May 30, 2017

VIA ELECTRONIC FILING

Ms. Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 First Street, NE

Washington, DC 20426

Re: FirstLight Hydro Generating Company, Turners Falls Hydroelectric Project (FERC No. 1889) and Northfield Mountain Pumped Storage Project (FERC No. 2485). Response to Stakeholder Requests for Study Modifications and/or New Studies Based on the Study Report and Meeting Summary

Dear Secretary Bose:

Pursuant to the regulations of the Federal Energy Regulatory Commission (Commission or FERC), Title 18 Code of Federal Regulations (18 C.F.R.) § 5.15(f), FirstLight Hydro Generating Company (FirstLight) encloses for filing this response to comments on FirstLight's Study Reports and meeting summary for the relicensing of the Turners Falls Hydroelectric Project (TF Project, FERC No. 1889) and Northfield Mountain Pumped Storage Project (NMPS Project, FERC No. 2485). The current licenses for the TF and NMPS Projects expire on April 30, 2018.

On March 1, 2017, FirstLight filed five study reports with FERC as follows:

Table 1: Reports filed with FERC on March 1, 2017

Study No.	Name
3.3.5	Evaluate Downstream Passage of American Eel
3.3.10*	Assess Operational Impacts on Emergence of State-Listed Odonates (2nd Year)
3.3.19	Evaluate the Use of an Ultrasound Array to Facilitate Upstream Movement to Turners Falls Dam by avoiding Cabot Tailrace
3.3.20*	Ichthyoplankton Entrainment Assessment at the Northfield Mountain Pumped Storage Project (2nd year)
3.8.1	Evaluate Impacts of Modes of Operation on Flow, Water Elevation and Hydropower Generation

**These reports were technically filed with FERC on December 28, 2016. In the cover letter of that filing, FirstLight requested that stakeholders withhold comment on these two reports to align with the other three reports filed on March 1, 2017.*

FirstLight held its Study Report meeting on March 16, 2017 and filed its meeting summary on April 3, 2017 per Commission regulations.

Stakeholder comments on the meeting summary and filed reports were due by May 1, 2017. Comments were received from the following:

Commenter	3.3.5	3.3.10	3.3.19	3.3.20	3.8.1
MA Division of Fisheries & Wildlife/ Natural Heritage and Endangered Species Program	x	x	x	x	-
US Fish and Wildlife Service	x	x	x	x	-
National Marine Fisheries Service	x	-	x	x	-

Douglas Bennett
Acting Plant Manager- Massachusetts Hydro
FirstLight Power Resources, Inc.
99 Millers Fall Road
Northfield, MA 01360
Tel. (413) 659-4489/ Fax (413) 659-4459
E-mail: douglas.bennett@firstlightpower.com

Commenter	3.3.5	3.3.10	3.3.19	3.3.20	3.8.1
Connecticut River Conservancy[1]	x	x	x	x	x

FirstLight's response to comments were due within 30 days or by May 30, 2017.

The purpose of the comment opportunity following the submission of the meeting summary is to give relicensing participants an opportunity to request modifications to approved studies or propose new studies (18 C.F.R. § 5.15(c)(4)). Such requests must demonstrate good cause and meet the criteria of 18 C.F.R. § 5.15(d) and (e), as appropriate.

FirstLight is filing this document with FERC electronically. To access the document on FERC's website (http://www.ferc.gov), go to the "eLibrary" link, and enter the docket number, P-1889 or P-2485. FirstLight is also making the document available for download at the following weblink: http://www.northfieldrelicensing.com/Pages/Documents2017.aspx.

In addition to this electronic filing with FERC, a paper copy of the document is available to the public at the Northfield Mountain Visitor Center at 99 Millers Falls Road, Northfield, MA 01360 during regular business hours.

If you have any questions regarding the above, please do not hesitate to contact me. Thank you for your assistance in this matter.

Sincerely,

Douglas P Bennett

Douglas Bennett
Acting Plant Manager

Attached: Study Report Comments and Responses

[1] Connecticut River Conservancy was previously called the Connecticut River Watershed Council.

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TABLE OF ATTACHMENTS

Study No. 3.3.5 Evaluate Downstream Passage of American Eel

Commenter	Comment	Response
MADFW-1	Evaluation of the images from the DIDSON unit deployed in the power canal determined that only the 10m and 20m range settings produced reliable data (the 40m range was not usable). With the range limited to 20m much of the power canal was not sampled. While the results were expanded in an attempt to account for the limited range, it is not certain that the estimates provided are accurate and they well may underestimate the actual number of eels in the canal as the bottom of the canal (where eels are thought to prefer to travel) was not sampled due to the range limitations. The study also did not clearly identify the eel migration period as eels were detected on the first day of deployment in both years and on the last day of deployment in 2016. Therefore these results should not be used to determine the window necessary for downstream eel protection. The results of the assessment of Northfield Mountain Pumped Storage (NMPS) entrainment are distressing. Somewhere between 25% and 40% of the eels attracted to the intake were entrained (if eels that disappeared after being detected at the intake were entrained). To help clarify, it would be helpful to have a table showing the conditions under which the 74 eels detected at the intake either became entrained, disappeared, or escaped, including date/time, how many units were pumping (or generating), what Connecticut River flow was in the vicinity of the intake, and operational conditions at the Turners Falls Project (TF) such as canal flow, spill, headpond elevation, etc.). To help better understand passage routes chosen by eels at TF it would be helpful to see a table that summarizes the conditions under which each eel passed the project. Information should include: where/when it was released; date/time it passed; station generation information at time of passage; and spill conditions at time of passage. Likewise a table that describes operational and environmental conditions when each eel passed out of the power canal would be of use.	The DIDSON camera was aimed at a downward angle such that all depth strata could be monitored from the near surface strata to the bottom. However, given that the identification of eel was not achievable at the 40 m range the bottom most strata was not effectively monitored. Studies have shown that eel can and do migrate at all depths but to what degree and extent is generally unknown and site specific, as such the impact of the lack of data near the bottom of the canal is unknown. The extrapolation represents the best estimation given the data available. (3.3.5 Attachment A**)** This response includes the three fates of Eel after being detected at the NMPS Intake; entrainment, unknown disappearance within the intake and escapement from the intake. 3.3.5 Attachment A-Table 1 represents the conditions experienced by the two eel that were confirmed to be entrained at NMPS. 3.3.5 Attachment A-Table 2 represents the conditions experienced by the 34 eel that were detected at the NMPS Intake and never subsequently detected again, assumed to be entrained. 3.3.5 Attachment A-Table 3 is the summary output for several Cox Proportional hazard regression models and the covariates (Rain, Northfield Generation, Northfield Pumping, Number of Units Pumping and diurnal effects) that statistically describe the conditions during the disappearance of 34 eel at the NMPS Intake. The two best models in 3.3.5 Attachment A-Table 3 incorporate Northfield Pumping operations (kcfs) (Model 4) and the number of units pumping (Model 5) during these unknown disappearances. Model 4 had the lowest AIC value of 241.5. The overall model was highly significant (LR <0.001) and the effect of pumping operations was also highly significant (p<0.001). The hazard ratio (1.31) suggests that eel are 1.31 times more likely to disappear when Northfield is in pumping mode. Model 5 incorporated the number of units used during a pumping scenario. The model was highly significant (LR<0.001) and the effect of utilizing 2 units (p=0.03) and 3 units (p<0.001) were significant and highly significant, respectively. The hazard ratios suggest that during a 2 pump scenario, eel are 5.67 more times likely to disappear after being detected in the NMPS Intake. During a 3 pump scenario (HR = 21.59), eel are 21.59 times more likely to disappear after being detected in the NMPS intake. A series of four histograms and plots were made to visualize some of the conditions experienced by eel in the intake upon disappearing or entering the "unknown" state (3.3.5 Attachment A-Figure 1). The upper left plot displays the transitions per hour, or the time at which these eel were confirmed to go missing. It is clear that almost all of the 34 eel experienced disappeared at night or early morning (sometime between 1800 and 0500). The top right figure displays the amount of eel that disappeared into the unknown state during a pumping scenario (-) or a generating scenario (+). Only two eel experienced this event during generation, the remaining 32 eel in the analysis disappeared during pumping scenarios while two did so during idle conditions at NMPS. The lower left plot is a two dimensional color plot that displays the conditions at Northfield (pumping or generating (kcfs)) and the flow outside of the NMPS Tailrace (cfs) during the disappearance. The lighter blues convey the highest counts of eel and can be seen during pumping scenarios (~10,000 cfs) and approximately 10,000 cfs River flow just outside of the NMPS Tailrace. The lower right figure reflects the number of units pumping during eel disappearance at the NMPS Intake. It is clear that the amount of eel that disappear in the intake is proportional to the amount of units pumping with the most eel disappearing (n=19) during a 3 pump scenario, as compared to 4 eel disappearing during a 1 pump scenario. 3.3.5 Attachment A-Table 4 represents a summary of conditions during Eel Escapement at NMPS (n = 54). Escapement from the NMPS Intake is not an absorbing state, eel can come back into the intake and escape again. Therefore, one eel can make multiple escapements from NMPS Intake as is reflected in this table in several instances. 3.3.5 Attachment A-Table 5 is the summary output for several Cox Proportional hazard regression models to describe the covariates (Rain, Cloud Cover, Northfield Generation, Northfield Pumping, tailrace flow outside the Intake, and diurnal effects) that statistically describe the conditions during escapement at NMPS Intake. The best model (lowest AIC = 344.68) incorporated Northfield Generation (kcfs). The model was significant (LR=0.02) and the effect of Northfield Generation (kcfs) was highly significant (p<0.001). The hazard ratio (1.13) suggests that eel are 1.13 more times likely to escape the NMPS Intake during times of generation. A series of four histograms and plots were made to visualize some of the conditions experienced by eel that escaped the NMPS Intake (3.3.5 Attachment A-Figure 2). The upper left plot displays the transitions per hour, or the time at which these eel escaped the intake. Similar to the previous plot, the majority of these movements occurred at night or early morning. The upper right plot displays the amount of eel that escaped the NMPS Intake during pumping (-) or generating (+) scenarios. There is a mix of escapements that occurred during both pumping and generating; however the majority of eel escaped the intake during idle operational scenarios (>20). The lower left plot is a two dimensional color plot that displays the conditions at Northfield (pumping or generating (kcfs)) and the flow outside of the NMPS Tailrace (cfs) during the disappearance. The lighter blues convey the highest counts of eel and can be seen during times around idle operations at NMPS and approximately 5,000 cfs outside of the tailrace.

Commenter	Comment	Response
		(3.3.5 Attachment B) This response includes the fate of Eel that passed over the Turners Falls Dam (n=13) as well as the eel that passed via the canal (n=84) and the conditions that were experienced during those downstream passages. 3.3.5 Attachment B-Table 1 represents the conditions experienced by the 13 eel that passed over the TFD. 3.3.5 Attachment B-Table 2 is the summary output for several Cox Proportional hazard regression models to describe the covariates (Rain, cloud cover, diurnal effects, canal flow and TFD discharge) that statistically describe the conditions during the passage of 13 eel over TFD. The best model in 3.3.5 Attachment B-Table 2 incorporated TFD Discharge (Model 6) and had the lowest AIC value (95.4). The overall model was highly significant (LR=0.001) and the main effect of discharge at TFD was also highly significant (p=0.001). The hazard ratio (1.57) suggests that eel are 1.57 more times likely to pass over the TFD when the dam is spilling. The second best model (Model 2) incorporated daily cumulative rainfall and had an AIC value of 96.33. The model was significant (LR=0.003) and the effect of daily cumulative rainfall was highly significant (p=0.001). The hazard ratio (10.59) suggests that eel are 10.59 times more likely to pass over TFD when there is increasing daily cumulative rainfall amounts. Therefore, when it rains, the eel are much more likely to move and pass over the dam. A series of four histograms and plots were made to visualize some of the conditions experienced by eel that passed over the TFD (3.3.5 Attachment B-Figure 1). The upper left plot displays the time (per hour) during passage over the dam and it is clear that all eel passed during the night or early morning (1600-0500). The upper right plot displays the discharge at the dam during passage. There were two eel that passed when there was no spill over the dam. In both cases, the fish were recaptured well into the bypass reach and we do not know the exact conditions at the time of passage. The remainder of eel that passed over the dam (n=11) did so at varied levels of spill (~1500 to 5000 cfs). The bottom left plot displays the canal flow during passage over the TFD. Eel spilled over the dam at various flows in the canal and did not seem to be selective. The lower right plot is a two dimensional color plot that displays the operations at Turners Falls Dam (kcfs) and in the canal (kcfs) during passage over the dam. The lighter blues convey the highest counts of eel and can be seen during a combination of flows in both areas. 3.3.5 Attachment B-Table 3 represents the conditions experienced by the 84 eel that passed via the canal from the Turners Falls Impoundment (n =84) during their downstream migration. 3.3.5 Attachment B-Table 4 is the summary output for several Cox Proportional Hazard regression models to describe the covariates (Rain, Cloud cover, Canal flow, and TFD Discharge) that statistically describe the conditions during passage through the canal for 84 eel. There were three eel that were removed from the analysis (149.740 25, 149.740 53, 149.740 69) due to lack of progression through the downstream stations. Some were only detected briefly at the Cabot forebay or experienced cross detections with receivers outside of the canal and for those reasons they were removed from the analysis. The best model in 3.3.5 Attachment B-Table 3 incorporated the interactive effects between Rain (in) and canal flow (kcfs). This model (Model 6) had the lowest AIC value (646.01) and the model was significant (LR = 0.02). The effects of rain (in) and canal flow (kcfs) were both significant (p=0.02 for both). The hazard ratio for rain (in) suggests that when interacting with canal flow, eel are 59.87 more times likely to pass via the canal when it is raining. The second best model (Model 4) incorporated canal flow (kcfs) (AIC = 647.37). The model was significant (LR = 0.02) and the effect of flow in the canal was also significant (p=0.02). The hazard ratio suggests that eel are 1.08 times more likely to pass via the canal when faced with a choice at TFD when canal flows are increasing. A series of four histograms and plots were made to visualize some of the conditions experienced by the eel that pass via the canal (3.3.5 Attachment B-Figure 2). The upper left plot displays the time (per hour) during passage via the canal and it is clear that the majority of eel passed during the nighttime or early morning hours. The upper right plot is a two dimensional color plot that displays the operations at TFD (kcfs) and canal flow (kcfs) during passage via the canal. The lighter blues convey the highest counts of eel and can be seen at varying canal flows but usually when the discharge at TFD is minimal. This makes sense as the gates are closed and canal flow is increasing, eel will choose to pass via the canal. The lower left plot shows the varying canal flows (kcfs) and how many eel passed during each flow. The lower right plot displays passage via the canal during different discharges at TFD (kcfs). Eel did pass into the canal when TFD was discharging; however the majority of eel (~50) passed into the canal when there was no spill at TFD.
NMFS-1	Section 3.1 Migratory Timing of Eel (DIDSON) and Section 4.2 Migratory Timing of Eel (DIDSON) These two sections describe the methods and results of tracking eels through the power canal using DIDSON technology. The results indicate this technology did not allow for any estimates of the number of fish that might have passed in the 40-meter range to be made. Based on the information provided, the 10-meter range setting sampled 5.1% ($12.28m2/241.59m^2$) of the channel and the 20- meter range setting sampled 20.3% ($49.1m2/241.59m^2$) of the channel. The methods used to extrapolate densities based on observed density; however, it is not clear that eel are uniformly	(3.3.5 Attachment C).. Date and times of eel observations in the Turners Falls Power Canal are listed in 3.3.5 Attachment C-Table 1. Table 1 also includes the water temperature, rain, and flows at the time of observation. No evident relationship was found between when eel were observed in the canal and the various environmental conditions. Eel were observed moving while water temperatures were between 7.75°C and 26.56°C (3.3.5 Attachment C- Table 2, Figure 1). Eel were observed at various amounts of cloud cover and rain fall (3.3.5 Attachment C- Table 2, Figures 2-4). Most eel were observed while canal flows were relatively low, median of 3,011 cfs (3.3.5 Attachment C- Table 2, Figure 5). Eel were observed passing through the canal at a

Commenter	Comment	Response
	distributed throughout the channel. Based on the data provided, we do not know if the extrapolated estimates are overestimating or underestimating eel counts through the power canal. *Recommendation* We recommend the report provide the timing of eel count data along with the recorded flow, canal temperature, and weather data. This will create a better understanding of the timing of passage relative to environmental and operational conditions.	wide range of flow conditions at Station No. 1 and Cabot Station (3.3.5 Attachment C-Table 2, Figure 6-7). No statistical trends were found among these environmental and operational conditions.
NMFS-2	Section 4.3 Overall Probability of Movement through Project The report provides some information on the amount of time it took to pass Montague Station as well as the percentage of fish that had moved beyond the Cabot tailrace within 2 days and 6 days of release. *Recommendation* The report should contain more specific information about the overall delay at the project. It should contain means, medians and standard deviations on the timing of passage past the project and past the Cabot tailrace. The report should provide more information on the delay that downstream migrating eel experience due to the project's structure and operation.	(3.3.5 Attachment D). - Table 1 shows descriptive statistics for the length of time (h) for fish to pass through project reaches. Reaches include TFI (time of release to time of passage into the bypass and canal), NMPS Intake, Canal (time of first detection of at T10 Upper Canal to time of egress through Cabot Powerhouse, Cabot Bypass Sluice, Station 1 Powerhouse, and unknown route), Bypass (time of first Upper Bypass detection to time of first detection at Cabot Tailrace), Cabot Tailrace to Montague (first detection at Cabot Tailrace to first detection at Montague), and the overall project (time of release to time of last detection in Cabot Tailrace and first detection at Montague). Because of the poor recapture rate at Montague, time of release to time of last detection at Cabot Tailrace probably serves as the best metric for overall project passage time. Travel times were highly variable among fish, as evidenced by the wide gap between median and mean travel times in most reaches.
NMFS-3	Section 4.4 Competing Risks: Assessment of Entrainment at NMPS Project Table 4.4-1 provides raw recaptures within each NMPS intake by release cohort. However, the narrative provided to explain these results is insufficient. Based on the information provided in the report and Table 4.4-1, it is our understanding that 91 'transitions' were documented rather than the number of fish. The fate of the 34 fish that "transitioned" is unclear. *Recommendation* The raw numbers of recaptures in Table 4.4-1 should be provided as unique number of fish which is typically presented as '*n*'. The number of fish released upstream from TransCanada or the upper impoundment that were either entrained, made it to the dam or were never detected again should be documented. This section discusses the Cox Proportional Hazards results. While results for daytime and nighttime with rain are discussed, it should be made clear what pumping flow or generation flow is associated with these results. The report should provide the probability that an entrained fish is not detected at any of the receivers associated with the intake. The report should state more clearly, the likelihood that an eel gets detected at the intake based on the number of turbines that are pumping. This is important to increase our understanding of eel passage with respect to project operations.	(3.3.5 Attachment E). -This response includes the attraction to NMPS Intake from Shearer Farms and from Gill Bank for downstream migrating eel. 3.3.5 Attachment E-Table 1 represents the conditions experienced by the eel that were attracted to NMPS intake from Shearer Farms (n=79). Eel can make multiple attempts into the intake from Shearer farm, which is reflected in Table 1. 3.3.5 Attachment E-Table 2 is the summary output for several Cox Proportional regression models and the covariates (Rain, Flow at Shearer Farm, Flow outside NMPS tailrace, NMPS Pumping flow and the number of units operating) that statistically describe the conditions during attraction to the NMPS intake from Shearer Farms. In regards to the fourth question, for those fish that were confirmed to be entrained and recaptured at T4 (upper impoundment), both were recapture at the intake. Therefore, the detection probability at the intake site is estimated to be 100%. The best model (Model 5) incorporated NMPS Pumping Flow (kcfs) and the overall model was significant (LR = 0.05). The main effect of pumping at NMPS was also significant (p=0.02) and the hazard ratio (1.06) suggests that eel are 1.06 more times likely to be attracted to NMPS Intake from Shearer Farms when pumping increases. A series of five histograms and plots were made to visualize some of the conditions experienced by eels attracted to the NMPS intake from Shearer Farms (3.3.5 Attachment E-Figure 1). The upper left plot displays the transitions per hour, or the time at which these eel were attracted to the intake. It is clear that the majority of eel are attracted to the NMPS Intake at nighttime or early morning hours. The upper right plot is a two dimensional color plot that displays the conditions NMPS pumping conditions as well as the Flow at Shearer Farm during intake attraction. The lighter blues convey the highest counts of eel and can be seen at various flows at Shearer Farm and at times of no pumping and pumping at Northfield. The middle left plot is another two dimensional color plot displaying the flows at Gill Bank (kcfs) and the flows at Shearer Farms (kcfs) during attraction to the intake. Eels are attracted to the NMPS intake at a variety of flows in the two areas. The middle right plot displays a histogram of the number of eels attracted to the intake at various Shearer Farm flows (kcfs). It seems that eels are most attracted to the intake when flows at Shearer Farm are between 6,000 and 10,000 cfs. The bottom left plot is plot displays the pumping and generating conditions during eel attraction to the NMPS Intake. The majority of eels are attracted to the intake during pumping scenarios, however a large number also enter the intake area when operations at NMPS are idle. 3.3.5 Attachment E-Table 3 represents the conditions experienced by the eels attracted to NMPS intake from Gill Bank (n=30). Eels can make multiple attempts into the intake from Gill Bank, which is reflected in 3.3.5 Attachment E-Table 3. 3.3.5 Attachment E-Table 4 is the summary output for several Cox Proportional regression models and the covariates (Rain, Flow at Gill bank, Flow outside NMPS intake, NMPS Pumping and number of units operating) that statistically describe the conditions during attraction to the NMPS intake from Gill bank. The best model (Model 4) incorporated flow outside of the NMPS tailrace (kcfs) and the overall model was almost significant (LR=0.05). The main effect of flow outside of the tailrace was almost significant (p=0.07) and the hazard ratio (0.88) suggests that eel as less likely to be attracted to the Intake when flow outside of the intake increases. A series of five histograms and plots were made to visualize some of the conditions experienced by eels attracted to the NMPS intake from Gill Bank (3.3.5 Attachment E-Figure 2). The upper left plot displays the transitions per hour, or the time at which these eels were attracted to the intake. It is clear that the majority of eels are attracted to the NMPS Intake at nighttime or early

Commenter	Comment	Response
		morning hours. The upper right plot is a two dimensional color plot that displays the conditions NMPS pumping conditions as well as the Flow at Shearer Farm during intake attraction. The lighter blues convey the highest counts of eel and can be seen at various flows at Shearer Farm and at times of no pumping at Northfield. The middle left plot is another two dimensional color plot displaying the flows at Gill Bank (kcfs) and the flows at Shearer Farms (kcfs) during attraction to the intake. Eels are attracted to the NMPS intake at a variety of flows in the two areas, with the majority attracted at lower flows at each area (<5000 cfs). The middle right plot displays a histogram of the number of eels attracted to the intake at various Gill bank flows (kcfs). It seems that eels are attracted to the intake during almost all flows at Gill bank. The bottom left plot is plot displays the pumping and generating conditions during eel attraction to the NMPS Intake. The majority of eel are attracted to the intake when operations at NMPS are idle. See response to MADFW-1
NMFS-4	Section 4.5 Competing Risks: Assessment of Passage at Turners Falls Dam The narrative on page 4-25 refers to "viable fish", whereas the Table caption refers to "raw recaptures." In reviewing Table 4.5-1, we summed the canal, bypass, mortality and unknown columns; these summed values did not agree with the numbers presented for the impoundment. *Recommendation* The report should indicate the number of unique fish ('*n*'), recaptures and percentages based off these numbers. Summary statistics provide important insights into the number of fish available for analysis. All but five values in Table 4.5-2 exceed 24 hours. We recommend the descriptive statistics in this table should be presented in days and hours.	3.3.5 Attachment F-Table 1 contains updated counts for Table 4.5-1 representing the number of unique fish in each state.
NMFS-5	Section 4.6 Competing Risks: Assessment of Escapement from the Power Canal *Recommendation* All but two values in table 4.6-2 exceed 24 hours. We recommend the descriptive statistics in this table should be presented in days and hours. The report should include operational conditions when eels were passed, this includes number of Cabot Station units running, number of Station 1 units that were running and estimated flow down the Cabot Station bypass.	3.3.5 Attachment G- This response includes the four fates of eel passing downstream through the Cabot Canal; passage through the Cabot Powerhouse, passage through the Cabot sluiceway, passage through Station No.1 or escapement from the canal through an unknown state. 3.3.5 Attachment G-Table 1 represents the conditions experienced by the 70 eel that passed through the Cabot Powerhouse. 3.3.5 Attachment G-Table 2 is the summary output for several Cox Proportional Hazard regression models and the covariates (Cabot Operations, Number of units running, Rain, cumulative daily rain, cloud cover and sluiceway flow) that statistically describe the conditions during passage via the Cabot Powerhouse. The two best models incorporated Cabot operations (kcfs) (Model 1) and number of units running at Cabot Station (Model 2). Model 2 had the lowest AIC value (433.5) and the model was highly significant (LR<0.001) and the effect of number of units was also highly significant (p<0.001) (3.3.5 Attachment G-Table 2). The hazard ratio (2.17) suggests that eel are 2.17 times more likely to pass through the Cabot Powerhouse when the number of units running increases. Model 1 incorporated Cabot Operations (kcfs) and the model was highly significant (LR<0.001). The effect of Cabot Operations was also highly significant (p<0.001). The hazard ratio (1.38) suggests that eel are 1.38 times more likely to pass via the Cabot Powerhouse as operations increase. A series of five histograms and plots were made to visualize some of the conditions experiences by eel in the canal that pass via the Cabot Powerhouse (3.3.5 Attachment G-Figure 1). The upper left plot displays the transitions through the Powerhouse per hour. It is clear that the majority of the eel pass during the nighttime or in the early morning hours. The top right figure is a two dimensional color plot that displays the operational conditions at Station No.1 and Cabot Station during passage. The lighter blues convey the highest counts of eel and can been seen when nothing is happening at Station No.1 and throughout varied operational conditions at Cabot Station. The highest amounts tend to occur when Cabot Station is operating above 5000 cfs. The middle left plot displays the amount of eel passing through the Powerhouse and the associated operations at Cabot. The highest amount of eel (~25) passed through the Powerhouse when Cabot Station was operating between 8000 and 10000 cfs. The middle right plot shows the amount of units running at Cabot Station and the number of eels passing through the Powerhouse. The majority of eels pass through the Powerhouse when 4 units are pumping. The last plot on the lower left is another two dimensional color plot related the operations at Cabot Station and the bypass sluice flow. Eels seem to pass through the Powerhouse when flow is going through the sluiceway right and right around 10000 cfs going through the Powerhouse. 3.3.5 Attachment G-Tables 3 displays the conditions experienced by the 5 eel that escaped the canal via the Sluiceway at Cabot Station. 3.3.5 Attachment G-Table 4 displays the conditions experienced by the 3 eel that escaped the canal via Station No. 1. 3.3.5 Attachment G-Table 5 displays the conditions experienced by the 5 eel that escaped the canal via an unknown state. The tables should provide enough information experienced by the eel that escaped through these three avenues.
USFWS-1	Migratory Timing	See response to NMFS-1, which includes a table of environmental and operational conditions at the time of each eel observation with DIDSON (3.3.5 Attachment C)

Commenter	Comment	Response
	FL deployed a DIDSON camera on the river right bank of the canal to detect and record migrating eels. Of the three detection ranges (10 meters, 20 meters and 40 meters) evaluated, it was determined that only the 10-m and 20-m modes produced reliable images. This limitation resulted in a substantial portion of the canal not being effectively monitored. While the results from the 10-m and 20-m windows and time periods not monitored/reviewed were extrapolated to account for the unmonitored area, that extrapolation assumes a uniform distribution of eels across the channel. Because no validation studies were done, it is not known whether this assumption is accurate or not. Given that eels tend to prefer deeper depths, it is reasonable to assume that the number of outmigrating eels was underestimated (as the bottom of the channel was not within the detection zone of any of the range windows). The report does not provide any environmental or operational data to put the DIDSON results into context (i.e., under what conditions did most eels pass the camera?). Eels were detected the first day of monitoring in both study years and on the last day of monitoring in 2016. Without knowing the full period of outmigration, the U.S. Fish and Wildlife Service is not able to specify a window for implementing passage and protection measures for outmigrants. Data from Eyler et al. (2016) showed that over 3 study years, adult eels migrated through a number of hydro projects on the Shenandoah River in all months except July. Absent site-specific data that encompasses this same temporal range (that either verifies movement over that extended period or justifies a narrower window), expanding the eel migration window (e.g., to March through November, or whenever river temperature exceeds 4°C) may be warranted. *Recommendations*: FL should provide a table summarizing actual counts of eels, by date/time, along with canal flow and associated environmental data (e.g., precipitation, cloud cover, moon phase, etc.).	See MADFW-1 for DIDSON monitoring discussion. Although the 2015 and 2016 DIDSON evaluation did not provide data on the seasonal timing of silver eel emigration from the Project area, previous studies conducted in the Connecticut River provide insight on the daily and seasonal patterns. Eel migration in the Connecticut River was assessed in 2004 and 2005 at the Holyoke Hydroelectric Project located at River Mile 80 (Kleinschmidt, 2006). Observations of naturally out-migrating silver eels suggested migration primarily occurs at night, between the hours of 1900 and 2400, with subsequent radio-tracking data suggesting 92% of the tagged eels migrate past Holyoke before 0100. In terms of seasonal timing, linear modeling suggested that air temperature, water temperature and precipitation were the three parameters (of seven that were tested) that significantly influenced the timing of migration at Holyoke. Over the two years of sampling, most eel collections occurred when water temperature ranged from 10 to 20°C, with air temperature reportedly ranging from -1.1 to 30°C throughout the 2004 and 2005 study periods. The largest one-night collection of eels (n=138) occurred on October 8, 2005, following the onset of a 6.5-inch rain event. As precipitation has an influence on other abiotic factors, it was unclear if a large rain event alone triggered emigration. EPRI (2011) has reported that eel movement is large rivers sometimes occurs at the time of a storm but before the precipitation from that storm causes changes in river flow or height. TransCanada conducted a literature search to gather information about the timing of downstream migration in the Connecticut River (Normandeau, 2016). In terms of water temperatures, the literature search revealed water temperature at Holyoke Dam ranged from about 7.5°C to 14.5°C during downstream passage of radio-tagged silver-phase eels (Normandeau, 2007). Haro et al. (2000) observed temperatures of 16.9°C (3 October) to 9.5°C (22 October) in 1996 and from 17.7°C (30 September) to 9.7°C (4 November) in 1997 during telemetry evaluations at Turners Falls. Those results were generally supportive of previous studies that indicated a range of temperatures during the emigration period of about 10°C to 20°C (Kleinschmidt, 2006). EPRI (Electric Power Research Institute). (2011). Review and Documentation of Research and technologies on Passage and Protection of Downstream Migrating Catadromous Eels at Hydroelectric Facilities. Technical Report No. 1000730. Palo Alto, CA. Haro, A., T. Castro-Santos T, and J. Boubée. (2000). Behavior and passage of silver-phase American eels, *Anguilla rostrata* (LeSueur), at a small hydroelectric facility. Dana, 12:33-42. Kleinschmidt. (2006). Holyoke Project (FERC No. 2004) Silver-phased American Eel Flow Priority Plan. Prepared for City of Holyoke Gas & Electric Department, Holyoke, MA. 12 pp. plus appendices. Normandeau. (2007). American Eel Emigration Approach and Downstream Passage Routes at the Holyoke Project, 2006. Final Report. Prepared for City of Holyoke Gas & Electric Department, Holyoke, MA. Normandeau. (2016). ILP Study 20 – American Eel Downstream Migration Timing Assessment Study Report. Prepared for TransCanada Hydro Northeast Inc. Concord, NH. 19 pp.
USFWS-2	Probability of Movement through Project One hundred seventy radio-telemetered eels were released or available to monitor through the project area. Test eels took between 2 and 26 days from release to leave the tailrace, with 35 percent passing the tailrace within 2 days after release and 72 percent passing within 6 days of release. Upon reviewing the data, FL determined that it had the ability to use the Cormack-Jolly-Seber (CJS) model to estimate survival at least up to the Cabot tailrace. *Recommendations:* FL should define the parameter "Project" in Tables 4.3-2 and 4.3-3. Also, it would be helpful to include a graphic like Figure 3.2.3-7 that has the number of radio-tagged eels passing (i.e., detected at) each receiver. Lastly, we recommend adding an appendix that includes individual 3D plots for each eel's path history (like Figure 3.2.5-1), or 2D plots with receiver ID on the Y-axis and Date on the X-axis.	In Tables 4.3-2 and 4.3-3, "Project" refers to stations below Turners Falls Dam and above Cabot Tailrace, specifically T10, T11, T12, T13, T14, T15, T20, T171, T172, T173, and T174. Attachment 3-3-5 H includes 2D plots of each fish's relative location on the river over time, with location on the y-axis and time on the x-axis. Fish ID numbers 149.740 37, 149.740 45, 149.740 47, 149.760 29, 149.760 41, and 149.760 54 each only had single detections so they are not presented in the appendix. Two fish, 149.740 56 and 150.340 104, were confirmed to be entrained during the study. The 2D plots show these two fish making upstream movements at the end of their detection histories – this represents entrainment into the Upper Reservoir, not upstream movement within the CT River. 3.3.5 Attachment I includes a graphic showing number of eel recaptured at each station.
USFWS-3	Assessment of NMPS Entrainment One hundred sixty one eels were potentially available to become entrained at NMPS, including those released into the lower portion of the Turners Falls Project impoundment (TFI) downstream of the NMPS intake. Seventy-four of the 161 fish were attracted to the intake. Those 74 fish had 91 transitions, of which 55 escaped entrainment (60 percent). The remaining 40 percent of transition events either ended with entrainment into NMPS or the fish entered an unknown state (not subsequently recorded at another location). Based on a Cox Proportional Hazards (CPH) regression analysis of the data, eels were over five times more likely to transition to the impoundment from the intake at night when it rains. A CPH	See response to MADFW-1 and 3.3.5 Attachment A

Commenter	Comment	Response
	ratio analysis for fish that entered an unknown state was completed and results showed that the probability of movement to an unknown state is highest when NMPS is pumping at maximum capacity and at night. Based on these results, FL states that fish that transitioned into an unknown state likely are entrained. *Comments*: From the way data are presented in the report, it is difficult to determine exactly how many fish from each release location ultimately became entrained or entered an unknown state from the NMPS intake. However, it appears that 29 individual fish (excluding lower impoundment released fish) out of 113 "available" fish were entrained (or entered an unknown state), resulting in an entrainment rate of over 25 percent. *Recommendations*: While the CPH tables are helpful, we recommend that the report also provide tabular data showing the conditions under which the 74 fish detected at the NMPS intake either became entrained (or entered an unknown state) or escaped the intake, including date/time, how many units were pumping (or generating) at NMPS, what Connecticut River flow was in the vicinity of the NMPS intake (not as measured at the downstream Montague USGS gage), and operational conditions at TF (flow in canal, spill, headpond elevation, etc.).	
USFWS-4	Assessment of Passage at Turners Falls Dam Of the 161 fish available to enter the TF project area, 127 were detected. Sixty-nine percent of those fish entered the canal, 15 percent entered an unknown state, 3 percent never left the impoundment, and 10 percent went over the dam in spill. The median time from release to detection of fish that passed into the bypass reach was 32.67 hours. The median time from release to detection of fish that passed through the canal was 97.58 hours. CPH analyses show that fish were four times more likely to transition into the canal per inch of rain and over eight times more likely to transition into the canal on rainy nights. Eels also were 24 times more likely to pass over the spillway with greater rainfall, likely due to increased spill over the bascule gates, and nearly 40 times more likely to choose the bypass reach at night when it rains. *Comments*: FL states that the high likelihood of eels passing via spill into the bypassed reach with greater rainfall is likely due to increased spill over the Bascule gates. It should be possible to say with certainty whether increased rainfall led to increased spill over the Bascule gates, given that FL has access to this data. We also note that, while the CPH ratios are helpful in identifying environmental or operational cues related to passage events, just looking at the ratios associated with each potential route does not tell the whole story, as CPH results would suggest more eels would choose the bypass reach, which was not the case. Therefore, there must be other factors involved that affect selection of a given passage route being chosen, such as the fact that the Bascule gates are only operated under certain flow conditions. *Recommendations*: We recommend that FL analyze operations data to confirm what appears to be a reasonable assumption regarding the relationship between spillway passage and increased river flows. In addition, we recommend that FL include a table in the report that summarizes the conditions under which each fish passed the project. For each fish, the following information should be included: (1) where/when it was released; (2) date/time it passed; (3) station generation information at time of passage; and (4) spill conditions at time of passage (how much spill, through which gates). This table could be provided as an appendix to the report. At a minimum, it is important to know what the ratio of flow between the canal and Bascule gates was during each passage event.	See response to MADFW-1 and 3.3.5 Attachment A The relationship between rainfall and discharge in river systems is complex, however discharge generally increases after rain events. TFI is a complex system, and there does not appear to be a clear relationship between spill over the bascule gates and cumulative daily rainfall (3.3.5 Attachment J - Figure 1). Other factors, such as the amount of water flowing through the Canal and the TFI water surface elevation, can have a strong influence on how much water spills over the bascule gates at any given time. 3.3.5 Attachment J – Figure 2 shows that initially there is not a strong relationship between total TFD discharge and bascule gate discharge, however as the Canal capacity is exceeded above 16,000 cfs, there is a clear inflection point, after which TFD discharge and bascule gate discharge appear to have a strong linear relationship. While this relationship does appear to exist at flows above 16,000 cfs, cumulative daily rainfall totals did not appear to be a strong driver of bascule gate flow during the 2015 study period (3.3.5 Attachment J - Figure 3).
USFWS-5	Assessment of Escapement from the Power Canal Of the 87 fish that entered the canal, 83 percent passed through the Cabot Station turbines, 8 percent used the downstream bypass, 3 percent went through Station No. 1, and the remainder entered an unknown state. CPH model results showed that eels are motivated to pass Cabot Station at night during high discharge events. No CPH analyses could be run for fish choosing the downstream bypass or Station 1 due to the small sample size. Once in the canal, most eels passed through the Cabot Powerhouse quickly (within 6 hours). *Recommendations*:	See response to NMFS-5 and 3.3.5 Attachment G

Commenter	Comment	Response
	As noted in Section 4.5 above [Assessment of Passage at Turners Falls Dam], we recommend including a table that describes the operational and environmental conditions under which each individual fish passed. For example, how many units were operating at Cabot Station when the seven eels used the downstream bypass? Likewise, was Cabot Station operating when the three eels passed downstream via Station 1 Powerhouse?	

