
1 PM	58.71	42.35		1'									3'		FA	SW	L
2	58.71	42.21													FA	SW	L
3	58.77	41.98													FA	SW	L
4	58.81	41.85													FA	SW	L
5	58.82	41.84													FA	SW	L
6	58.85	41.76													FA	SW	L-9
7	58.87	41.72													FA	S	L
8	58.90	41.67											26	OPENED #2-1' @ 8:45	FA	SW	L
9	58.92	41.83		2'									4'		FA	SW	L
10	58.92	41.92													FA	SW	L
11	58.93	41.99											12		FA	SW	L
24 Hour Temp.	PRECIPITATION			MEN ON DUTY								REMARKS					
MAX.	Start	End	Amt.					AUG 4.3									
11°				12	KOSARSKI				GENANT				✓ storage yd @ 11:10 AM - 8K				
MIN.				8	GALLUP				SADNICK				✓ storage yd @ 7:15 AM - 8K				
-2°				to	PORTER				PETRE								
6 AM				4													
4°	24 Hour Precip.	6 AM	0"	4 to 12	BOTTOMLEY				SPIRES				WT-32° ICE RAT 9 A2C8				

LOCKMASTER'S DAILY REPORT STARVED Rock Lock

DATE 8 Feb 19 89

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER	WIND		
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT	
12 M	458.93	442.07	2'	2'	0	0	0	0	0	0	0	0	4'		PC	SW	L	
1 AM	58.93	42.10											8	OPENED #1 - 1' @ 01:41 AM	PC	SW	L	
2	58.55	42.23	3'										5'		PC	SW	M	
3	58.91	42.30													CL	SW	M	
4	58.90	42.41													CL	W	M	
5	58.84	42.48													PC	W	M	
6	58.87	42.59													PC	W	M	
7	58.87	42.69													FA	W	M	
8	58.88	42.69													FA	W	M	
9	58.81	42.80													FA	WNW	M	
10	58.81	42.85													FA	WNW	M	
11	58.79	42.90											50	Closed #1 - 1' @ 11:30	FA	WNW	M	
12	58.80	42.77	2'										4'		FA	WNW	M 18	
1 PM	58.81	42.74													FA	WNW	M	
2	58.83	42.69													FA	W	M	
3	58.53	42.62													FA	W	M	
4	58.90	42.56													FA	W	M	
5	58.90	42.53													FA	W	M	
6	58.91	42.47													FA	W	M-14	
7	58.94	42.44													FA	W	L	
8	58.95	42.42											30	Closed #1 - 2' @ 8:16	FA	W	M	
9	58.89	42.62	4'										6'		FA	W	M	
10	58.87	42.81													FA	W	M	
11	58.87	42.95											18		FA	W	M	
24 Hour Temp.	PRECIPITATION			MEN ON DUTY										REMARKS ✓ Storage gate 11:30 AM M.W.				
MAX.	Start	End	Am.	12 to 8	WITALKA					SWARTZ								
MIN.				8 to 4	SADNICK					PETRE								
					PORTER													
6 AM																		
16°	24 Hour Precip.	6 AM	0"	4 to 12	BOTTOMNEY					SPIRES					WT-32°	JCE RPT. 9A 3C10	X's Rpt.	

LOCKMASTER'S DAILY REPORT STARVED ROCK Lock

 DATE 9 Feb 1989

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER	WIND		
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT	
12 M	458.89	443.07	4'	2'	0	0	0	0	0	0	0	0	6'		FA	W	M	
1 AM	58.86	43.80													FA	W	M	
2	58.80	43.72											10	CLOSED #1-1' @ 2:10am	FA	W	M	
3	58.78	43.83	3'										5'		FA	W	L	
4	58.72	43.07													FA	W	L	
5	58.69	42.83											15	CLOSED #1-1' @ 5:15am	FA	NW	L	
6	58.67	42.65	2'										4' &	CLOSED #1-1' @ 6:55am	FA	W	L	
7	58.66	42.65	1'										3'		FA	SW	L	
8	458.66	442.64													FA	SW	L	
9	58.74	42.65													FA	SW	L	
10	58.86	42.51											12	opened #1-1' @ 10:25	FA	SW	L	
11	58.89	42.64	2'										4'		PC	SW	L	
12	58.91	42.66													PC	W	L 10	
1 PM	58.95	42.68													PC	W	L	
2	58.99	42.69											110	opened #1-1' @ 2:39	PC	SW	L	
3	58.97	42.85	3'										5'		PC	SW	L	
4	58.95	42.89													CL	S	M	
5	58.93	42.91													CL	S	M	
6	58.90	42.93													CL	SW	M	
7	58.88	42.94													CL	SW	L	
8	58.85	43.05													FA	SW	M	
9	58.83	43.13													FA	SW	M	
10	58.85	43.14											60	Closed #1-1' @ 10:30	FA	SW	M	
11	58.74	43.04	2'										4' &		FA	NW	M	
24 Hour TEMP.	PRECIPITATION			MEN ON DUTY										REMARKS				
MAX.	Start	End	Amt.	AUG 4.5										✓ storage yd @ 11:20 pm MU				
17°				16 to 8	WITALKA					SWARZE								
MIN.				8 to 4	SADNICK					PETRE								
1°					PORTER													
6 AM				4 to 12														
1°	24 Hour Pprecip.	6 AM	0"	4 to 12	BOTTOMLEY					SPIRES					WT-32°	ICE RPT 9 A 3 C 10	L. Pinter	