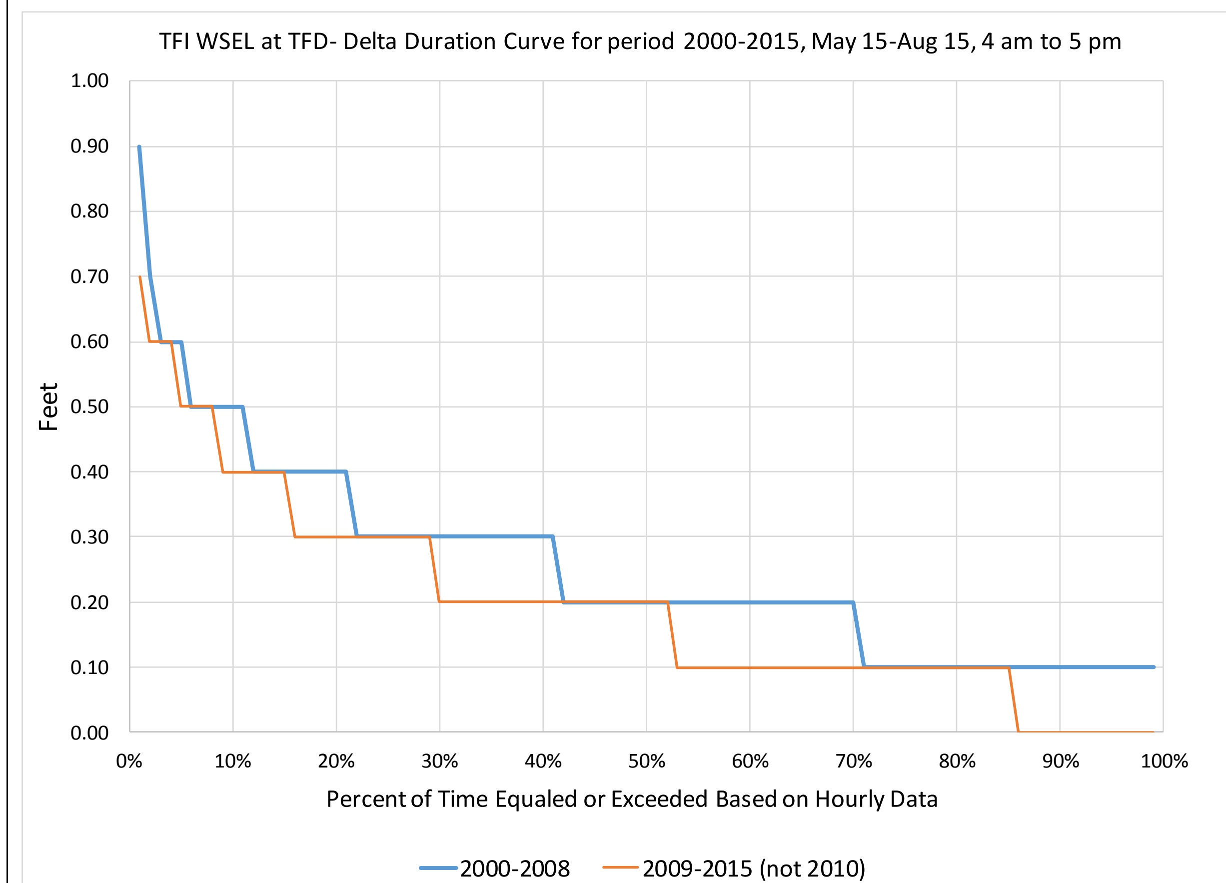
Study No. 3.3.10 Assess Operational Impacts on Emergence of State-Listed Odonates (2nd year)

<table>
<tr><th>Commenter</th><th>Comment</th><th>Response</th></tr>
<tr><td>NHESP-1</td><td>2.4 Water Level Fluctuation Impact Assessment

1. The Division requested a comparison of key WSEL statistics at the Montague Gage and below Rock Dam for all years between 2010 and 2015 to confirm whether key WSEL statistics for 2015 are broadly representative of previous years. In response, FL utilized data from hydraulic models developed for the Turners Falls Impoundment (TFI), and for the Montague USGS Gage downstream to Holyoke Dam. The hydraulic model for the TFI was based on data from 2000-2015 (excluding 2010); for downstream of the Montague USGS Gage, the model was based on data from 2008-2015 (excluding 2010). A shorter period of time was analyzed for the downstream model due to Holyoke Dam experiencing a change in operations in 2008. Data from 2010 were excluded because the Northfield Mountain Project was off-line during this period. Overall, the Division is supportive of the approach outlined above. However, we request that FL compare rates of change within the TFI between 2000-2008 and 2008-2015 (e.g., before and after FL acquired the Project) to confirm that rates of WSEL change in the TFI before 2008 do not differ significantly relative to rates of WSEL change after 2008.</td><td>FL records the Turners Falls Impoundment (TFI) water surface elevation (WSEL) every hour at the TF Dam. To fulfil NHESP's request, the following steps were taken. For each day between May 15 and August 15, and between the hours of 4 am to 5 pm, the WSEL was subtracted every hour to yield the "delta" WSEL fluctuation for that time period. For example, assume the WSEL at the TFD on May 15 between the hours of 4 am and 10 am were as follows:

<table>
<tr><th>4 am</th><th>5 am</th><th>6 am</th><th>7 am</th><th>8 am</th><th>9 am</th><th>10 am</th></tr>
<tr><td>181.2</td><td>180.4</td><td>179.7</td><td>179.5</td><td>179.6</td><td>179.8</td><td>180.0</td></tr>
<tr><td>Delta</td><td>-0.8 (181.2-180.4)</td><td>-0.7</td><td>-0.2</td><td>+0.1</td><td>+0.2</td><td>+0.2</td></tr>
</table>

Because the concern with odonates is rising WSEL, the deltas computed between 4-5 am, 5-6 am and 7-8 am are not relevant since the WSEL is dropping (negative delta). However, between 7-8 am, 8-9 am, 9-10 the WSEL is rising (positive delta) 0.1 ft, 0.2 ft and 0.2 ft, respectively. The example presented above was conducted over two periods 2000-2008 and 2009-2015 (sans 2010 since Northfield was not operating). Using the hourly positive (rising WSEL) deltas, delta duration curves were developed for the two periods of record as shown below. In sum, there is negligible difference in the magnitude of fluctuation before and after FL acquired the Project.


</td></tr>
<tr><td>NHESP-2</td><td>2.4 Water Level Fluctuation Impact Assessment

2. For the bypass reach, FL used empirical water level data from 2014-2015 at sites above and below Rock Dam because an unsteady state (time-varying) model was not developed for the bypass reach. However, FL notes that several relicensing studies were being conducted in 2014 and 2015, during which special flow releases were being provided to the bypass reach via the Turners Falls Dam. Examples include the whitewater boating study (July 2014), the instream flow study (July 2014), and various manipulations of spillage flow and station generation combinations in association with the adult American Shad study (2015). FL notes that flow</td><td>As NHESP notes the flow releases in the bypass reach in 2014-2015 were conducted to support various studies. The flow releases were purposely manipulated to provide the desired flow. In practice flow releases from the TF Dam into the bypass (above the current minimum flow requirements) typically only occur when the hydraulic capacity of the Turners Falls Project is exceeded, which occurs during the spring freshet or other high flow periods.</td></tr>
</table>

<table>
<tr><th>Commenter</th><th>Comment</th><th>Response</th></tr>
<tr><td></td><td>releases during these studies caused a higher frequency and magnitude of water surface elevation changes than would have been observed under more typical spring and summer conditions. Therefore, we request that FL provide additional data/analyses to assess to what extent, if any, these flow manipulations may have affected maximum hourly rates of change in the bypass reach.</td><td>Summary statistics of Maximum Hourly Rates of Change in WSEL in the Bypass Reach above and below Rock Dam based on available logger data collected during the period from May 15 to August 15 for the Years 2014 to 2015 (4AM-5PM) where flows were manipulated by relicensing studies vs. no studies are shown in the table below.
<table>
<tr><th rowspan="3">Statistic</th><th colspan="4">Maximum Hourly Rates of Change in Water Surface Elevation (ft/hr)</th></tr>
<tr><th colspan="2">Above Rock Dam</th><th colspan="2">Below Rock Dam</th></tr>
<tr><th>No Studies</th><th>Studies</th><th>No Studies</th><th>Studies</th></tr>
<tr><td>Mean</td><td>0.60</td><td>0.60</td><td>0.63</td><td>0.75</td></tr>
<tr><td>StDev</td><td>0.90</td><td>1.45</td><td>0.66</td><td>0.65</td></tr>
<tr><td>Lowest Max</td><td>0.01</td><td>0.04</td><td>0.00</td><td>0.00</td></tr>
<tr><td>25th Percentile</td><td>0.02</td><td>0.07</td><td>0.07</td><td>0.33</td></tr>
<tr><td>Median</td><td>0.03</td><td>0.26</td><td>0.51</td><td>0.55</td></tr>
<tr><td>75th Percentile</td><td>0.08</td><td>0.99</td><td>0.88</td><td>0.98</td></tr>
<tr><td>95th Percentile</td><td>2.90</td><td>4.47</td><td>1.81</td><td>1.85</td></tr>
<tr><td>Maximum</td><td>3.15</td><td>6.04</td><td>4.21</td><td>3.42</td></tr>
</table>
Note that max value Below Rock Dam during the “no study” period occurred on June 14, 2014 due to a Cabot Station trip/load rejection. The max value Above Rock Dam occurred during the whitewater boating study on July 21, 2014.</td></tr>
<tr><td>NHESP-3</td><td>3.3 Crawl Distances and Heights

1. Phase 1 qualitative surveys in 2014 collected approximately 250 exuvia and documented a median vertical crawl height of 4.0 ft for all species. During quantitative surveys in 2015 and 2016, FL documented a median vertical crawl height of 5.5 ft for all species observed. This represents a relatively significant difference in median crawl heights between 2014 and 2015/2016. More importantly, it also suggests that the 2014 data was not used to establish mean/median vertical crawl heights in the Year 2 Study Report and it is unclear why this data was not included. Therefore, the Division recommends that vertical crawl heights from 2014 surveys be used to help refine and enhance the accuracy of median vertical crawl heights and Critical Protective Rates (CPRs).</td><td>As described in the Interim Report on the 2014 field work, two phases of the fieldwork were proposed. Phase 1, completed in 2014, included <u>qualitative</u> surveys of odonate larvae and exuviae at selected sites to determine assemblage structure and to collect basic habitat data. Phase 2, completed in 2015 and 2016, included <u>quantitative</u> surveys and observations of emergency/eclosure behavior of odonates to provide data for analyses of the effects of Project operations on odonates. The Interim report notes that Phase 2 methods were not finalized in the Revised Study Plan, rather these details were to be discussed in the Interim report and finalized before the 2015 field season.

Although some exuviae were collected and identified in 2014 as part of the effort to determine the odonate community composition, crawl distances and crawl heights were not recorded for individually labeled exuviae, and thus the 2014 study provides no data on species-specific crawl heights and distances. Only the 2015 and 2016 studies provide these data. Thus, there is no scientifically supported basis for using the more cursory, non-specific crawl heights from 2014 to refine the crawl heights and CPRs developed from the 2015 and 2016 data.</td></tr>
<tr><td>NHESP-4</td><td>3.3 Crawl Distances and Heights

2. It appears that FL calculated crawl heights statistics for the Gomphus Group based on all crawl heights collected for G. abbreviatus (20 observations; median crawl height of 7.1ft), G. vastus (348 observations; median crawl height of 7.3ft) and Dromogomphus spinosus (21 observations; median crawl height of 2.8ft) collectively. Gomphus Group statistics are intended to assist in developing CPRs for three (3) other state-listed Gomphus species (G. fraternus and G. quadricolor, Endangered; G. ventricosus, Threatened) that are known to occur within the Project area but were not observed during field assessments. However, because G. vastus makes up approximately 90% of the Gomphus Group observations, FLs approach skews all crawl height statistics (and therefore CPRs) toward G. vastus, which exhibits the largest mean/median crawl heights of any odonate species observed during field assessments. Therefore, the Division recommends revising crawl height statistics for the Gomphus Groups by averaging each metric across the three observed Gomphus sp., which should in turn yield statistics that more fully capture the variation observed between species in that genera. This approach is similar to calculation of Genus Mean Acute Values (GMAV) in toxicity tests used for risk assessments and species sensitivity distributions, and will incorporate more uncertainty into the estimate than a pooled mean (which would be dominated by observations of the most abundant species). In such a manner, the Gomphus Group should be the average of each statistic across G. abbreviatus, G. vastus, and D. spinosus (H. brevistylus removed because of differences in ecology, size and shape of nymph). The same approach should be taken for the Stylurus Group, with each statistic averaged across S. amnicola, and S. spiniceps; however, S. amnicola is the only state-listed Stylurus species known to occur within Project area, so CPRs for this species should be used for assessing risk. See example Table below, which is based on values from Table 3.3-2. All CPRs will need to be revaluated for the Gomphus Group based on mean statistics presented below.</td><td>As a general point, we should have greater confidence in the data collected for G. vastus because of the larger sample sizes. NHESP has suggested that G. vastus may skew crawl height statistics and CPRs for the Gomphus Group, implying that other species in the genus Gomphus may have lower crawl heights. G. abbreviatus, for which we have a sample size of 20, has a nearly identical range and mean/median as G. vastus. FirstLight has no data for the other three state-listed Gomphus (fraternus, quadricolor, and ventricosus). FirstLight notes that Dromogomphus is not in the genus Gomphus, and should be excluded from this group because there is no scientifically justifiable reason to include data for a different genus in a group meant only for state-listed Gomphus.</td></tr>
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<tr><th>Commenter</th><th>Comment</th><th>Response</th></tr>
<tr><td></td><td>

<table>
<tr><th>Metric</th><th>DrSp</th><th>GoAb</th><th>GoVa</th><th>Mean Gomphus Statistic</th><th>StAm</th><th>StSp</th><th>Mean Stylurus Statistic</th></tr>
<tr><td>Vertical Crawl Height</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Mean</td><td>5.2</td><td>7.1</td><td>7.4</td><td>6.57</td><td>2.4</td><td>4.0</td><td>3.20</td></tr>
<tr><td>25%</td><td>2.4</td><td>5.2</td><td>4.8</td><td>4.13</td><td>0.4</td><td>1.6</td><td>1.00</td></tr>
<tr><td>Median</td><td>2.8</td><td>7.1</td><td>7.3</td><td>5.73</td><td>2.2</td><td>3.4</td><td>2.80</td></tr>
<tr><td>75%</td><td>8.8</td><td>8.6</td><td>9.6</td><td>9.00</td><td>2.9</td><td>5.5</td><td>4.20</td></tr>
<tr><td>Critical Height Percentiles</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>5%</td><td>0.13</td><td>3.35</td><td>1.81</td><td>1.76</td><td>0.15</td><td>0.09</td><td>0.12</td></tr>
<tr><td>10%</td><td>0.15</td><td>3.51</td><td>3.07</td><td>2.24</td><td>0.27</td><td>0.18</td><td>0.23</td></tr>
<tr><td>20%</td><td>1.84</td><td>5.05</td><td>4.42</td><td>3.77</td><td>0.37</td><td>1.01</td><td>0.69</td></tr>
<tr><td>30%</td><td>2.5</td><td>5.22</td><td>5.59</td><td>4.44</td><td>0.75</td><td>2.24</td><td>1.50</td></tr>
<tr><td>50%</td><td>2.83</td><td>7.08</td><td>7.34</td><td>5.75</td><td>2.17</td><td>3.35</td><td>2.76</td></tr>
</table>

</td><td></td></tr>
<tr><td>NHESP-5</td><td>

3.4 Substrate Selection

FL expressed substrate preference in terms of the percentage of individuals observed to eclose within each substrate. However, the Division notes that it is not possible to determine preference within and among species based on a simple percent preference across all sites. Preference may depend on the availability of a substrate within a transect or site. FL presents the proportion of habitat available at each site and transect during Phase 2 surveys (2015) in Table 3.4-1, and the substrate preferences of exuviae used for emergence duration in Appendix F. However, the proportion of habitat used by each species, within each transect is needed to assess whether a preference of habitat exists. Therefore, we request a site by site comparison of substrate use by species, transect and site. A table similar to Appendix F should be provided for species crawling height, crawling distance, and eclosure substrate of all exuviae measured during Phase 2 (2015) surveys. Tables should be similar to the following, but we request that FL work with the Division to confirm and clarify how best to compile the data:

<table>
<tr><th>Species</th><th>Date</th><th>Site No</th><th>Trans No</th><th>Vert Height</th><th>Horz Height</th><th>Soil</th><th>Root</th><th>LRock</th><th>Rock</th><th>Cwood</th><th>Detrit</th><th>Moss</th><th>Herb</th><th>Shrub</th><th>Tree</th></tr>
<tr><td>Boyeriavinos</td><td>7/9/2015</td><td>?</td><td>?</td><td>1.5</td><td>1.0</td><td></td><td>x</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

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FirstLight's study did not quantify the amount or spatial distribution of each potential substrate type at each site. Given the low sample sizes for most species, it is not appropriate to draw conclusions on eclosure substrate preferences using data from this study. Nevertheless, the table that NHESP requests is provided. Specifically Appendix 5 in the 2015 report contained these data and is being provided in spreadsheet format (3.3.10 Attachment B).

</td></tr>
<tr><td>NHESP-6</td><td>

3.5 Emergence and Eclosure Speed

2. The Division requested that additional observations of crawl height derived from the 2016 field effort be used to refine estimates of average/median crawl heights and assess any potential bias in the data. The Division noted in its previous comments that, in the absence of water level stabilization, collected exuvia may bias data toward individuals and species that travel far and/or fast enough to be observed and measured. For the 156 additional individuals observed during 2016 (Year 2) field assessments, FL collected crawl height data. However, it does not appear that FL used crawl heights from the 180 individuals observed for all or part of the eclosure process to refine average/median crawl heights and assess data bias, as requested by the Division.

Based on a cursory analysis of the data, for Gomphus sp. the difference in average/median crawl heights for all data (all 2015 and 2016 observations) and the 135 Gomphus individuals observed for all or part of the eclosure process was minimal. This seems reasonable given that Gomphus sp. exhibit relatively high crawl heights (median of 7.2ft) compared with many of the other species occurring in the Project area. On the other hand, there does appear to be a significant difference in average/median crawl heights for Stylurus sp. for all data (all 2015 and 2016 observations) and the 32 Stylurus sp. observed for all or part of the eclosure process. Median crawl heights for all Stylurus sp. (based on all 2015 and 2016 observations) are 3.3ft, and 2.2ft for S. amnicola in particular. Median crawl heights for Stylurus sp. observed for all or part of the eclosure process exhibit reduced median crawl heights of 2.5ft, and 1.0ft for S. amnicola. Given that average/median crawl heights for Stylurus sp. are significantly lower than for Gomphus sp., it is not surprising that crawl height data for Stylurus sp. would be more likely to exhibit bias. **In summary,** a more conservative estimate of average/median crawl heights for S. amnicola (1.6ft and 1.0ft, respectively) should be used to calculate CPRs.

</td><td>

As suggested, FirstLight looked at crawl heights for individuals observed during all or part of the eclosure process, versus crawl heights for individuals not observed during eclosure. However, low sample sizes, especially for uncommon species, severely limits the utility of this type of analysis especially in light of both natural variability and sample bias when interpreting or drawing conclusions from these data. Relatively few observations of the eclosure process were observed in 2015 when biologists were typically constrained to searching within established transects at the five sampling sites. A far greater number of observations of eclosure were recorded in 2016, when biologists searched in a less constrained manner at a larger number of survey sites. The 2016 field effort also provided some insight into eclosure behavior that helped biologists decide where and how to look for eclosing individuals.

In the absence of water level stabilization, there is potential for bias toward individuals that crawl far enough to not be affected by water level fluctuations. For each individual, if eclosure is not observed, and yet the crawl height/distance for exuvia is recorded, the exact position of that exuviae in relation to the water level at the time of eclosure is unknown. It could have been closer to, or farther from, the water's surface than recorded - the potential error is bidirectional. NHESP has suggested that data are more likely to be biased for those species that remain close to the water, and focuses on statistics for S. amnicola, which, incidentally, is one of the species for which we have very few observations (n = 8 for observations of eclosure, and n = 6 for individuals not observed eclosing).

For other species that also emerge relatively close to the water, crawl heights for individuals observed eclosing were actually higher than crawl heights for individuals not observed eclosing (see chart below). This is opposite than what

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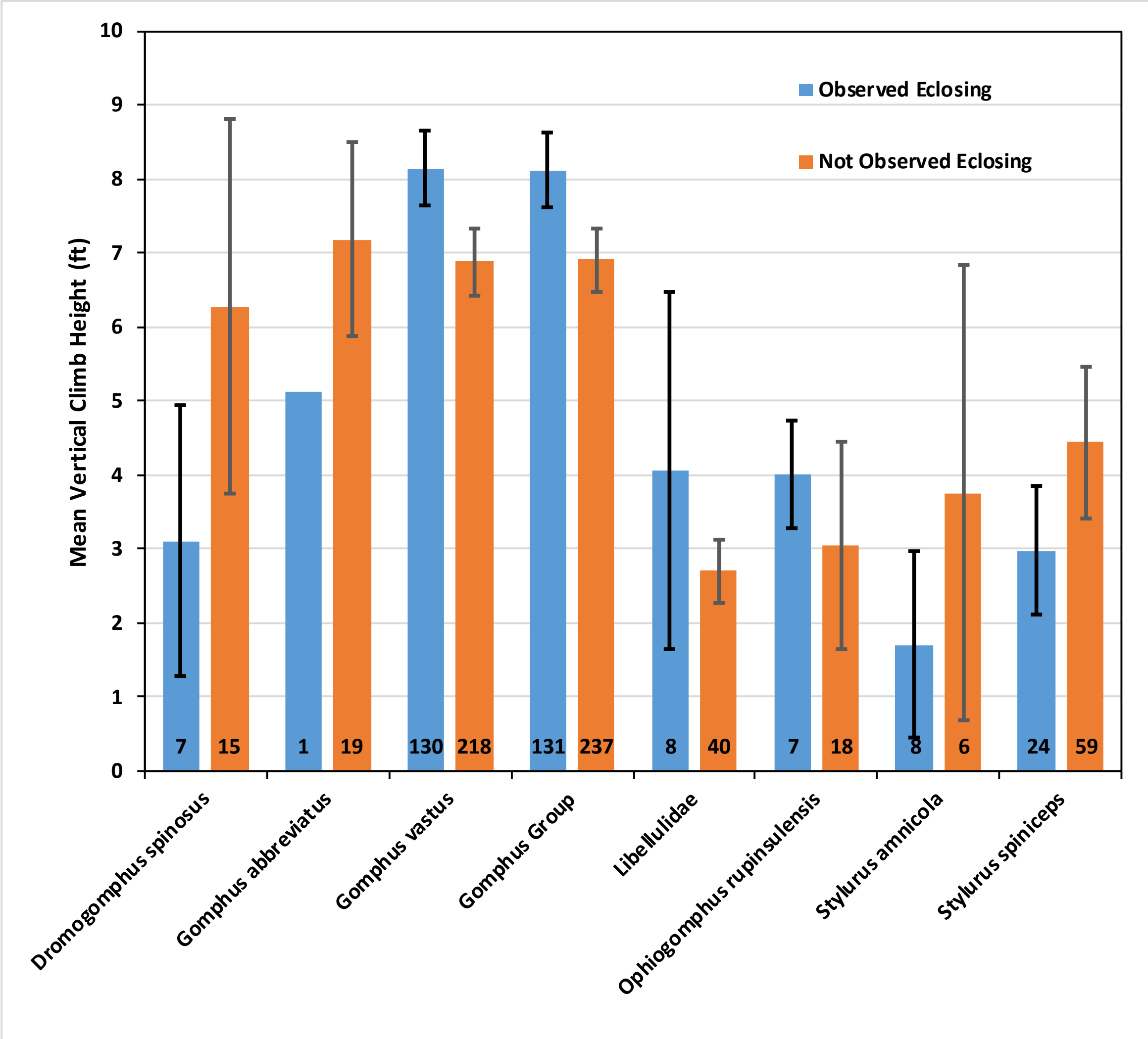
Commenter	Comment	Response
		was calculated for S. amnicola, and is counter to the assertion that sampling was biased only toward individuals that crawl far enough to not be affected by water levels. Overall, the low sample sizes, and both the species natural variability and the inherent sampling variability precludes confidence in the analysis suggested in the comment. NHESP's recommendation to essentially omit approximately half of the datapoints for S. amnicola and use a "more conservative" estimate of crawl heights to calculate CPRs is not supported. Using a simple mean or median value for an uncommon species for which only 8 datapoints exist is not scientifically defensible.  **Error bars indicate 95% confidence intervals. Total number of samples per species/group in bold within each bar.**
NHESP-7	*4.2 Potential Effects of Project Operations* 1. The Division requested that FL include additional risk assessment based on the maximum rate of water level change at each site in order to help illustrate the full range of potential effects. In response, FL used the 95th percentile of the maximum hourly rates of change (ft/hr) to conduct its risk assessment. Overall, the Division agrees that this represents a reasonable approach. However, for comparative purposes **we still request** that FL amend Table 3.6-1 through 3.6-3 to include maximum rates of water level change for each transect.	The maximum hourly rates of change for each transect are included below.

Revised Table 3.6-1. Summary Statistics of Maximum Hourly Rates of Change in WSEL Upstream of Turners Falls Dam, Each Day from May 15 to August 15 for the Years 2000 to 2015.

Statistic	Maximum Hourly Rates of Change in Water Surface Elevation (ft/hr)						
	HEC-RAS Transect No.						
	2895	14877	25845	31191	48441	56235	70507
Mean	0.43	0.41	0.43	0.41	0.35	0.33	0.32
StDev	0.26	0.24	0.20	0.18	0.17	0.17	0.17
Lowest Max	0.00	0.02	0.03	0.02	0.00	0.00	0.00
25th Percentile	0.29	0.27	0.30	0.28	0.23	0.22	0.20
Median	0.40	0.37	0.41	0.39	0.32	0.31	0.30
75th Percentile	0.50	0.50	0.53	0.50	0.44	0.42	0.41
95th Percentile	0.89	0.81	0.74	0.72	0.66	0.65	0.66
Maximum	2.17	1.99	1.83	1.58	1.05	1.04	0.99

Notes: Data reflects peak emergence period only, between 4 am to 5 pm. Year 2010 not included.

Revised Table 3.6-2. Summary Statistics of Maximum Hourly Rates of Change in WSEL Downstream of Cabot Station, Each Day from May 15 to August 15 for the Years 2008 to 2015.

Statistic	Maximum Hourly Rates of Change in Water Surface Elevation (ft/hr)				
	HEC-RAS Transect No.				
	109.52	113.17	115.07	116.64	118.51
Mean	0.18	0.26	0.30	0.39	0.57
StDev	0.14	0.20	0.21	0.27	0.39
Lowest Max	0.00	0.00	0.00	0.00	0.00
25th Percentile	0.07	0.11	0.14	0.19	0.26
Median	0.16	0.24	0.28	0.36	0.52
75th Percentile	0.28	0.39	0.44	0.57	0.83
95th Percentile	0.45	0.62	0.65	0.85	1.25
Maximum	0.76	0.98	1.00	1.29	1.92

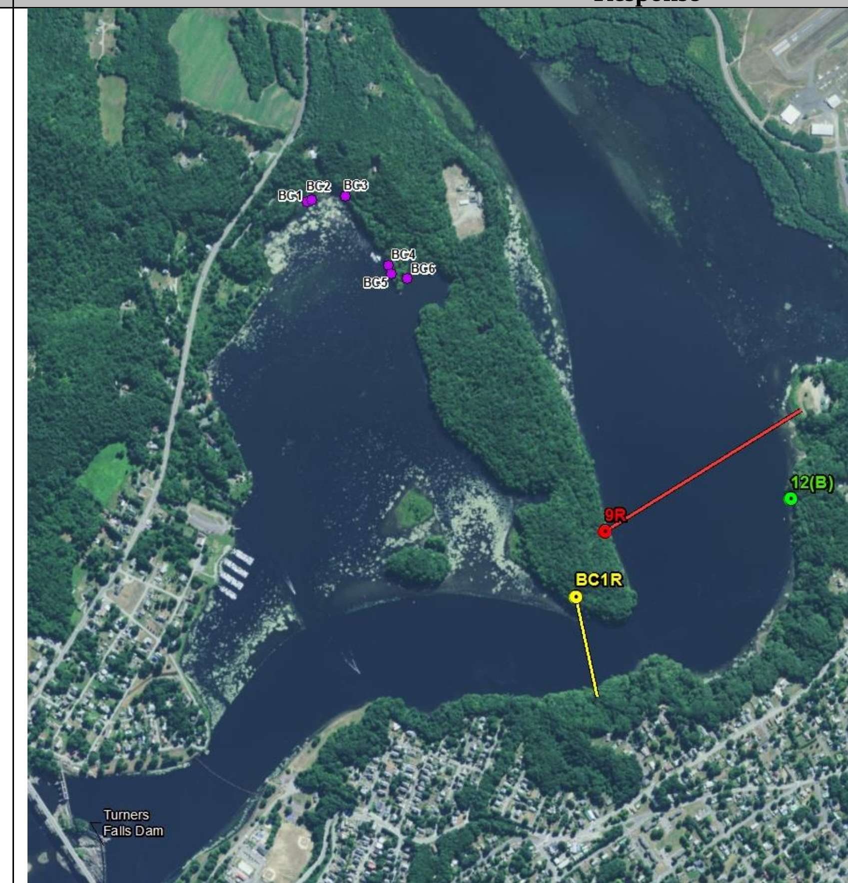
Note: Data reflects peak emergence period only, between 4 am to 5 pm. Year 2010 not included.

Revised Table 3.6-3. Summary Statistics of Maximum Hourly Rates of Change in WSEL in Bypass Reach, Each Day from May 15 to August 15 for the Years 2014 to 2015.

Statistic	Maximum Hourly Rates of Change in Water Surface Elevation (ft/hr)	
	Water Level Logger Data	
	Above Rock Dam	Below Rock Dam
Mean	0.70	0.69
StDev	1.19	0.69
Lowest Max	0.01	0.00
25th Percentile	0.02	0.21
Median	0.07	0.54
75th Percentile	0.80	0.91
95th Percentile	3.14	2.07
Maximum	6.04	4.21

Commenter	Comment	Response
		Note: Data reflects peak emergence period only, between 4 am to 5 pm.
NHESP-9	*4.2 Potential Effects of Project Operations* 4. The Division requests that Appendix E and Appendix F be provided in editable format (Microsoft Excel or similar).	Study 3.3.10 Appendix E and F data are provided in Excel format as part of this responsiveness summary (3.3.10 Attachment C).
NHESP-10	*4.2 Potential Effects of Project Operations* 5. Overall, and in advance of refining the analyses per the guidelines above, preliminary findings suggest that Project operations are likely resulting in a Take (321 CMR 10.18 (2)(b)) of several state-listed odonate species. Project effects are most severe where daily and hourly water level fluctuations (and rates of change) are greatest (e.g. closest to Cabot Station). Although Project effects are most severe for species that eclose closest to the water surface (S. amnicola and similar), even the Gomphus Group appears to be affected within the Bypass Reach and, to a lesser extent, transects closest to Cabot Station and the Turners Falls Dam. In addition to direct mortality of individuals during the eclosure process, Table 3.2-1 (which reflects 2015 surveys) confirms that areas closest to Cabot Station (Survey Site 3 at the Deerfield Confluence and Survey Site 4 at Rock Dam) exhibit reduced abundance and species richness relative to transects located further downstream. Preliminary findings suggest that MHR-95% would need to be reduced – to a greater (Bypass Reach and downstream of Cabot Station) or lesser (the Impoundment) extent – throughout the Project area in order to avoid and minimize affects to state-listed odonate species. As the state-listed odonate species most affected by Project operations, we recommend reducing MHR-95% below CPR-95% for S. amnicola between May 15th and July 31st throughout the Project area. This would effectively avoid and minimize concerns relative to S. amnicola as well as all other state-listed odonate species. In addition, we note that reducing the magnitude of peaking may also represent a complimentary strategy for reducing impacts to state-listed odonates in the Bypass Reach and downstream of Cabot Station.	These Responses to Stakeholder Requests for Study Modifications is not the forum to address NHESP's preliminary findings or suggested changes in Project operations, which will be fully addressed at the appropriate stage of the relicensing. However, FirstLight respectfully disagrees with the conclusions inherent in the statement. FirstLight would be pleased to provide a full explanation for the basis of its disagreement at the appropriate time.
NHESP-11	March 2016 Study Report Meeting During its March 16, 2017 Study Report Meeting, FL suggested that MHR-95% statistics may be overly conservative for odonates whose peak activity is in the morning because operations typically release flows in the early- to mid-afternoon. However, FL's data do not appear to support this claim. Summarizing observation start times from Appendix F, 30% or more of all odonates were not observed to start emergence until 12:41PM or later, and fewer than 30% of all species were observed emerging prior to 10:53AM (Table 1). Further, >40% of Stylurus (Figure 2) and >20 % of Gomphus (Figure 3) began emergence after 1PM.	FirstLight conducted the water level fluctuation analysis during the peak emergence period of 4am to 5pm, as suggested in NHESP's comment letter on the 2015 study report dated April 30, 2016.
CRC-1	This study was not conducted as provided for in the approved study plan. The RSP reassured stakeholders that the many years of existing data in the Turners Falls impoundment could be used to assess project effects, as listed below: The first objective of the study as written in the Revised Study Plan (RSP) dated August 14, 2013, was, "Synthesis of existing data, supplemented with field surveys, to characterize the assemblage structure and emergence/eclosure behavior of odonates in the project area." The RSP on page 3-238 stated, "To some extent, a thorough review of existing information will provide adequate biological information for an impact assessment using the hydraulic model…, but field observations are planned to fill critical knowledge gaps by conducting surveys in both the Turners Fall Impoundment and downstream from the Turners Falls Dam." Task 1 of this study as listed in the RSP was to gather existing information on species composition in the proposed study reaches and to summarize the life history and ecology of these species. Section 4.1 in the Interim Report for Study 3.3.10 dated April 2015, stated, "Information on the odonate assemblage in the project-affected reaches of the Connecticut River will be gathered from publications, reports, and relevant case studies. Experts who were involved with the dragonfly studies in the Turners Falls Impoundment in the 2000s have been contacted to provide expert opinion and in some cases unpublished data. The life history and ecology, and particularly emergence and eclosure behavior, of these species and species groups will be summarized in the final report."	Based on the types of analyses and overall risk assessment framework that was used, which was based on the recommendations of NHESP, we made best use of existing data on the ecology and life history of the target species. Some of the most critical parameters, such as crawl distance, crawl height, and eclosure speed/timing, are not well documented in the scientific literature or previous studies in the Connecticut River. Given the evolution of the study plan and analyses from 2014 to 2016, based on ongoing feedback from NHESP, FirstLight believes that the study was conducted as planned.
CRC-2	The RSP on page 3-241 stated that, "In addition, the influence of water level, habitat characteristics (substrate, vegetation cover, elevation), and weather conditions on emergence distance will be determined using correlation and regression analysis." Correlation and regression analysis never took place. The study reported eclosure substrate by species (see Table 3.4-1) but didn't indicate how emergence distance (or height, as the study became focused on) varied by substrate. This is important because, for example, the Turners Falls impoundment had no observations upstream of Barton Cove and previous studies had shown that emergence distance varied by substrate and by location upstream or downstream of the Northfield Mountain tailrace (Martin, 2010). One of the	CRC states in its comment "One of the operational effects of Northfield Mountain since it began operation has been an increase of erosion in the impoundment, which has led to a greater prevalence of banks lacking vegetation than elsewhere in the study area and repaired banks, making rip rap more common in the impoundment than elsewhere in the study area". FL strongly disagrees with this statement, as supported by Study No. 3.1.2 Erosion Causation Report,

Commenter	Comment	Response
	operational effects of Northfield Mountain since it began operation has been an increase of erosion in the impoundment, which has led to a greater prevalence of banks lacking vegetation than elsewhere in the study area and repaired banks, making rip rap more common in the impoundment than elsewhere in the study area. As such, this study report did not adequately assess operational impacts in the Turners Falls impoundment.	which was filed with FERC in October 2016. The findings of the erosion causation study do not support CRC's unsubstantiated claim. With regard to the analysis conducted, the analysis/risk assessment was consistent with what NHESP recommended based on comments on the 2015 study report (comment letter dated April 30, 2016), and some of the methods envisioned in the RSP became less important. Thus, the study did evolve but FirstLight was responsive to NHESP comments on data analysis methodologies.
CRC-3	Page 5-209 of Study Report 3.2.1 (April, 2017 version), states, "Based on these data, the rate of rise and fall of the water level based on boat waves is approximately 0.2 to 0.66 feet per second (or 720 to 2400 feet per hour over the limited range of wave from crest to trough). This can be compared with the rate of rise and fall of the TFI fluctuations that are generally on the order of a few tenths of a foot per hour. The rate of change in water level for boat waves therefore ranges from about 1,000 to 10,000 times larger than for TFI fluctuations caused by variability in flow or hydropower operations. Compared against high rates of water level fluctuation that occur less frequently, the ratio of boat wave induced change to TFI level induced change would be smaller than the factor of 1,000 times. Compared against the low rates of TFI water level change that occurs more frequently, the ratio would be even greater than the factor of 10,000. This demonstrates that boat waves are orders of magnitude more intense in terms of rapidity of change of water level than TFI fluctuations caused by variability of flow or hydropower operations." The rationale for the 0.23 ft/hour "correction factor" used in this study is not explained and does not seem to be based on data from Study 3.1.2. Moreover, it completely underestimates the instantaneous nature of impact – a boat wake immediately increases the river height; it is not averaged over an hour.	Study Report No 3.1.2 (Erosion Causation Study) states "The average maximum wave height was around 7 to 8 cm and the average wave period was approximately 1.4 s." 7 cm equals 0.23 feet. This change occurs over a period of 1.4 seconds. We simply added this short term value of 0.23 feet to the hourly WSEL rate of change values. In their comment letter dated April 30, 2016 NHESP "recommends that 0.23 ft be added to the climbing height quantiles to account for effects of average boat wakes." This is consistent with the boat wake data collected during Study No. 3.2.1.
CRC-4	The 2009 Dragonfly Studies Report on Figure 8 shows the average height of boat wakes on weekends versus weekdays for the years 2006, 2007, and 2008. Weekday boat wakes ranged in height between an average 2.51 inches in 2007 to 6.10 inches in 2008. Weekend boat wakes ranged in height between an average 3.90 inches in 2007 to 6.70 inches in 2007. Comparatively, the December 2016 Study 3.3.10 Study Report added a correction factor of 0.23 ft (or 2.76 inches) to the MHR-95% (the 95th percentile Maximum Hourly Rate of Change in ft/hr). The MHR-95% used in Study 3.3.10 varied by HEC-RAS transect, but was in the range of 0.66 to 0.89 ft/hour or (7.92 to 10.68 inches/hour). It appears that the boat wave height used in Study 3.3.10 is underestimating the impact on odonates from boat wakes.	See CRC-3 above for rationale on boat wakes assessment.
CRC-5	A note at the bottom of Tables 3.6-6 and 3.6-7 indicates that Transect 2895 was not used in the boat wake analysis because it is located in Barton Cove, a no-wake zone. This is interesting, given that Study 3.1.2 cited "boat wakes" as being a main cause of erosion in Barton Cove.	Shown in the aerial image map below are the locations where the odonate surveys were conducted in Barton Cove and the transect locations where detailed data was collected as part of the erosion causation study. The area in Barton Cove that is posted as a no wake zone is in the Franklin Boat Club and boat launch area, as the water depths are shallow in this area. The 2015 odonate transects and their habitat were located in the shallow no wake zone of Barton Cove. The lowermost transect used to represent conditions in Barton Cove for the erosion causation study (Transect BC1R) is not in a no wake zone. As mentioned above, the majority of Barton Cove is not posted as a no wake zone and, as such, the extrapolation of BSTEM results throughout Barton Cove was appropriate.

Commenter	Comment	Response
		
CRC-6	To analyze risk, we are mainly concerned about whether the eclosure height in the 2-hour period falls within the maximum elevation change of this 2 hour period. To look at this, averages of rates of change over years do not represent a "worse-case scenario." A low summer flow combined with 4 turbines generating at Northfield Mountain would represent a worst case scenario. The HEC-RAS transect closest to Northfield Mountain, 25845, is listed as having a maximum hourly rate of change of 0.74 ft/hour. Over a 2-hour period, this would be 1.48 ft. I scanned through the logger data for Study 3.3.9, and found an example date of July 2, 2014 in which the logger located 1 km downstream of the Northfield Mountain tailrace (a similar location to HEC-RAS transect 25845) measured at 181.22 ft at 14:30 and at 183.08 at 16:30, a difference of 1.86 ft. It would be better to model the largest 2-hour change in elevation over the study period, that represents the 95th %.	The 0.74 ft/hour value references represents the 95^{th} percentile of the Maximum Hourly Rate of Change in Water Surface Elevation for the entire period. FirtsLight is not proposing to redo the analyses as suggested. The analysis was performed according to NHESP recommendations. See their comment letter dated April 30, 2016.
USFWS-1	**Crawl Distances and Heights** Data collected in 2015 and 2016 were analyzed to determine crawl height and distance based on exuviae (cast off exoskeleton) for which species-level identification was possible. Median crawl heights were similar between 2015 and 2016, although median crawl distances were higher in 2016. *Comments:* It is unclear why only 2015 and 2016 data were used in the analysis, as 250 exuviae were also collected in 2014. In the absence of water level stabilization, collected exuvia data may be biased toward those individuals and species that traveled far and/or fast enough to be observed and measured. A preliminary assessment suggests that use of the more conservative estimates of average/median crawl heights are warranted, especially for State-listed S. amnicola. *Recommendations:* FL should include 2014 data in the crawl distance and height analysis. In addition, FL should use crawl heights from the 180 individuals observed for all or part of the eclosure process to refine average/median crawl heights and assess data bias.	As described in the Interim Report on the 2014 field work, two phases of the fieldwork were proposed. Phase 1, completed in 2014 included qualitative surveys of odonate larvae and exuviae at selected sites to determine assemblage structure and to collect basic habitat data. Phase 2, which occurred in 2015 and 2016 included quantitative surveys and observations of emergency/eclosure behavior of odonates to provide data for analyses of the effects of Project operations on odonates. The Interim report notes that Phase 2 methods were not finalized in the Revised Study Plan, rather these details were to be discussed in the Interim report and finalized before the 2015 field season. Although some exuviae were collected and identified in 2014 as part of the effort to determine the odonate community composition, crawl distances and crawl heights were not recorded for individually labeled exuviae, and thus the 2014 study provides no data on species-specific crawl heights and distances. Only the 2015 and 2016 studies provide these data. Thus, FirstLight cannot use the more cursory, non-specific crawl heights from 2014 to refine the crawl heights and CPRs developed from the 2015 and 2016 data.

Commenter	Comment	Response
USFWS-2	**Critical Protective Rates** Critical height percentiles, representing the critical heights protective of 95, 90, 80, 70, and 50 percent of individuals within a species or species group, were divided by an eclosure duration of 2 hours to derive Critical Protective Rates (CPR) for species and species groups. CPR values then were compared to the 95th percentile of the maximum hourly rates of change in water level (MHR-95 percent) for the daily period from 0400 hours to 1700 hours (May 15 to August 15) to provide a way of assessing potential project effects, based on species (or species group) climb height and eclosure time. FL assessed the results based on the assumption that the population is not likely to be affected if the MHR-95 percent is less than the CPR for a given percentile. Of the State-listed species, approximately 20 to 30 percent of individuals in the Gomphus Group were found to be affected at the bypass reach sites, whereas 30 percent of S. amnicola individuals were affected at 11 of the survey sites, with 50 percent of S. amnicola affected at the remaining three sites (two in the bypass reach as well as the site closest to Cabot Station). *Comments:* The MHR-95 percent values were derived from water level logger data for the time period 0400 hours to 1700 hours. However, the data provided in Appendix F of the report indicate that greater than 40 percent of Stylurus and 20 percent of Gomphus individuals completed the eclosure process after 1300 hours, suggesting that the MHR-95 percent may not be an overly restrictive/conservative metric. *Recommendations:* FL should determine if early afternoon rises in water surface elevation differ substantially from the longer time period analyzed. If the narrower time band results in greater rates of change, the project effects analysis should be redone.	FirstLight conducted the water level fluctuation analysis during the peak emergence period of 4am to 5pm, as suggested in NHESP's comment letter on the 2015 study report dated April 30, 2016. To respond to the USFWS's recommendation, FirstLight evaluated hourly rate of change of water levels at the transects used in the odonate study in the TFI and downstream (3.3.10 Attachment A). FirstLight is not proposing to redo the project effects analysis.

Study No. 3.3.19 Ultrasound Array

Commenter	Comment	Response
MADFW-1	The Division agrees with FL's conclusion, that while interesting, the results are not conclusive and that more investigation may be warranted. We would support a repeat test in 2017, however shad would need to be radio tagged to determine if the shad repelled from the tailrace continue their migration upstream into the bypass reach (desirable) or just flee downstream which would cause migratory delay (undesirable). Since this report was produced FL has decided not to repeat the study in 2017 unless the ultrasound transmitters can be placed far enough away from the units as to be free of the interference of entrained air.	FirstLight intends to develop a comprehensive plan to repeat the study in 2018.
CRC-1	The RSP stated that in task 2 of this study, "The CFD modeling will be coupled with the telemetry results, passage counts, and environmental variables (water temperature, river flow) to understand which conditions are preferable for guiding migrating fish to the entrances." A revised study plan dated January 2016 stated, "Environmental and operational data will be recorded and reported during each test period to understand which conditions are preferable for guiding migrating fish to the entrances." The January 2016 RSP indicated on page 7 that environmental data included temperature data, and operational data included hourly Montague USGS gage flows, Cabot Station hourly discharges, Station No. 1 hourly discharges, and Turners Falls Dam spill flow. CRC could not find any analysis of temperature, Station No. 1 discharges, or Turners Falls Dam spill flow in the report (a regression model compared fish movement with Cabot generation, Montague gage flow, and bypass flow). The report looked at the impact of the ultrasound array on fish passage numbers on the Cabot ladder only, whereas the RSP had said that the study would aid in the understanding which conditions are preferable for guiding migrating fish to the "entrances," not one entrance. CRC recommendation: The study report should have reported these deviations from the RSP, indicating the rationale. FirstLight should explain the rationale for the deviations in its response. FirstLight should also discuss what information can be presented to stakeholders to aid in the understanding of conditions that are conducive to successful entrance and passage at the three fish ladders.	The CFD modeling was not included since the study results revealed that conditions for guiding fish away from Cabot Fishway entrances had to do with the amount of time the array was turned on, not the flow in the area. Figure 4.1-2 in the study report has operational data from Cabot Station, Station No. 1 and the Turners Falls spill. Analysis included Cabot generation, river flow and bypass flow. The bypass flow includes combined discharge from Station No. 1 and Turners Falls Dam spill. The study results revealed that adult shad exhibited a response when the array was turned on but then after about 2 hours fish seemed to acclimate to the sound. This occurred throughout the sampling period indicating that there was no influence from water temperatures. However a graph of water temperature and fish counts is attached (3.3.19 Attachment A) The intent of this study was to investigate if ultrasound could be used to exclude migrating shad from the Cabot Fish Ladder entrances and tailwater area. The study monitored one of two immediately adjacent and active entrances at the Cabot Fish Ladder using a DIDSON. All entrances at the Spillway ladder (2) and Cabot ladder (2 active) were monitored via a combination of both PIT and radio telemetry and therefore as stipulated in the RSP. The gatehouse fishway entrance was not a component of this evaluation. The plural "entrances" in the RSP referred to the multiple entrances at the two respective fishways, Spillway and Cabot ladders. As such, the study did not deviate from the amended RSP provided to stakeholders on January 13, 2016. This amended RSP was developed to comply with the FERC SPDL from February 21, 2014, which recommended that FirstLight consult with the stakeholders and file an amended RSP. Comments were received from the USFWS, NMFS, MADFW, Don Pugh, and Karl Meyer. As such, though some items differ from the original RSP, no deviations in field sampling occurred given that changes to the plan were developed in consultation with the stakeholders, per FERC recommendations.
NMFS-1	**Section 4.2 DIDSON** The report states: "as flow increases by 1,000 cfs in the Bypass Reach, the number of shad targets in the Cabot Ladder decreases when the ultrasound array is activated for the first hour." Flows did not change within this timeframe. Flows were held constant every three days according to the study plan as is displayed by the red line in figure 4.1-2. Based on the approved bypass flow study plan, we do not agree with a result that appears to be based on a linear interpolation between these flows. *Recommendation* The report should include an appendix that provides more temporal detail than what is displayed in Figure 4.2-1. The x-axis should provide detail between 7AM and 10AM for days that have fish counts in excess of 100 between these hours. The graph should contain two y-axes. The primary y-axis should contain the number of targets observed for a given hour. The secondary axis should display bypass flows and Cabot Discharge flows.	Requested table can be found in 3.3.19 Attachment B
NMFS-2	**Section 4.3 Shad Counts** Transit times for American shad in the Cabot Station ladder were measured from 1999 to 2002. (Sullivan 2004). The median transit time for these four years to transit the 67 weirs in the ladder was 10.2 hours and some fish spending over a day in the ladder. With respect to Relicensing Study 3.3.19, the window counts of shad near the exit of the Cabot Station fish ladder did not take into account the median transit time for these fish. Consequently, fish counted at the window early in the morning likely entered the ladder before the ultrasound was activated. *Recommendation* Window count data should take into account the average time for a shad to ascend the Cabot ladder. While we recognize the variability inherent in median transit time, we do not support the notion that there is a one to one relationship between	DIDSON and ladder counts were not compared on intervals of < 1.0 days, nor were ladder counts modeled; DIDSON counts were modeled, which were proximate to the ultrasound array. Thus there was no time lag between the DIDSON count and the covariates experienced at the time of the count.

<table>
<tr><th>Commenter</th><th>Comment</th><th>Response</th></tr>
<tr><td></td><td>when the ultrasound array was on and when a fish was counted in the Cabot ladder window. We recommend licensee consult with us to establish an agreed upon accounting of fish that takes into account transit time in the ladder.</td><td></td></tr>
<tr><td>NMFS-3</td><td>Section 5.0 Discussion

Page 5-1 states the following:

“Those fish that entered the array and moved upstream from there did so because of the bypass flow, and this relationship was highly significant (p < 0.001). In other words, bypass flow has an effect on timing of upstream movement from the Cabot Tailrace and the probability of movement is linearly proportional to flow. Fish that entered the array and moved downstream from there did so because of Cabot Station generation, and this relationship was also significant (p = 0.02). As Cabot Station generation increases, time to downstream movement decreases.”

This statement is helpful in determining how bypass flows affect the movement of fish in the bypass reach. However, upon review of the study and after attending the study report meeting, it was not clear that any reporting of the likelihood of a fish being detected at T8 (Conte Discharge) or T10 (Spillway Ladder) was reported for the various flows that occurred in the bypass reach, and whether or not the ultrasound array was on or off. The goal of the study was to determine whether the ultrasound array could deter fish from the Cabot Ladder entrance as well as determine if migrating shad would move upstream up the bypass reach. This study, as written, does not clearly provide that information.

Recommendation

The report should include a narrative that better explains the fate of the 29 fish that chose to move upstream after being detected in the array. The narrative should explain what the bypass flow was for each of these fish and the number of fish that were detected at the dam. The report should include mean migration time to T8 and to T10 for these 29 fish. In addition to the reported statistics on the likelihood of deterrence from the ultrasound array, we want information that will help us understand the movement of deterred shad swimming up the bypass channel.</td><td>(3.3.19 Attachment C.) 3.3.19 Attachment C--Table 1 represents the conditions experienced by the 29 fish that moved upstream from the tailrace during the ultrasound study. The reason there are more than 29 movements upstream from the tailrace is because some fish make multiple attempts or transitions upstream from the tailrace. 3.3.19 Attachment C-Table 2 represents the conditions experienced by the fish that moved upstream from the tailrace when the array was on. Again, some fish made multiple attempts or transitions upstream from the tailrace. In total, there were only 5 fish (149.740 119, 149.780 135, 149.780 97, 150.420 193 and 150.460 178) that made it all the way to Spillway Ladder entrance.

The summary of the Cox Proportional hazard regression models for upstream movement out of the tailrace are described in the report (Section 4.4.4.1). Additional covariates were modeled and summarized (3.3.19 Attachment C-Table 3) and included water temperature, Station No.1 operations, TFD Spill, the interaction between TFD Spill and Station No.1 and the interaction between water temperature and Bypass flow. The best model (Model 3) incorporated TFD Spill flow (kcfs) and the model was highly significant (LR=0.006). The effect of Spill on upstream movement into the bypass was also highly significant (p=0.002) and the hazard ratio (1.33) suggests that fish are 1.33 more times likely to move upstream from Cabot Station tailrace when spill increases at TFD.

3.3.19 Attachment C-Table 4 represents the summary of time it took 29 fish to move from the tailrace to the Bypass (T8) and from the tailrace to the Spillway Ladder (T10).</td></tr>
<tr><td>USFWS-1</td><td>Movement Upstream from Ultrasound Array

Results show no effect of the ultrasound array in deterring shad from entering the tailrace area. It is possible that the lack of shad response may be due to the “on” test period covering a full day, as within-day differences in detected responses to the array effect were reported in Section 4.2 of the report.

Recommendations:

It is our understanding that these models are using the full daily array exposure data set. In order to help understand if there is an influence of duration on shad response to the array, we recommend that FL perform a supplemental analysis only on data from the first several hours of array operation (e.g., censor all detections after 9:00 a.m.).</td><td>See NMFS-3

3.3.19 Attachment C</td></tr>
<tr><td>USFWS-2</td><td>Discussion

When DIDSON camera count data were plotted against treatment flow in the bypass reach and fit with a Poisson regression, significant interactions were observed at 0700 a.m. and 0800 a.m. These results suggest that in the first hours of array operation, there may be a positive treatment effect, with fewer fish near the entrance to the Cabot ladder compared to when the system is off. This initial treatment effect does not persist however, suggesting fish may acclimate to the array over time.

Recommendation:

Given what appears to be a positive response to the ultrasound array in the initial hour of operation, we would support FL conducting another study to determine if more frequent array activation enhances effectiveness of the system. However, as was discussed during the March 16, 2017 updated study report meeting, in addition to using a DIDSON camera system, radio-tagging shad would be necessary to ascertain not only if the array is successful at repelling shad from the tailrace, but also to determine individual fish behavior, including passage delay and where repelled shad go (i.e., upstream or downstream). We note, however, that the array would need to be highly effective to significantly affect fish passage configuration and operation.</td><td>FirstLight intends to develop a comprehensive plan to repeat the study in 2018.</td></tr>
</table>

Study No. 3.3.20 Ichthyoplankton Entrainment at Northfield Mountain Pumped Storage Project

Commenter	Comment	Response
MADFW-1	One of the reasons the Division asked that the Ichthyoplankton Entrainment study be repeated was the lack of correlation between the intake pipe samples and the offshore collections taken in 2015. Unfortunately, the 2016 study results also show no correlation, calling the 2016 results into question. FL estimated the number of potential juvenile American shad that would have been lost due to entrainment of eggs and larvae at NMPS to be 2,093 in 2016. The estimate appear to rely on an Environmental Protection Agency rate which includes the period of time from larval metamorphosis in freshwater up to age 1 in the marine environment. Use of the Crecco et al. (1983) model to estimate egg and larva survival would result in an estimated loss of over 40,000 potential freshwater juveniles based on the number of eggs entrained at NMPS in 2016 and loss of over 1 million potential freshwater juveniles based on the number of L4 larvae estimated to have been entrained. The Division believes that the use of the freshwater juvenile number is important as the number of juvenile shad available in the river and estuary as a forage fish is an important ecological contribution of the American shad population in the river not simply the number of returning adults.	Ichthyoplankton densities in the source waterbody and entrainment samples are often different. The entrainable life stages of fish tend to have highly variable, non-random spatial distributions. The patchiness of the spatial distribution of eggs and larvae originates with spawning activity, which releases eggs in dispersed patches, theoretically ranging in size from the spawning area of a single female to the entire area of spawning activity associated with major hydrographic features (Smith and Richardson 1977). Local and wide scale water motions may disperse or concentrate these patches, and localized mortality from starvation or predation may create open areas within patches. Later larvae and early juveniles of some species may also move to preferred depths or aggregate into schools as swimming ability develops. These processes can cause early life stage densities to vary over relatively small spatial scales, potentially resulting in non-random "microdistributions" within the hydraulic zone of influence. Such variations in spatial distribution, coupled with hydraulic conditions that depend on intake type, design, and operation, as well as waterbody hydrodynamics, may result in variations in entrainment rates in densities of organisms approaching the face of the intake structure (EPRI 2014). Patchy distribution common for eggs and larvae could account for the difference between the entrainment and offshore collections. In addition, net avoidance in the waterbody is common as motile larvae are capable of avoiding sampling gear (e.g., plankton nets) but the potential for avoidance is substantially reduced during entrainment sampling as sample water is drawn from intake piping with reduced area and higher velocities that do not permit volitional movement by larvae. EPRI (2014) indicates that there is little question that larger planktonic organisms can and do avoid traditional plankton nets in open water sampling. Such a phenomenon is well documented in the scientific literature (Smith and Richardson 1977; EPRI 2004). Active gear avoidance can occur when organisms detect the collection device in sufficient time so as to permit the organism to swim out of the path of the collection device and avoid capture. Detection can occur as a result of visual cues or through sensing of vibration or hydrostatic pressures produced by the passage of the collection device through the water. Studies of this phenomenon demonstrate that avoidance increases among larger individuals (EPRI 2004). A case of active gear avoidance was documented by a study comparing density estimates of larval anchovies in waters off Hawaii collected using a bridled 1-m net to concurrent densities obtained using a large larval purse seine. The results of this comparison found that densities of larvae as small as 7 mm long made using the towed net were only 10 percent of those made using the purse seine (EPRI 2004). Larvae especially larger larvae, can avoid the offshore plankton nets, but not the entrainment net as the entrained larvae are well mixed and distributed. The approved study plan for Study 3.3.20 indicated that survival fraction data for all life stages of American shad entrained will be compiled from EPA (2004). For the second year of study, stakeholders requested that river specific survival fractions from Crecco et al (1983) be used for calculating egg and larval survival. As requested, these were used for the egg and larval stages. Current comments request the in-river juvenile stage now be split out from the estuarine- marine juvenile life stage. The stakeholders requested that a 98% daily survival for in-river juvenile shad for 70 days based on Crecco et al. (1983) be used. FirstLight used the egg and larval mortality rates from Crecco et al. (1983) as requested but used the EPA (2004) mortality estimates for the juvenile stage as we believe this is a more accurate estimate of juvenile mortality. The same authors, Vic Crecco and Tom Savoy, Connecticut Department of Energy and Environmental Protection, revisited their juvenile shad mortality estimate in a published paper, Savoy and Crecco (2004). They indicated that a dramatic and unexpected decline in American Shad abundance occurred in the Connecticut River since 1992. They attributed this decline to increased predation in the Connecticut River from 1992 to 2002. They concluded that future stock assessments consider time varying natural mortality rates brought about by shifts in predation. Stakeholders requested juvenile equivalent estimates for the period of freshwater residency should be separated out because a peer-reviewed, river-specific rate exists in Crecco et al. 1983. However, since the authors of this estimate have revisited the mortality rates and concluded that it has shifted over time, we believe that using the more recently published EPA (2004) mortality rates is a better estimate of juvenile mortality. This is a regional estimate of mortality that includes both in-river and estuarine-marine juvenile life stages. Using this estimate with a larger sample size should better account for annual variations in mortality and provides a standard metric for comparing losses among species, years, and regions. EPRI. (2014). Entrainment Abundance Monitoring Technical Support Document: Updated for the New Clean Water Act 316(b) Rule. Technical Report No. 3002001425. Palo Alto, CA. Savoy, T.F., and V.A. Crecco. 2004. Factors Affecting the Recent Decline of Blueback Herring and American Shad in the Connecticut River *in* The Connecticut River Ecological Study (1965-1973), revisited: ecology of the lower Connecticut River 1973-2003. American Fisheries Society Monograph 9. Bethesda, Maryland

Commenter	Comment	Response
		Smith, P. E. and S.L. Richardson. (1977). Standard techniques for pelagic fish egg and larva studies. FAO (Food and Agricultural Organization of the United Nations) Fisheries Technical Paper 175.
Larvae, especially larger larvae, CRC-1	The report in section 4.1 states, "There does not appear to be a trend with river flow and entrainment density," citing a comparison of the daily organism densities with daily average flow at the Montague USGS gage. This comparison is meaningless and does not comply with the RSP and is not "generally accepted practice in the scientific community." The number of entrained shad eggs and larvae would be related to the number of pumps operating at Northfield Mountain and the river flow coming from upstream. The average flows at Montague do not have a close relationship with the flow happening during the pumping at Northfield. The FERC study plan determination dated January 22, 2015 stated, "River discharge could potentially affect estimates of both ichthyoplankton densities and entrainment rates. For example, if the same number of adult shad spawn at high flow conditions and at low flow conditions and produce identical numbers of eggs and larvae at both conditions, the resulting high flow ichthyoplankton density estimate may be lower than the low flow estimate because the additional water associated with high river flow conditions "dilutes" the eggs and larvae. Similarly, river discharge may affect entrainment rates because a given level of pumping at the Northfield Mountain Project may remove a larger proportion of available water at low flow conditions than at high flow conditions. Including river discharge in the analyses of ichthyoplankton density and entrainment rates would require minimal additional cost (section 5.9(b)(7)) and could inform the development of license requirements (section 5.9(b)(5)). Therefore, we recommend that FirstLight include river discharge in its analyses of ichthyoplankton density and entrainment rates." CRC commented in 2016 that this analysis was lacking in the 2015 report in our May 2, 2016 letter (we also submitted a corrected version of this letter on May 3, 2016) letter and again in a response on June 8, 2016, specifically asking for Vernon flows. FERC concurred in their Study Plan Determination dated June 30, 2016, stating that, "Therefore, as required by the January 22, 2015, letter, FirstLight should include river discharge in its analyses of 2015 and 2016 ichthyoplankton density estimates and entrainment rates in its supplemental report for the 2016 study." The river flow analysis was a topic of discussion at the study report meeting held on March 16, 2017. FirstLight stated that the level of effort to do an accurate assessment of upstream river flow and project operations on shad egg and larvae entrainment was too high. FirstLight has had two years to sort out that issue and recommend a solution to stakeholders, and this was the first time we heard of this difficulty.	See 3.3.20 Attachment A FirstLight modeled river flows at three TFI HEC-RAS transects near NMPS Intake (one at the Shearer Farms telemetry station, one perpendicular to NMPS Intake, and one at the Gill Bank telemetry station) at one-hour time stamps between May 1st, 2016 and September 1, 2016. Flows at the three transects ranged from -7,633 to 23,875 cfs during this time and all three transects periodically experienced negative flows as a result of pumping and production cycles at NMPS (Table CRC-1-1). River flow was not strongly correlated with pumping magnitude at any of the three transects, however flow at Shearer Farms and NMPS Tailrace did appear to increase with increases in pumping magnitude, while flow at Gill Bank appeared to decrease with increases in pumping magnitude (Figure CRC-1-1). In general, as additional units turned on during pumping cycles, discharge increased at Shearer Farms and NMPS Tailrace while discharge decreased at Gill Bank. In contrast, as additional units turned on during generation cycles, discharge decreased at Shearer Farms and NMPS Tailrace (due to backwatering) and increased at Gill Bank. The response of river flow to NMPS pumping/generation cycles can be seen for a low-water period in Figure CRC-1-2 and a high-water period in Figure CRC-1-3. The ratio of water pumped by NMPS to river flow averaged approximately 0.3 for both Shear Farms and NMPS Tailrace, indicating that NMPS generally pumped about a third of the river water from upstream during this time period (Table CRC-1-1 and Figure CRC-1-4). Gill Bank, which is located downstream of NMPS Intake had an average pumping ratio of approximately 1.04, indicating were instances where more water was being pumped through NMPS than was available to flow downstream (Table CRC-1-1), which is when flow reversals may occur. In Figure CRC-1-5, the extreme positive ratios indicate events where nearly no water flowed downstream at Gill Bank, while the negative ratios indicate events where the flow of water was actually reversed in an upstream direction towards NMPS Intake. FirstLight assessed entrainment sample densities for 2015 and 2016 and compared them with river flow conditions to see if there was a relationship between density and river flow, and/or a relationship between density and the ratio of water pumped to water available and ratio of water pumped to water remaining in the river. In general, samples were collected over a range of pumping flows, with samples containing at least one organism (non-zero) occurring across all flows (Figure CRC-1-6). Over the two sampling periods, the majority of samples started during the midnight hour and between 2 and 3 o'clock in the morning, with non-zero samples occurring in every hour except 23:00 (Figure CRC-1-7). Figure CRC-1-8 counts non-zero samples for a range of pumping flows and water available at Shearer Farms. Note that most non-zero samples (count = 7) occurred when pumping discharge is low (< 5000 cfs) and Shearer Farms is between 10,000 and 20,000 cfs. Conversely, the most non-zero samples (count = 5) occurred when pumping flow was low (< 5,000 cfs) and the water remaining at Gill Banks was between 5,000 and 10,000 cfs (Figure CRC-1-9). Over all samples, organisms were collected during all unit operating scenarios, with a majority of non-zero samples occurring when 3 units were pumping (Figure CRC-1-10). FirstLight found that 2016 had higher densities than 2015 (Figure CRC-1-11), with more samples containing densities between 0.1 and 0.2 organisms per cubic meter (org/m^3) of water pumped. There does not appear to be a clear trend between with entrainment density over time or with the number of units pumping (Figure CRC-1-12). For example, the highest densities during the 2 o'clock hour occurred when three units were pumping, but the highest densities during the 1 o'clock hour occur when only 1 unit was pumping. These differences may be due to how the plant operates with units coming online and offline sequentially. Therefore during the 1 o'clock hour there may be more times when only 1 unit was running than the 2 o'clock hour when there is more than likely more than 1 unit was operating. FirstLight also examined the potential for relationships between organism density and the water available in the Turners Falls Impoundment (Shearer Farms modeled river flow), and if the ratio to pumping to water available (Shearer) and the ratio of pumping to water remaining (Gill Banks) influenced organism density. Figure CRC-1-12 shows organism density (org/m^3) as a function of water available in the TFI (Shearer Farms) for non-zero samples. There does not appear to be a trend. FirstLight computed the ratio of pump flow to water available (Shearer Farms – Figure CRC-1-13) and ratio of pumped flow to water remaining (Gill Banks – Figure CRC-1-14). Neither figure demonstrated a functional relationship between the ratio of water pumped to water available (Figure CRC-1-13) nor ratio of water pumped to water remaining (Figure CRC-1-14). During worst case scenarios when Northfield was pumping more water than was available at Shearer Farms and the flow in the river reversed (negative flow at Gill Bank), the density of organisms was low. However, the highest densities occurred when Northfield was pumping at rates that equaled flow in the river, meaning flow at Gill bank was near zero. Within this narrow flow range, pumping flow could have an effect on the densities of organisms within the source water body.
CRC-2	CRC recommendation: The Report on page 1-3 states that a future filing will include an estimate of ichthyoplankton entrainment for FirstLight's proposal to expand the Upper Reservoir's Operating Range. As part of that filing, CRC	This information will be submitted as an addendum by July 28. 2017

Commenter	Comment	Response
	recommends that FirstLight include the flow analysis as required by FERC. Otherwise, we have two data points from 2015 and 2016, and we will have to make our own conservative assumptions on impact of project operations and flows.	
NMFS-1	Section 3.4 Entrainment Data Analysis Methods Table 3.4-1 is missing a row for freshwater in-river juveniles that (Crecco et al. 1983) include in their paper. These freshwater juveniles are an important component to the aquatic ecology of the Connecticut River as forage fish. These fish should be considered in the EPA 2004 survival rate of 0.0006113 for ocean going juveniles. *Recommendation* Table 3.4-1 should be updated to include a 98% daily survival rate for the juvenile migrating fish that spend, on average, 70 days in the river. This additional accounting would specify the number of in-river freshwater juveniles leaving the river.	See MADFW-1
USFWS-1	Entrainment Densities In 2016, both egg and larval density peaked during the week of June 8. FL states that larvae were absent from 50 percent of the samples collected. There was no apparent trend between river flow and entrainment density, or a discernible temporal distribution throughout the sampling period. *Comments*: It seems unusual that peak densities of eggs and larvae would be concurrent, versus egg densities peaking prior to larval densities. *Recommendations*: FL should clarify if larvae were absent from half of all samples or if that statement refers to just entrainment or just offshore samples. While Table 4.0-1 identifies how many units were pumping during each entrainment sample collection, Table 4.1-1 only provides an average density for all samples taken during a given collection night. We recommend that FL analyze the data to determine if there is a relationship between number of units pumping and ichthyoplankton density. We also recommend that tabular data of raw counts or estimated density by sample number also be provided. While hours 0:00 through 4:00 had similar numbers of samples (8 or 9), hour 23:00 had only a single sample and hour 5:00 only had two samples. It would be helpful if Table 4.1-2 had a column showing the variability around the hourly density estimates. The results presented in Table 4.1-2 are interesting and potentially useful, but more data are needed over a broader temporal range to fully assess project effects. We recommend that hourly pumping data from NMPS during the sampling period along with hourly estimates of river flow upstream of the intake be provided in an appendix to the report. Figure 4.1-1 shows daily entrainment density relative to Connecticut River flow as measured at the Montague gage. Rather than relate ichthyoplankton density to flow at Montague, it would be more informative to assess the relationship between density and flow as measured at NMPS. This information is readily available (combined flow from the Vernon Project, the Ashuelot River and the Millers River), but would need to be adjusted to account for travel time between the various gages and arrival within the vicinity of the NMPS intake.	See response to CRC-1 The table included in 3.3.20 Attachment B states the number of eggs and larvae found in entrainment and offshore samples, as well as the date and time samples were collected. The table included in 3.3.20 Attachment C shows flow rates (cfs) for NMPS units and modeled Connecticut River transects (Gill Bank, NMPS Tailrace, and Shearer Farms) at hourly time steps during the 2016 entrainment sampling period.
USFWS-2	Offshore Densities Verification samples were collected each evening that entrainment samples were collected. Only a single egg was observed during the entire 2016 study period and larvae were only observed in two samples (on sample dates June 8 and June 17). *Comments*: One of the primary assumptions in the study design was that the intake pipe water contained samples representative of offshore waters. The lack of sufficient validation data from the 2015 field sampling was one of several reasons that the study was repeated. For the second year of study, we recommended a modification to the validation sampling that would have followed the LMS (1993) study. Collections would have been made out in the River at three locations (upstream,	See MADFW-1

Commenter	Comment	Response
	across from, and downstream of the NMPS intake), towing a net parallel to the current rather than at a location where flow fields caused by NMPS pumping operations may have hindered collection of ichthyoplankton (i.e., the net may have been towed parallel to river channel but nearly perpendicular to the flow field/current). FERC did not support our requested modification and FL chose not to adopt it either. Based on the 2016 results, we once again are left not knowing if the intake water does in fact represent the density of ichthyoplankton in the River near the NMPS intake.	
USFWS-3	Equivalent Adult Estimates FL estimated the number of potential juvenile American shad that would have been lost due to entrainment of eggs and larvae at NMPS to be 2,093 in 2016. According to Table 3.4-1, however, the calculation used to derive those estimates appear to rely on an Environmental Protection Agency rate which includes the period of time from larval metamorphosis in freshwater up to age 1 in the marine environment. Not separating out in-river juvenile survival from estuarine and marine survival results in a much lower juvenile estimate than if Crecco et al.'s (1983) 98 percent daily survival rate is applied to the approximately 70-day-long in-river juvenile stage. Use of the Crecco et al. (1983) rate would result in an estimated loss of over 40,000 potential juveniles (or juvenile equivalents) based on the number of eggs entrained at NMPS in 2016 and loss of over 1 million potential juveniles based on the number of L4 larvae estimated to have been entrained. These estimates are substantially larger than the 1,987 (for egg life stage) and 106 (for L4 life stage) juvenile equivalent estimates calculated by FL. We understand that the results are not directly comparable, as FL's estimates capture the entire juvenile life stage while our estimates relate only to the in-river portion of this life stage. However, juvenile equivalent estimates for the period of freshwater residency should be separated out because a peer-reviewed, river-specific rate exists and it provides important context in considering and evaluating passage and protection measures not only at NMPS but also at the downstream TF Project. *Discussion* As in its initial study report, FL hypothesizes that the lower densities of shad ichthyoplankton at NMPS relative to the higher densities found near Stebbins Island may be explained by active spawning documented at Stebbins in 2015. We previously commented that lack of documented spawning at other locations within the TFI does not mean it is not occurring (just that FL failed to document it in other places). We also pointed out that TransCanada documented a number of shad spawning locations in studies at their upstream hydro projects, but saw splashing behavior at very few of these sites (the primary means that FL used to assess spawning behavior). In addition, LMS (1993) collected yolk sac larvae in its ichthyoplankton sampling. If spawning were only occurring at Stebbins Island, with shad eggs rolling along the bottom for 1.6 to 6.4 km and newly hatched larvae remaining near the river bottom until the yolk sac is absorbed, very few yolk sac larvae would be expected to be entrained at NMPS. This suggests that there are additional (undocumented) spawning locations upstream of NMPS. FL states that the 2016 juvenile shad index of abundance was the highest ever recorded. That index is based on samples collected downstream from Holyoke Dam to Essex, Connecticut and does not inform the relative impact of ichthyoplankton entrainment at NMPS which would impact production potential in the TFI reach of the River and potentially the number of adult returns to that reach of river. FL notes that the estimated entrainment of shad ichthyoplankton for 2015 (over 3 million eggs and 500,000 larvae) equates to 696 juveniles or 94 adults; likewise, the estimates of nearly 10 million eggs and over 5 million larvae entrained in 2016 equates to 2,093 juveniles or 578 adults. As noted above, based on our calculations, we estimate that the equivalent of over 1 million pre-migrant juveniles was entrained in 2016. This juvenile equivalent loss to entrainment at NMPS reduces the ecological contributions those juveniles and subsequent sub-adult life stages could make as an important forage species in the river, estuary and marine environments. These losses also run counter to stated fishery management objectives; both Amendment 3 of the Atlantic States Marine Fisheries Commission's Interstate Fishery Management Plan for Shad and River Herring (ASMFC 2010) and the Connecticut River Atlantic Salmon Commission's Shad Plan (CRASC 1994) call for maximizing juvenile shad outmigrant survival. Further, given that juvenile indices have been positively correlated with recruitment levels of adult females returning to the Connecticut River 4 to 6 years later (Savoy et al. 2004), juvenile equivalent loss to entrainment potentially impacts adult recruitment and therefore should be minimized.	See MADFW-1

Study No. 3.8.1 Evaluate Impacts of Modes of Operation on Flow, Water Elevation and Hydropower Generation

<table>
<tr><th>Commenter</th><th>Comment</th><th>Response</th></tr>
<tr><td>CRC-1</td><td>This study deviates from the approved RSP in several ways.