LOCKMASTER'S DAILY REPORT STARVED ROCK LOCK

 DATE 10 FEB 1989

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER	WIND		
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT	
12 M	458.74	442.90	2'	2'	0	0	0	0	0	0	0	0	4'		FA	NW	M	
1 AM	58.75	42.87													FA	NW	L	
2	58.71	42.84											12	CLOSED #1-1' @ 0210 AM	FA	NW	L	
3	58.84	42.82	1'										3'		FA	NW	L	
4	58.91	42.52											0	OPENED #1-1' @ 4:10 AM	FA	NW	L	
5	58.93	42.62	2'										4'		FA	NW	L	
6	58.96	42.66											8	OPENED #1-1 1/2 @ 6:25 AM	FA	NW	L-L	
7	58.95	42.89	3'										5'		FA	NW	L	
8	458.95	442.89													FA	W	L	
9	58.94	42.92													FA	W	L	
10	58.94	42.98													FA	SW	L	
11	58.89	43.12													FA	SW	L	
12	58.88	43.13											30	CLOSE #1-1' @ 12:40 P.M.	FA	SW	L 10	
1 PM	58.90	43.04	2'	2'									4'		FA	SW	L	
2	58.88	42.93											8	CLOSED #1-1' @ 2:50	PC	SW	L	
3	58.85	42.77	1'										2'		FA	SW	L	
4	58.87	42.63													FA	S	L	
5	58.92	42.58													PC	S	L	
6	58.91	42.49													PC	S	L-7	
7	58.93	42.28	2'										15	OPENED #1-1' @ 7:35 P	PC	S	L	
8	58.92	42.31											4'		PC	S	L	
9	58.89	42.28													PC	SW	L	
10	58.85	42.36													PC	SW	L	
11	58.83	42.40											10		PC	SW	L	
24 Hour Temp.			PRECIPITATION			MEN ON DUTY							REMARKS					
MAX.			Start	End	Am.	AUG 3.9							✓ storage yd @ 11:20 PM MW ✓ storage yd @ 3:15 PM-8K					
MIN.						12 to 8	WITACKA		SWIFT									
						8 to 4	SADNICK		PETRE									
							PORTER											
6 AM																		
11°			24 Hour Pprecip. 6 AM			0'	4 to 12	KOSARSKI		GENANT		WT-32 ICE RPT 10A4C13 L. P. Smith						

LOCKMASTER'S DAILY REPORT STARVED ROCK LOCK

 DATE 11 FEB 19 89

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER	WIND				
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT			
12 M	458.80	442.38	2'	2'	0	0	0	0	0	0	0	0	4'		PC	SW	L			
1 AM	58.81	42.52													PC	SW	L			
2	58.82	42.49													PC	W	L			
3	58.81	42.50													PC	W	L			
4	58.83	42.53													PC	W	L			
5	58.84	42.57													FA	W	L			
6	58.85	42.54													FA	NW	L			
7	58.91	42.55													FA	W	L			
8	458.91	442.53													FA	W	L			
9	58.95	42.50													FA	W	L			
10	58.98	42.54													FA	W	L			
11	58.99	42.57											48	OPENED #1-1 @ 11:20 A	FA	W	L			
12	58.97	42.67	3'										5'		FA	W	L-6			
1 PM	58.97	42.81													FA	W	L			
2	58.91	42.86											19	CLOSED #1-1 @ 2:50 P	FA	W	L			
3	58.86	42.90	2'										4'		FA	W	L			
4	58.84	42.78													FA	W	M			
5	58.84	42.70													FA	W	M			
6	58.81	42.63													FA	SW	L-8			
7	58.80	42.60													FA	SW	L			
8	58.79	42.58	1'										13	CLOSED #1-1 @ 8:50 P	FA	SW	L			
9	58.82	42.49											5'		FA	SW	L			
10	58.83	42.40													FA	SW	L			
11	58.86	42.28											9		FA	W	L			
24 Hour Temp.			PRECIPITATION			MEN ON DUTY AUG 4										REMARKS ✓ storage 4d @ 11:20pm MW ✓ storage 4d @ 3:15pm JK GR PINTALS W.T. 32' ICE RPT 1044C13				
MAX. 27°			Start	End	Am.	12 to 8	WITALKA		SWARTZ											
MIN. 8°						8 to 4	SADNICK		PORTER											
6 AM																				
16°			24 Hour P.Precip. 6 AM		0"	4 to 12	KOSARSKI		GEHANT											

LOCKMASTER'S DAILY REPORT STARVED ROCK LOCK

DATE 12 FEB 1989

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER	WIND	
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT
12 M	458.87	442.16	1'	2'	0	0	0	0	0	0	0	0	3' 3"	OPENED #1-1' @ 12:30 AM	FA	W	L
1 AM	58.89	42.24	2'										4'		FA	W	L
2	58.91	42.23													FA	W	L
3	58.92	42.22													FA	W	L
4	58.92	42.22													FA	W	L
5	58.97	42.31											20	OPENED #1-1' @ 5:10 AM	FA	W	L
6	58.94	42.47	3'										5'		FA	NW	L
7	58.96	42.58													FA	NW	L
8	58.96	42.62												REARRANGED #1-4' + 2 = 1' 8:20	FA	NW	L
9	58.93	42.79	4'	1'											FA	NW	L
10	58.91	42.83													FA	NW	L
11	58.92	42.85													FA	S	L
12	58.92	42.86													FA	SE	L-6
1 PM	58.92	42.79													FA	SE	L
2	58.94	42.68													FA	SE	L
3	58.93	42.65													FA	SE	L
4	58.92	42.55													CL	S	L
5	58.87	42.38													CL	S	L
6	58.85	42.40													CL	SE	L-6
7	58.82	42.41													CL	SE	L
8	58.83	42.19													CL	SE	L
9	58.85	42.20													CL	SE	L
10	58.85	42.18											95		CL	SE	L
11	58.75	42.19	2'										3' 3"	CLOSED #1-2' @ 11:05 PM	CL	SE	L
24 Hour Temp.	PRECIPITATION			MEN ON DUTY		REMARKS											
MAX.	Start	End	Ant.	4.0													
MIN.				12 to 8	WITALKA		SUKITZ										
				8 to 4	BOTTOMLEY		SADNICK										
6 AM																	
	24 Hour P.Precip.	6 AM		4 to 12	KOSARSKI		GEHANT		UN-310 ICE FRT 1044C13								

✓ storage yd @ 11:20 pm
✓ storage yd @ 3:15 PM - 8K

LOCKMASTER'S DAILY REPORT Starved Rock Lock

 DATE 13 Feb 19 89

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER	WIND						
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT					
12 M	458.76	442.02	2'	1'	0	0	0	0	0	0	0	0	3'		CL	SE	L					
1 AM	58.71	41.85													SN	E	L					
2	58.75	41.85													SN	SE	L					
3	58.80	41.81													SN	E	L					
4	58.89	41.74												15	OPENED #1-1' @ 4:10AM	SN	E	M				
5	58.92	41.90	3'										4'	OPENED #1-1' @ 5:40AM	SN/RN	E	L					
6	58.95	41.99	4'										5		MIST	S	L-6					
7	59.00	42.15											10		CL	SW	L					
8	59.01	42.20	3'										4'	CLOSED #1-1' @ 8:30AM	CL	SW	L					
9	58.94	42.33	2'										3'	CLOSED #1-1' @ 9:00 A	CL	SW	L					
10	58.99	42.1													CL	SW	L					
11	58.90	42.25													CL	SW	L					
12	58.97	42.12													CL	SW	L-8					
1 PM	58.96	42.10													CL	SW	L					
2	58.97	42.07												15:30		CL	SW	L				
3	58.77	42.25											21	OPENED 2' REARRANGED GATES	CL	SW	L					
4	58.75	42.32	4.5	5									5		CL	SW	L					
5	58.71	42.35	3.5										10	CLOSED #1-1' @ 5:05 P	CL	SW	L					
6	58.73	42.26											4'		CL	SW	L-6					
7	58.71	41.99													CL	SW	L					
8	58.74	41.83													CL	SW	L					
9	58.79	41.78													CL	SW	L					
10	58.82	41.74													CL	SW	L					
11	58.90	41.71											24		PC	SW	L					
24 Hour Temp.			PRECIPITATION			MEN ON DUTY						REMARKS										
MAX.			Start	End	Am.	AVG 3.0						✓ storage yd @ 11:25pm MW ✓ storage yd @ 3:10PM-8K										
34°			12:10AM	6:20A		12	WITALKA		SWARTZ													
MIN.						8	PORTER		SPIRES													
16°						to																
6 AM						4																
33°			24 Hour Pprecip. 6 AM			28"	4 to 12	KOSARSKI		GEHANT		GR. PINTA'S WT-32° ICE RPT 10A4C13 SNOW-3"										

LOCKMASTER'S DAILY REPORT STARVED ROCK LOCK

 DATE 14 FEB 19 89

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER	WIND		
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT	
12 M	468.91	441.74	36"	6"	0	0	0	0	0	0	0	0	4'		PC	NW	L	
1 AM	58.96	41.71											8	OPENED #1-1' @ 1:20AM	PC	NW	L	
2	58.92	41.80	46"										5'		PC	NW	L	
3	58.86	41.83													PC	NW	L	
4	58.82	41.84											15	CLOSED #1-1' @ 4:15am	PC	NW	L	
5	58.78	41.76	36"										4'		PC	NW	L	
6	58.77	41.73											8	CLOSED #1-1' @ 6:10AM	PC	NW	L	
7	58.78	41.62	26"										3' 3"	CLOSED #1-1' @ 7:05AM	PC	NW	L	
8	58.82	41.41	16"										2'		PC	NW	L	
9	58.89	41.35													PC	N	L	
10	58.94	41.41													PC	N	L	
11	58.99	41.50											8	OPENED #1 3'6" #2 6" @ 11:30A	PC	N	L	
12	58.92	41.80	5'	1'									6'		PC	N	L	
1 PM	58.91	41.93													PC	N	L	
2	58.89	42.04													PC	N	L	
3	58.84	42.10											20	CLOSED #1-1/2 3:20 PM	CL	N	L	
4	58.86	42.01	4										3		CL	N	L	
5	58.87	41.98													CL		CLM	
6	58.87	41.94													CL		CLM	
7	58.86	41.92													CL		CLM	
8	58.88	41.89	3'										25	CLOSED #1-1' @ 8:40 P	CL	E	L	
9	58.86	41.75											41		CL	E	L	
10	58.89	41.70													CL	E	L	
11	58.88	41.66													CL	E	L	
24 Hour TEMP.	PRECIPITATION			MEN ON DUTY										REMARKS				
MAX.	38°																	✓ storage yd @ 11:20pm H.W.
MIN.	20°																	✓ storage yd @ 3:15 PM - JK
6 AM	20°																	
		24 Hour FPrecip.	6 AM	T														
					4 to 12													

LOCKMASTER'S DAILY REPORT STARVED ROCK LOCKDATE 15 FEB 19 89

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER	WIND				
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT			
12 M	58.85	41.62	3	1	0	0	0	0	0	0	0	0	X		CL	W	L			
1 AM	58.84	41.60													LT SN	E	L			
2	58.86	41.59													LT SN	E	L			
3	58.88	41.58													LT SN	E	L			
4	58.89	41.57													LT SN	W	L			
5	58.90	41.55													SN	N	L			
6	58.95	41.54												28 6' OPENED 12' @ 63° A	SN	N	L			
7	58.98	41.80	5'												SN	N	L			
8	58.98	41.95													SN	N	L			
9	58.97	42.08													SN	N	L			
10	58.94	42.02													SN	N	L			
11	58.88	42.05													LT SN	N	L			
12	58.87	42.09													CL	N	L -4			
1 PM	58.86	42.11													CL	N	L			
2	58.85	42.15												48 5' CLOSED 1+2 - 6" EA @ 2:17	CL	N	L			
3	58.77	42.06	4 1/2"	6"											CL	N	L			
4	58.77	42.03													CL	N	L			
5	58.80	41.95													CL	N	L			
6	58.83	41.96													CL	N	L-3			
7	58.87	41.93													CL	N	L			
8	58.89	41.94													CL	N	L			
9	58.92	41.85													CL	N	L			
10	58.95	41.84												40 6' 10" OPENED 12' @ 230	PC	N	L			
11	58.92	42.12	5 1/2"												PC		CLM			
24 Hour TEMP.	PRECIPITATION			MEN ON DUTY										REMARKS						
MAX.	Start	End	Amt.	12 to 8	AUG 5.0					Storage yd @ 3:15 PM - JK										
33°	1220 A	12:00 P		8	BOTTOMLEY	SADNICK														
MIN.				to	PETRE	SPIRES														
19°				4	PORTER															
6 AM																				
29°	24 Hour Precip.	6 AM	.11	4 to 12	KOSARSKI	GEHANT	XP WT 32° ICE F-FT 10 A 5 C 4													