The RSP said that the study report would include, “a table comparing annual and monthly baseline generation with the same for the various production runs. The net loss/gain and percentage loss/gain will be computed relative to the baseline model.” The report shows annual generation, but no monthly information has been given.</td><td>FirstLight has included monthly generation (in MWh) for the baseline model below. No production runs have been made as part of the relicensing effort to date, hence FirstLight cannot compare the baseline generation with production run generation estimates as of yet.
<table>
<tr><th></th><th>Jan</th><th>Feb</th><th>Mar</th><th>Apr</th><th>May</th><th>Jun</th><th>Jul</th><th>Aug</th><th>Sep</th><th>Oct</th><th>Nov</th><th>Dec</th></tr>
<tr><td>Cabot</td><td>10,663</td><td>15,925</td><td>38,188</td><td>37,800</td><td>39,780</td><td>36,440</td><td>20,252</td><td>3,671</td><td>3,271</td><td>11,980</td><td>28,226</td><td>28,850</td></tr>
<tr><td>Station 1</td><td>26</td><td>67</td><td>2,382</td><td>4,244</td><td>3,524</td><td>2,404</td><td>886</td><td>1,843</td><td>1,487</td><td>721</td><td>1,511</td><td>326</td></tr>
<tr><td>Northfield</td><td>62,542</td><td>48,115</td><td>54,325</td><td>64,621</td><td>57,567</td><td>76,987</td><td>94,685</td><td>120,766</td><td>88,684</td><td>88,838</td><td>76,704</td><td>90,135</td></tr>
</table></td></tr>
<tr><td>CRC-2</td><td>The RSP said that, “For select periods, hourly hydrographs will be developed for the baseline model and compared with the same for a select number of Production Runs.” The report showed the observed vs. calibration and baseline run results for only the period 7/19/2002 to 7/26/2002. We have no idea what the rest of the year looks like.</td><td>FirstLight provided an example hourly hydrograph of the baseline results at the USGS Montage Gage (see Figure 5.2-4) of the report. This select period (i.e. 7/19 to 7/26) was chosen to show the results with respect to peaking operations, whereas other times of the year (e.g. spring runoff) are dominated by total river flow. No production runs have been made as part of the relicensing effort to date, hence FirstLight cannot compare the baseline hourly hydrographs with a production run.</td></tr>
<tr><td>CRC-3</td><td>The report states that Production Runs will be completed later in the relicensing process. For now, the report compares the baseline and calibration runs with the actual results from 2002. CRC is concerned that the model runs show large deviations from the actual data:

The monthly flow duration curves (Figures 4.1-2 through 4.1-5) show large differences.

Figure 5.2-2 indicates a large difference (between 1,000 and >2,000 MWh) between observed and modeled Cabot Station baseline runs during all times of day. Figure 5.2-3 indicates a large (1,000 to 2,000 cfs) difference between observed (2002) and modeled Station 1 power output during all times of day.

The timing and maximum and minimum flows for the day differ between the modeled runs and the calibration and baseline runs. For example, in Figure 5.1-5, later in the day on July 24, there is a 8,000 cfs difference between the observed (2002) and the modeled peak flow. This is just as important, or more so, than the flow duration curves of Figure 5.1-1 and 5.1-2. Assessing certain impacts using the model is likely to be inaccurate.</td><td>FirstLight expected there would be differences in the monthly flow duration curves since the hydrology in a given month of a single year (2002) is being compared to the hydrology of a longer period of record (1975-2015). It is not possible to find a single year that has virtually the same hydrology as a long term period of record for each month.

FirstLight expected that the generation values for the Baseline Run would not match the observed values from 2002, as it combines model inputs from different years (e.g. hydrology, unit capacity, unit efficiencies, reservoir imbalance, and pump/gen schedules). Figures 5.2-2 and 5.2-3 were only intended to indicate that the relative timing of generation for the Baseline Run is consistent with observed conditions on an annual basis (i.e. less Cabot Generation in the morning compared to the evening, and similar Station No. 1 generation regardless of the time of the day).

FirstLight expected the model to have some level of inconsistency between calibration and observed results on an hour to hour basis. The model uses various reservoir imbalance adjustments, to estimate how a project would generally be operated from hour to hour throughout the year. These reservoir imbalance adjustments are based on long term averages for a given month, TFI level, and hour. As such, the Calibration Run is not intended to match exactly each hour observed in 2002. Figure 5.1-5 indicates that the model does a reasonable job of providing peaking flows of the same general magnitude and frequency as observed during 2002. FirstLight expected the results of the Baseline Run to be further from those observed in 2002, as it combines model inputs from different years.</td></tr>
<tr><td>CRC-4</td><td>With regard to the representative years of 2002 and 2009, FirstLight has not presented any data that help us understand if these years are representative of current or future operations.</td><td>The 2002 Northfield pump/gen schedule was only used for the Calibration Run to provide confidence in the models ability to provide relatively accurate results when compared to observed conditions. The selection of 2009 pump/gen schedule for the Baseline Run is addressed in FirstLight’s filing related to increasing the usable storage of the Upper Reservoir and its potential impact on streambank erosion on Turners Falls Impoundment. The following was noted in that report (filed with FERC in April 2017) regarding the selection of the 2009 pump/gen schedule :

"The 2009 pump/gen schedule was chosen as it represented a typical year of current operations. Figure 2-3 provides duration curves for the daily water volume (acre-feet) for generation at Northfield Mountain in 2009, as compared to 2000-2007, 2008, 2011, 2012, 2013, and 2014. This figure indicates that the daily volume of water used for generation in 2009 was about average for the 2000-2014 period and higher than the recent years of current Northfield Mountain operations. Data from 2010 were not included in this figure due to the extended outage at Northfield Mountain during that year."</td></tr>
<tr><td>CRC-5</td><td><u>CRC recommendation</u>: FL should prepare an addendum that shows more time segments than one week in July and analyzes the model on a monthly basis so we can have more confidence in the model’s ability to perform scenarios with relative accuracy. Stakeholders need to have a sense of the model’s ability to accurately model the magnitude and timing of bypass flows, hydropower releases and river levels in the impoundment and downstream of Cabot Station.</td><td>FirstLight does not propose to file an addendum to Study Report 3.8.1, as the comments have been addressed within this response matrix.</td></tr>
</table>

STUDY NO. 3.3.5 ATTACHMENTS

Attachment A to Study 3.3.5:
Evaluate Downstream Passage of American Eel (Northfield Mountain Pumped Storage)

Table 1: Summary of conditions during Eel Entrainment at NMPS, n = 2. Flows at CT River at Shearer Farms, Gill Bank, and Outside NMPS Tailrace are from the hydraulic model.

Frequency and Code	Release Date	Release Location	Date Entrained	NMPS_Unit1 (cfs)	NMPS_Unit2 (cfs)	NMPS_Unit3 (cfs)	NMPS_Unit4 (cfs)	CT River at Shearer Farms (cfs)	CT River at Gill Bank (cfs)	CT River at Outside NMPS Tailrace (cfs)	Canal Flow (cfs)	TFD Discharge (cfs)	TFI Water Surface Elevation (ft)
150.340 104	11/3/2015 15:55	Vernon	11/10/2015 0:52	0	-3435	-3458	-3409	4387	-1609	4430	2959	0	182.29
149.740 56	10/28/2015 22:49	Lower Impoundment	11/19/2015 18:10	0	-3432	-3572	0	1821	983	1844	3447	0	181.65

Table 2: Summary of conditions during Eel unknown disappearance at NMPS, n = 34. Flows at CT River at Shearer Farms, Gill Bank, and Outside NMPS Tailrace are from the hydraulic model.

Frequency and Code	Release Date	Release Location	Last Date Seen	NMPS_U 1 (cfs)	NMPS_ U2 (cfs)	NMPS_U3 (cfs)	NMPS_U4 (cfs)	CT River at Shearer Farms (cfs)	CT River at Gill Bank (cfs)	CT River at Outside NMPS Tailrace (cfs)	Canal Flow (cfs)	TFD Discharge (cfs)	TFI Water Surface Elevation (ft)
149.740 27	10/27/2015 23:20	Upper Impoundment	10/28/2015 4:01	0	-3297	-3394	0	7475	1237	7708	2797	2521	181.65
149.760 26	10/27/2015 0:00	Upper Impoundment	10/28/2015 23:53	0	-3356	0	0	10542	8828	10536	7266	3564	182.44
149.740 34	10/27/2015 23:20	Upper Impoundment	10/29/2015 15:19	0	0	0	0	13921	14059	13965	10695	5130	180.77
149.740 40	10/27/2015 23:20	Upper Impoundment	10/31/2015 2:01	0	-3312	0	0	14333	11245	14436	13869	439	182.49
149.740 61	11/2/2015 22:40	Lower Impoundment	11/3/2015 2:07	0	-3351	0	-3388	7000	3791	7147	5478	1464	182.27
149.740 65	11/2/2015 23:05	Upper Impoundment	11/3/2015 23:21	0	-3422	0	-3468	9740	9738	9779	6366	1471	183.41
149.740 57	10/28/2015 23:16	Upper Impoundment	11/4/2015 0:54	0	-3335	-3239	-3361	9426	8523	9480	6594	1424	183.31
149.760 77	11/3/2015 23:05	Upper Impoundment	11/4/2015 1:25	0	-3444	-3508	-3434	9473	4913	9607	3160	1505	183.15
149.760 79	11/3/2015 23:05	Upper Impoundment	11/4/2015 1:39	0	-3404	-3469	-3425	9659	3078	9837	3150	1518	183.03
150.360 177	10/31/2015 18:22	Bellows Falls	11/4/2015 1:02	0	-3455	-3548	-3481	9359	6833	9448	4172	1537	183.24
149.740 77	11/3/2015 23:05	Upper Impoundment	11/4/2015 2:03	0	-3352	-3458	-3436	9847	830	10061	3114	1518	182.87
150.380 146	11/5/2015 16:20	Bellows Falls	11/9/2015 0:12	0	0	0	-3508	7893	7501	7964	5833	0	182.67
150.380 189	10/31/2015 19:21	Wilder	11/9/2015 3:29	0	-3267	-3430	-3434	9111	226.	9361	3636	0	181.83
150.340 128	11/3/2015 17:32	Wilder	11/10/2015 1:21	0	-3348	-3382	-3389	4684	-2121	4776	2943	0	182.17
150.360 166	10/31/2015 13:40	Vernon	11/10/2015 1:14	0	-3435	-3458	-3409	4387	-1609	4430	2959	0	182.29
149.760 75	11/3/2015 23:05	Upper Impoundment	11/10/2015 2:30	0	-3353	-3392	-3363	6647	-2837	6891	3074	0	181.65
150.340 141	10/29/2015 17:52	Bellows Falls	11/10/2015 2:39	0	-3353	-3392	-3363	6647	-2837	6891	3074	0	181.65
150.340 57	10/28/2015 22:49	Lower Impoundment	11/11/2015 4:49	0	-3335	-3405	0	6790	418	7040	5084	0	181.15
150.340 102	10/27/2015 17:45	Vernon	11/11/2015 23:23	0	-3551	0	-3555	8135	7999	8214	11303	0	182.28

Frequency and Code	Release Date	Release Location	Last Date Seen	NMPS_U1 (cfs)	NMPS_U2 (cfs)	NMPS_U3 (cfs)	NMPS_U4 (cfs)	CT River at Shearer Farms (cfs)	CT River at Gill Bank (cfs)	CT River at Outside NMPS Tailrace (cfs)	Canal Flow (cfs)	TFD Discharge (cfs)	TFI Water Surface Elevation (ft)
150.380 153	11/5/2015 17:05	Wilder	11/12/2015 1:40	0	-3545	0	-3550	9028	3735	9198	2532	0	181.93
150.360 158	11/5/2015 17:05	Wilder	11/13/2015 3:40	0	-3414	-3522	-3480	7718	-2395	7927	2299	0	181.71
150.380 169	10/31/2015 13:40	Vernon	11/16/2015 16:36	0	2386	2412	0	4284	4068	4142	2366	0	179.62
149.740 80	11/4/2015 23:02	Upper Impoundment	11/5/02015 1:18	0	-3431	-3503	0	8619	4603	8754	2714	0	182.91
149.740 85	11/4/2015 23:02	Upper Impoundment	11/5/2015 1:29	0	-3431	-3503	0	8619	4603	8754	2714	0	182.91
149.760 80	11/4/2015 23:02	Upper Impoundment	11/5/2015 1:29	0	-3366	-3444	-3419	8110	610	8292	2795	0	182.62
149.760 84	11/4/2015 23:02	Upper Impoundment	11/5/2015 2:49	0	-3304	-3427	-3308	6510	-2704	6611	2406	0	182.25
150.360 156	10/29/2015 18:43	Wilder	11/5/2015 4:10	0	-3271	-3337	-3306	7408	-2031	7655	2719	0	181.83
150.340 55	10/31/2015 18:05	Bellows Falls	11/6/2015 2:38	0	-3311	-3373	-3328	9206	-876	9398	7173	0	182.72
150.380 180	10/31/2015 18:22	Bellows Falls	11/15/2015 23:45	0	0	-3609	0	6067	7397	6014	8937	0	182.76
149.760 85	11/4/2015 23:02	Upper Impoundment	11/20/2015 23:13	0	0	0	0	10607	10310	10385	11260	0	182.99
150.340 105	11/3/2015 15:55	Vernon	11/21/2015 3:46	0	-3439	-3459	-3402	17948	10538	18139	15925	0	181.63
149.760 70	11/2/2015 22:40	Lower Impoundment	11/26/2015 22:56	0	0	0	0	6800	8998	6699	9064	0	NA
149.760 65	11/2/2015 22:40	Lower Impoundment	11/30/2015 19:10	0	5297	2676	2265	81	11867	-334	8066	0	NA
150.340 107	11/3/2015 15:55	Vernon	12/2/2015 4:48	0	-3506	-3496	-3487	9550	-494	9857	4475	0	NA

Table 3: Cox Proportional Hazard Regression model outputs for Eel unknown disappearance from NMPS Intake

Model Number	Covariates	AIC	LR Test	Hazard Ratio	SE	P	(+/-)
1	Rain (in)	277.37	0.08	2452.7	3.98	0.05	(0.99,6032012)
2	Daily Cumulative Rain (in)	280.48	0.90	1.14	1.03	0.9	(0.15,8.6)
3	Northfield Generation (kcfs)	271.53	0.003	0.63	0.25	0.06	(0.39,1.02)
4	Northfield Pumping (kcfs)	241.5	4.22e-10	1.31	0.05	4.32e-09	(1.2,1.4)
5	1 Unit	247.17	3.93e-08	2.08	0.87	0.4	(0.38,11.44)
	2 Units			5.67	0.78	0.03	(1.22,26.37)
	3 Units			21.59	0.75	4.52e-05	(4.93,94.5)
6	Diurnal (Day)	279.6	0.34	0.43	1.02	0.4	(0.06,3.13)

Table 4: Summary of conditions during Eel Escapement at NMPS, n = 54. Flows at CT River at Shearer Farms, Gill Bank, and Outside NMPS Tailrace are from the hydraulic model.

Escapement from the NMPS Intake is not an absorbing state, eel can come back into the intake and escape again. Therefore, one eel can make multiple escapements from NMPS Intake as is reflected in this table.

Frequency and Code	Release Date and Time	Release Location	Date and Time of Escapement	NMPS_U1 (cfs)	NMPS_U2 (cfs)	NMPS_U3 (cfs)	NMPS_U4 (cfs)	CT River at Shearer Farms (cfs)	CT River at Gill Bank (cfs)	CT River at Outside NMPS Tailrace (cfs)	Canal Flow (cfs)	TFD Discharge (cfs)	TFI Water Surface Elevation (ft)
149.740 30	10/27/2015 23:20	Upper Impoundment	10/28/2015 19:15	0	2414	0	0	8541	9562	8548	3385	3532	182.05
149.740 36	10/27/2015 23:07	Lower Impoundment	10/28/2015 2:15	0	-3382	-3442	0	6880	523	7086	2501	2505	182.2
149.740 40	10/27/2015 23:20	Upper Impoundment	10/30/2015 21:30	0	-3292	0	0	13661	12337	13734	14509	411	182.81
149.740 41	10/27/2015 23:20	Upper Impoundment	10/28/2015 10:39	0	0	0	0	3112	2977	3109	2877	2462	181.97
149.740 49	10/28/2015 22:49	Lower Impoundment	11/8/2015 20:18	0	-3384	-3488	-3379	8163	885	8379	5615	0	181.84
149.740 49	10/28/2015 22:49	Lower Impoundment	11/9/2015 7:01	0	0	0	0	3947	4873	3952	5527	0	181.01
149.740 50	10/28/2015 23:16	Upper Impoundment	10/29/2015 2:39	0	-3416	0	0	10296	7130	10368	6920	3455	182.06
149.740 56	10/28/2015 22:49	Lower Impoundment	11/12/2015 2:18	0	-3416	-3539	-3480	5153	-1477	5279	2832	0	181.21
149.740 59	11/2/2015 22:40	Lower Impoundment	11/4/2015 13:48	0	0	0	0	5155	1813	5177	2688	0	181.51
149.740 59	11/2/2015 22:40	Lower Impoundment	11/7/2015 22:14	0	-3335	-3435	0	9946	3582	10275	8967	0	179.91
149.740 62	11/2/2015 23:05	Upper Impoundment	11/7/2015 21:54	0	0	0	0	8006	7987	7997	8756	0	182.58
149.740 68	11/2/2015 23:05	Upper Impoundment	11/3/2015 1:45	0	-3339	0	0	7163	4019	7313	5552	1461	182.36
149.740 71	11/2/2015 23:05	Upper Impoundment	11/3/2015 1:07	0	-3363	0	0	7636	4963	7809	6900	1531	182.66
149.740 74	11/3/2015 23:05	Upper Impoundment	11/8/2015 19:13	0	0	4426	3173	3604	14119	3322	11147	0	182.54
149.740 75	11/3/2015 23:05	Upper Impoundment	11/7/2015 6:17	0	0	0	0	2480	2470	2475	3942	0	182.45
149.740 76	11/3/2015 23:05	Upper Impoundment	11/5/2015 19:29	0	0	0	0	4878	9825	4775	12703	0	183.02
149.740 78	11/3/2015 23:05	Upper Impoundment	11/10/2015 20:31	0	0	0	0	6236	6629	6188	6973	0	182.54
149.740 81	11/4/2015 23:02	Upper Impoundment	11/5/2015 18:22	0	0	0	4654	2866	8787	2577	10823	0	183.19
149.760 22	10/27/2015 0:00	Upper Impoundment	10/28/2015 22:36	0	0	0	0	9470	9697	9451	7782	3423	182.47
149.760 34	10/26/2015 23:37	Lower Impoundment	11/10/2015 4:54	0	0	0	0	6184	265	6332	2926	0	180.69
149.760 34	10/26/2015 23:37	Lower Impoundment	11/14/2015 17:20	0	2310	0	0	8215	12251	8102	11360	0	181.35
149.760 34	10/26/2015 23:37	Lower Impoundment	11/7/2015 18:32	0	2100	3497	5137	2810	13986	2484	8498	0	182.03
149.760 38	10/27/2015 23:20	Upper Impoundment	10/28/2015 2:47	0	-3381	-3406	0	7249	884	7479	2857	2564	182.16
149.760 40	10/27/2015 23:20	Upper Impoundment	10/28/2015 2:48	0	-3304	-3457	0	7068	713	7287	2513	2497	181.2
149.760 53	10/28/2015 22:49	Lower Impoundment	11/4/2015 21:08	0	3432	5089	0	619	6784	852	2460	0	180.79
149.760 57	10/28/2015 22:49	Lower Impoundment	11/15/2015 20:09	0	0	0	0	9571	9490	9598	11353	0	181.35
149.760 65	11/2/2015 22:40	Lower Impoundment	11/3/2015 3:42	0	-3321	0	0	8012	1158	8273	5064	1476	182.54
149.760 66	11/2/2015 22:40	Lower Impoundment	11/7/2015 20:47	0	0	0	0	6707	8728	6702	9122	0	181.95
149.760 66	11/2/2015 22:40	Lower Impoundment	11/8/2015 2:18	0	0	-3491	-3474	4731	1520	4875	4896	0	182.44

Frequency and Code	Release Date and Time	Release Location	Date and Time of Escapement	NMPS_U1 (cfs)	NMPS_U2 (cfs)	NMPS_U 3 (cfs)	NMPS_U4 (cfs)	CT River at Shearer Farms (cfs)	CT River at Gill Bank (cfs)	CT River at Outside NMPS Tailrace (cfs)	Canal Flow (cfs)	TFD Discharge (cfs)	TFI Water Surface Elevation (ft)
149.760 68	11/2/2015 23:05	Upper Impoundment	11/9/2015 20:53	0	0	0	0	3233	4784	3031	4577	0	182.54
149.760 70	11/2/2015 22:40	Lower Impoundment	11/6/2015 4:38	0	0	0	0	5875	5694	5763	7701	0	NA
149.760 70	11/2/2015 22:40	Lower Impoundment	11/20/2015 2:54	0	-5482	2927	3127	8889	10546	8773	8972	0	182.67
149.760 71	11/2/2015 22:40	Lower Impoundment	11/3/2015 0:29	0	-3432	0	0	7296	5564	7405	7024	1565	182.75
149.760 75	11/3/2015 23:05	Upper Impoundment	11/9/2015 21:46	0	-3417	0	0	5304	4353	5212	5446	0	182.41
149.760 82	11/4/2015 23:02	Upper Impoundment	11/5/2015 13:52	0	0	0	3838	815	8298	512	5040	1450	182.43
150.340 102	10/27/2015 17:45	Vernon	11/10/2015 19:30	0	0	0	2198	3824	10570	3831	6799	0	180.95
150.340 103	10/27/2015 17:45	Vernon	10/29/2015 23:05	0	0	-3505	0	15321	15079	15317	11653	5025	182.61
150.340 112	10/27/2015 18:20	Bellows Falls	11/7/2015 20:46	0	0	0	0	7250	8355	7257	8736	0	181.34
150.340 134	10/29/2015 13:05	Vernon	11/1/2015 20:55	0	0	0	0	9546	9537	9570	11857	0	183.2
150.340 143	10/29/2015 17:52	Bellows Falls	11/6/2015 1:14	0	-3305	-3428	-3404	9095	1860	9226	7472	0	182.3
150.340 161	10/31/2015 13:40	Vernon	11/13/2015 18:12	0	0	0	0	8163	11189	7967	9795	0	180.87
150.340 183	10/31/2015 19:21	Wilder	11/9/2015 4:35	0	5004	5082	0	1032	4745	900	3285	0	181.43
150.340 57	11/5/2015 17:05	Wilder	11/11/2015 4:13	0	-3365	-3441	0	6134	-321	6288	4689	0	183.11
150.380 102	11/3/2015 15:55	Vernon	11/12/2015 20:44	0	0	0	0	6948	8766	6899	9119	0	182.44
150.380 113	11/3/2015 16:45	Bellows Falls	11/7/2015 3:35	0	0	0	0	4366	4497	4436	6823	0	181.12
150.380 118	10/27/2015 18:20	Bellows Falls	11/7/2015 12:52	0	0	0	3194	5555	5653	5606	9402	0	181.9
150.380 118	10/27/2015 18:20	Bellows Falls	11/7/2015 17:50	0	2445	3477	5111	4648	12549	4411	9345	0	181.78
150.380 124	11/3/2015 17:32	Wilder	11/8/2015 17:29	0	2855	5107	4998	2848	5509	2816	7608	0	182.5
150.380 149	10/29/2015 17:52	Bellows Falls	11/4/2015 17:17	0	3986	0	4936	6083	7722	6105	9355	1460	182.89
150.380 149	10/29/2015 17:52	Bellows Falls	11/4/2015 18:29	0	2365	0	5087	4545	13290	4327	9118	1539	181.91
150.380 152	11/5/2015 17:05	Wilder	11/12/2015 0:01	0	-3486	0	0	8787	6987	8936	9457	0	183.1
150.380 159	10/29/2015 18:43	Wilder	11/4/2015 23:15	0	0	0	0	8572	8609	8536	9190	0	182.59
150.380 170	10/31/2015 13:40	Vernon	11/2/2015 20:43	0	0	0	0	9907	12875	9996	10881	0	182.05
150.380 180	10/31/2015 18:22	Bellows Falls	11/15/2015 5:44	0	0	0	0	10543	10521	10527	11353	0	180.87

Table 5: Cox Proportional Hazard Regression model outputs for Eel escapement from NMPS Intake

Model Number	Covariates	AIC	LR Test	Hazard Ratio	SE	P	(+/-)
1	Rain (in)	346.2	0.04	2.381e+07	6.5	0.0009	(1056,5.369e+11)
2	Daily Cumulative Rain (in)	350.4	0.77	1.29	0.86	0.83	(0.13,13.18)
3	Cloud Cover	349.24	0.27	1.45	0.34	0.28	(0.74,2.82)
4	Northfield Generation (kcfs)	344.68	0.02	1.13	0.05	0.0005	(1.055,1.21)
5	Northfield Pumping (kcfs)	349.63	0.36	0.96	0.05	0.39	(0.87,1.01)
6	Tailrace Flow outside NMPS Intake (kcfs)	349.37	0.29	0.95	0.05	0.3	(0.85,1.05)
7	Diurnal (Day)	350.37	0.78	1.14	0.47	0.74	(0.52,2.51)

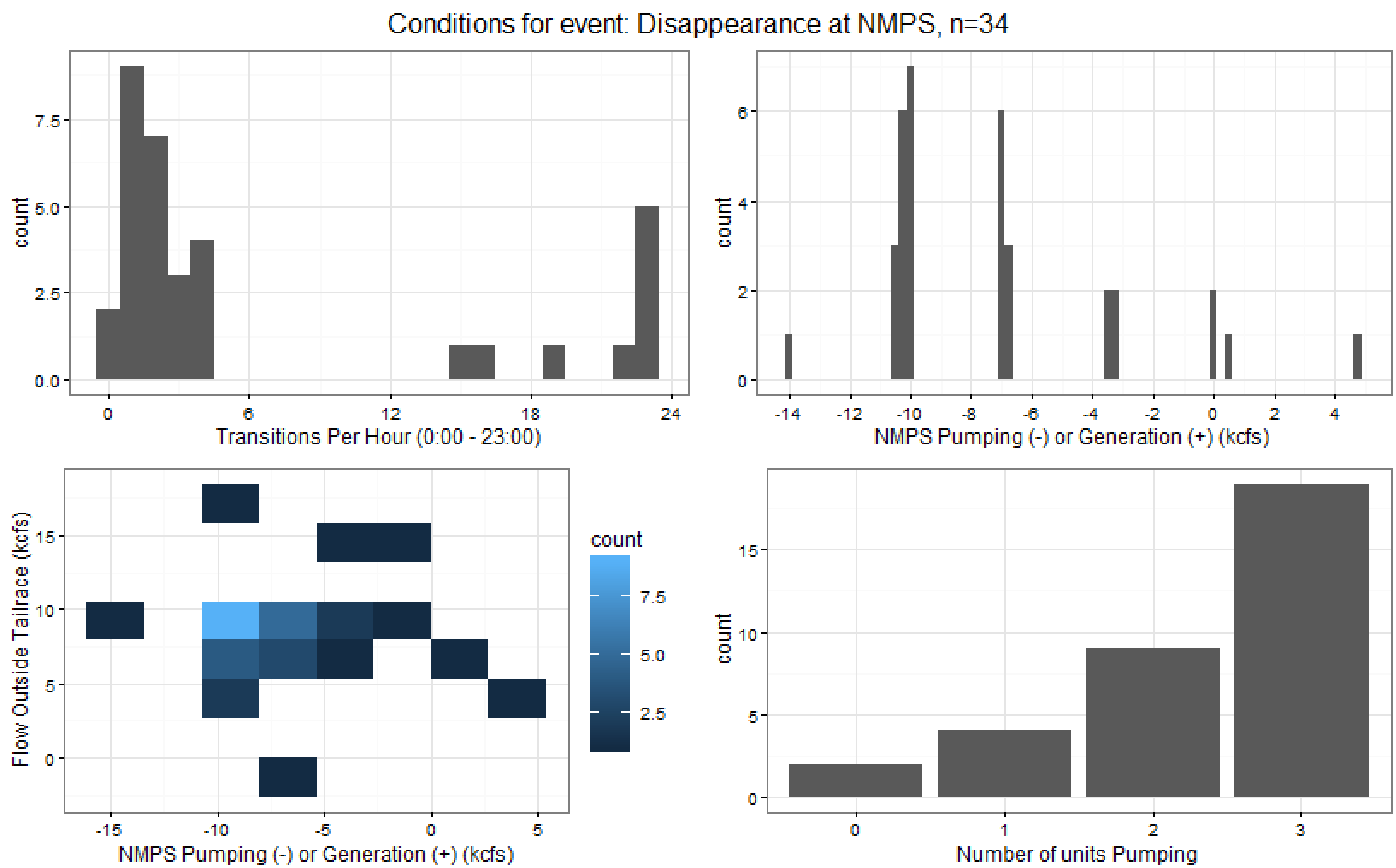


Figure 1: Histograms and plots of the conditions during unknown disappearance of Eel (n = 34) at NMPS Intake

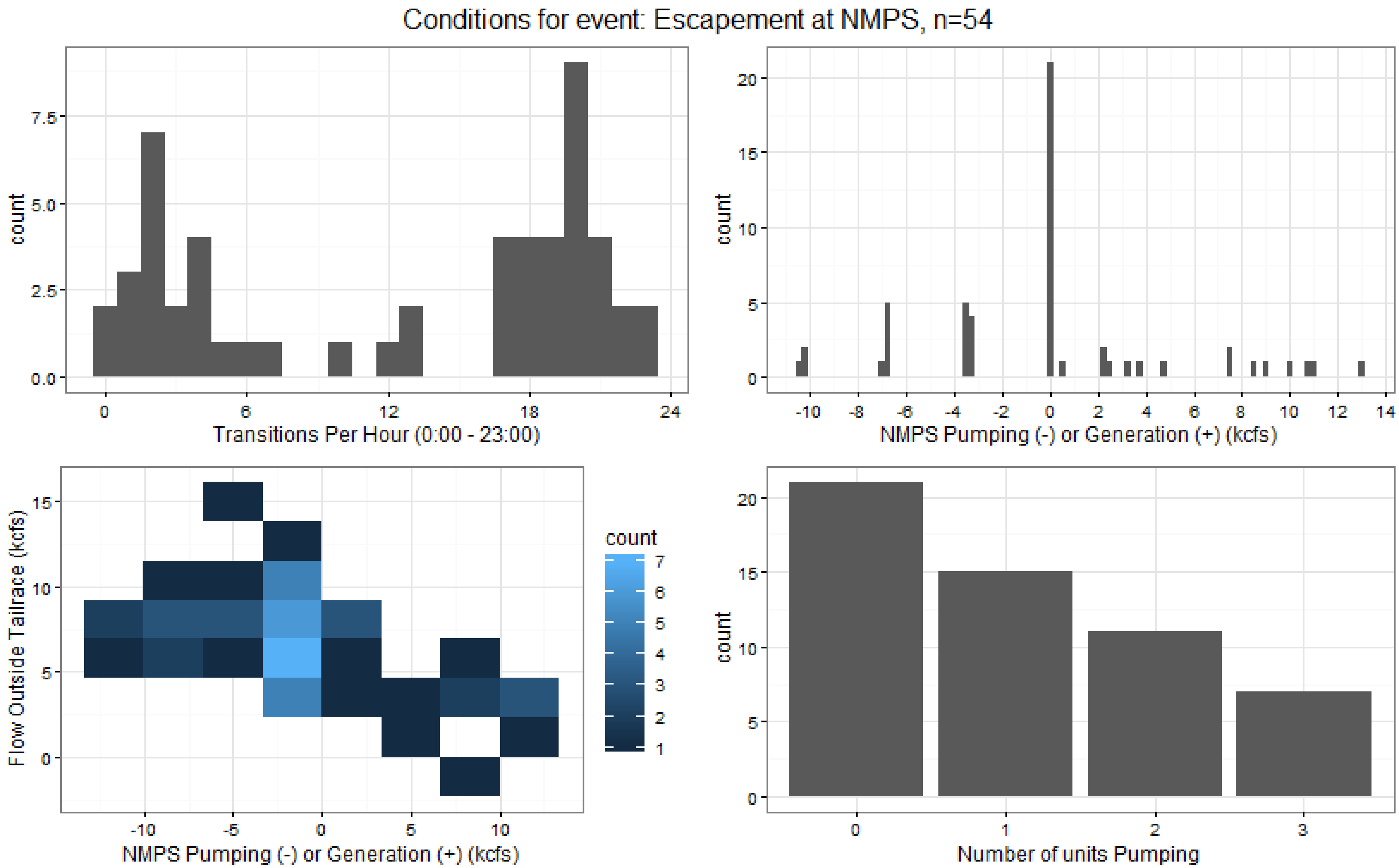


Figure 2: Histograms and plots of the conditions during escapement of Eel (n = 54) at NMPS Intake

Attachment B to Study 3.3.5:
Evaluate Downstream Passage of American Eel (Route choice at TFD)

Table 1: Summary of conditions during Eel passage over Turners Falls Dam, n = 13

Frequency and Code	Release Date	Release Location	Date and Time Passed TFD	TFD Discharge (cfs)	Bascule_1 (cfs)	Bascule_2 (cfs)	Bascule_3 (cfs)	Bascule_4 (cfs)	Canal Flow (cfs)	Daily Cumulative Rainfall (in)
149.740 34	10/27/2015 23:20	Upper Impoundment	10/29/2015 19:21	5035	5035	0	0	0	11461	0.89
149.760 47	10/28/2015 23:16	Upper Impoundment	10/29/2015 19:46	5025	5025	0	0	0	11709	0.89
149.760 49	10/28/2015 23:16	Upper Impoundment	10/29/2015 22:43	5096	5096	0	0	0	11766	0.89
150.340 103	10/27/2015 17:45	Vernon	10/30/2015 2:32	5056	5056	0	0	0	8739	0
149.760 56*	10/28/2015 22:49	Lower Impoundment	10/31/2015 19:47	0	0	0	0	0	14189	0
149.740 33	10/27/2015 23:07	Lower Impoundment	10/28/2015 20:11	3491	3491	0	0	0	2650	0.63
149.760 37	10/27/2015 23:20	Upper Impoundment	10/28/2015 20:40	2937	2937	0	0	0	6774	0.63
149.760 40	10/27/2015 23:20	Upper Impoundment	10/28/2015 20:34	2937	2937	0	0	0	6774	0.63
150.380 170	10/31/2015 13:40	Vernon	11/3/2015 0:56	1565	1565	0	0	0	7024	0
149.760 42	10/28/2015 22:49	Lower Impoundment	11/3/2015 22:21	1502	1488	0	0	0	10628	0
149.760 74	11/3/2015 23:05	Upper Impoundment	11/4/2015 19:11	1544	1544	0	0	0	9118	0
149.740 68	11/2/2015 23:05	Upper Impoundment	11/4/2015 20:03	1566	1566	0	0	0	9196	0
149.760 57*	10/28/2015 22:49	Lower Impoundment	11/22/2015 15:31	0	0	0	0	0	16029	0.03

*These eel passed over the TFD and were first recaptured in the bypass reach near the Conte Tailrace

Table 2: Cox Proportional Hazard Regression model outputs for Eel passed over TFD

Model Number	Covariates	AIC	LR Test	Hazard Ratio	SE	P	(+/-)
1	Rain (in)	104.94	0.56	13.94	3.8	0.49	(0.008,23894)
2	Daily Cumulative Rain (in)	96.33	0.003	10.59	0.73	0.001	(2.54,44.14)
3	Cloud Cover	105.14	0.70	1.29	0.68	0.70	(0.34,4.86)
4	Diurnal (Day)	105.29	0.99	1.01	1.05	0.99	(0.13,7.89)
5	Canal Flow (kcfs)	100.61	0.03	1.21	0.09	0.03	(1.02,1.43)
6	TFD Discharge (kcfs)	95.4	0.001	1.57	0.14	0.001	(1.19,2.09)

Table 3: Summary of conditions during Eel passage into the canal from the Turners Falls Impoundment, n = 84

Frequency and Code	Release Date	Release Location	Date and Time	Bascule 1 (cfs)	Bascule 2 (cfs)	Bascule 3 (cfs)	Bascule 4 (cfs)	TF Dam Discharge (cfs)	Canal Flow (cfs)	Cumulative Daily Rainfall (in)
149.760 25	10/26/2015 23:37	Lower Impoundment	10/28/2015 22:30	4993	0	0	0	5031	11951	0.89
149.740 55	10/28/2015 22:49	Lower Impoundment	10/29/2015 18:19	5008	0	0	0	5008	11596	0.89
149.760 39	10/27/2015 23:20	Upper Impoundment	10/28/2015 20:02	5008	0	0	0	5008	11596	0.89
149.760 50	10/28/2015 22:49	Lower Impoundment	10/29/2015 18:47	5063	0	0	0	5071	11533	0.89
149.740 42	10/28/2015 22:49	Lower Impoundment	10/29/2015 19:51	5101	0	0	0	5101	11623	0.89
149.740 30	10/27/2015 23:20	Upper Impoundment	10/28/2015 19:24	5048	0	0	0	5071	11605	0.89
149.760 46	10/28/2015 23:16	Upper Impoundment	10/29/2015 18:16	5164	0	0	0	5164	9947	0
149.740 54	10/28/2015 22:49	Lower Impoundment	10/30/2015 5:16	5049	0	0	0	5030	9730	0
150.380 110	10/27/2015 17:45	Vernon	10/30/2015 22:13	0	0	0	0	0	14932	0
149.740 29	10/27/2015 23:07	Lower Impoundment	10/31/2015 18:50	0	0	0	0	0	14248	0
149.740 22	10/27/2015 23:20	Upper Impoundment	10/29/2015 17:54	0	0	0	0	0	11721	0.02
149.740 24	10/27/2015 23:07	Lower Impoundment	10/28/2015 18:00	3968	0	0	0	3968	3732	0.44
149.740 38	10/27/2015 23:07	Lower Impoundment	10/28/2015 19:48	3491	0	0	0	3491	2650	0.63
149.760 28	10/26/2015 23:37	Lower Impoundment	10/28/2015 20:41	3502	0	0	0	3493	7679	0.63
149.740 23	10/27/2015 23:20	Upper Impoundment	10/28/2015 3:16	3990	0	0	0	4004	8110	0.69
149.760 35	10/27/2015 23:20	Lower Impoundment	10/28/2015 21:41	3013	0	0	0	3010	5808	0.69
149.740 26	10/27/2015 23:07	Lower Impoundment	10/29/2015 7:13	3483	0	0	0	3483	6897	0.88
150.340 101	10/27/2015 17:45	Vernon	10/28/2015 19:40	3524	0	0	0	3520	7033	0.09
149.760 23	10/26/2015 23:37	Lower Impoundment	10/28/2015 23:48	3454	0	0	0	3444	7034	0.87
149.740 48	10/28/2015 23:16	Upper Impoundment	10/29/2015 4:03	3565	0	0	0	3565	6819	0.87
149.760 51	10/28/2015 22:49	Lower Impoundment	10/29/2015 4:51	3553	0	0	0	3553	6830	0.87
149.740 44	10/28/2015 22:49	Lower Impoundment	11/2/2015 19:01	0	0	0	0	0	13474	0
149.740 46	10/28/2015 22:49	Lower Impoundment	11/3/2015 0:00	1465	0	0	0	1457	8066	0
150.380 150	10/29/2015 17:52	Bellows Falls	11/2/2015 21:35	1444	0	0	0	1444	7145	0
150.360 176	10/31/2015 18:22	Bellows Falls	11/2/2015 23:47	1512	0	0	0	1497	4729	0