LOCKMASTER'S DAILY REPORT STARVED ROCK LOCKDATE 16 FEB 1989

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER	WIND		
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT	
12 M	458.93	442.10	56"	64"	0	0	0	0	0	0	0	0	0	6'		PC	N	L
1 AM	58.86	42.09														PC	NE	L
2	58.86	42.09														PC	NE	L
3	58.89	42.17														PC	NE	L
4	58.84	42.16														PC	N	L
5	58.79	42.15														PC	N	L
6	58.76	42.16												42	CLOSED #1 1' @ 6:10A	PC	N	L
7	58.75	42.06	46"											5'		PC	N	L
8	58.74	42.03												10	CLOSED #1-2 @ 8:30A	FA	NNE	L-3
9	58.76	41.85	26"											3		FA	NE	L
10	58.79	41.81														FA	N	L
11	58.87	41.56														FA	N	L
12	58.90	41.54														FA	N	L-4
1 PM	58.94	41.51														FA	N	L
2	58.93	41.49												18	OPENED #1-2 @ 2:45 P	PC	N	L
3	58.90	41.90	46"											5		PC	NW	L
4	58.90	41.87														PC	NE	L
5	58.86	41.84														PC	N	L
6	58.84	41.83														PC	N	L-2
7	58.85	41.84														PC	N	L
8	58.83	41.79														PC	NE	L
9	58.80	41.80														PC	NE	L
10	58.82	41.82														FA	NE	L
11	58.84	41.81												26		FA	NE	L
24 Hour Temp.	PRECIPITATION			MEN ON DUTY										REMARKS				
MAX.	Start	End	Amt.	AVG 4.7										V. storage yd @ 3:10 PM - JAL				
MIN.				BOTTONLEY SADNICK														
				Petrie SPIRES														
				Porter														
6 AM																		
24 Hour Precip. 6 AM			.14	KOSARSKI GEHANT										WT 32° ICE RPT 10 A 5 C 4 SLP				

LOCKMASTER'S DAILY REPORT STARVED ROCK LOCK

 DATE 17 FEB 1989

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER	WIND		
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT	
12 M	458.87	441.82	4'6"	6"	0	0	0	0	0	0	0	0	0	5		PC	NE	L
1 AM	58.91	41.83													PC	NE	L	
2	58.93	41.84													PC	NE	L	
3	58.93	41.85													PC	NE	L	
4	58.98	41.99	5'6"											6'	20 OPENED #1 1' @ 3:00A	PC	NE	L
5	58.98	42.03													PC	E	L	
6	58.98	42.05													PC	E	L	
7	58.98	42.09													PC	E	L	
8	58.98	42.14													PC	E	L	
9	58.99	42.18													30 OPENED #2 1+2 = 6" @ 9:24	PC	E	L
10	58.96	42.36	6'	1'										7'		PC	NE	L
11	58.89	42.43													PC	NE	L	
12	58.88	42.45													2 CLOSE #1-2' @ 12:53	PC	NE	L
1 PM	58.88	42.37	4'											5'		PC	NE	L
2	58.88	42.17													PC	NE	L	
3	58.87	42.09													PC	NE	L	
4	58.89	42.04													PC	NE	L	
5	58.90	41.99													PC	NE	L	
6	58.90	41.98													PC	NE	L	
7	58.90	41.95													PC	NE	L	
8	58.92	41.96													PC	NE	L	
9	58.92	41.94													FA	E	L	
10	58.90	41.94													FA	E	L	
11	58.90	41.94													FA	E	L	
24 Hour TEMP.	PRECIPITATION			MEN ON DUTY										REMARKS				
MAX. 24	Start	End	Ant.	AUG 5.5										✓ storage 40' @ 3:20pm m/w Comp - N. 19:30				
MIN. 5				12 to 8	BOTTOMLEY					SADNICK								
				8 to 4	PETRE					SPIRES								
					WORTER													
6 AM 7	24 Hour Precip. 6 AM	0	4 to 12	WITALKA					SWARTZ					WT 32° KEPT 25RCX				

LOCKMASTER'S DAILY REPORT STARVED ROCK LOCK

 DATE 18 FEB 1989

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER	WIND					
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT				
12 M	458.91	441.97	4	1	0	0	0	0	0	0	0	0	5		FA	E	L				
1 AM	58.95	41.95													FA	E	L				
2	58.96	41.93													FA	E	L				
3	58.94	41.94													FA	E	L				
4	58.94	41.96													PC	E	L				
5	58.89	41.95													PC	E	L				
6	58.90	41.94													PC	E	L-5				
7	58.88	41.95													PC	E	L				
8	58.85	41.98													PC	E	L				
9	58.80	41.94												2' Closed #1-2 @ 9:20	CL	E	L				
10	58.78	41.73	2'										3'		CL	NE	L				
11	58.83	41.61													CL	NE	L				
12	58.82	41.54													PC	NE	L-4				
1 PM	58.84	41.49													PC	NE	L				
2	58.92	41.46													PC	NE	L				
3	58.90	41.41													PC	NE	L				
4	58.90	41.39													CL	E	L				
5	58.91	41.43													CL	SE	L				
6	58.91	41.39													CL	SE	L				
7	58.96	41.43												OPENED #1-2 @ 7:15pm	CL	SE	L				
8	59.00	41.76	4'										5'		CLSN	SE	L				
9	59.00	41.80												OPENED #1-1 @ 2153	CL	E	L				
10	59.00	41.86	5'										6'		CL	E	L				
11	58.99	41.90	6'										7'	OPENED #1-1 @ 2255AM	CL	E	L				
24 Hour Temp.	PRECIPITATION			MEN ON DUTY										REMARKS							
MAX.	Start	End	Am.	AVG 6.2										V storage yd @ 3:20pm MW WT 32° ICE R.F. 1R4CX							
MIN.				80	BOTTOMLEY SADNICK																
				8	SPIRES PETRE																
				to																	
6 AM				4																	
11	24 Hour P.Precip.	6 AM	0	4 to 12	WITALKA SWARTZ																