Frequency and Code	Release Date	Release Location	Date and Time	Bascule 1 (cfs)	Bascule 2 (cfs)	Bascule 3 (cfs)	Bascule 4 (cfs)	TF Dam Discharge (cfs)	Canal Flow (cfs)	Cumulative Daily Rainfall (in)
149.760 58	11/2/2015 22:40	Lower Impoundment	11/3/2015 3:54	1449	0	0	0	1449	4747	0
150.340 153	10/29/2015 18:43	Wilder	11/2/2015 23:13	1489	0	0	0	1489	11230	0
150.340 134	10/29/2015 13:05	Vernon	11/1/2015 21:45	1563	0	0	0	1556	9421	0
149.740 71	11/2/2015 23:05	Upper Impoundment	11/3/2015 1:16	1509	0	0	0	1502	8882	0
150.360 53	10/31/2015 18:05	Bellows Falls	11/3/2015 19:02	1528	0	0	0	1528	11396	0
149.760 63	11/2/2015 23:05	Upper Impoundment	11/3/2015 19:05	1518	0	0	0	1518	3150	0
150.360 164	10/31/2015 13:40	Vernon	11/2/2015 23:08	1511	0	0	0	1537	4172	0
149.740 60	11/2/2015 23:05	Upper Impoundment	11/4/2015 14:49	1447	0	0	0	1447	7090	0
149.740 41	10/27/2015 23:20	Upper Impoundment	10/28/2015 10:44	1523	0	0	0	1509	9095	0
149.740 70	11/2/2015 22:40	Lower Impoundment	11/4/2015 18:09	1480	0	0	0	1487	9187	0
150.360 165	10/31/2015 13:40	Vernon	11/3/2015 22:26	1549	0	0	0	1541	9543	0
150.340 143	10/29/2015 17:52	Bellows Falls	11/6/2015 1:53	0	0	0	0	0	10970	0
149.740 83	11/4/2015 23:02	Upper Impoundment	11/7/2015 4:22	0	0	0	0	0	10912	0
149.760 72	11/2/2015 22:40	Lower Impoundment	11/8/2015 20:02	0	0	0	0	0	11332	0
149.740 82	11/4/2015 23:02	Upper Impoundment	11/6/2015 18:49	0	0	0	0	0	11300	0
150.380 124	11/3/2015 17:32	Wilder	11/8/2015 17:39	0	0	0	0	0	10969	0
149.740 51	10/28/2015 22:49	Lower Impoundment	10/29/2015 20:42	0	0	0	0	0	4508	0
150.380 112	11/3/2015 16:45	Bellows Falls	11/8/2015 19:46	0	0	0	0	0	3053	0
150.380 118	10/27/2015 18:20	Bellows Falls	11/7/2015 18:00	0	0	0	0	0	5195	0
149.760 68	11/2/2015 23:05	Upper Impoundment	11/9/2015 21:22	0	0	0	0	0	11258	0.32
150.340 54	10/31/2015 18:05	Bellows Falls	11/11/2015 20:59	0	0	0	0	0	11585	0.001
149.740 49	10/28/2015 22:49	Lower Impoundment	11/8/2015 19:10	0	0	0	0	0	9332	0.005
150.360 51	10/31/2015 18:05	Bellows Falls	11/4/2015 0:23	1566	0	0	0	1566	9196	0
149.760 61	11/2/2015 22:40	Lower Impoundment	11/4/2015 21:31	0	0	0	0	0	9193	0
149.760 60	11/2/2015 22:40	Lower Impoundment	11/4/2015 22:05	0	0	0	0	0	5159	0
149.760 82	11/4/2015 23:02	Upper Impoundment	11/5/2015 14:07	0	0	0	0	0	6315	0

Frequency and Code	Release Date	Release Location	Date and Time	Bascule 1 (cfs)	Bascule 2 (cfs)	Bascule 3 (cfs)	Bascule 4 (cfs)	TF Dam Discharge (cfs)	Canal Flow (cfs)	Cumulative Daily Rainfall (in)
149.760 83	11/4/2015 23:02	Upper Impoundment	11/5/2015 0:58	0	0	0	0	0	13034	0
150.340 181	10/31/2015 19:21	Wilder	11/4/2015 23:01	0	0	0	0	0	11563	0
150.380 149	10/29/2015 17:52	Bellows Falls	11/4/2015 17:35	0	0	0	0	0	12703	0
149.740 64	11/2/2015 22:40	Lower River	11/5/2015 21:10	0	0	0	0	0	8086	0
149.740 72	11/2/2015 23:05	Upper Impoundment	11/3/2015 1:52	0	0	0	0	0	8042	0
149.740 81	11/4/2015 23:02	Upper Impoundment	11/5/2015 18:38	0	0	0	0	0	7818	0
149.740 76	11/3/2015 23:05	Upper Impoundment	11/5/2015 19:48	0	0	0	0	0	7168	0
150.360 184	10/31/2015 19:21	Wilder	11/5/2015 1:25	0	0	0	0	0	7242	0
149.760 67	11/2/2015 23:05	Upper Impoundment	11/3/2015 2:18	0	0	0	0	0	5098	0.01
149.740 67	11/2/2015 22:40	Lower Impoundment	11/6/2015 19:59	0	0	0	0	0	5079	0.01
149.740 75	11/3/2015 23:05	Upper Impoundment	11/7/2015 6:45	0	0	0	0	0	6780	0
149.760 44	10/28/2015 23:16	Upper Impoundment	10/30/2015 19:57	0	0	0	0	0	9345	0
150.380 113	11/3/2015 16:45	Bellows Falls	11/7/2015 3:47	0	0	0	0	0	8554	0
150.380 188	10/31/2015 19:21	Wilder	11/7/2015 4:21	0	0	0	0	0	9153	0
149.760 64	11/2/2015 22:40	Lower Impoundment	11/7/2015 15:27	0	0	0	0	0	5191	0
150.340 112	10/27/2015 18:20	Bellows Falls	11/7/2015 21:22	0	0	0	0	0	2439	0
149.740 52	10/28/2015 22:49	Lower Impoundment	11/14/2015 18:40	0	0	0	0	0	11417	0.001
150.340 173	10/31/2015 18:22	Bellows Falls	11/11/2015 21:26	0	0	0	0	0	9238	0.05
149.740 84	11/4/2015 23:02	Upper Impoundment	11/9/2015 21:14	0	0	0	0	0	9477	0.05
150.340 129	11/3/2015 17:32	Wilder	11/11/2015 19:25	0	0	0	0	0	9477	0.05
150.380 152	11/5/2015 17:05	Wilder	11/12/2015 0:27	0	0	0	0	0	9292	0.05
150.380 102	11/3/2015 15:55	Vernon	11/12/2015 20:54	0	0	0	0	0	2314	0
150.360 140	11/5/2015 15:35	Vernon	11/12/2015 20:24	0	0	0	0	0	8632	0.01
149.760 43	10/28/2015 23:16	Upper Impoundment	10/30/2015 1:24	0	0	0	0	0	11545	0.001
149.740 78	11/3/2015 23:05	Upper Impoundment	11/10/2015 21:47	0	0	0	0	0	11546	0.001
149.760 34	10/26/2015 23:37	Lower Impoundment	11/1/2015 19:40	0	0	0	0	0	11281	0
149.760 62	11/2/2015 22:40	Lower Impoundment	11/15/2015 15:24	0	0	0	0	0	11353	0

Frequency and Code	Release Date	Release Location	Date and Time	Bascule 1 (cfs)	Bascule 2 (cfs)	Bascule 3 (cfs)	Bascule 4 (cfs)	TF Dam Discharge (cfs)	Canal Flow (cfs)	Cumulative Daily Rainfall (in)
150.340 161	10/31/2015 13:40	Vernon	11/13/2015 18:55	0	0	0	0	0	11329	0
150.340 150	11/5/2015 16:20	Bellows Falls	11/16/2015 4:12	0	0	0	0	0	13681	0
149.740 62	11/2/2015 23:05	Upper Impoundment	11/7/2015 22:14	0	0	0	0	0	5100	0
149.760 27	10/26/2015 23:37	Lower Impoundment	10/27/2015 2:01	2428	0	0	0	2442	2324	0
149.760 32	10/26/2015 23:37	Lower Impoundment	10/27/2015 3:00	2521	0	0	0	2540	2662	0
150.360 139	11/5/2015 15:35	Vernon	11/28/2015 23:28	0	0	0	0	0	4118	0

Table 4: Cox Proportional Hazard Regression model outputs for Eel choosing the canal during downstream passage choice at TFD

Model Number	Covariates	AIC	LR Test	Hazard Ratio	SE	P	(+/-)
1	Rain (in)	649.54	0.09	46.74	1.83	0.04	(1.3,1683)
2	Daily Cumulative Rainfall (in)	648.51	0.05	2.16	0.36	0.03	(1.06,4.4)
3	Cloud Cover	652.1	0.54	1.18	0.28	0.54	(0.69,2.03)
4	Canal Flow (kcfs)	647.37	0.02	1.08	0.03	0.02	(1.01,1.15)
5	TF Discharge (kcfs)	651.65	0.37	1.06	0.07	0.36	(0.93,1.21)
6	Rain (in)	646.01	0.01	59.87	1.79	0.02	(1.8,1988.25)
	Canal Flow (kcfs)			1.08	0.03	0.02	(1.01,1.16)

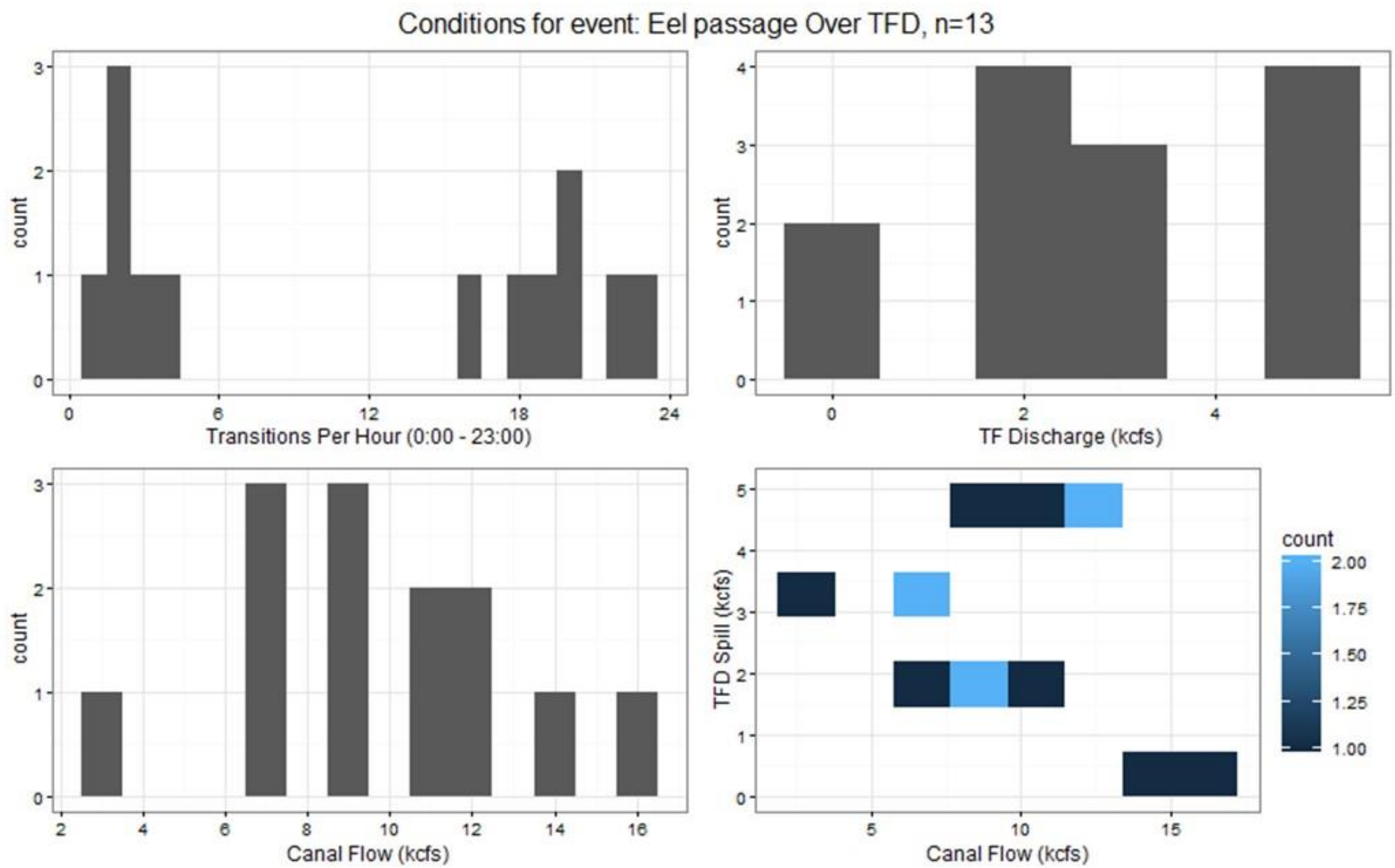


Figure 1: Histograms and Plots of the conditions during downstream eel passage over TFD (n=13)

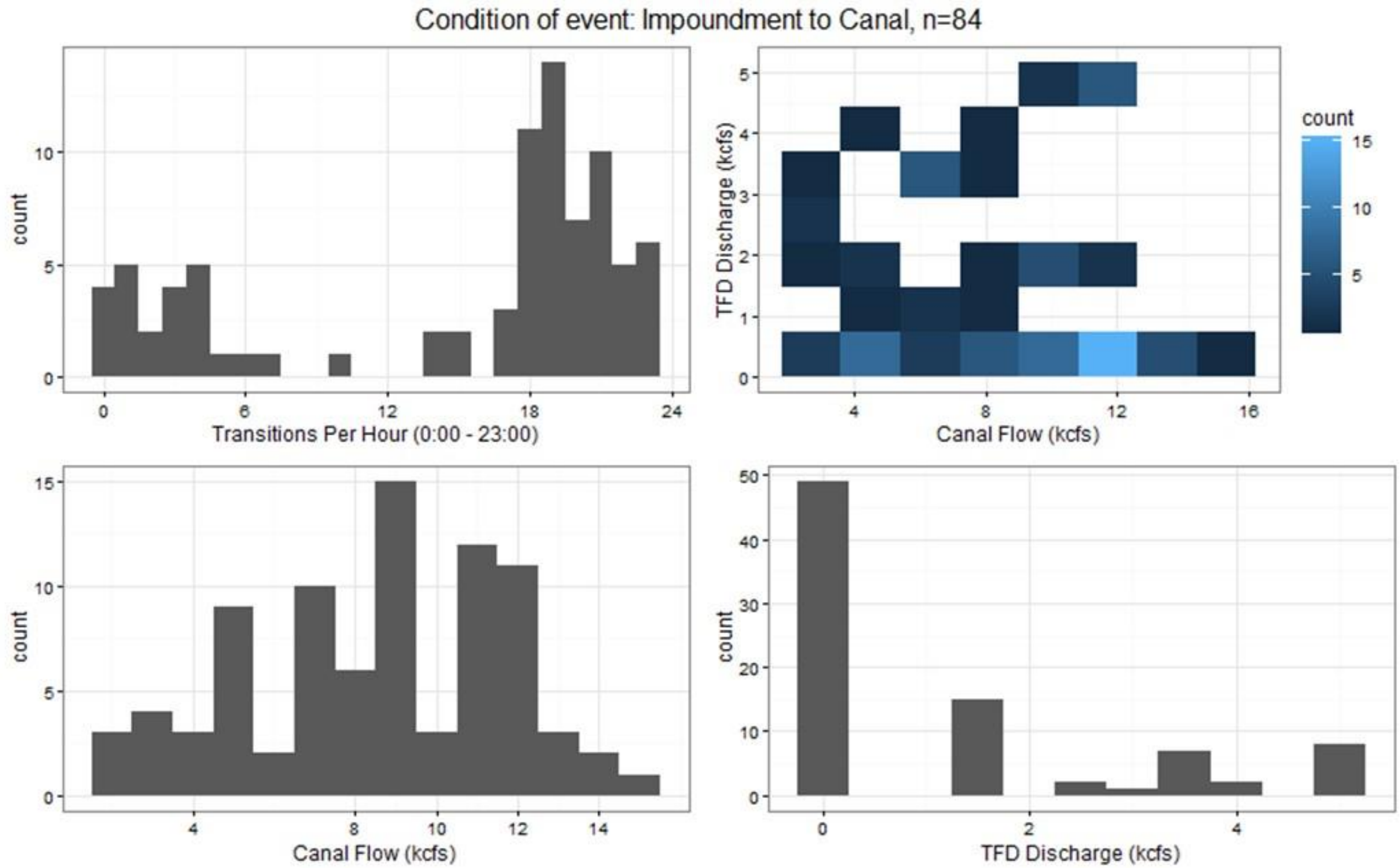


Figure 2: Histograms and Plots of the conditions during downstream eel passage into the canal from Turners Falls Impoundment (n=84)

Attachment C to Study 3.3.5.

Date and times of eel observations in the Turners Falls Power Canal are listed in Table 1. Table 1 also includes the water temperature, rain, and flows at the time of observation. No evident relationship was found between when eel were observed in the canal and the various environmental conditions. Eel were observed moving while water temperatures were between 7.75°C and 26.56°C (Table 2; Figure 1). Eel were observed at various amounts of cloud cover and rain fall (Table 2; Figures 2-4). Most eel were observed while canal flows were relatively low, median of 3,011 cfs (Table 2, Figure 5). Eel were observed passing through the canal at a wide range of flow conditions at Station No. 1 and Cabot Station (Table 2, Figure 6-7). No statistical trends were found among these environmental and operational conditions.

Table 1: NMFS-1- Section 3.1 Migratory Timing of Eel (DIDSON) and Section 4.2 Migratory Timing of Eel (DIDSON). The daily cumulative rainfall sum is the running total of rainfall for that day and rain in inches is the amount of rain that has fallen in the hour leading up to the event.

Date	Time	Eel (06-15 m)	Water Temp (°C)	Cloud Cover (%)	Rain [2](in)	Daily Cumulative Sum (in)	Power Canal Flow (cfs)	Dam Spill (cfs)	Station No. 1 Flow (cfs)	Cabot Flow (cfs)
8/2/2015	23:29	1	25.30	0.08	0.00	0.00	2,530	0	0	1,838
8/3/2015	22:00	1	25.42	0.37	0.00	0.00	7,887	0	0	6,830
8/7/2015	21:06	1	25.29	0.26	0.00	0.00	6,611	0	0	9,031
8/7/2015	21:16	1	25.26	0.26	0.00	0.00	6,073	0	0	4,621
8/9/2015	0:00	1	25.52	0.20	0.00	0.00	2,320	0	0	1,838
8/11/2015	23:14	1	24.65	0.52	0.00	0.74	9,518	0	0	8,947
8/12/2015	17:09	1	24.65	0.89	0.00	0.00	13,315	0	0	13,663
8/12/2015	18:16	1	24.56	0.68	0.00	0.00	14,265	0	0	13,660
8/12/2015	20:16	1	24.30	0.68	0.00	0.00	14,136	0	0	13,508
8/15/2015	20:01	1	24.89	0.14	0.46	0.48	6,357	0	0	11
8/16/2015	17:19	1	25.37	0.03	0.00	0.00	6,214	0	0	6,715
8/20/2015	1:16	1	26.02	0.58	0.00	0.00	2,338	0	0	1,798
9/5/2015	1:13	1	24.97	0.00	0.00	0.00	1,863	0	1,067	13
9/6/2015	20:33	1	24.95	0.36	0.00	0.00	1,716	0	1,070	13
9/7/2015	18:09	1	25.25	0.00	0.00	0.00	6,071	0	1,074	4,601
9/8/2015	18:02	1	25.55	0.34	0.00	0.00	5,925	0	1,070	4,523
9/13/2015	3:23	1	24.71	1.00	0.02	0.05	1,608	0	1,067	13
9/16/2015	22:17	1	22.13	0.00	0.00	0.00	10,407	0	1,059	9,071
9/24/2015	4:16	1	20.97	0.00	0.00	0.00	1,735	N/A	1,052	13
9/26/2015	18:20	1	20.88	0.10	0.00	0.00	2,515	N/A	0	1,674
9/26/2015	23:23	1	20.55	0.14	0.00	0.00	2,558	N/A	0	1,656
9/28/2015	1:00	1	20.34	0.23	0.00	0.00	2,585	N/A	0	1,638

[2] Rain (inches) is a continuous variable that describes the amount of rain that has fallen in the hour in which the event occurred. Daily Cumulative Sum is the amount of rain that has fallen so far that day.

Date	Time	Eel (06-15 m)	Water Temp (°C)	Cloud Cover (%)	Rain [2](in)	Daily Cumulative Sum (in)	Power Canal Flow (cfs)	Dam Spill (cfs)	Station No. 1 Flow (cfs)	Cabot Flow (cfs)
10/2/2015	19:22	1	16.55	1.00	0.01	0.02	16,772	13,743	2,093	12,230
10/12/2015	21:16	1	14.60	0.33	0.00	0.00	11,701	5,945	0	11,183
10/12/2015	18:25	1	14.68	0.00	0.00	0.00	3,029	1,519	0	2,272
10/17/2015	4:14	1	13.82	0.33	0.00	0.00	2,255	1,541	0	1,871
10/17/2015	0:39	1	13.93	0.34	0.00	0.00	2,355	1,492	0	1,844
10/19/2015	0:00	1	12.61	0.00	0.00	0.00	3,078	0	0	1,886
10/24/2015	18:33	1	11.26	1.00	0.00	0.00	9,267	0	0	9,115
10/24/2015	22:34	1	11.52	1.00	0.00	0.00	11,315	0	0	11,411
10/25/2015	2:22	1	11.03	1.00	0.01	0.01	2,758	0	0	1,829
10/31/2015	19:11	1	9.38	0.60	0.00	0.00	14,759	0	0	13,437
11/3/2015	20:16	1	9.39	0.00	0.00	0.00	9,421	1,556	0	9,137
11/16/2015	3:20	1	7.84	0.01	0.00	0.00	11,585	0	0	11,305
8/1/2016	17:23	1	26.05	0.68	0.00	0.00	6,997	N/A	1,312	6,892
8/10/2016	3:02	1	25.75	0.48	0.00	0.00	1,486	0	1,289	13
8/11/2016	21:14	1	26.51	0.00	0.00	0.00	1,489	0	0	948
8/12/2016	18:06	1	26.56	0.40	0.00	0.11	13,619	0	0	13,492
8/20/2016	3:24	1	26.20	0.83	0.00	0.00	2,077	N/A	1,586	15
8/21/2016	18:23	1	26.53	1.00	0.00	0.00	1,705	N/A	1,589	13
8/21/2016	22:27	1	26.48	1.00	0.05	0.07	1,797	N/A	1,545	13
8/22/2016	20:01	1	26.25	0.00	0.00	0.26	5,801	N/A	1,564	4,623
8/31/2016	0:02	1	25.31	0.22	0.00	0.00	2,590	0	1,582	13
8/31/2016	21:24	1	25.27	1.00	0.00	0.00	1,764	0	1,534	13
9/7/2016	20:06	1	23.80	0.00	0.00	0.00	8,877	0	1,541	6,877
9/8/2016	5:27	1	23.69	1.00	0.00	0.00	1,931	0	1,526	13
9/26/2016	22:34	1	20.74	0.62	0.00	0.00	2,204	0	1,256	13
9/30/2016	20:37	1	19.77	1.00	0.07	0.07	4,506	0	1,245	2,325
9/30/2016	23:30	1	19.41	1.00	0.06	0.19	1,639	0	1,249	13
10/1/2016	19:00	1	19.06	1.00	0.00	0.34	1,582	0	1,256	13

Date	Time	Eel (06-15 m)	Water Temp (°C)	Cloud Cover (%)	Rain [2](in)	Daily Cumulative Sum (in)	Power Canal Flow (cfs)	Dam Spill (cfs)	Station No. 1 Flow (cfs)	Cabot Flow (cfs)
10/2/2016	23:17	1	18.38	1.00	0.00	0.00	1,657	0	1,249	13
10/4/2016	22:39	1	18.13	0.00	0.00	0.00	1,469	0	1,260	13
10/8/2016	19:38	1	17.88	0.69	0.00	0.00	1,617	N/A	1,230	13
10/16/2016	19:14	1	15.55	1.00	0.00	0.00	1,558	N/A	0	817
10/16/2016	20:35	1	15.55	1.00	0.00	0.00	1,565	N/A	0	837
10/17/2016	19:17	1	15.25	0.54	0.00	0.00	8,607	N/A	0	9,049
10/18/2016	1:00	1	15.11	0.24	0.06	0.06	1,630	N/A	0	912
10/18/2016	19:08	1	15.54	0.00	0.00	0.09	5,637	N/A	0	6,762
10/18/2016	20:16	1	15.48	0.00	0.00	0.09	6,230	N/A	0	6,919
10/20/2016	4:03	1	15.67	0.28	0.00	0.00	1,474	N/A	0	773
10/20/2016	19:11	1	15.97	1.00	0.00	0.00	7,436	N/A	0	6,914
10/26/2016	23:24	1	12.78	0.69	0.00	0.00	1,672	N/A	0	2,241
10/27/2016	17:01	1	12.18	1.00	0.15	0.31	8,752	N/A	0	9,166
10/28/2016	23:26	1	11.15	0.61	0.00	0.63	1,624	N/A	0	1,838
10/29/2016	5:11	1	10.65	0.69	0.00	0.00	6,574	N/A	0	6,886
10/30/2016	23:07	1	10.03	1.00	0.00	0.04	7,068	N/A	0	9,144
10/30/2016	19:39	1	10.48	1.00	0.00	0.04	9,465	N/A	0	8,967
11/4/2016	4:01	1	9.21	0.50	0.00	0.00	2,581	N/A	0	2,280
11/9/2016	19:00	1	8.08	0.50	0.00	0.03	6,626	N/A	0	6,753
11/10/2016	1:20	1	7.75	1.00	0.00	0.00	2,993	N/A	0	2,236

Table 2: NMFS-1- Range of Conditions at time of eel observations

	Time	Water Temp (°C)	Cloud Cover (%)	Rain (in)	Daily Cumulative Sum (in)	Power Canal Flow (cfs)	Dam Spill (cfs)	Station No. 1 Flow (cfs)	[3]Cabot Flow (cfs)
Min	0:00	7.75	0.00	0.00	0.00	1,469	0	0	11
25%	4:30	14.10	0.14	0.00	0.00	1,772	0	0	205
Median	19:09	20.05	0.50	0.00	0.00	3,011	0	0	2,238
75%	21:12	25.26	1.00	0.00	0.01	7,774	0	1,191	8,440
Max	23:30	26.56	1.00	0.46	0.74	16,772	13,743	2,093	13,663

[3] Cabot flow computed by converting MWH to cfs. A unit could come on for fraction of an hour. For the first two Cabot flows below (11 and 205 cfs), it is suspected that a unit was on for only a few minutes within that hour. Typically, Cabot does not discharge continuously flows of such low magnitude. One unit at full capacity is approximately 2,288 cfs.

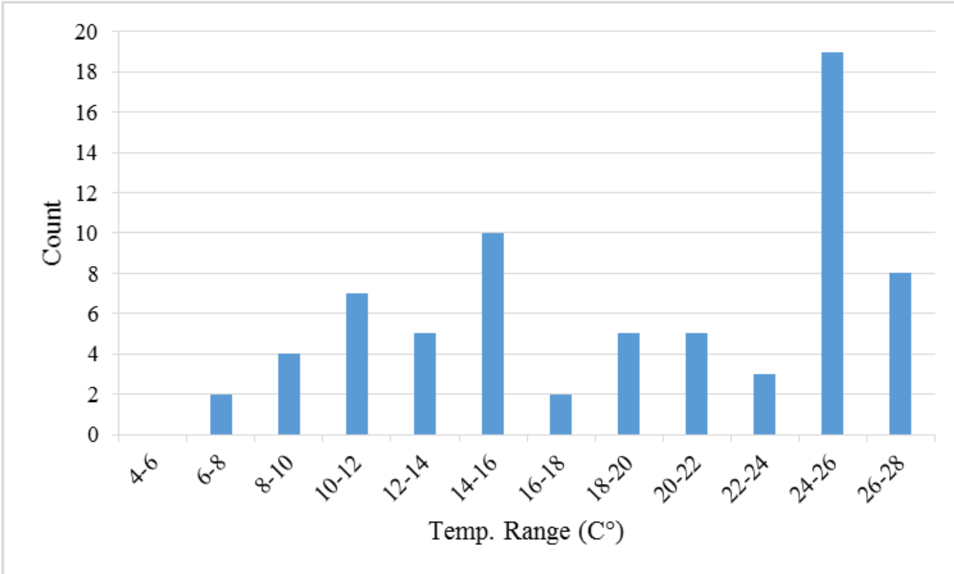


Figure 1: NMFS-1- Histogram of eel observation at range of water temperatures

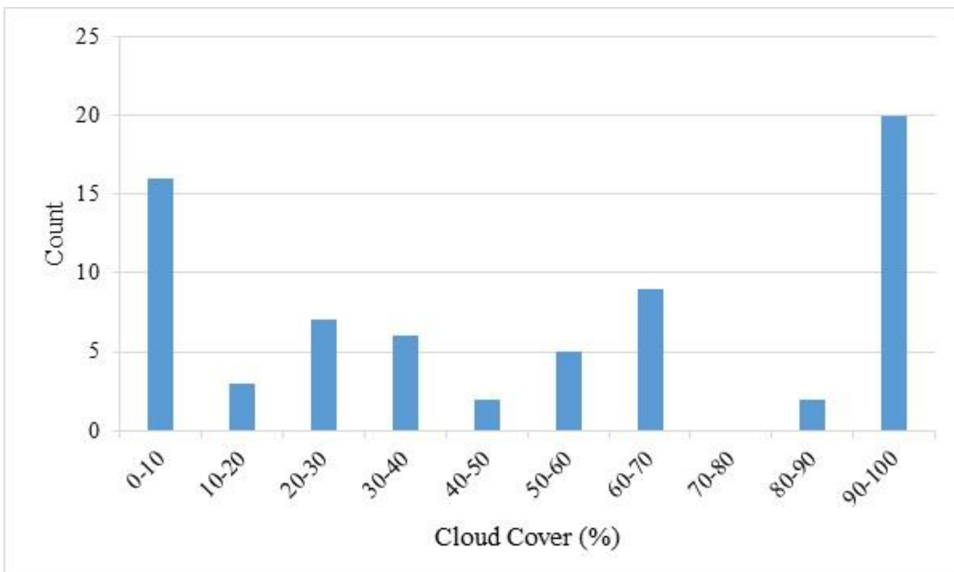


Figure 2: Histogram of eel observations and cloud cover

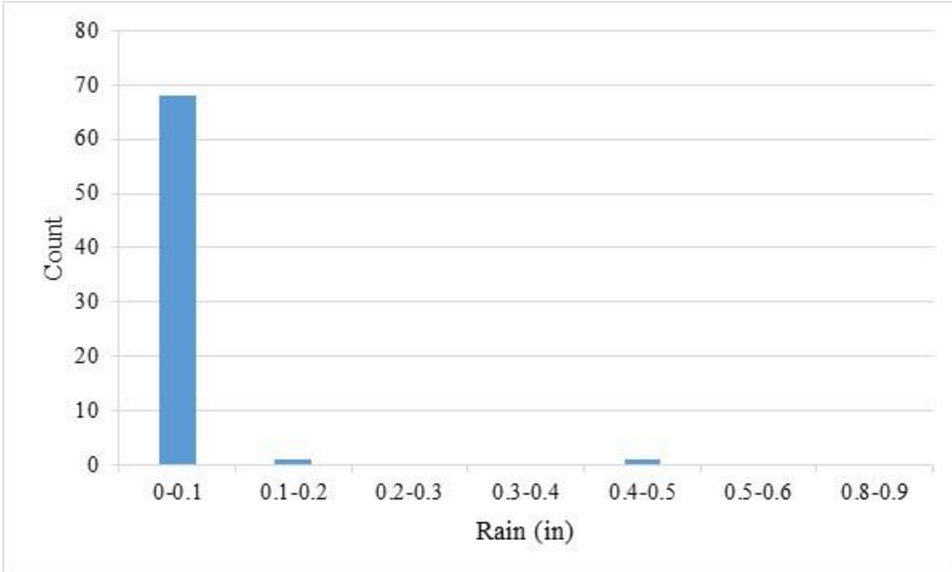


Figure 3: Histogram of eel observations at various amounts of rain

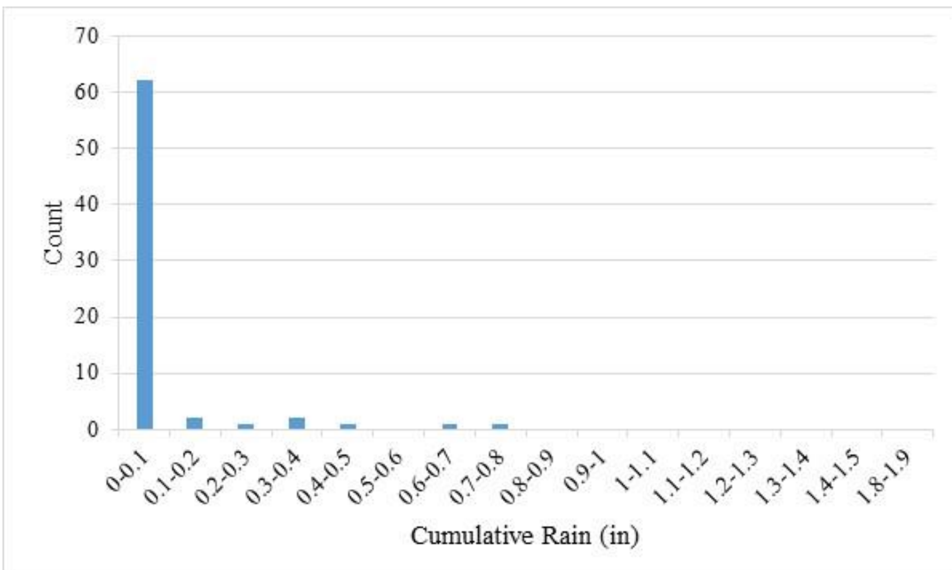


Figure 4: histogram of eel observations and daily cumulative rain

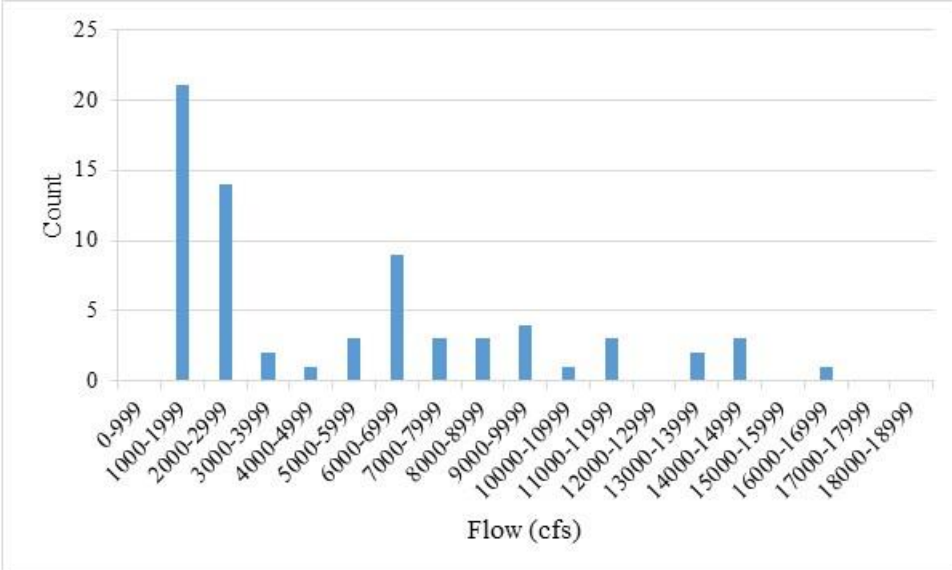


Figure 5: Histogram of eel observations and Turners Falls Power Canal Flows

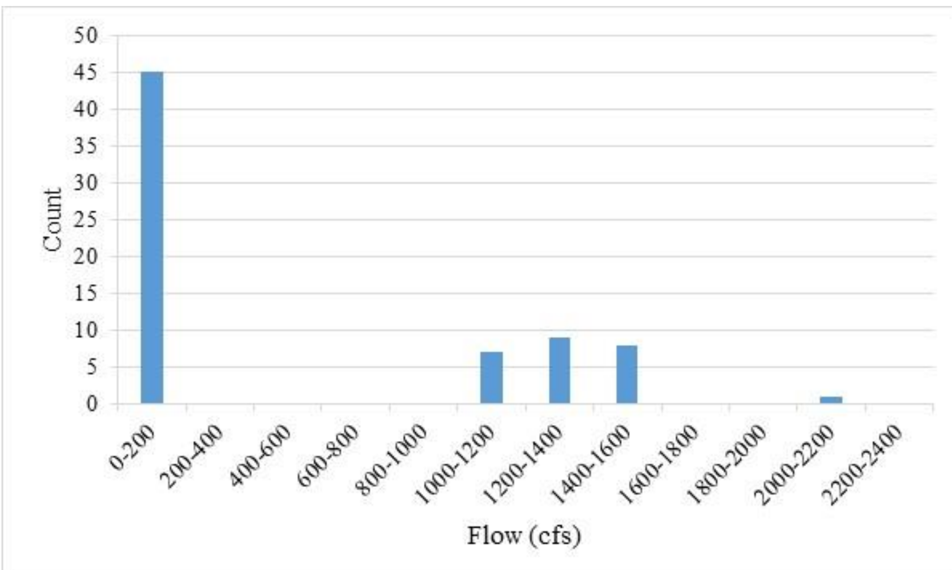


Figure 6: Histogram of eel observations and flows at Station No. 1

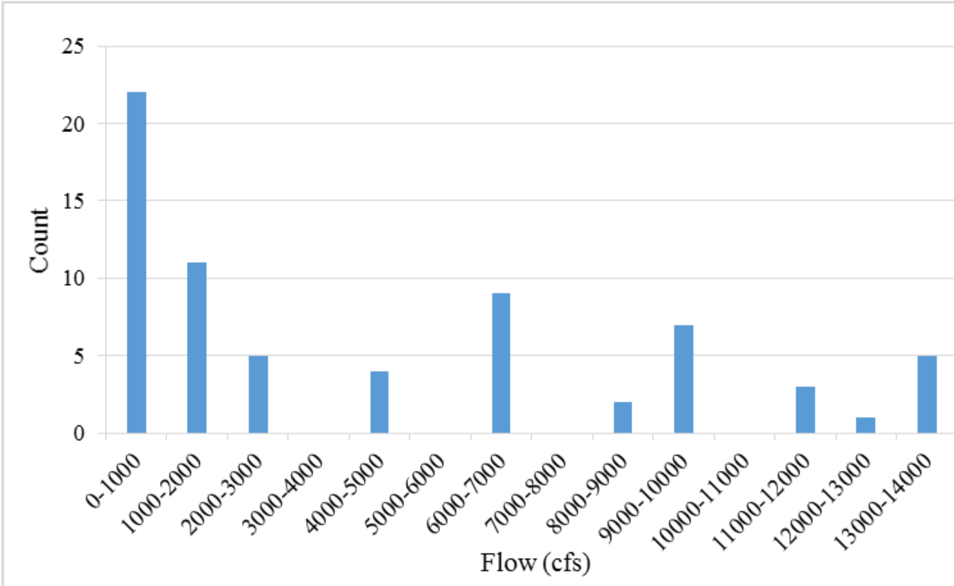


Figure 7: Histogram of eel observations and flows at Cabot Station

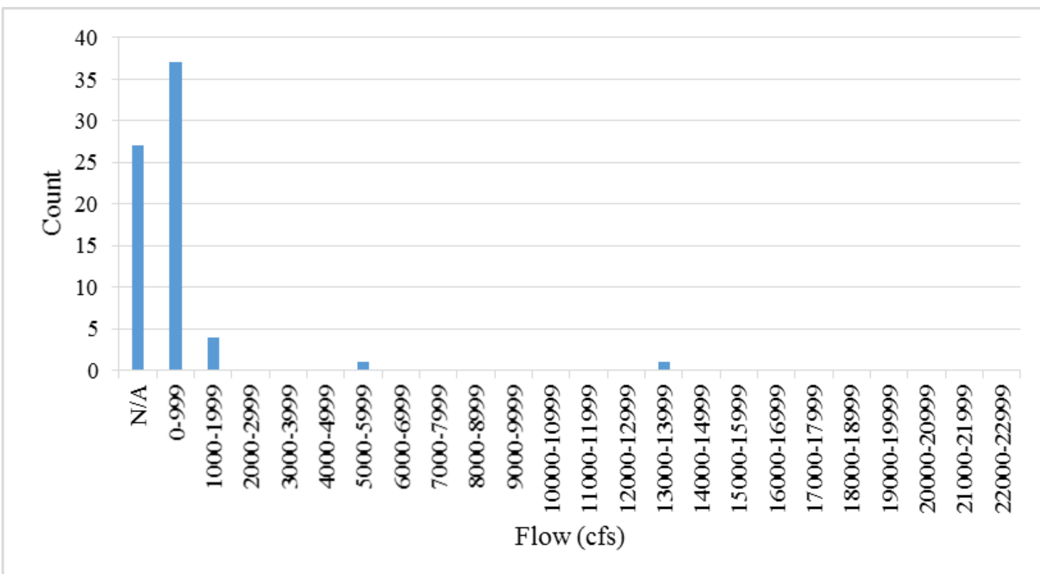


Figure 8: Histogram of eel observations and flows over the Turners Falls Dam

Attachment D to Study 3.3.5.