LOCKMASTER'S DAILY REPORT STARVED ROCK LOCK

 DATE 19 FEB 19 89

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER	WIND		
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT	
12 M	458.96	442.10	6'	1'	0	0	0	0	0	0	0	0	7'		CL	E	L	
1 AM	58.88	42.29	4'										14	CLOSED #1-2' @ 1:15 A	CL	E	L	
2	58.84	42.07											5'		CL	E	L	
3	58.84	42.02													CL	SW	L	
4	58.83	41.95													CL	SW	L	
5	58.83	41.98													CL	SW	L	
6	58.84	41.91													CL	SW	L-2	
7	58.83	41.97													CL	SW	L	
8	58.82	41.96											35	CLOSED #2 6" @ 905 A	CL	SW	L	
9	58.80	41.95	6"										4' 6"		CL	NW	L	
10	58.79	41.98													CL	NW	L	
11	58.79	41.83													CL	NW	L	
12	58.79	41.80													CL	NW	L-3	
1 PM	58.80	41.87													CL	NW	L	
2	58.80	41.86													CL	NW	L	
3	58.80	41.79													CL	NW	L	
4	58.83	41.80													CL	N	L	
5	58.84	41.81													CL	S	L	
6	58.86	41.84													CL	S	L	
7	58.85	41.75													CL	S	L	
8	58.84	41.74													CL	S	L	
9	58.84	41.75													CL	S	L	
10	58.83	41.75													SN	S	L	
11	58.81	41.74											12/6		SN	S	L	
24 Hour TEMP.	PRECIPITATION			MEN ON DUTY										REMARKS				
MAX.	Start	End	Ant.	AUG 4.8										V storage yd @ 11:00 PM - 2K V storage yd @ 3:30 PM - 11:00				
29°	9:15pm			12 80	KOSARSKI					SADNICK								
MIN.				8	BOTTOMLEY					PETRE								
11°				to														
6 AM				4														
25°	24 Hour Precip. 6 AM	T	4 to 12	WITALKA					SWARTZ					WT 32° ICERPT 1P 2C1				

LOCKMASTER'S DAILY REPORT STARVED ROCK LOCK

 DATE 20 FEB 1989

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER	WIND					
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT				
12 M	458.81	441.71	4'	6"	0	0	0	0	0	0	0	0	4'6"		SN	SW	L				
1 AM	58.70	41.63													SN	SW	L				
2	58.69	41.70	16"											CLOSED #1 - 2'6" @ 3:35 A	CL	SW	L				
3	58.74	41.48											2'		CL	SW	L				
4	58.77	41.30											5'		LT SN	SW	L				
5	58.88	41.28	4'										4'	OPENED #1 - 2'6" @ 5:25 A	SN		CLM				
6	58.97	41.52	5'										5'6"	OPENED #1 - 1' @ 5:55 A	SN		CLM				
7	58.99	41.72	6'										11'	OPENED #1 - 1' @ 7:10	LT SN		CLM				
8	59.00	41.98											6'6"		LT SN	NNE	L-C				
9	58.98	41.95													SN	NNE	L				
10	58.96	42.05													SN	NNE	L				
11	58.94	42.08													SN	NE	L				
12	58.88	42.07													SN	NE	L-1				
1 PM	58.80	42.12											39'	CLOSED #1 2' @ 1:50	LT SN	E	L				
2	58.81	42.01	4'										4'6"		CL	E	L-				
3	58.76	41.90													LT SN	NE	L				
4	58.75	41.77													SN	NE	L				
5	58.75	41.72													SN	NE	L				
6	58.77	41.68													SN	NE	L				
7	58.79	41.66													SN	NE	L				
8	58.79	41.66													SN	NE	L				
9	58.77	41.67													LT SN	N	L				
10	58.75	41.68											40.5		LT SN	N	L				
11	58.70	41.55	2'										2'6" 2.5	CLOSED #1 - 2' @ 11:20 P	LT SN	N	L				
24 Hour TEMP.	PRECIPITATION			MEN ON DUTY AUG 4.0										REMARKS							
MAX.	Start	End	Ant.	12 to 8	KOSARSKI		SADNICK		V storage yd @ 11:05 PM - JK												
MIN.				8	SPIRES		Gehant														
				to																	
				4																	
6 AM	24 Hour Pprecip. 6 AM			.02"	4 to 12	WITALKA		SWARTZ		1/4" NEW SNOW WT-34° ICE RPT Ø LOWER GAGE - QUIT @ 1745											

LOCKMASTER'S DAILY REPORT STARVED ROCK LOCK

 DATE 21 FEB 1989

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER	WIND	
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT
12 M	458.73	441.41	2'	6"	0	0	0	0	0	0	0	0	2'6"		LT. SN	N	L
1 AM	58.74	41.26													LT. SN	N	L
2	58.77	41.10											7.5		LT. SN	N	L
3	58.85	41.02	4 1/2"											OPENED #1-2'6" @ 3:20 A	CL	N	L
4	58.83	41.40											5'		CL	N	L
5	58.77	41.50											15'		CL	N	L
6	58.76	41.55	3 1/2"										3.5	CLOSED #1-1' @ 6:20 A	CL	NW	L-2
7	58.78	41.45											4'		CL	NW	L
8	58.87	41.42													CL	NW	L
9	58.93	41.50											12	OPENED #1-1'6" @ 9:33	CL	N	L
10	58.95	41.60	5'										5'6"		CL	N	L
11	58.92	41.76													CL	N	L
12	58.91	41.78													CL	N	L
1 PM	58.86	41.90											22	Closed #1-3' + OPENED #2-6" @ 1:07	PC	NW	L-8
2	58.82	41.65	3'	1'									4' 4"	CLOSED #2-1' @ 2:35	CL	NW	L
3	58.82	41.40	3'										3'		CL	NW	L
4	58.82	41.35													PC	NW	M
5	58.83	41.33													CL	NW	M
6	58.98	41.25											17	OPENED #1-2' @ 6:05pm	CL	NW	M
7	58.96	41.50	4'	2'									6'	OPENED #2-1' @ 6:35pm	CL	NW	L
8	58.97	41.70													PC	NW	L
9	58.99	41.75													PC	NW	L
10	58.95	41.85													PC	NW	L
11	58.90	41.88											30		FA	NW	L
24 Hour Temp.			PRECIPITATION			MEN ON DUTY AUG 4.4								REMARKS			
MAX.			Start	End	Amt.	12 to 6	KOSARSKI		SADNICK								
MIN.						8 to 4	SPIRES		Gibert								
6 AM							Porter										
21°			24 Hour P.Precip.	6 AM	.23"	4 to 12	WITALKA		SWARTZ								
												WT-35° ICE RPT Ø NEW SNOW 2 1/2" S.F.					

LOCKMASTER'S DAILY REPORT STARVED ROCK LOCKDATE 22 FEB 19 89

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER	WIND		
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT	
12 M	58.90	41.92	4'	2'	0	0	0	0	0	0	0	0	6'		FA	NW	L	
1 AM	58.88	41.90													FA	NW	L	
2	58.86	41.07													PC	NW	L	
3	58.80	41.09													PC	NW	L	
4	58.79	41.10											30	CLOSED #1-1' @ 4:50 A	CL	NW	L	
5	58.75	41.06	3'										5'		CL	NW	L	
6	58.71	41.05											10	CLOSED #1 1' @ 6:10 A	CL	NW	L-9	
7	58.72	41.05	2'										3'	CLOSED #1 1' @ 6:50 A	PC	NW	L	
8	58.72	41.50													FA	NW	L	
9	58.74	41.48													FA	NW	L	
10	58.82	41.32													FA	N	L	
11	58.84	41.30											15	OPENED #1-1' @ 11:57	FA	N	L	
12	58.82	41.32	2'										4'		FA	N	L-10	
1 PM	58.81	41.38													CL	N	L	
2	58.82	41.43													CL	N	L	
3	58.78	41.40													CL	N	L	
4	58.78	41.38													PC	NW	L	
5	58.80	41.36													LTWN	NE	L	
6	58.80	41.33													PC	NW	L	
7	58.89	41.33											28	OPENED #1-2' @ 7:30pm	PC	N	L	
8	58.96	41.57	4'										6'		PC	NW	L	
9	58.93	41.66													PC	NW	L	
10	58.90	41.79													PC	NW	L	
11	58.88	41.82											24		PC	NW	L	
24 Hour Temp.	PRECIPITATION			MEN ON DUTY AUG 4.4										REMARKS ✓ storage yd @ 3:20pm MW WT 35° ICE RPT & J.F.				
MAX. 30°	Start	End	Amt.	12 to 8	BOTTOMLEY					PETRE								
MIN. 15°				8 to 4	SPIRES					Gekant								
6 AM 15°																		
	24 Hour P.Precip. 6 AM		0	4 to 12	WITALKA					SWARTZ								

LOCKMASTER'S DAILY REPORT STARVED ROCK LOCK

 DATE 23 FEB 1989

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER	WIND		
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT	
12 M	458.84	441.84	4'	2'	0	0	0	0	0	0	0	0	0	6'		FA	N	L
1 AM	58.80	41.91												12	CLOSED #1 1' @ 1:30A	FA	NW	L
2	58.82	41.91	3'											5		FA	NW	L
3	58.76	41.83														FA	N	L
4	58.74	41.78												15	CLOSED #1 1' @ 4:15A	FA	N	L
5	58.72	41.67	2'											4' 4	CLOSED #1 1' @ 5:55A	FA	N	L
6	58.72	41.57	1'											3'		FA	NW	L-6
7	58.72	41.40														FA	NW	L
8	58.81	41.35														FA	NW	L
9	58.83	41.32														FA	N	L
10	58.87	41.12														FA	N	L
11	58.86	41.19														FA	NW	L
12	58.84	41.15														FA	N	L-7
1 PM	58.85	41.18														FA	N	L
2	58.87	41.14														FA	N	L
3	58.84	41.06														FA	NW	L
4	58.85	41.12														FA	NW	L
5	58.96	41.16												3/4	OPENED #1-2' @ 1:10 PM	FA	NW	L
6	58.95	41.92	3'											5'		FA	NW	L-5
7	58.93	41.46														FA	NW	L
8	58.92	41.50														FA	NW	L
9	58.96	41.52														FA	NW	L
10	58.97	41.60														FA		CLM
11	58.97	41.63												30		FA		CLM
24 Hour Temp.			PRECIPITATION			MEN ON DUTY								REMARKS				
MAX. 22°			Start	End	Ant.	12 to 8				BOTTOMLEY				PETRE				
MIN. 1°						8 to 4				PORTER				GCHANT				
6 AM 1°										SPIRES								
			24 Hour FP Precip. 6 AM	T		4 to 12				WITALKA				SWARTZ				
GR. PINTAILS WT 34° 1000PT 0																		