3.3.5 Attachment D - Table 1 shows descriptive statistics for the length of time (h) for fish to pass through project reaches. Reaches include TFI (time of release to time of passage into the bypass and canal), NMPS Intake, Canal (time of first detection of at T10 Upper Canal to time of egress through Cabot Powerhouse, Cabot Bypass Sluice, Station 1 Powerhouse, and unknown route), Bypass (time of first Upper Bypass detection to time of first detection at Cabot Tailrace), Cabot Tailrace to Montague (first detection at Cabot Tailrace to first detection at Montague), and the overall project (time of release to time of last detection in Cabot Tailrace and first detection at Montague). Because of the poor recapture rate at Montague, time of release to time of last detection at Cabot Tailrace probably serves as the best metric for overall project passage time. Travel times were highly variable among fish, as evidenced by the wide gap between median and mean travel times in most reaches

Table 1: Descriptive statistics for the length of time (h) for fish to pass through project reaches.

Reach	Number of Fish	Min	25% Quartile	Median	75% Quartile	Max	Mean	Standard Deviation
Boat Barrier to Bypass	13	20.11	21.24	44.02	59.27	592.70	87.54	155.58
Boat Barrier to Canal	84	2.75	43.83	96.58	190.62	593.48	138.08	132.72
Escapement from NMPS Intake	45	0.003	0.009	0.02	0.05	12.29	0.52	1.98
Shearer to Gill Banks	43	0.00	0.02	0.02	0.03	9.72	0.35	1.56
Gatehouse to Cabot Powerhouse	55	0.60	0.79	1.00	1.28	175.57	7.04	25.29
Gatehouse to Bypass Sluice	5	0.73	0.74	1.07	1.25	112.89	23.34	50.07
Gatehouse to Station 1 Powerhouse	2	0.49	0.50	0.51	0.52	0.52	0.51	0.02
Canal via Unknown	5	0.01	0.02	0.02	0.02	0.03	0.02	0.01
Spillway to Cabot Tailrace	7	0.95	1.21	1.76	4.19	18.70	4.60	6.52
Cabot Tailrace to Montague	10	0.35	0.38	0.49	0.56	14.80	1.90	4.53
Release to Last Cabot Tailrace	106	4.78	44.62	95.12	183.46	622.90	137.39	136.40
Release to Montague	10	6.15	19.69	21.81	23.53	47.43	22.24	11.54

Attachment E to Study 3.3.5.
Evaluate Downstream Passage of American Eel (Attraction to NMPS)

Response:

This response includes the attraction to NMPS Intake from Shearer Farms and from Gill Bank for downstream migrating eel. Table 1 represents the conditions experienced by the eel that were attracted to NMPS intake from Shearer Farms (n=79). Eel can make multiple attempts into the intake from Shearer farm, which is reflected in Table 1. Table 2 is the summary output for several Cox Proportional regression models and the covariates (Rain, Flow at Shearer Farm, Flow outside NMPS tailrace, NMPS Pumping flow and the number of units operating) that statistically describe the conditions during attraction to the NMPS intake from Shearer Farms.

The best model (Model 5) incorporated NMPS Pumping Flow (kcfs) and the overall model was significant (LR = 0.05). The main effect of pumping at NMPS was also significant (p=0.02) and the hazard ratio (1.06) suggests that eel are 1.06 more times likely to be attracted to NMPS Intake from Shearer Farms when pumping increases.

A series of five histograms and plots were made to visualize some of the conditions experienced by eel attracted to the NMPS intake from Shearer Farms (Figure 1). The upper left plot displays the transitions per hour, or the time at which these eel were attracted to the intake. It is clear that the majority of eel are attracted to the NMPS Intake at nighttime or early morning hours. The upper right plot is a two dimensional color plot that displays the conditions NMPS pumping conditions as well as the Flow at Shearer Farm during intake attraction. The lighter blues convey the highest counts of eel and can be seen at various flows at Shearer Farm and at times of no pumping and pumping at Northfield. The middle left plot is another two dimensional color plot displaying the flows at Gill Bank (kcfs) and the flows at Shearer Farms (kcfs) during attraction to the intake. Eels are attracted to the NMPS intake at a variety of flows in the two areas. The middle right plot displays a histogram of the amount of eel attracted to the intake at various Shearer Farm flows (kcfs). It seems that eel are most attracted to the intake when flows at Shearer Farm are between 6,000 and 10,000 cfs. The bottom left plot is plot displays the pumping and generating conditions during eel attraction to the NMPS Intake. The majority of eel are attracted to the intake during pumping scenarios, however a large amount are attracting when operations at NMPS are idle.

Table 3 represents the conditions experienced by the eel attracted to NMPS intake from Gill Bank (n=30). Eel can make multiple attempts into the intake from Gill Bank, which is reflected in Table 3. Table 4 is the summary output for several Cox Proportional regression models and the covariates (Rain, Flow at Gill bank, Flow outside NMPS intake, NMPS Pumping and number of units operating) that statistically describe the conditions during attraction to the NMPS intake from Gill bank. The best model (Model 4) incorporated flow outside of the NMPS tailrace (kcfs) and the overall model was almost significant (LR=0.05). The main effect of flow outside of the tailrace was almost significant (p=0.07) and the hazard ratio (0.88) suggests that eel as less likely to be attracted to the Intake when flow outside of the intake increases.

A series of five histograms and plots were made to visualize some of the conditions experienced by eel attracted to the NMPS intake from Gill Bank (Figure 2). The upper left plot displays the transitions per hour, or the time at which these eel were attracted to the intake. It is clear that the majority of eel are attracted to the NMPS Intake at nighttime or early morning hours. The upper right plot is a two dimensional color plot that displays the conditions NMPS pumping conditions as well as the Flow at Shearer Farm during intake attraction. The lighter blues convey the highest counts of eel and can be seen at various flows at Shearer Farm and at times of no pumping at Northfield. The middle left plot is another two dimensional color plot displaying the flows at Gill Bank (kcfs) and the flows at Shearer Farms (kcfs) during attraction to the intake. Eels are attracted to the NMPS intake at a variety of flows in the two areas, with the majority attracted at lower flows at each area (<5000 cfs). The middle right plot displays a histogram of the amount of eel attracted to the intake at various Gill bank flows (kcfs). It seems that eel are attracted to the intake at almost all flows at Gill bank. The bottom left plot is plot displays the pumping and generating conditions during eel attraction to the NMPS Intake. The majority of eel are attracted to the intake when operations at NMPS are idle.

Table 1: Summary of conditions for Eel attracted to NMPS Intake from Shearer Farms, n = 79, eel can make multiple attempts into the intake from Shearer Farms

Frequency and Code	Date and Time of Release	Release Location	Date and Time	CT River at Gill Bank (cfs)	CT River at Shearer Farms (cfs)	CT River at NFM Tailrace (cfs)	NMPS U1 (cfs)	NMPS U2 (cfs)	NMPS U3 (cfs)	NMPS U4 (cfs)	Rain (in)
149.740 36	10/27/2015 23:20	Upper Impoundment	10/28/2015 1:49	90	6516	6700	0	-3330	-3465	0	0
149.760 38	10/27/2015 23:20	Upper Impoundment	10/28/2015 2:27	523	6880	7086	0	-3382	-3442	0	0
149.760 40	10/27/2015 23:20	Upper Impoundment	10/28/2015 2:28	523	6880	7086	0	-3382	-3442	0	0
149.740 27	10/27/2015 23:20	Upper Impoundment	10/28/2015 3:11	1211	7532	7772	0	-3306	-3383	0	0
149.740 30	10/27/2015 23:20	Upper Impoundment	10/28/2015 18:58	10010	7794	7779	0	0	0	0	0.12
149.760 22	10/27/2015 0:00	Upper Impoundment	10/28/2015 22:19	9693	9185	9165	0	0	0	0	0.12
149.760 26	10/27/2015 0:00	Upper Impoundment	10/28/2015 23:35	9051	10289	10273	0	-3323	0	0	0.09
149.740 50	10/28/2015 23:16	Upper Impoundment	10/29/2015 2:10	7265	10446	10504	0	-3335	0	0	0.001
150.340 103	10/27/2015 17:45	Vernon	10/29/2015 22:46	15191	15218	15204	0	0	-3456	0	0
149.740 40	10/27/2015 23:20	Upper Impoundment	10/31/2015 0:22	11306	14463	14567	0	-3305	0	0	0
150.340 134	10/29/2015 13:05	Vernon	11/1/2015 20:33	9599	9365	9428	0	0	0	0	0
149.740 74	11/3/2015 23:05	Upper Impoundment	11/8/2015 18:47	13540	2130	1748	0	0	4381	3135	0
150.380 146	11/5/2015 16:20	Bellows Falls	11/8/2015 23:50	9048	8964	9009	0	0	0	0	0
150.340 183	10/31/2015 19:21	Wilder	11/9/2015 4:04	-1151	8679	8886	0	-3336	0	-3328	0
149.740 49	10/28/2015 22:49	Lower Impoundment	11/9/2015 3:02	3922	5568	5675	0	0	2422	0	0
149.760 66	11/2/2015 22:40	Lower Impoundment	11/3/2015 3:38	9280	5989	5954	0	0	0	0	0
150.340 112	10/27/2015 18:20	Bellows Falls	11/7/2015 20:12	9280	5989	5954	0	0	0	0	0
149.740 62	11/2/2015 23:05	Upper Impoundment	11/7/2015 21:25	8026	7870	7869	0	0	0	0	0
149.740 59	11/2/2015 22:40	Lower Impoundment	11/5/2015 7:13	7987	8006	7997	0	0	0	0	0
150.380 124	11/3/2015 17:32	Wilder	11/8/2015 7:34	4325	2780	2784	0	2848	5103	4852	0
149.760 68	11/2/2015 23:05	Upper Impoundment	11/9/2015 20:31	5494	2625	2418	0	0	2373	0	0
150.340 104	11/3/2015 15:55	Vernon	11/10/2015 0:11	115	4340	4308	0	-3481	0	-3398	0
150.360 166	10/31/2015 13:40	Vernon	11/10/2015 0:32	-870	4259	4259	0	-3380	0	-3431	0
149.760 75	11/3/2015 23:05	Upper Impoundment	11/9/2015 23:44	-2868	6329	6563	0	-3318	-3364	0	0
150.340 141	10/29/2015 17:52	Bellows Falls	11/10/2015 2:07	-2868	6329	6563	0	-3318	-3364	0	0
149.740 78	11/3/2015 23:05	Upper Impoundment	11/10/2015 20:07	9290	4743	4715	0	0	0	0	0.001

Frequency and Code	Date and Time of Release	Release Location	Date and Time	CT River at Gill Bank (cfs)	CT River at Shearer Farms (cfs)	CT River at NFM Tailrace (cfs)	NMPS U1 (cfs)	NMPS U2 (cfs)	NMPS U3 (cfs)	NMPS U4 (cfs)	Rain (in)
150.340 57	11/5/2015 17:05	Wilder	11/11/2015 3:50	-447	6156	6291	0	-3363	-3471	0	0
150.340 102	10/27/2015 17:45	Vernon	11/10/2015 20:03	8208	8318	8416	0	-3488	0	0	0.01
150.380 152	11/5/2015 17:05	Wilder	11/11/2015 23:37	7502	8208	8297	0	-3527	0	-3570	0
150.380 153	11/5/2015 17:05	Wilder	11/12/2015 1:21	4219	9873	10120	0	-3524	0	-3519	0
149.740 56	10/28/2015 22:49	Lower Impoundment	11/7/2015 22:09	1981	7356	7428	0	-3522	0	-3504	0.001
150.380 178	10/31/2015 18:22	Bellows Falls	11/12/2015 2:04	1981	7356	7428	0	-3522	0	-3504	0.001
150.380 178	10/31/2015 18:22	Bellows Falls	11/12/2015 2:04	1981	7356	7428	0	-3522	0	-3504	0.001
150.380 178	10/31/2015 18:22	Bellows Falls	11/12/2015 2:04	1981	7356	7428	0	-3522	0	-3504	0.001
150.380 178	10/31/2015 18:22	Bellows Falls	11/12/2015 10:45	7892	4262	4094	0	0	5154	0	0.001
150.380 178	10/31/2015 18:22	Bellows Falls	11/12/2015 10:45	7892	4262	4094	0	0	5154	0	0.001
149.740 56	10/28/2015 22:49	Lower Impoundment	11/12/2015 3:49	12494	4670	4388	0	0	5285	3238	0
149.740 57	10/28/2015 23:16	Upper Impoundment	11/4/2015 0:31	9738	9740	9778	0	-3422	0	-3468	0
149.760 77	11/3/2015 23:05	Upper Impoundment	11/4/2015 1:00	6833	9359	9447	0	-3455	-3548	-3481	0
149.760 79	11/3/2015 23:05	Upper Impoundment	11/4/2015 1:17	4913	9473	9607	0	-3443	-3508	-3434	0
150.360 177	10/31/2015 18:22	Bellows Falls	11/4/2015 0:36	8523	9426	9480	0	-3335	-3239	-3361	0
150.380 149	10/29/2015 17:52	Bellows Falls	11/4/2015 16:45	7064	5821	5842	0	4011	0	4857	0
150.380 159	10/29/2015 18:43	Wilder	11/4/2015 22:19	8607	8598	8562	0	0	0	0	0
149.740 80	11/4/2015 23:02	Upper Impoundment	11/5/2015 0:59	5688	8438	8520	0	-3383	-3466	0	0
149.740 85	11/4/2015 23:02	Upper Impoundment	11/5/2015 1:09	5688	8438	8520	0	-3383	-3466	0	0
149.760 80	11/4/2015 23:02	Upper Impoundment	11/5/2015 1:07	5688	8438	8520	0	-3383	-3466	0	0
150.360 156	10/29/2015 18:43	Wilder	11/5/2015 3:03	-2404	7242	7478	0	-3268	-3429	-3378	0
149.760 82	11/4/2015 23:02	Upper Impoundment	11/5/2015 13:07	8945	2033	1740	0	0	0	4924	0
149.740 81	11/4/2015 23:02	Upper Impoundment	11/5/2015 18:00	8208	3509	3273	0	2361	0	4901	0
149.740 76	11/3/2015 23:05	Upper Impoundment	11/5/2015 18:15	9711	2798	2524	0	0	0	2156	0
149.740 63	11/2/2015 23:05	Upper Impoundment	11/5/2015 21:47	6768	6936	6847	0	0	0	0	0
150.340 143	10/29/2015 17:52	Bellows Falls	11/6/2015 0:43	6209	7166	7107	0	-3441	-3470	-3354	0
150.340 55	10/31/2015	Bellows Falls	11/6/2015 2:12	-757	9469	9668	0	-3344	-3380	-3409	0

Frequency and Code	Date and Time of Release	Release Location	Date and Time	CT River at Gill Bank (cfs)	CT River at Shearer Farms (cfs)	CT River at NFM Tailrace (cfs)	NMPS U1 (cfs)	NMPS U2 (cfs)	NMPS U3 (cfs)	NMPS U4 (cfs)	Rain (in)
	18:05										
150.380 178	10/31/2015 18:22	Bellows Falls	11/6/2015 2:52	-616	8914	9154	0	-3338	-3333	-3245	0
149.760 70	11/2/2015 22:40	Lower Impoundment	11/3/2015 2:26	-446	8860	9151	0	-3246	0	-3286	0
150.380 113	11/3/2015 16:45	Bellows Falls	11/7/2015 3:03	4531	4424	4481	0	0	0	0	0
149.740 75	11/3/2015 23:05	Upper Impoundment	11/7/2015 5:41	2869	2871	2872	0	0	0	0	0
150.380 118	10/27/2015 18:20	Bellows Falls	11/7/2015 12:11	6066	4402	4467	0	0	0	3141	0
150.380 118	10/27/2015 18:20	Bellows Falls	11/7/2015 16:00	11663	5410	5247	0	2425	5128	5128	0
149.760 34	10/26/2015 23:37	Lower Impoundment	11/1/2015 21:00	13743	3294	2977	0	2456	3501	5128	0
150.380 102	11/3/2015 15:55	Vernon	11/12/2015 20:20	9244	6595	6535	0	0	0	0	0.001
150.360 158	11/5/2015 17:05	Wilder	11/13/2015 3:07	-2509	7652	7855	0	-3475	-3544	-3450	0
150.340 161	10/31/2015 13:40	Vernon	11/13/2015 4:47	9868	7812	7667	0	3878	0	0	0
149.760 34	10/26/2015 23:37	Lower Impoundment	11/10/2015 6:23	10238	9212	9215	0	3961	0	0	0
150.380 180	10/31/2015 18:22	Bellows Falls	11/15/2015 4:51	4832	4693	4770	0	0	0	0	0
149.760 57	10/28/2015 22:49	Lower Impoundment	11/12/2015 23:44	8775	6874	6804	0	0	0	0	0
149.760 70	11/2/2015 22:40	Lower Impoundment	11/6/2015 22:20	2505	8685	9022	0	-3364	-3565	0	0.08
149.740 68	11/2/2015 23:05	Upper Impoundment	11/3/2015 1:22	4304	7366	7526	0	-3384	0	0	0
149.740 71	11/2/2015 23:05	Upper Impoundment	11/3/2015 0:52	5280	7563	7716	0	-3448	0	0	0
149.740 61	11/2/2015 22:40	Lower Impoundment	11/3/2015 1:42	4019	7163	7313	0	-3339	0	0	0
149.740 65	11/2/2015 23:05	Upper Impoundment	11/3/2015 22:52	10826	10962	10909	0	0	0	0	0
149.740 77	11/3/2015 23:05	Upper Impoundment	11/4/2015 1:46	1642	9811	10018	0	-3446	0	-3458	0
150.380 170	10/31/2015 13:40	Vernon	11/2/2015 20:15	13403	8474	8509	0	0	0	0	0
149.760 85	11/4/2015 23:02	Upper Impoundment	11/20/2015 22:45	10244	10664	10443	0	0	0	0	0
150.340 105	11/3/2015 15:55	Vernon	11/21/2015 3:27	10647	17794	17984	0	-3447	-3415	-3432	0
150.380 178	10/31/2015 18:22	Bellows Falls	11/21/2015 19:53	7425	12884	13162	0	-3425	-3446	0	0
149.760 70	11/2/2015 22:40	Lower Impoundment	11/26/2015 22:12	9710	7432	7318	0	0	0	0	0
149.760 65	11/2/2015 22:40	Lower Impoundment	11/3/2015 4:30	11905	-504	-940	0	5297	2676	2265	0
150.340 107	11/3/2015 15:55	Vernon	12/2/2015 4:09	-495	9562	9870	0	-3506	-3496	-3487	0

Table 2: Cox Proportional Hazard Regression model outputs for Eel attracted to NMPS Intake from Shearer Farms

Model Number	Covariates	AIC	LR Test	Hazard Ratio	SE	P	(+/-)
1	Rain (in)	608.98	0.57	5.46	2.61	0.42	(0.09,344.8)
2	Daily Cumulative Rainfall (in)	608.93	0.54	1.58	0.71	0.52	(0.39,6.4)
3	Flow at Shearer Farms (kcfs)	606.89	0.12	1.06	0.04	0.15	(0.98,1.14)
4	Flow outside NMPS Tailrace (kcfs)	606.81	0.11	1.06	0.04	0.14	(0.98,1.14)
5	NMPS Pumping Flow (kcfs)	605.41	0.05	1.06	0.03	0.02	(1.00,1.11)
6	1 Unit	608.16	0.16	1.2	0.34	0.59	(0.62,2.31)
	2 Units			1.79	0.30	0.08	(0.92,3.48)
	3 Units			1.85	0.36	0.08	(0.93,3.66)

Table 3: Summary of conditions for Eel attracted to NMPS Intake from Gill Bank, n = 30, eel can make multiple attempts into the intake from Gill bank

Frequency and Code	Release Time and Date	Release Location	Date and Time	CT River at Gill bank (cfs)	CT River at Shearer Farms (cfs)	CT River at NFM Tailrace (cfs)	NMPS U1 (cfs)	NMPS U2 (cfs)	NMPS U3 (cfs)	NMPS U4 (cfs)	Rain (in)
149.740 34	10/27/2015 23:20	Upper Impoundment	10/28/2015 3:20	13791.49	13679	13721	0	0	0	0	0
149.740 40	10/27/2015 23:20	Upper Impoundment	10/28/2015 20:19	12555.43	12605	12589	0	0	0	0	0
149.740 49	10/28/2015 22:49	Lower Impoundment	11/8/2015 19:10	13267.78	5499	5360	0	0	2399	0	0
150.380 189	10/31/2015 19:21	Wilder	11/8/2015 23:50	590.9184	8742	8979	0	-3413	-3443	-3371	0
149.760 66	11/2/2015 22:40	Lower Impoundment	11/7/2015 21:04	2122.606	4056	4164	0	0	-3488	-3426	0
150.380 178	10/31/2015 18:22	Bellows Falls	11/8/2015 3:08	-168.461	6276	6484	0	0	0	-3452	0
150.380 178	10/31/2015 18:22	Bellows Falls	11/8/2015 3:47	-111	6432	6638	0	0	0	-3418	0
149.760 75	11/3/2015 23:05	Upper Impoundment	11/4/2015 4:17	5009.76	3557	3352	0	0	0	0	0
150.340 128	11/3/2015 17:32	Wilder	11/9/2015 23:54	-1609.09	4387	4430	0	-3435	-3458	-3409	0
149.760 34	10/26/2015 23:37	Lower Impoundment	11/7/2015 18:54	-609.754	7523	7767	0	-3332	0	-3303	0
150.380 178	10/31/2015 18:22	Bellows Falls	11/9/2015 3:46	9029.852	6410	6345	0	0	0	4870	0
150.380 178	10/31/2015 18:22	Bellows Falls	11/10/2015 15:31	7308.85	2553	2606	0	0	0	0	0
150.340 102	10/27/2015 17:45	Vernon	10/31/2015 22:46	11402.76	1896	1841	0	0	0	4713	0.001
150.340 57	11/5/2015 17:05	Wilder	11/11/2015 4:23	189.5385	6542	6763	0	-3248	-3496	0	0
149.740 63	11/2/2015 23:05	Upper Impoundment	11/6/2015 1:09	12657.73	5370	5271	0	0	0	0	0.01
149.740 59	11/2/2015 22:40	Lower Impoundment	11/4/2015 12:55	5668.354	5590	5591	0	0	0	0	0
150.380 149	10/29/2015 17:52	Bellows Falls	11/4/2015 17:35	10785.77	5758	5678	0	2356	0	5074	0

Frequency and Code	Release Time and Date	Release Location	Date and Time	CT River at Gill bank (cfs)	CT River at Shearer Farms (cfs)	CT River at NFM Tailrace (cfs)	NMPS U1 (cfs)	NMPS U2 (cfs)	NMPS U3 (cfs)	NMPS U4 (cfs)	Rain (in)
149.760 53	10/28/2015 22:49	Lower Impoundment	11/4/2015 9:23	10334	7891	7880	0	0	0	0	0
149.760 84	11/4/2015 23:02	Upper Impoundment	11/5/2015 1:18	-1901.86	6902	7018	0	-3285	-3409	-3393	0
150.380 178	10/31/2015 18:22	Bellows Falls	11/6/2015 21:55	6470.316	4278	4291	0	0	0	0	0
149.740 63	11/2/2015 23:05	Upper Impoundment	11/12/2015 4:30	8766.105	6948	6899	0	0	0	0	0.001
149.740 63	11/2/2015 23:05	Upper Impoundment	11/12/2015 21:10	2980	3034	3005	0	0	0	0	0
149.740 63	11/2/2015 23:05	Upper Impoundment	11/14/2015 9:07	3049.226	3039	3013	0	0	0	0	0
149.740 63	11/2/2015 23:05	Upper Impoundment	11/14/2015 9:07	3049.226	3039	3013	0	0	0	0	0
149.740 63	11/2/2015 23:05	Upper Impoundment	11/14/2015 9:14	3541	3561	3549	0	0	0	0	0
150.380 178	10/31/2015 18:22	Bellows Falls	11/14/2015 7:53	3889	3967	3930	0	0	0	0	0
150.380 178	10/31/2015 18:22	Bellows Falls	11/16/2015 3:24	4306	2271	2292	0	0	2398	0	0
150.380 178	10/31/2015 18:22	Bellows Falls	11/17/2015 23:58	6329	6559	6767	0	0	0	-3455	0
149.760 71	11/2/2015 22:40	Lower Impoundment	11/2/2015 23:44	6211	6746	6733	0	-4	0	-3491	0
149.760 65	11/2/2015 22:40	Lower Impoundment	11/3/2015 0:41	2220	7284	7503	0	-3313	0	-3402	0

Table 4: Cox Proportional Hazard Regression model outputs for Eel attracted to NMPS Intake from Gill Bank

Model Number	Covariates	AIC	LR Test	Hazard Ratio	SE	P	(+/-)
1	Rain (in)	192	0.15	1.27e-19	5.86e+1	0.02	(7.15e-36,0.002)
2	Daily Cumulative Rainfall (in)	193	0.31	0.36	1.13	0.33	(0.05,2.76)
3	Flow at Gill Bank (kcfs)	192	0.09	0.93	0.05	0.05	(0.86,0.99)
4	Flow outside NMPS tailrace (kcfs)	190	0.05	0.88	0.07	0.07	(0.77,1.01)
5	NMPS Pumping (kcfs)	194	0.38	1.05	0.06	0.46	(0.92,1.21)
6	1 Unit	195	0.38	0.60	0.5	0.5	(0.14,2.63)
	2 Units			1.71	0.52	0.46	(0.41,7.14)
	3 Units			1.08	0.66	0.92	(0.24,4.94)

Table 5: describes the total number of movements by all fish (m) between reaches, the number of fish (n) that made those movements and describes the expected number of movements that a fish will make for each transition among states in the Intake to State Unknown model. The diagonal counts the number of fish detected within each reach.

To	Intake	Escape	Confirmed Entrainment	Unknown
From				
Intake	n: 76	n: 47 m: 74 Min: 1 Median: 1 Max: 14	n: 2 m: 2 Min: 1 Median: 1 Max: 1	n: 35 m: 35 Min: 1 Median: 1 Max: 1
Escape	n: 15 m: 35 Min: 1 Median: 1 Max:14	n: 47	n: 0 m: 0 Min: 0 Median: 0 Max:0	n:0 m: 0 Min: 0 Median: 0 Max:0
Confirmed Entrainment	n: 0 m: 0 Min: 0 Median: 0 Max: 0	n: 0 m: 0 Min: 0 Median: 0 Max: 0	n: 2	n: 0 m: 0 Min: 0 Median: 0 Max: 0
Unknown	n: 0 m: 0 Min: 0 Median: 0 Max: 0	n: 0 m: 0 Min: 0 Median: 0 Max: 0	n: 0 m: 0 Min: 0 Median: 0 Max: 0	n: 35

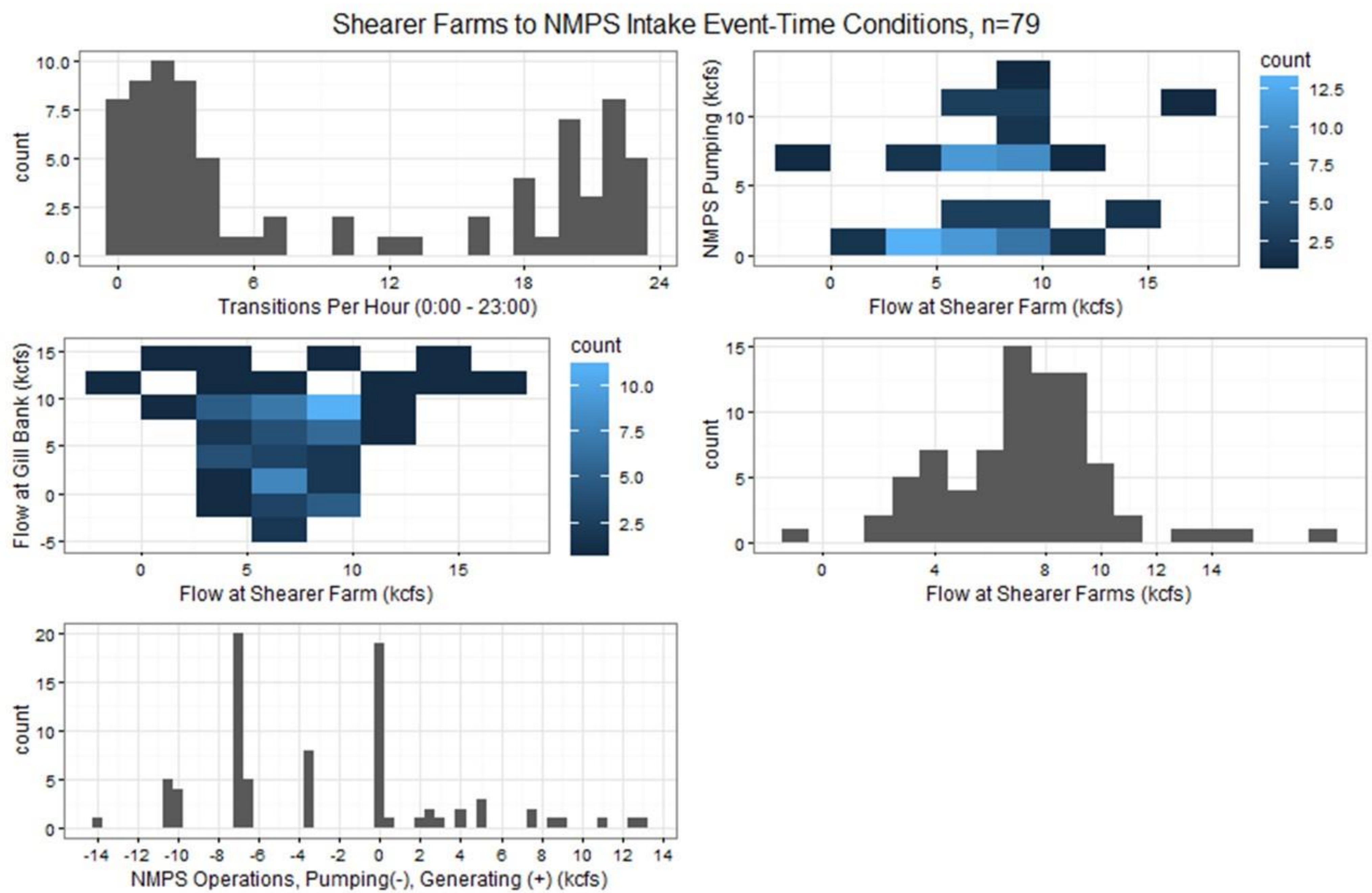


Figure 1: Histograms and plots of the conditions for Eel attracted to NMPS Intake from Shearer Farms (n = 79)

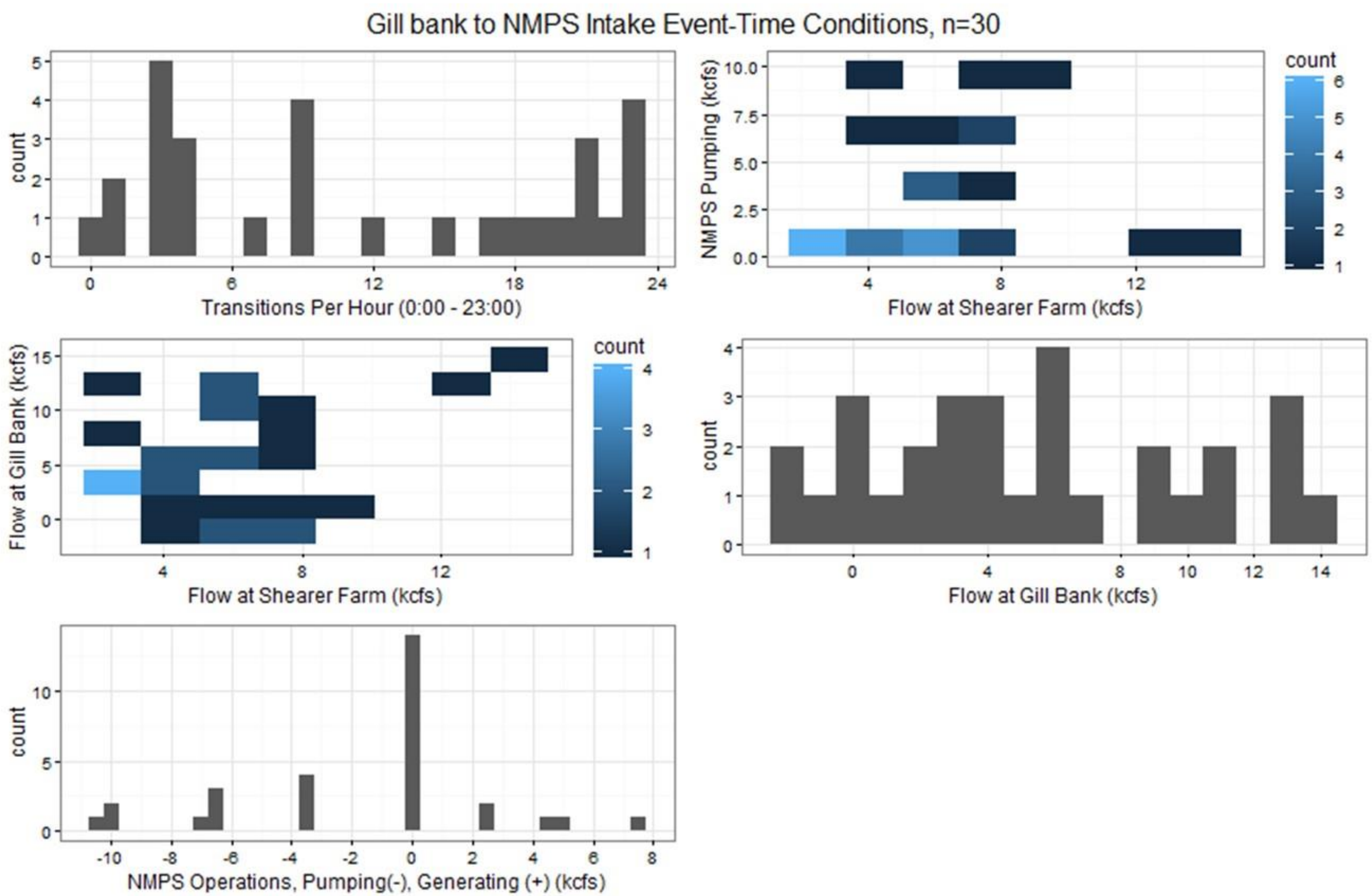


Figure 2: Histograms and plots of the conditions for Eel attracted to NMPS Intake from Gill bank (n = 30)

Attachment F to Study 3.3.5.
Updated counts for Table 4.5-1 representing the number of unique fish in each state.