LOCKMASTER'S DAILY REPORT STARVED ROCK LOCK

 DATE 24 FEB 1989

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER	WIND	
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT
12 M	45.8.97	441.65	3'	2'	0	0	0	0	0	0	0	0	5'		FG		clm
1 AM	58.97	41.60													FG		clm
2	58.95	41.60													FG		clm
3	58.92	41.61													FG		clm
4	58.90	41.63													FG		clm
5	58.88	41.66													FG		clm
6	58.86	41.70													LT FG	N	L-2
7	58.83	41.70													LT FG		clm
8	58.81	41.65													LT FG		clm
9	58.75	41.69	4	1									5'50	GATES REARRANGED @ 0905 A CLOSED #1-1' @ 0945 A	PC	S	L
10	58.70	41.62	3										4'		CL	S	L
11	58.66	41.60											3	CLOSED #1-1' @ 11:56 A	CL	S	L
12	58.70	41.50	2'										3'		CL	S	L-10
1 PM	58.71	41.39													CL	S	M
2	58.70	41.30	1'										9	CLOSED #1-1' @ 2:15 P	CL	S	L
3	58.77	41.08											2'		CL	S	L
4	58.80	441.02	1'	1'	0	0	0	0	0	0	0	0	2' 4	OPENED #1-2' @ 4:50 P	CL	SE	L-P
5	58.86	41.03	3'										4'		CL	SW	L
6	58.89	41.14													CL	S	L-10
7	58.93	41.26													PC	SE	L
8	58.86	41.36													PC	SW	L
9	58.89	41.36													PC	SW	L
10	58.88	41.39													PC	SW	L
11	58.88	41.37											23		PC	SW	L
24 Hour Temp.	PRECIPITATION			MEN ON DUTY AUG = 4.1										REMARKS ✓ storage yd @ 7:05 AM - OK ✓ storage yd @ 3:15 PM - OK greased gate pintles - OK WT 34° ICE RPT 10F 1/2 C X			
MAX.	20°	Start	End	Ant.	12 to 8	BOTTOMLEY	PETRE										
MIN.	-6°				8 to 4	KOSARSKI	SPIRES										
						PORTER	GEHANT										
6 AM	-2°				4 to 12												
		24 Hour PP	6 AM	0		GALLUP	SADNICK										

LOCKMASTER'S DAILY REPORT STARVED ROCK LOCK

 DATE 25 FEB 1989

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER	WIND	
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT
12 M	458.84	441.37	3'	1'	0	0	0	0	0	0	0	0	4'		PC	S	L
1 AM	58.83	41.36													PC	SW	L
2	58.80	41.34													FA		CLM
3	58.79	41.41													FA		CLM
4	58.80	41.39													FA		CLM
5	58.80	41.39													FA		CLM
6	58.80	41.39													FA		CLM
7	58.88	41.38													FA		CLM
8	58.94	41.38	5'										30	OPENED #1-2' @ 2:55 PM	FA	SW	L
9	58.97	41.48											6'		FA	SW	L
10	58.94	41.72													FA	SW	L
11	58.96	41.72													PC	SW	L
12	58.94	41.85													PC	SW	L-5
1 PM	58.91	41.96													PC	SW	L
2	58.76	41.95											30	Closed #1-3' @ 2:05 PM	CL	SW	L
3	58.80	41.57	2'										3'		CL	SW	L
4	58.78	441.48	2'	1'	0	0	0	0	0	0	0	0	3'		LT. RW	S	L-8
5	58.81	41.25													LT. RW	S	L
6	58.87	41.18													PC	SW	L-4
7	58.89	41.24													PC	SW	L
8	58.92	41.32													RW	SW	L
9	58.94	41.18											2'	OPENED #1-2' @ 9:25 PM	RW	SW	L
10	58.92	41.27	4'										5'		LT. RW	W	L
11	58.92	41.41											10		PC	W	L
24 Hour Temp.			PRECIPITATION			MEN ON DUTY AUG 4-2								REMARKS			
MAX.			Start	End	Ant.	12	BOTTONLEY		PETRE								
MIN.			7:15 PM	10:45		8	KOSARSKI		PORTER								
						to											
6 AM						4											
12			24 Hour FP Precip. 6 AM			4 to 12	GALLI		SADNICK								
												Vistorage up @ 7:15 AM - 8K Vistorage fd @ 3:20 PM - 8K Lower gauge out @ 1:00 PM - 8K Gassed gate penitler - 8K WT 33° ICE RPT 10 F 1 CX					

LOCKMASTER'S DAILY REPORT STARVED ROCK LOCK

 DATE 26 FEB 1989

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER	WIND	
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT
12 M	458.85	441.54	4'	1'	0	0	0	0	0	0	0	0	5'	CLOSED #1-1' @ 12:00	PC	NW	L
1 AM	58.83	41.52	4'										4'		PC	NW	L
2	58.82	41.47													PC	NW	L
3	58.89	41.46													PC	NW	L
4	58.93	41.43													PC	NW	M
5	59.00	41.45													CL	NW	M
6	58.93	41.60	4'										5'	OPENED #1-1' @ 5:05	CL	NNW	M-15
7	58.94	41.57													CL	NNW	M
8	58.94	41.56													CL	NW	L
9	58.91	41.72													PC	NW	M
10	58.83	41.75												Closed #1-2' @ 11:35 A	PC	NW	M
11	58.81	41.77											3'		PC	NW	M
12	58.78	41.66	2'												PC	NW	L-8
1 PM	58.73	41.53													PC	NW	L
2	58.75	41.48													PC	NW	M
3	58.81	41.42													PC	NW	M
4	58.75	441.36	2'	1'	0	0	0	0	0	0	0	0	3'		PC	NW	M-12
5	58.80	41.30													PC	NW	M
6	58.90	41.27													PC	NW	M-16
7	58.92	41.15												OPENED #1-2' @ 7:20 PM	PC	NW	M
8	58.90	41.32	4'										5'		PC	NW	M
9	58.87	41.36													PC	NW	L
10	58.85	41.39													PC	NW	L
11	58.85	41.40											20		PC	W	L
24 Hour Temp.			PRECIPITATION			MEN ON DUTY							REMARKS				
MAX. 40°			Start	End	Amt.	12 to 8	BOTTOMLEY		PETRE				V. Storage yd @ 7:10 AM - JK V. Storage yd @ 3:10 PM @				
MIN. 12°						8 to 4	KOSARSKI		PORTER								
6 AM 30°						4 to 12											
			24 Hour Precip. 6 AM		T	4 to 12	GALLUP		SADLER				General gate pintles - JK WT 34° ICE RPT @				