Table 1: Fish within each TFD route selection reach by cohort

Reach	Release Cohort			
	TransCanada	Upper Impoundment	Lower Impoundment	All Cohorts
Impoundment	38	43	45	126
Canal	29	25	30	84
Bypass	2	7	4	13
Mortality	0	1	1	2
Unknown State	7	10	10	27

Table 2: Time to event in hours and minutes for passage routes available at Turners Falls Dam

Route	Min	25%	Median	75%	Max
Canal	0 h, 2 min	1 h, 17 min	16 h, 22 min	26 h, 11 min	474 h, 18 min
Bypass Reach	0 h, 29 min	3 h, 11 min	15 h, 5 min	20 h, 39 min	233 h, 6 min
Mortality	131 h, 12 min	192 h, 30 min	253 h, 48 min	315 h, 0 min	376 h, 18 min
State Unknown	0 h, 1 min	0 h, 6.13 min	1h, 1 min	30 h, 46 min	514 h, 48 min

Attachment G to Study 3.3.5.
Evaluate Downstream Passage of American Eel (Canal Escapement)

Response:

This response includes the four fates of eel passing downstream through the Cabot Canal; passage through the Cabot Powerhouse, passage through the Cabot sluiceway, passage through Station No.1 or escapement from the canal through an unknown state. Table 1 represents the conditions experienced by the 70 eel that passed through the Cabot Powerhouse. Table 2 is the summary output for several Cox Proportional Hazard regression models and the covariates (Cabot Operations, Number of units running, Rain, cumulative daily rain, cloud cover and sluiceway flow) that statistically describe the conditions during passage via the Cabot Powerhouse.

The two best models incorporated Cabot operations (kcfs) (Model 1) and number of units running at Cabot Station (Model 2). Model 2 had the lowest AIC value (433.5) and the model was highly significant (LR<0.001) and the effect of number of units was also highly significant (p<0.001) (Table 2). The hazard ratio (2.17) suggests that eel are 2.17 times more likely to pass through the Cabot Powerhouse when the number of units running increases. Model 1 incorporated Cabot Operations (kcfs) and the model was highly significant (LR<0.001). The effect of Cabot Operations was also highly significant (p<0.001). The hazard ratio (1.38) suggests that eel are 1.38 times more likely to pass via the Cabot Powerhouse as operations increase.

A series of five histograms and plots were made to visualize some of the conditions experiences by eel in the canal that pass via the Cabot Powerhouse (Figure 1). The upper left plot displays the transitions through the Powerhouse per hour. It is clear that the majority of the eel pass during the nighttime or in the early morning hours. The top right figure is a two dimensional colot plot that displays the operational conditions at Station No.1 and Cabot Station during passage. The lighter blues convey convey the highest counts of eel and can been seen when nothing is happening at Station No.1 and throughout varied operational conditions at Cabot Station. The highest amounts tend to occur when Cabot Station is operating above 5000 cfs. The middle left plot displays the amount of eel passing through the Powerhouse and the associated operations at Cabot. The highest amount of eel (~25) passed through the Powerhouse when Cabot Station was operating between 8000 and 10000 cfs. The middle right plot shows the amount of units running at Cabot Station and the number of eels passing through the Powerhouse. The majority of eels pass through the Powerhouse when 4 units are pumping. The last plot on the lower left is another two dimensional color plot related the operations at Cabot Station and the bypass sluice flow. Eels seem to pass through the Powerhouse when flow is going through the sluiceway right and right around 10000 cfs going through the Powerhouse.

Tables 3 displays the conditions experienced by the 5 eel that escaped the canal via the Sluiceway at Cabot Station. Table 4 displays the conditions experienced by the 3 eel that escaped the canal via Station No. 1. Table 5 displays the conditions experienced by the 5 eel that escaped the canal via an unknown state. There was no further statistical analysis done for the eel that escaped via the sluiceway, Station No.1 or an unknown state because the numbers were so low. The tables should provide enough information experienced by the eel that escaped through these three avenues.

Table 1: Summary of conditions during eel escapement from the canal via the Cabot Powerhouse (n=70)

Frequency and Code	Release Date	Release Location	Date and Time	Cabot U1 (cfs)	Cabot U2 (cfs)	Cabot U3 (cfs)	Cabot U4 (cfs)	Cabot U5 (cfs)	Cabot U6 (cfs)	No1 Station Generation (cfs)	Rain (in)	Cumulative Daily Rain Sum (in)	Cabot Generation (cfs)	Sluice (cfs)
149.740 22	10/27/2015 23:20	Upper Impoundment	11/1/2015 10:35	2241	2298	2289	2196	4	2236	0	0.001	0.02	11265	213
149.760 28	10/26/2015 23:37	Lower Impoundment	10/28/2015 20:44	4	1824	4	2165	2	2272	0	0.06	0.69	6272	189
149.740 23	0/27/2015 23:20	Upper Impoundment	10/28/2015 21:13	2	1787	2	2283	4	2234	0	0.12	0.81	6312	158
149.760 35	10/26/2015 23:37	Lower Impoundment	10/28/2015 21:46	2	1811	2	2291	2	2265	0	0.12	0.81	6374	241
149.740 24	10/27/2015 23:07	Lower Impoundment	10/28/2015 18:48	2	1833	2	2273	2	2232	0	0.07	0.63	6345	202
149.740 38	10/27/2015 23:07	Lower Impoundment	10/28/2015 20:13	2205	2223	12	2201		2234	2153	0.01	0.89	8866	214
149.740 26	10/27/2015 23:07	Lower Impoundment	10/29/2015 7:16	2238	2227	42	2221		2223	2160	0	0.89	8903	210
149.740 55	10/28/2015 22:49	Lower Impoundment	10/29/2015 19:05	2238	2227	42	2221		2223	2160	0	0.89	8903	210
149.760 39	10/27/2015 23:20	Upper Impoundment	10/29/2015 19:08	2238	2227	42	2221		2223	2160	0	0.89	8903	210
149.760 50	10/28/2015 22:49	Lower Impoundment	10/29/2015 19:30	2245	2238	43	2247		2203	2164	0	0.89	8928	221
149.740 29	10/27/2015 23:07	Lower Impoundment	10/31/2015 20:02	2287	2280	2256	2223	2205	2176	0	0	0	13428	218
149.740 30	10/27/2015 23:20	Upper Impoundment	10/29/2015 21:12	2234	2229	43	2238		2241	2160	0	0.89	8937	216
150.340 101	10/27/2015 17:45	Vernon	10/28/2015 23:09	2	1767	2	2272	2	2243	0	0.23	0.32	6288	231
149.740 48	10/28/2015 23:16	Upper Impoundment	10/29/2015 4:12	4	1791	4	2278	4	2238	0	0.001	0.87	6321	221
149.760 51	10/28/2015 22:49	Lower Impoundment	10/29/2015 5:04	4	1784	4	2272	4	2221	0	0.01	0.88	6290	214
149.740 41	10/27/2015 23:20	Upper Impoundment	11/4/2015 18:56	2283	2316	2	2	2229	2238	0	0	0	9071	211
149.740 70	11/2/2015 22:40	Lower Impoundment	11/4/2015 18:30	2289	2318	4	4	2247	2247	0	0	0	9111	216
150.360 165	10/31/2015 13:40	Vernon	11/4/2015 18:19	2289	2318	4	4	2247	2247	0	0	0	9111	216
149.740 44	10/28/2015 22:49	Lower Impoundment	11/2/2015 19:23	2247	2245	2241	2263	2196	2128	0	0	0	13319	213
149.740 46	10/28/2015 22:49	Lower Impoundment	11/3/2015 0:23	2303	2327	2	2	4	2199	0	0	0	6837	204
149.740 49	10/28/2015 22:49	Lower Impoundment	11/12/2015 11:14	2280	1827	4	4	2296	2223	0	0.01	0.01	8635	212
150.380 112	11/3/2015 16:45	BellowsFalls	11/9/2015 19:27	4	2334	4	2	2	2296	0	0	0	4643	227
149.740 54	10/28/2015 22:49	Lower Impoundment	10/30/2015 19:20	2	2274	2272	2221	4	2283	0	0	0	9055	223
149.740 60	11/2/2015 23:05	Upper Impoundment	11/4/2015 15:44	4	2280	2	2	2316	2322	0	0	0	6928	215
149.740 62	11/2/2015 23:05	Upper Impoundment	11/27/2015 16:33	2280	2303	2280	0	2280	2236	0	0	0.19	11380	0

Frequency and Code	Release Date	Release Location	Date and Time	Cabot U1 (cfs)	Cabot U2 (cfs)	Cabot U3 (cfs)	Cabot U4 (cfs)	Cabot U5 (cfs)	Cabot U6 (cfs)	No1 Station Generation (cfs)	Rain (in)	Cumulative Daily Rain Sum (in)	Cabot Generation (cfs)	Sluice (cfs)
149.760 67	11/2/2015 23:05	Upper Impoundment	11/6/2015 18:23	4	2327	2	2	2	2267	0	0	0.01	4605	212
149.740 67	11/2/2015 22:40	Lower Impoundment	11/6/2015 21:33	2249	2245	4	4	4	2218	0	0	0	6726	218
149.740 71	11/2/2015 23:05	Upper Impoundment	11/3/2015 21:54	2	2196	2316	2238	2267	2283	0	0	0	11302	192
149.740 81	11/4/2015 23:02	Upper Impoundment	11/5/2015 21:51	2296	2340	2	2	2	2314	0	0	0	6956	197
149.740 72	11/2/2015 23:05	Upper Impoundment	11/5/2015 21:43	2316	2256	2	2	2	2314	0	0	0	6892	215
149.740 75	11/3/2015 23:05	Upper Impoundment	11/7/2015 13:50	2236	2263	2269	2	2	2	0	0	0	6775	215
149.740 76	11/3/2015 23:05	Upper Impoundment	11/5/2015 23:15	2305	2229	2	2	4	2318	0	0	0	6861	212
149.740 78	11/3/2015 23:05	Upper Impoundment	11/14/2015 21:08	2272	2300	4	2272	2236	2234	0	0	0.001	11318	219
149.760 43	10/28/2015 23:16	Upper Impoundment	11/14/2015 20:20	2265	2291	2	2256	2238	2234	0	0	0.001	11287	217
149.740 82	11/4/2015 23:02	Upper Impoundment	11/8/2015 22:35	2280	2265	2	2285	2	2265	2079	0	0	9100	219
149.740 84	11/4/2015 23:02	Upper Impoundment	11/12/2015 19:12	2289	2108	2	2	2187	2229	0	0.001	0.05	8818	222
150.340 129	11/3/2015 17:32	Wilder	11/12/2015 19:03	2289	2108	2	2	2187	2229	0	0.001	0.05	8818	222
149.760 23	10/26/2015 23:37	Lower Impoundment	10/29/2015 1:35	2	2260	2258	2223	2	2272	0	0	0	9018	221
149.760 46	10/28/2015 23:16	Upper Impoundment	10/30/2015 18:28	4	2287	2276	2236	4	2294	0	0	0	9102	215
149.760 27	10/26/2015 23:37	Lower Impoundment	10/27/2015 2:22	2	1959	2	2	4	3053	0	0	0	5023	217
149.760 32	10/26/2015 23:37	Lower Impoundment	10/27/2015 3:26	4	2353	2	2	4	2342	0	0	0	4709	208
149.760 34	10/26/2015 23:37	Lower Impoundment	11/14/2015 23:43	2256	2283	2	2238	2221	2227	0	0	0	11227	209
149.760 72	11/2/2015 22:40	Lower Impoundment	11/8/2015 21:21	2287	2252	4	2289	2	2280	2067	0	0	9115	218
150.340 143	10/29/2015 17:52	BellowsFalls	11/8/2015 20:43	2287	2252	4	2289	2	2280	2067	0	0	9115	218
150.380 118	10/27/2015 18:20	BellowsFalls	11/9/2015 20:13	4	2276	2	2	2	2269	0	0	0	4556	199
149.760 64	11/2/2015 22:40	Lower Impoundment	11/8/2015 4:06	2254	2311	4	4	2276	2316	0	0.001	0.001	9166	225
149.760 68	11/2/2015 23:05	Upper Impoundment	11/11/2015 19:16	2241	2287	4	2283	2314	2196	0	0.02	0.34	11325	216
150.340 54	10/31/2015 18:05	BellowsFalls	11/11/2015 23:51	2336	2320	4	4	2	2258	0	0	0.001	6925	226
150.340 173	10/31/2015 18:22	BellowsFalls	11/12/2015 16:54	2294	2130	2	2	2199	2234	0	0	0.05	8860	221
150.380 152	11/5/2015 17:05	Wilder	11/12/2015 20:11	2285	2101	2	2	2285	2187	0	0.001	0.05	8863	217
150.380 102	11/3/2015 15:55	Vernon	11/13/2015 3:13	2291	2236	2	2183	4	2252	0	0	0.01	8969	208

Frequency and Code	Release Date	Release Location	Date and Time	Cabot U1 (cfs)	Cabot U2 (cfs)	Cabot U3 (cfs)	Cabot U4 (cfs)	Cabot U5 (cfs)	Cabot U6 (cfs)	No1 Station Generation (cfs)	Rain (in)	Cumulative Daily Rain Sum (in)	Cabot Generation (cfs)	Sluice (cfs)
150.360 140	11/5/2015 15:35	Vernon	11/13/2015 21:33	2289	2243	2	2289	2	2247	0	0	0.01	9073	207
149.760 44	10/28/2015 23:16	Upper Impoundment	11/7/2015 18:09	2252	2287	2	2234	2227	2234	0	0	0	11236	205
150.340 153	10/29/2015 18:43	Wilder	11/3/2015 19:58	2298	2300	2287	2305	2265	2296	0	0	0	13751	213
150.340 134	10/29/2015 13:05	Vernon	11/3/2015 20:17	2296	2303	2289	2379	2288	2322	0	0	0	13878	220
150.360 53	10/31/2015 18:05	BellowsFalls	11/3/2015 22:44	4	2252	2340	2283	2291	2316	0	0	0	11486	229
149.760 63	11/2/2015 23:05	Upper Impoundment	11/4/2015 1:51	4	2291	4	2	2	2	0	0	0	2307	214
150.360 164	10/31/2015 13:40	Vernon	11/4/2015 1:17	4	2296	2	2	2	2	0	0	0	2309	206
150.360 51	10/31/2015 18:05	BellowsFalls	11/4/2015 20:14	2291	2336	4	4	2243	2247	0	0	0	9126	209
149.760 61	11/2/2015 22:40	Lower Impoundment	11/4/2015 21:59	2316	2365	4	4	2285	2272	0	0	0	9246	220
149.760 60	11/2/2015 22:40	Lower Impoundment	11/5/2015 17:40	2254	2256	2278	2274	4	2285	0	0	0	11351	171
149.760 82	11/4/2015 23:02	Upper Impoundment	11/5/2015 18:13	2269	2272	2291	2272	2	2269	0	0	0	11376	175
150.340 181	10/31/2015 19:21	Wilder	11/5/2015 19:04	2267	2283	2289	2269	2	2283	0	0	0	11393	200
149.760 83	11/4/2015 23:02	Upper Impoundment	11/5/2015 19:31	2289	2296	2314	2294	2	2294	0	0	0	11488	244
150.380 149	10/29/2015 17:52	BellowsFalls	11/5/2015 19:53	2283	2274	2300	2276	2	2258	0	0	0	11393	213
149.760 62	11/2/2015 22:40	Lower Impoundment	11/15/2015 23:31	2276	2267	2276	2	2170	2254	0	0	0	11245	208
150.340 150	11/5/2015 16:20	BellowsFalls	11/23/2015 21:17	2245	2287	2128	2247	2232	2205	0	0	0	13344	225
150.340 161	10/31/2015 13:40	Vernon	11/17/2015 19:33	2269	2329	2216	4	2223	2267	0	0	0	11309	224
150.360 139	11/5/2015 15:35	Vernon	11/29/2015 1:20	0	2303	0	0	0	2369	0	0	0	4672	0
150.380 110	10/27/2015 17:45	Vernon	10/31/2015 19:20	2291	2285	2263	2229	2218	2183	0	0	0	13470	195

Table 2: Cox Proportional Hazard Regression model outputs for Eel escapement from the canal via the Cabot Powerhouse (n=70)

Model Number	Covariates	AIC	LR Test	Hazard Ratio	SE	P	(+/-)
1	Cabot Operations (kcfs)	434.8	3.2e-11	1.38	0.05	5.86e-10	(1.25,1.53)
2	Number of Units	433.5	1.66e-11	2.17	0.12	3.48e-10	(1.7,2.76)
3	Rain (in)	478.76	0.77	0.39	3.37	0.78	(0.0005,286.8)
4	Cumulative Daily Rain (in)	478.72	0.72	1.15	0.39	0.72	(0.54,2.47)
5	Cloud Cover	477.46	0.24	0.70	0.3	0.24	(0.39,1.26)
6	Sluiceway flow (kcfs)	478.74	0.74	2.62	3.01	0.75	(0.01,950.2)

Table 3: Summary of conditions during eel escapement from the canal via the Cabot Sluiceway (n=5)

Frequency and Code	Release Date and Time	Release Location	Date and Time	Cabot U1 (cfs)	Cabot U2 (cfs)	Cabot U3 (cfs)	Cabot U4 (cfs)	Cabot U5 (cfs)	Cabot U6 (cfs)	No1 Station Generation (cfs)	Flow Over Sluice Gate (cfs)	Rain (in)	Cabot Generation (cfs)
149.740 42	10/28/2015 22:49	Lower Impoundmnet	10/29/2015 20:45	2236	2238	43	2247	-49	2218	2171	214	0	8934
150.380 124	11/3/2015 17:32	Wilder	11/8/2015 22:19	2272	2234	2	2260	4	2285	2079	221	0	9057
149.760 58	11/2/2015 22:40	Lower Impoundment	11/3/2015 3:56	2172	2329	2296	2	2	2	2160	221	0	6804
150.360 176	10/31/2015 18:22	Bellows Falls	11/3/2015 2:56	4	2252	4	2	2	2148	0	211	0	4412
150.360 184	10/31/2015 19:21	Wilder	11/6/2015 0:33	2305	2236	2	2	2	2307	0	204	0	6855

Table 4: Summary of conditions during eel escapement from the canal via Station No.1 (n=3)

Frequency and Code	Release Date and Time	Release Location	Date and Time	Cabot U1 (cfs)	Cabot U2 (cfs)	Cabot U3 (cfs)	Cabot U4 (cfs)	Cabot U5 (cfs)	Cabot U6 (cfs)	No1 Station Generation (cfs)	Flow Over Sluice Gate (cfs)	Rain (in)	Cabot Generation (cfs)
149.760 25	10/26/2015 23:37	Lower Impoundment	10/29/2015 18:05	2243	2229	40	2234	-45	2225	2160	223	0	8926
150.380 113	11/3/2015 16:45	Bellows Falls	11/7/2015 19:08	2170	2329	2307	4	2	2	2160	208	0	6815
150.340 112	10/27/2015 18:20	Bellows Falls	11/8/2015 13:59	2	2	2	2	2	2	2093	212	0	13

Table 5: Summary of conditions during eel escapement from the canal to an unknown state (n=5)

Frequency and Code	Release Date and Time	Release Location	Date and Time	Cabot U1 (cfs)	Cabot U2 (cfs)	Cabot U3 (cfs)	Cabot U4 (cfs)	Cabot U5 (cfs)	Cabot U6 (cfs)	No1 Station Generation (cfs)	Flow Over Sluice Gate (cfs)	Rain (in)	Cabot Generation (cfs)
149.740 51	10/28/2015 22:49	Lower Impoundment	11/9/2015 19:48	4	2291	2	2	2	2263	0	198	0	4565
149.740 52	10/28/2015 22:49	Lower Impoundment	11/14/2015 19:02	2256	2283	2	2243	2227	2229	0	214	0	11240
149.740 64	11/2/2015 22:40	Lower Impoundment	11/5/2015 21:28	2331	2331	2	2	4	2327	0	213	0	6998
149.740 83	11/4/2015 23:02	Upper Impoundment	11/8/2015 21:59	2272	2229	2	2276	2	2276	2079	211	0	9057
150.380 188	10/31/2015 19:21	Wilder	11/7/2015 20:28	2174	2340	2309	4	2	2	2167	219	0	6832

Table 6: Summary of time to various passage routes in hours and minutes.

Route	Min	25%	Median	75%	Max
Powerhouse	0 h, 0.07 min	0 h, 41.13 min	0 h, 52.2 min,	1 h, 14.04 min	175 h, 36 min
Sluiceway	0 h , 42 min	0 h, 44 min	0 h, 54 min	1 h, 12.2 min	112 h, 54 min
Station Number 1	0 h, 2.72 min	0 h, 16.1 min	0 h, 30 min	0 h, 31 min	0 h, 32 min
Unknown	0 h, 0.7 min	0 h, 1.2 min	0 h, 1.2 min	0 h, 1.2 min	0 h, 2.02 min

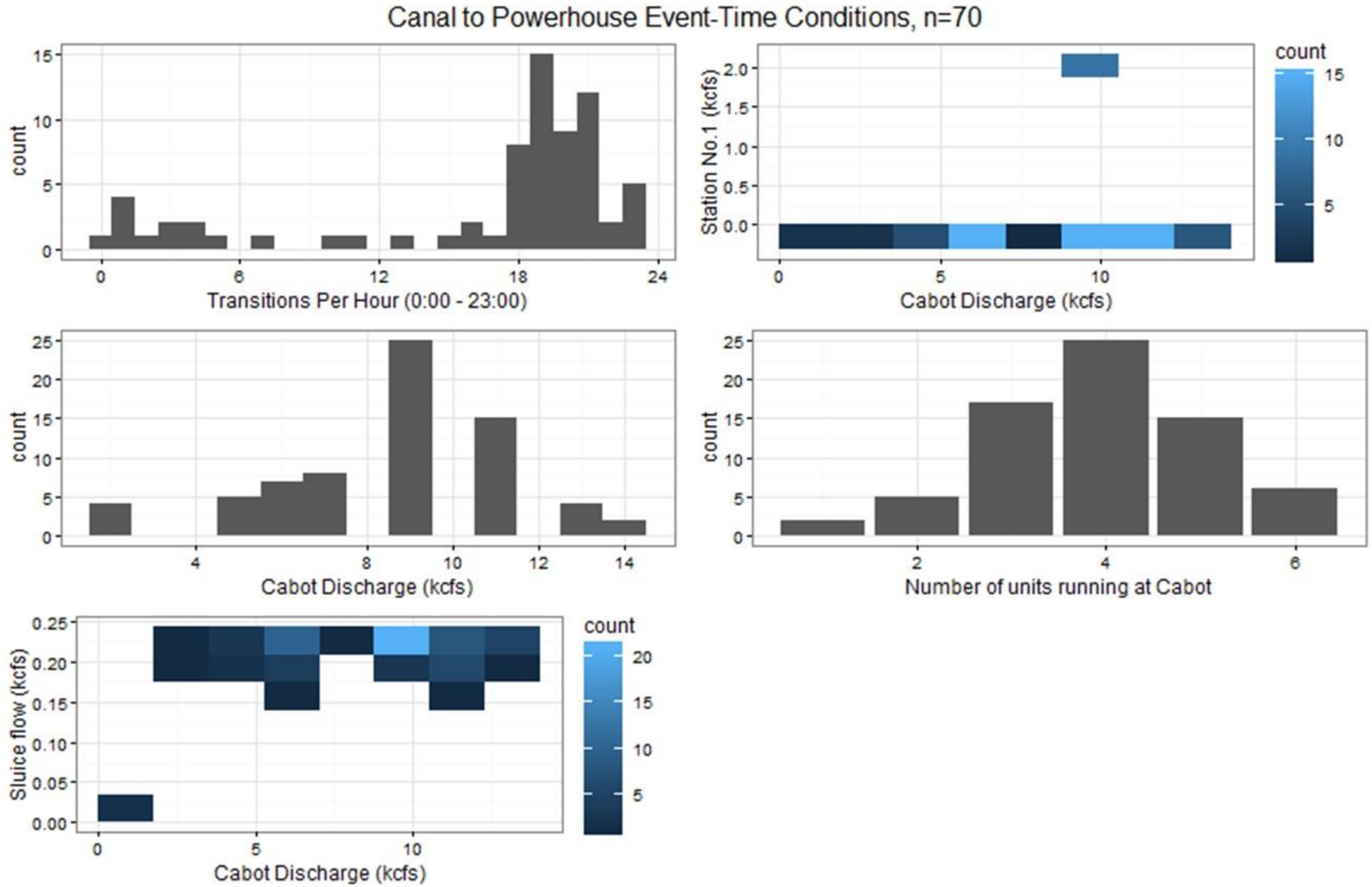
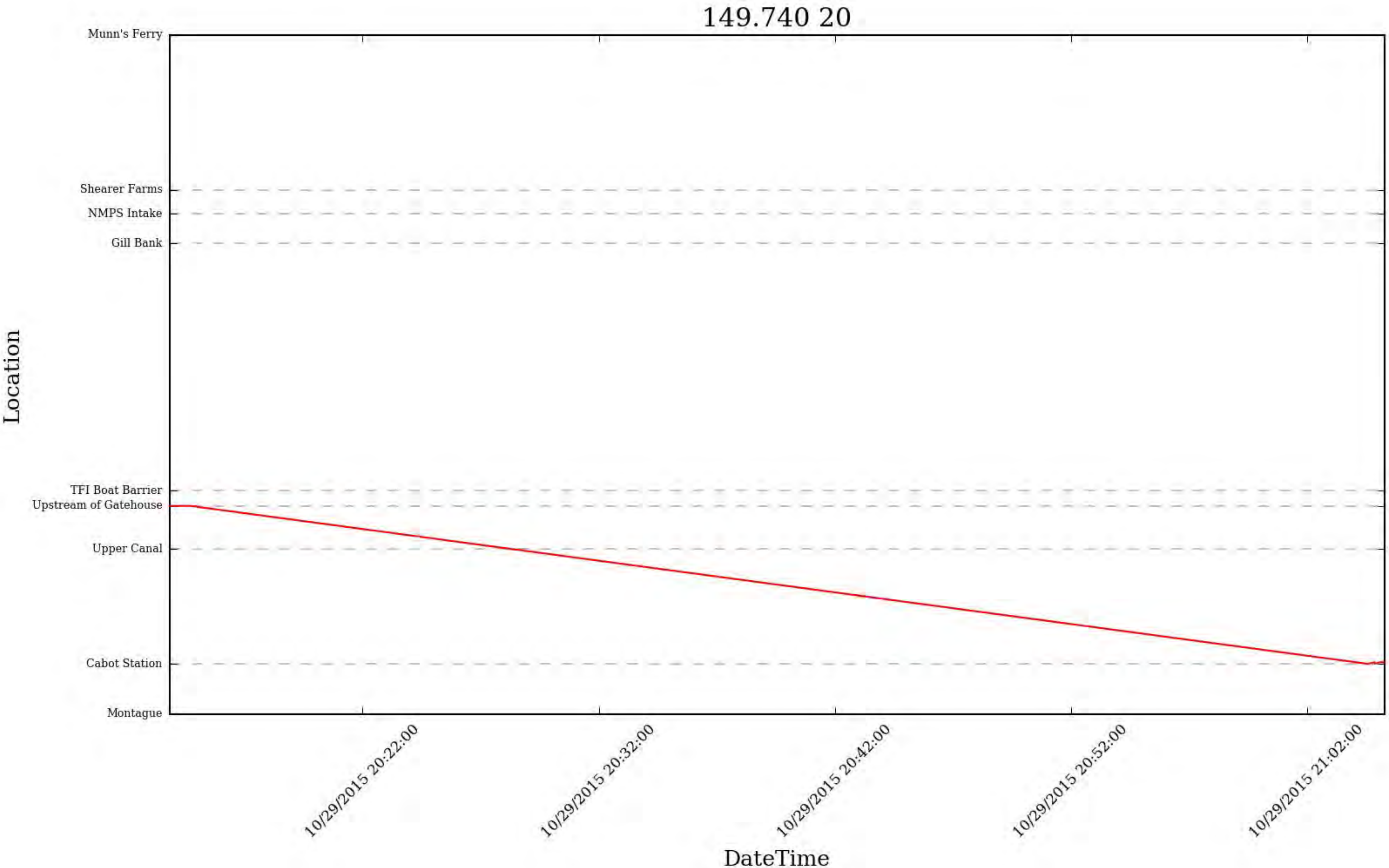
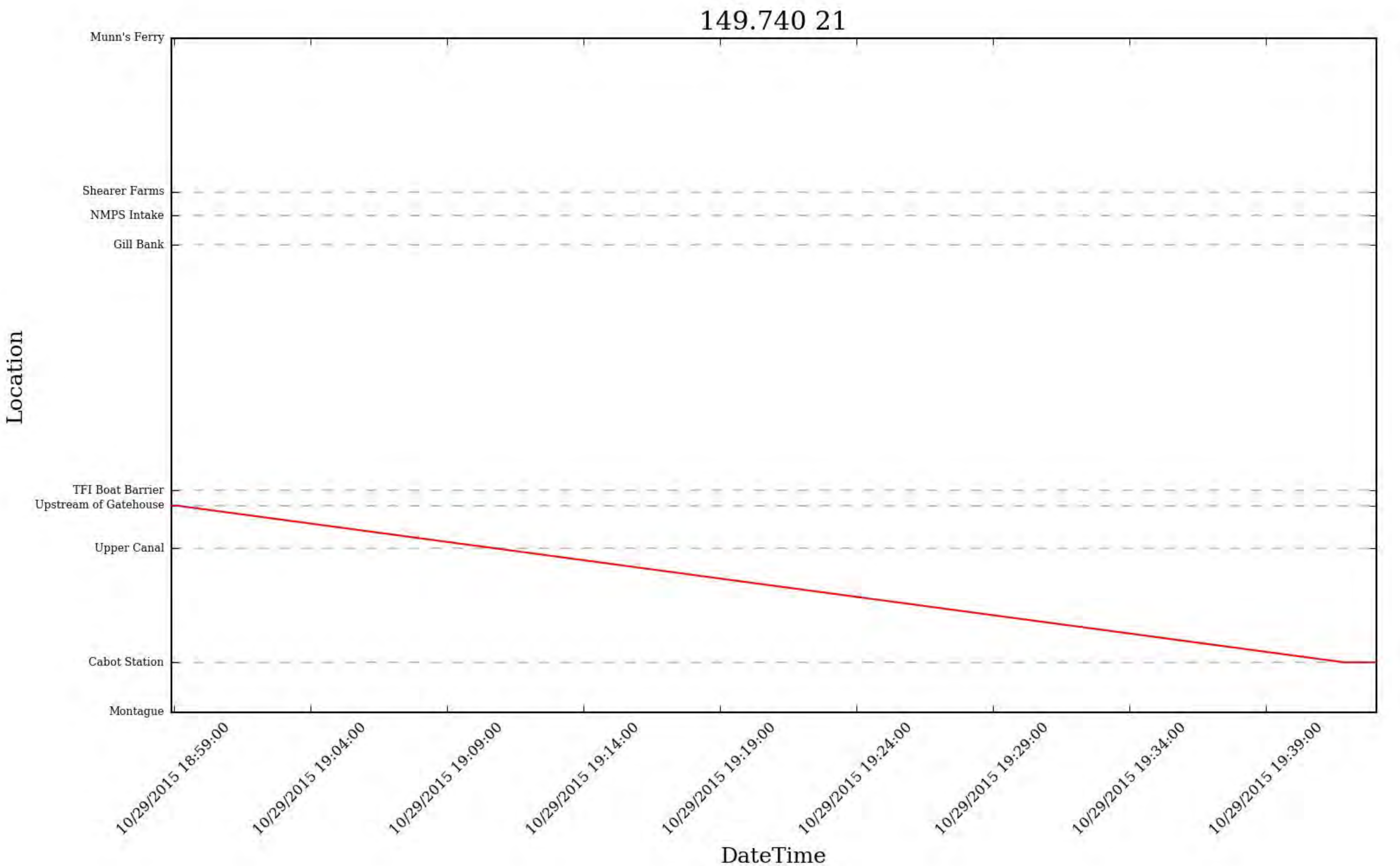


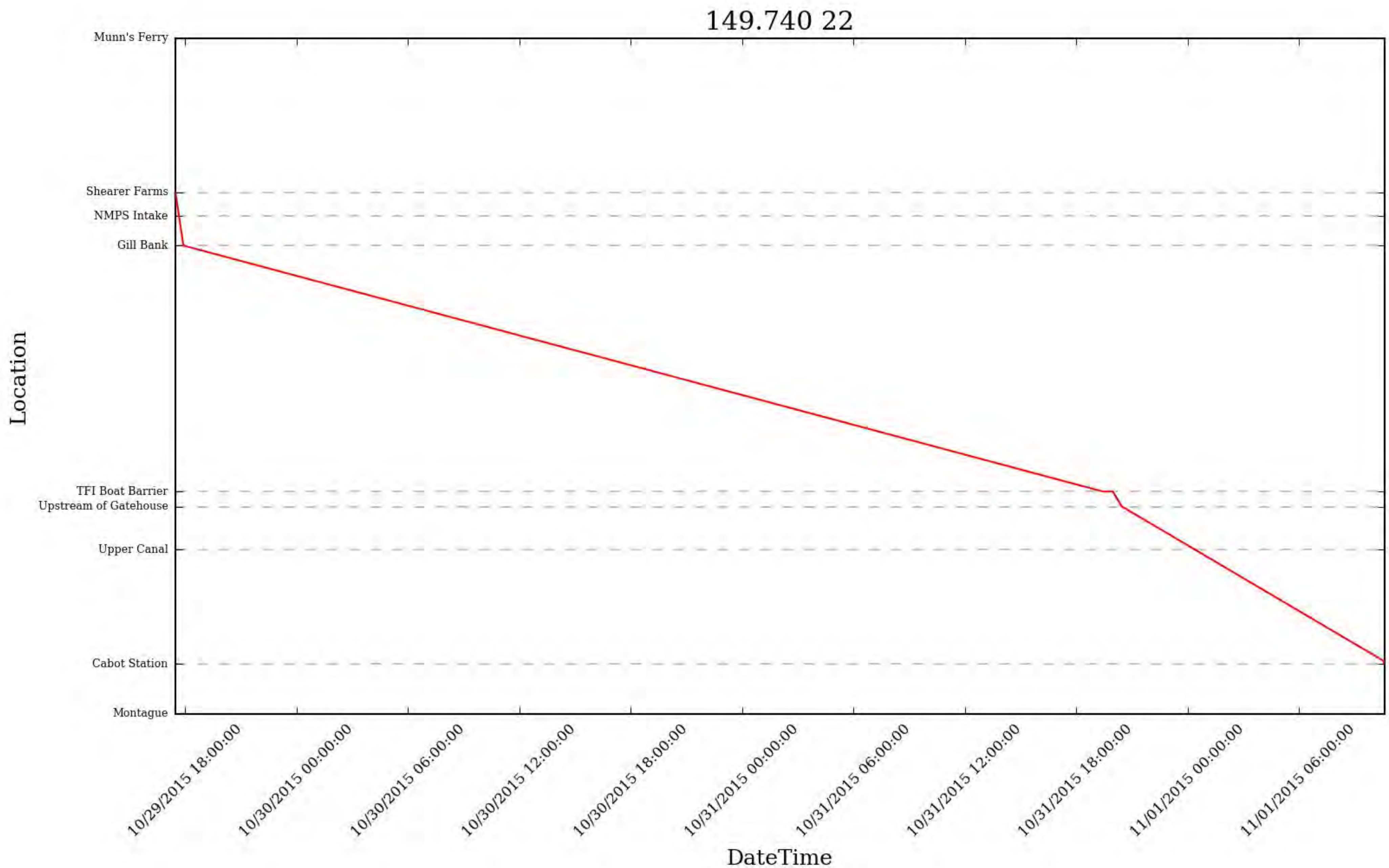
Figure 1: Conditions experienced by eel passing via Cabot Powerhouse

Attachment H to Study 3.3.5.
2D plots


149.740 20
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
10/29/2015 20:22:00
10/29/2015 20:32:00
10/29/2015 20:42:00
10/29/2015 20:52:00
10/29/2015 21:02:00
DateTime



149.740 21
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
10/29/2015 18:59:00
10/29/2015 19:04:00
10/29/2015 19:09:00
10/29/2015 19:14:00
10/29/2015 19:19:00
10/29/2015 19:24:00
10/29/2015 19:29:00
10/29/2015 19:34:00
10/29/2015 19:39:00
DateTime