LOCKMASTER'S DAILY REPORT STARVED ROCK LOCKDATE 27 FEB 1989

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN	GATE CHANGES	WEATHER	WIND		
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT	
12 M	458.89	44.42	4'	1'	0	0	0	0	0	0	0	0	0	5'		PC	W	L
1 AM	58.89	41.43														PC	W	L
2	58.92	41.44														PC	NW	L
3	58.92	41.46														PC	NW	L
4	58.94	41.49														PC	NW	L
5	58.95	41.50														FA	W	L
6	58.93	41.51														FA	W	L-4
7	58.94	41.56														FA	W	L
8	458.94	41.62														FA	W	L
9	58.94	41.61														FA	W	L
10	58.91	41.59														FA	W	L
11	58.95	41.56														FA	W	L
12	58.86	41.57														FA	S	L-4
1 PM	58.86	41.56												70	CLOSED #1-1'c 1345 PM	FA	S	L
2	58.87	41.55	3'											4'		FA	S	L
3	58.85	41.43														FA	S	L
4	458.95	41.31	3'	1'	0	0	0	0	0	0	0	0	4'12	CLOSED #1-1'c 4:25	FA	S	L	
5	58.77	41.29	2'											3'		FA	S	L
6	58.76	41.23														FA	S	L-6
7	58.76	41.19														PC	S	L
8	58.77	41.10														PC	S	L
9	58.80	41.05														PC	S	L
10	58.89	40.99												18	OPENED #1-2'c 10:55 PM	PC	SW	L
11	58.93	41.13	4'											5'15		PC	SE	L

24 Hour Temp.	PRECIPITATION			MEN ON DUTY	REMARKS
	Start	End	Ant.		
MAX. 31°				12 80 BOTTOMLEY PETRE	V. STRAP PC 3:10 PM @
MIN. 10°				8 to 4 GHEANT SWARTZ	
6 AM 10°					
	24 Hour Precip. 6 AM	Ø	4 to 12 GALLUP SADNICK	WT. 34° / CE RPT Ø 2P.	

LOCKMASTER'S DAILY REPORT STARVED ROCK LOCK

DATE 28 FEB 1989

C. S. TIME	UPPER GAUGE	LOWER GAUGE	POSITION OF GATES										TOT. OPEN.	GATE CHANGES	WEATHER	WIND	
			1	2	3	4	5	6	7	8	9	10				DIR.	AMOUNT
12 M	458.52	441.29	4'	1'									5'		CL	S	L
1 AM	58.86	41.30													PC	S	L
2	58.86	41.44													PC	S	L
3	58.85	41.50													LT SN	S	L
4	58.75	41.51											25	CLOSED 1-1' @ 4:10 A	LT SN	S	L
5	58.79	41.38	3'										4'		LT SN	S	L
6	58.74	41.36													CL	SW	L-10
7	58.79	41.28													CL	SW	L
8	458.78	441.41													CL	SW	L
9	58.75	41.35											20	CLOSED 1-1' @ 9:10	CL	NW	L
10	58.73	41.29	2'										3'		PC	NW	M
11	58.79	41.27													PC	NW	L
12	58.80	41.27													PC	NW	L
1 PM	58.79	41.26													PC	NW	L
2	58.85	41.29													PC	NW	L
3	58.83	41.29											18		PC	NW	L
4	458.84	441.29	2'	1'	0	0	0	0	0	0	0	0	3'		PC	W	M-16
5	58.89	41.29													PC	W	M
6	58.90	41.20													PC	W	1-6
7	58.91	41.10													PC	W	L
8	58.87	41.12													PC	W	L
9	58.92	41.06											18	OPENED #1-1' @ 9:10 P	PC	W	L
10	58.87	41.07	3'										4'	OPENED #1-2' @ 10:35 P	PC	NW	L
11	58.95	41.33	5'										6'	OPENED #1-1' @ 11:35 P	PC	NW	L
24 Hour Temp.	PRECIPITATION 6'			MEN ON DUTY AVG = 3.7										REMARKS			
MAX.	23°	Start	End	Ant.	12 to 8	BOTTOMLEY		PETRE									
MIN.	8°				8 to 4	WITALKA		GENANT									
						SPIRES		SWARTZ									
6 AM	21°																
		24 Hour Precip.	6 AM	T	4 to 12	GALLUP		SADNICK		WT 35° KCRPT & MR							

✓ 1 storage shed at 3:15 PM @

REPORT DOCUMENTATION PAGE

Form Approved

OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestion for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE November 1990		3. REPORT TYPE AND DATES COVERED	
4. TITLE AND SUBTITLE Modeling Ice Passage Through Submergible and Non-submergible Tainter Gates				5. FUNDING NUMBERS	
6. AUTHORS Gordon Gooch, John Rand, Ben Hanamoto and Jon Zufelt					
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) U.S. Army Cold Regions Research and Engineering Laboratory 72 Lyme Road Hanover, New Hampshire 03755-1290				8. PERFORMING ORGANIZATION REPORT NUMBER Special Report 90-39	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) U.S. Army Engineer District, Rock Island Rock Island, Illinois 61201				10. SPONSORING/MONITORING AGENCY REPORT NUMBER	
11. SUPPLEMENTARY NOTES					
12a. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution is unlimited. Available from NTIS, Springfield, Virginia 22161.				12b. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 words) In the colder regions of the U.S., ice accumulation in the approach area of navigation locks has been a constant problem. This ice is often pushed into the lock ahead of a towboat, sometimes requiring a separate lock cycle. This reduces the efficiency of the lock and slows down ship traffic. By modeling this problem and testing the solution to it, the research team has been able to conclusively show that submergible tainter gates located near the approach will solve the above-mentioned ice problems.					
14. SUBJECT TERMS Ice Ice problems Navigation locks Rivers River ice management River transportation				15. NUMBER OF PAGES 81	
				16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT UNCLASSIFIED		18. SECURITY CLASSIFICATION OF THIS PAGE UNCLASSIFIED		19. SECURITY CLASSIFICATION OF ABSTRACT UNCLASSIFIED	
				20. LIMITATION OF ABSTRACT UL	