149.740 22
Location
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
10/29/2015 18:00:00
10/30/2015 00:00:00
10/30/2015 06:00:00
10/30/2015 12:00:00
10/30/2015 18:00:00
10/31/2015 00:00:00
10/31/2015 06:00:00
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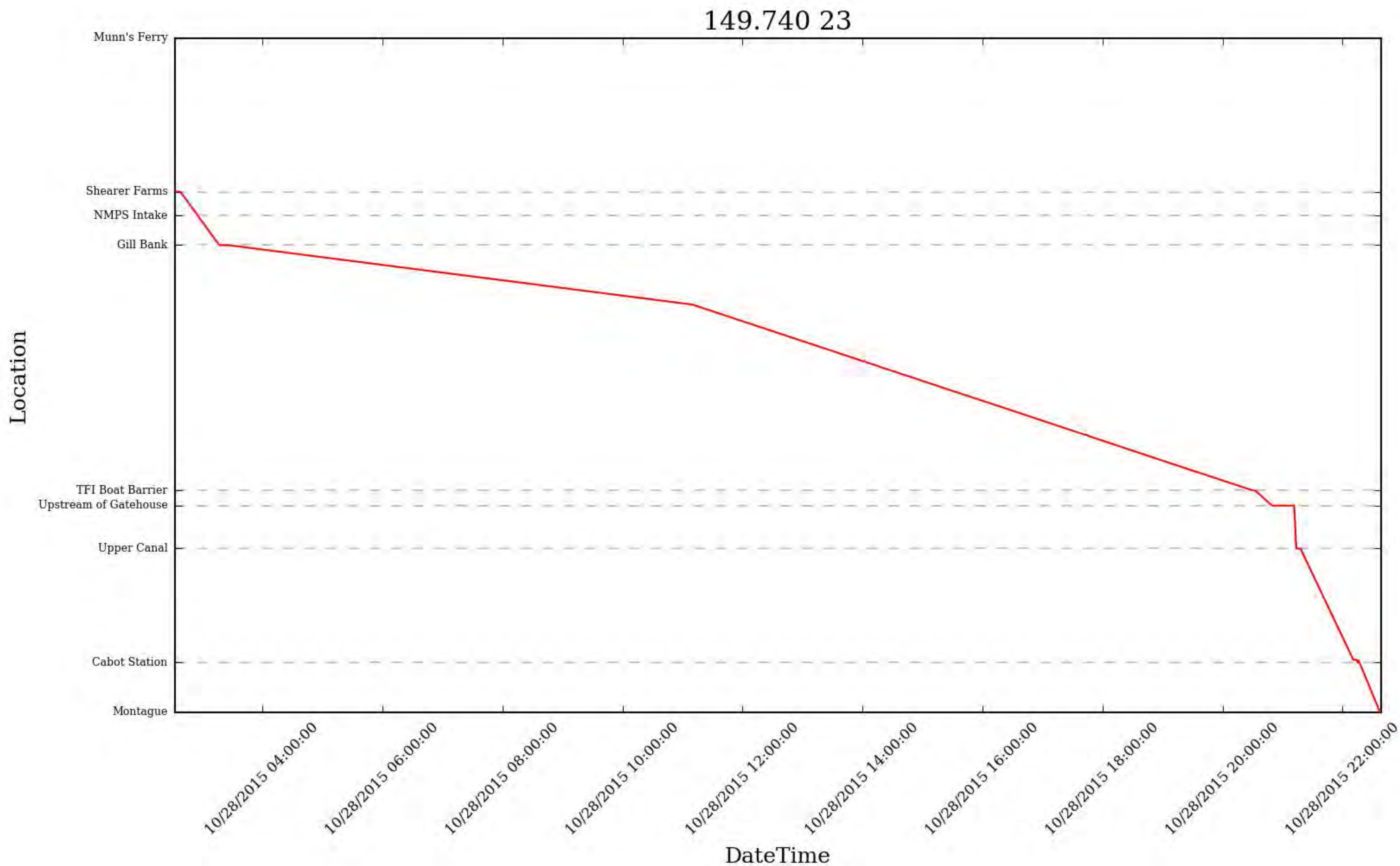
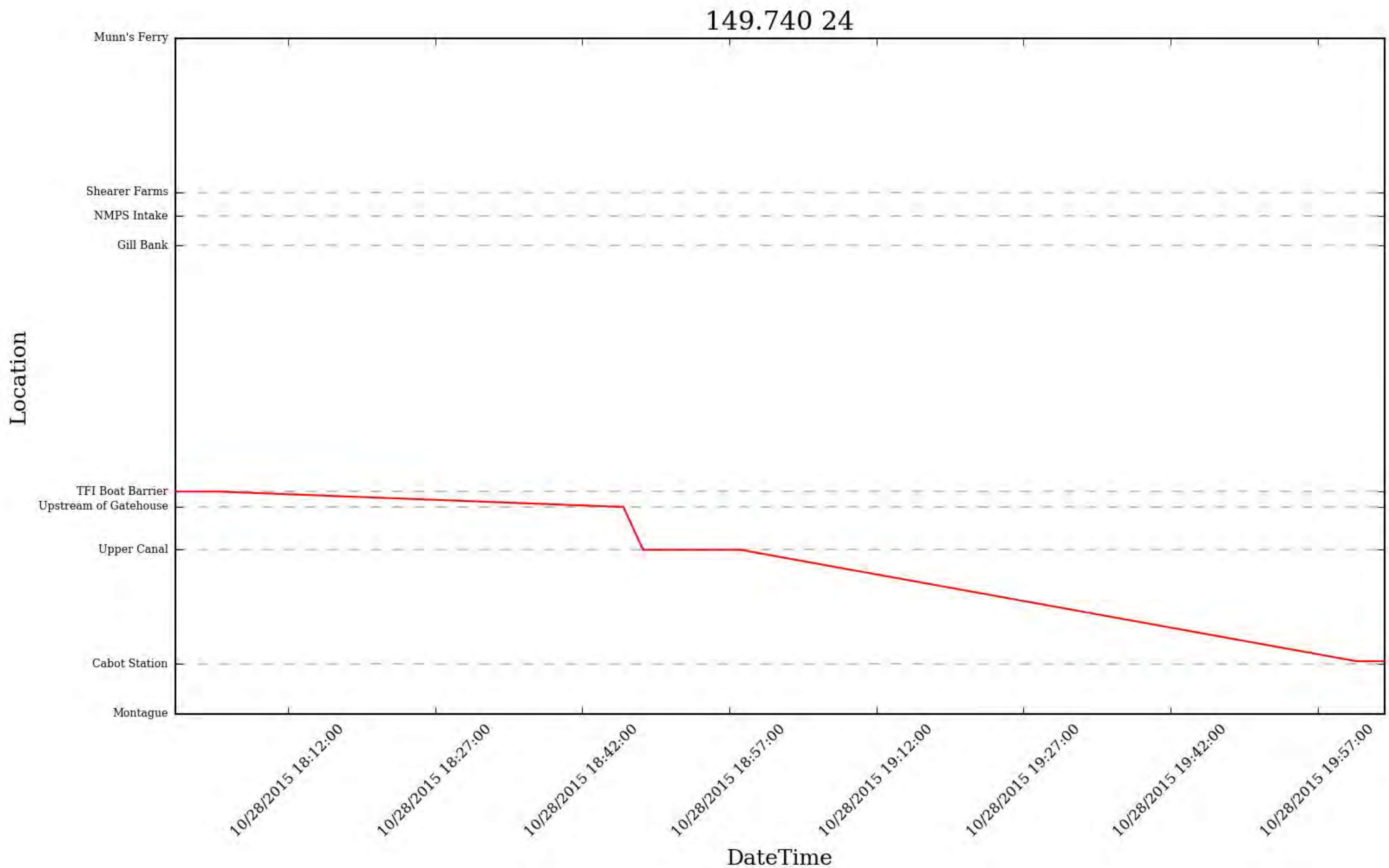
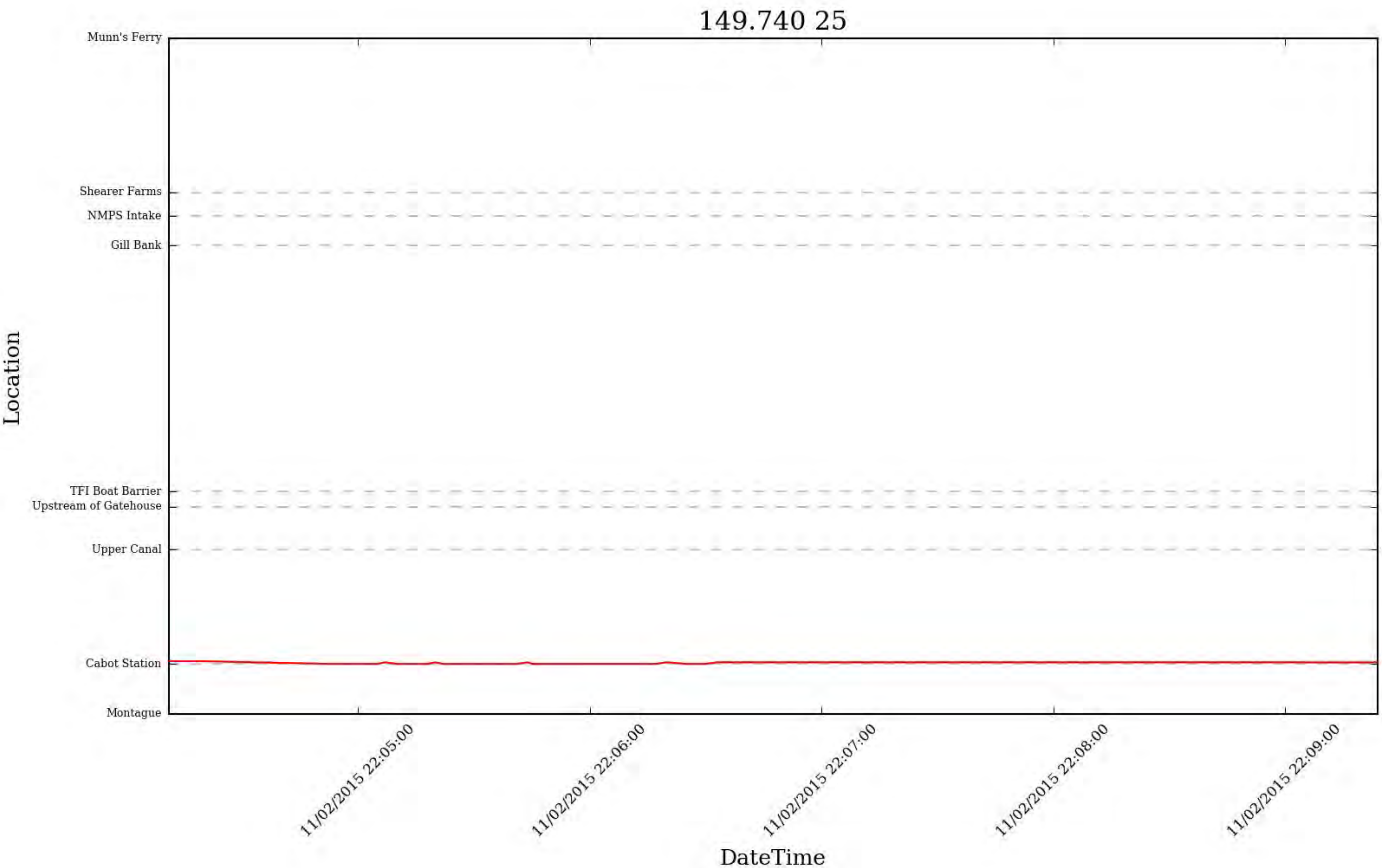
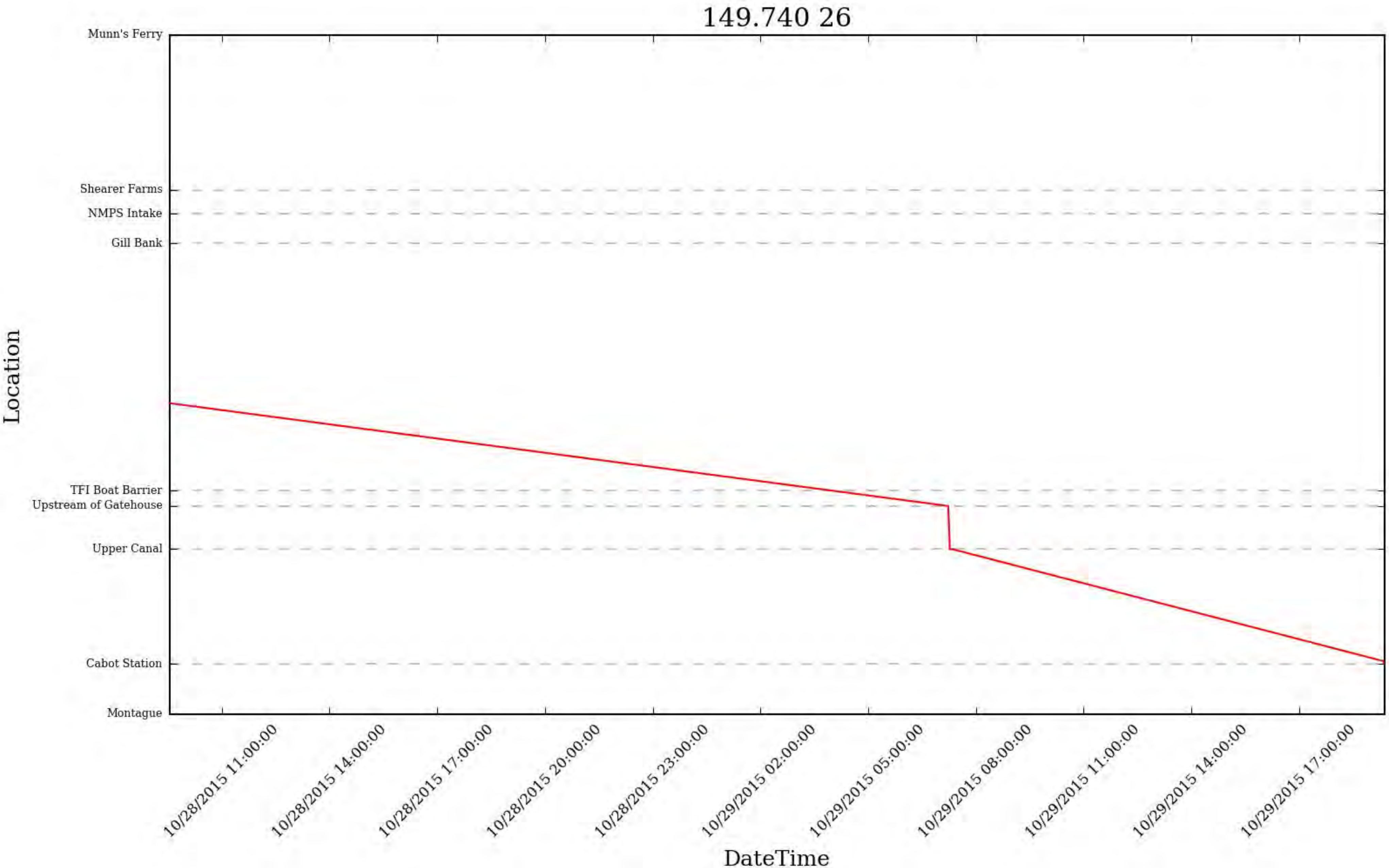
10/31/2015 18:00:00
11/01/2015 00:00:00
11/01/2015 06:00:00
DateTime



149.740 23
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
10/28/2015 04:00:00
10/28/2015 06:00:00
10/28/2015 08:00:00
10/28/2015 10:00:00
10/28/2015 12:00:00
10/28/2015 14:00:00
10/28/2015 16:00:00
10/28/2015 18:00:00
10/28/2015 20:00:00
10/28/2015 22:00:00
DateTime


149.740 24
Location
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
10/28/2015 18:12:00
10/28/2015 18:27:00
10/28/2015 18:42:00
10/28/2015 18:57:00
10/28/2015 19:12:00
10/28/2015 19:27:00
10/28/2015 19:42:00
10/28/2015 19:57:00
DateTime


149.740 25
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/02/2015 22:05:00
11/02/2015 22:06:00
11/02/2015 22:07:00
11/02/2015 22:08:00
11/02/2015 22:09:00
DateTime



149.740 26
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
Location
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
10/28/2015 11:00:00
10/28/2015 14:00:00
10/28/2015 17:00:00
10/28/2015 20:00:00
10/28/2015 23:00:00
10/29/2015 02:00:00
10/29/2015 05:00:00
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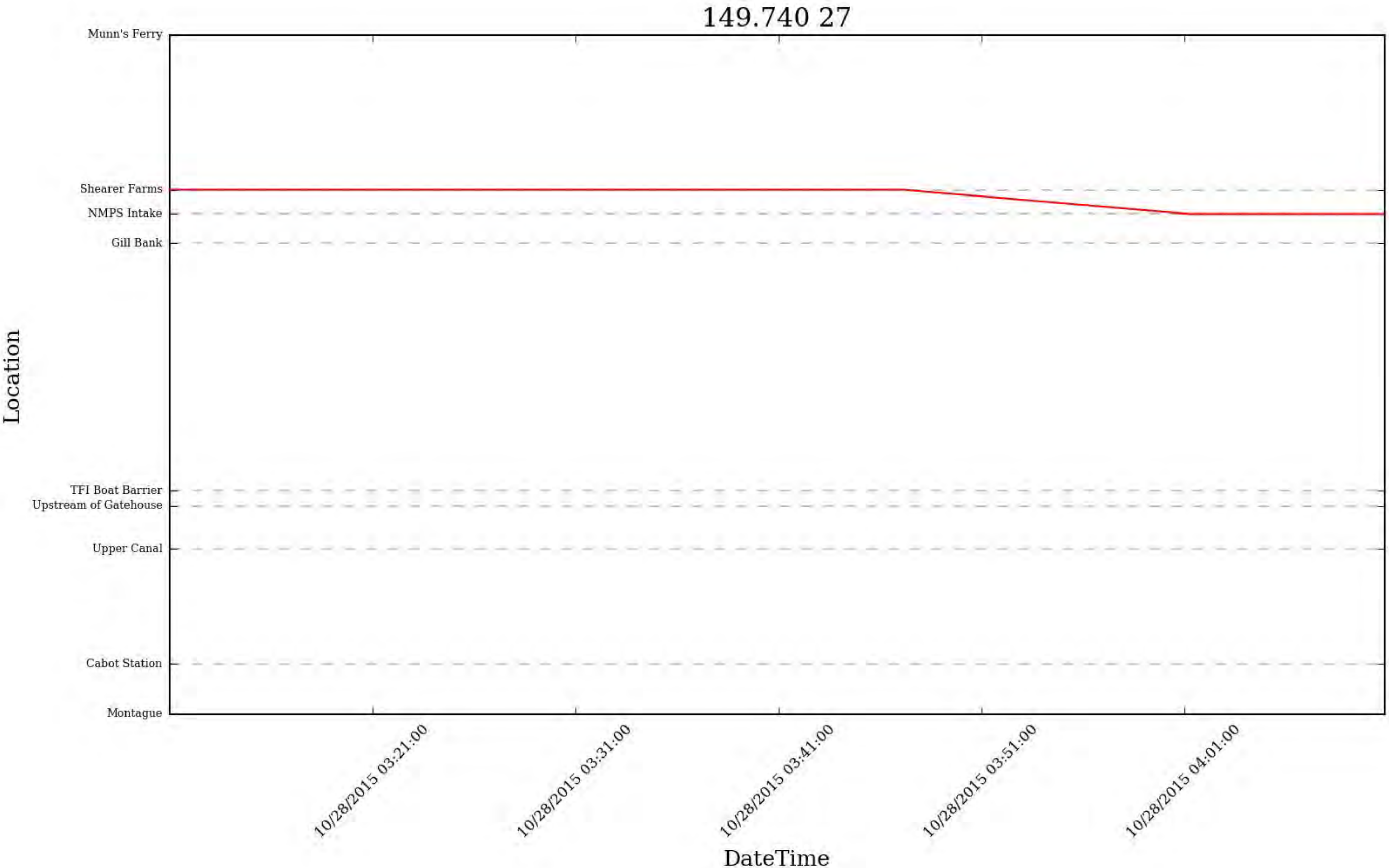
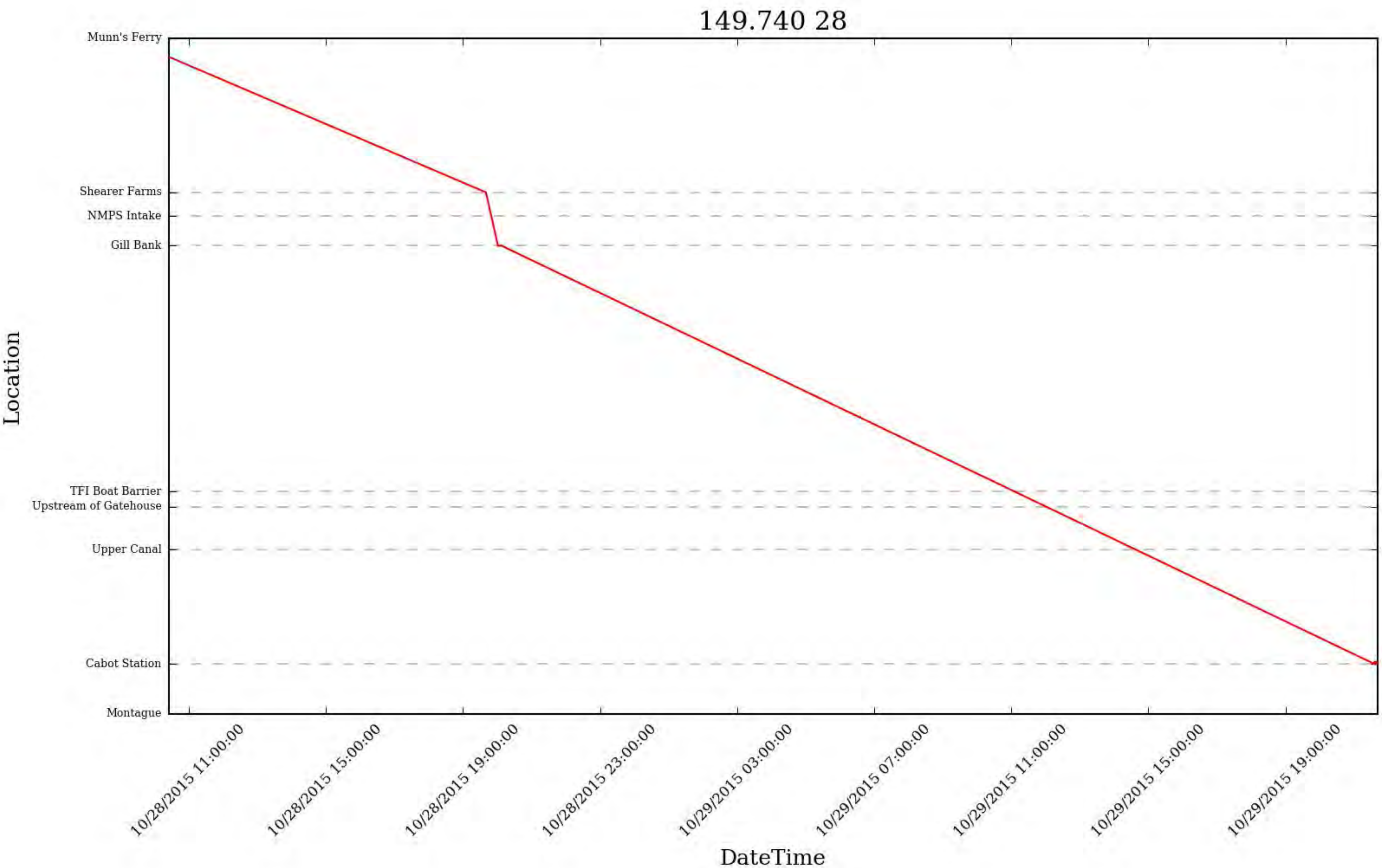
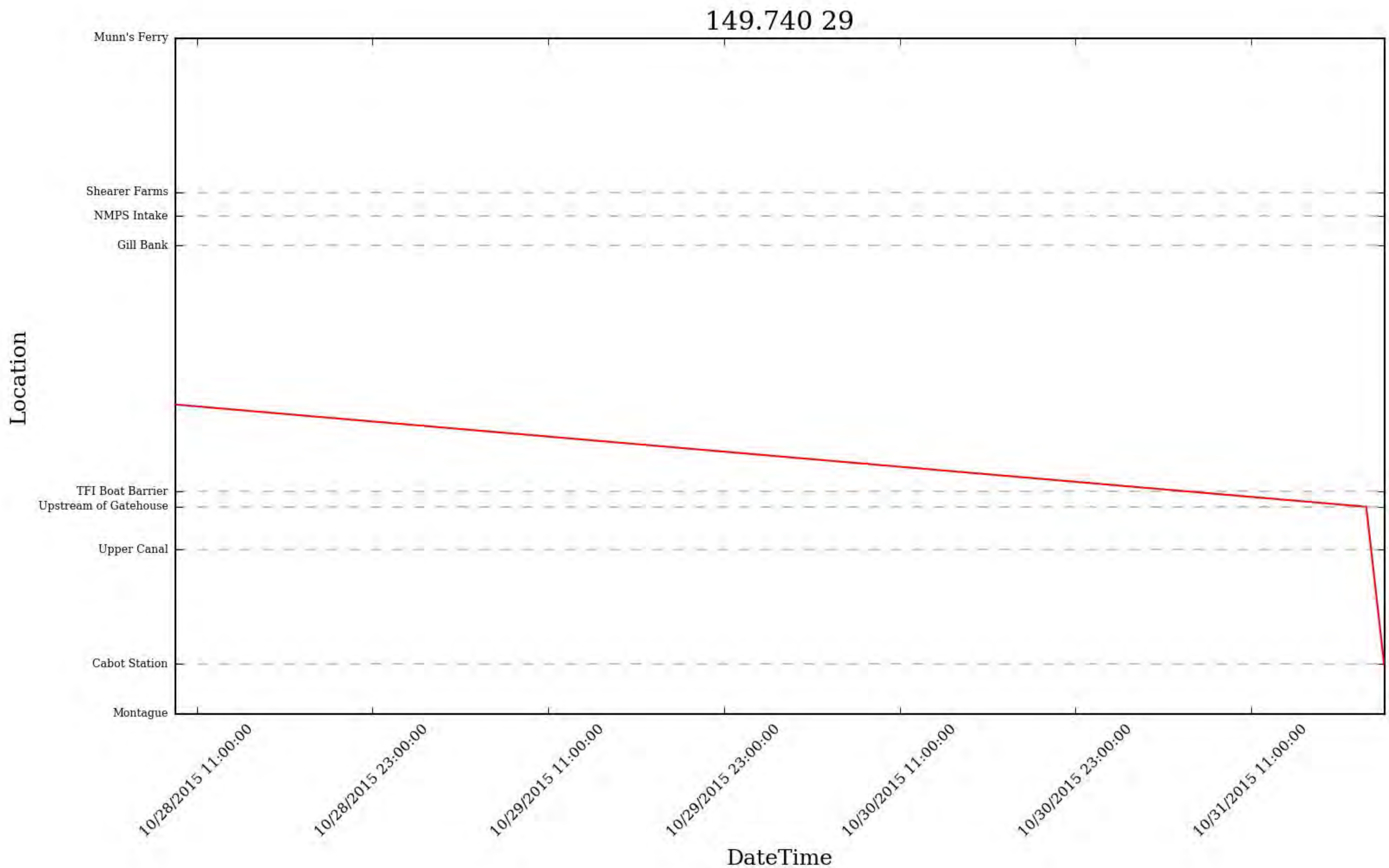
10/29/2015 14:00:00
10/29/2015 17:00:00
DateTime



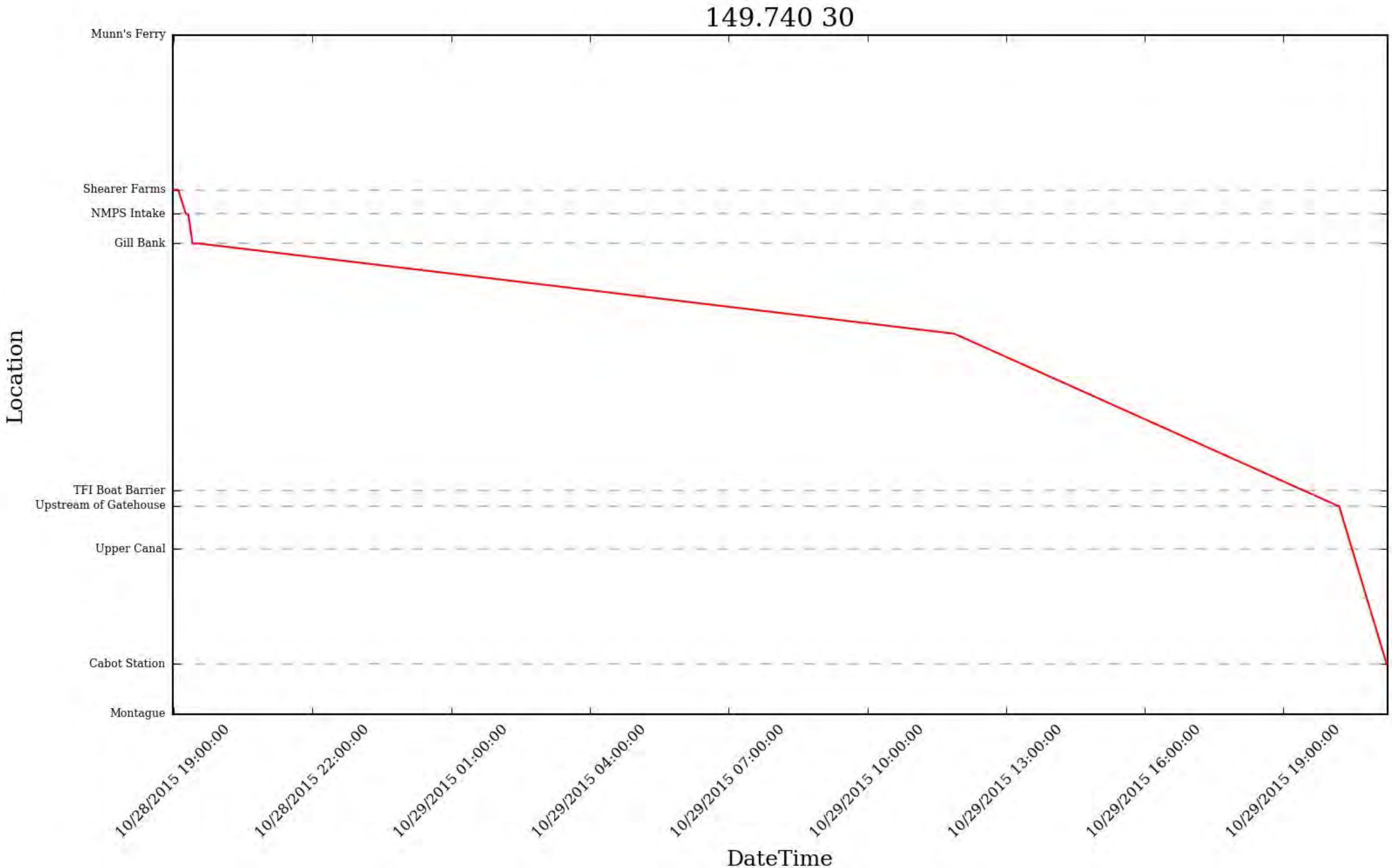
149.740 27
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
10/28/2015 03:21:00
10/28/2015 03:31:00
10/28/2015 03:41:00
10/28/2015 03:51:00
10/28/2015 04:01:00
DateTime



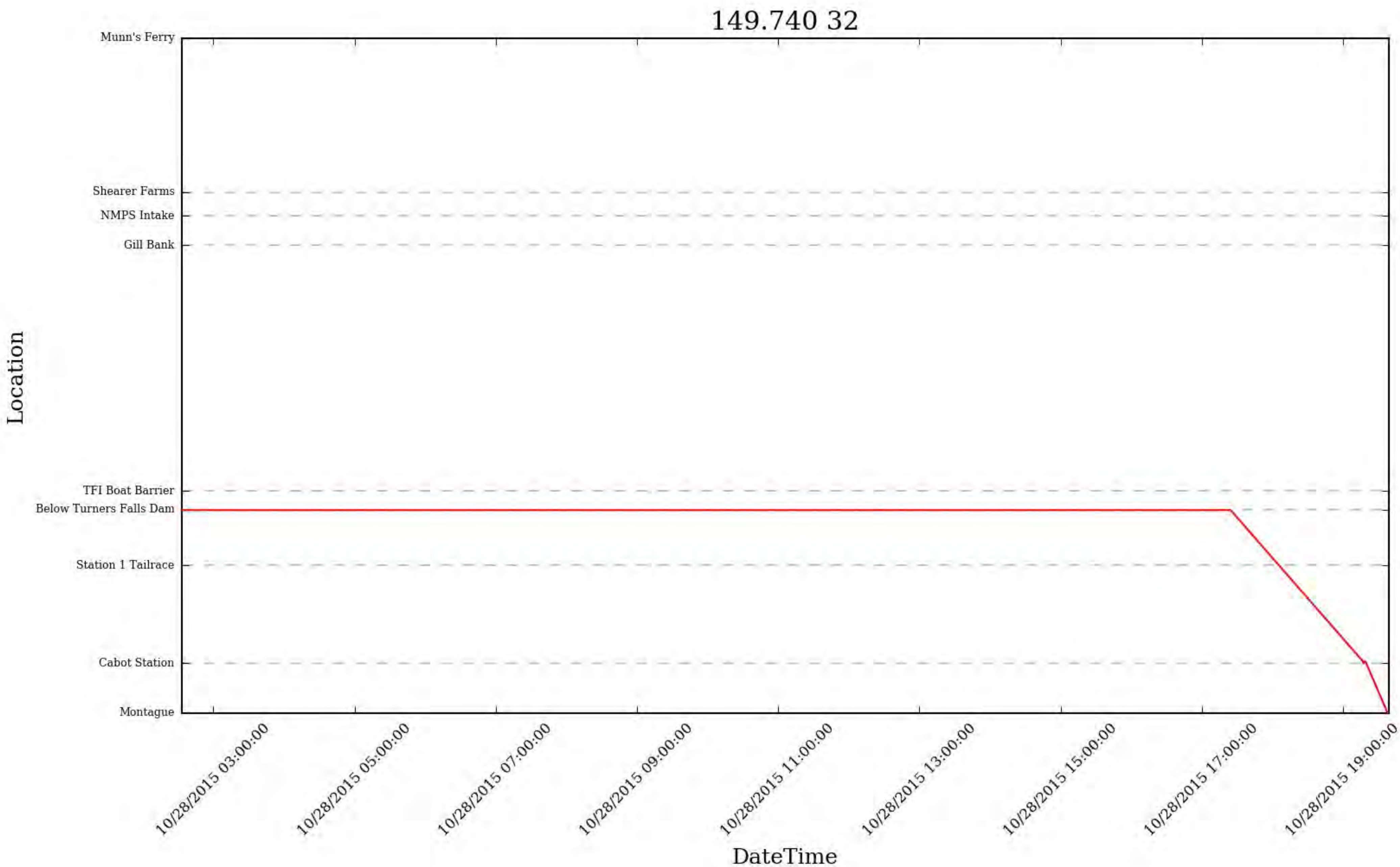
149.740 28
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
10/28/2015 11:00:00
10/28/2015 15:00:00
10/28/2015 19:00:00
10/28/2015 23:00:00
10/29/2015 03:00:00
10/29/2015 07:00:00
10/29/2015 11:00:00
10/29/2015 15:00:00
10/29/2015 19:00:00
DateTime

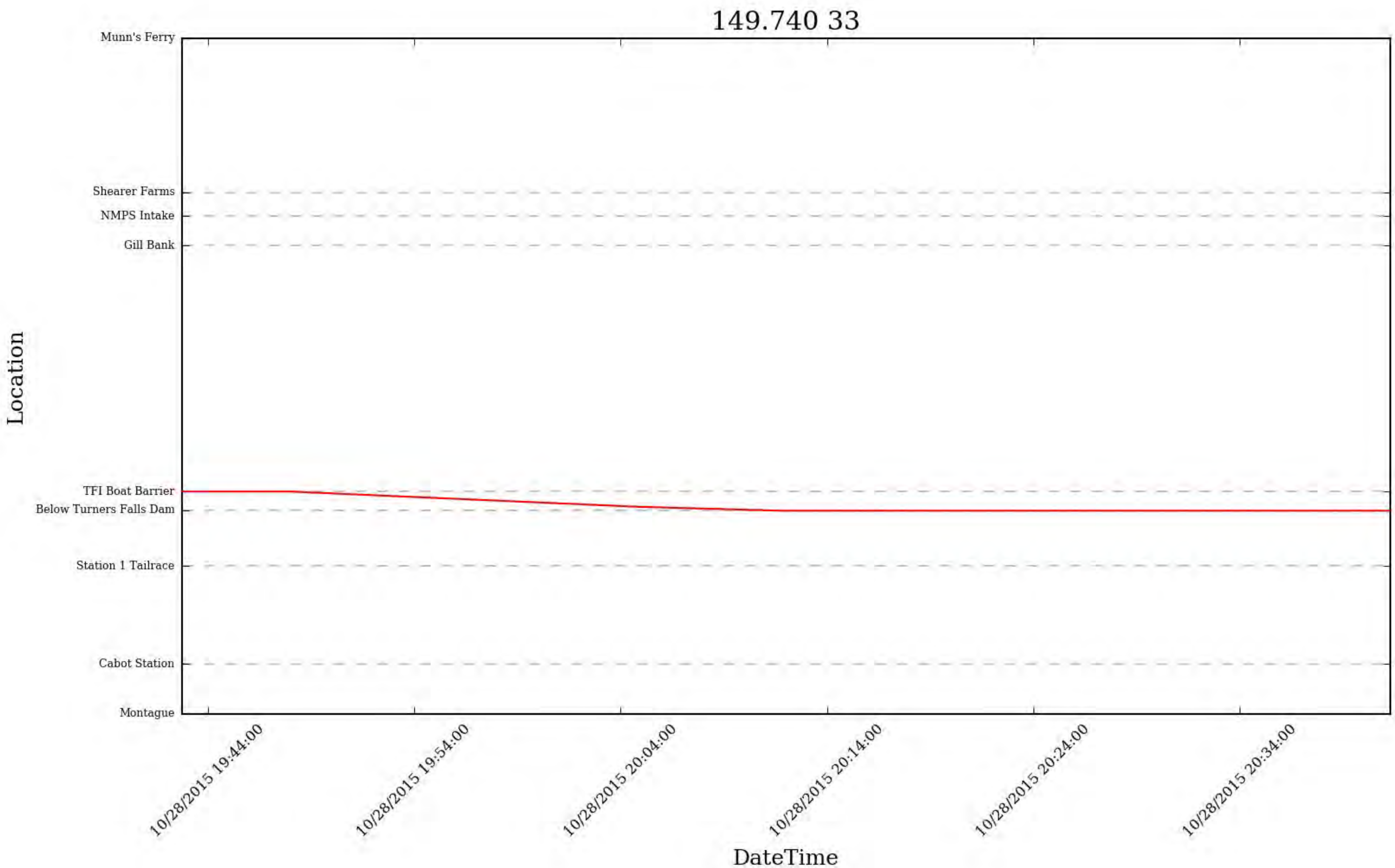


149.740 29
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
10/28/2015 11:00:00
10/28/2015 23:00:00
10/29/2015 11:00:00
10/29/2015 23:00:00
10/30/2015 11:00:00
10/30/2015 23:00:00
10/31/2015 11:00:00
DateTime

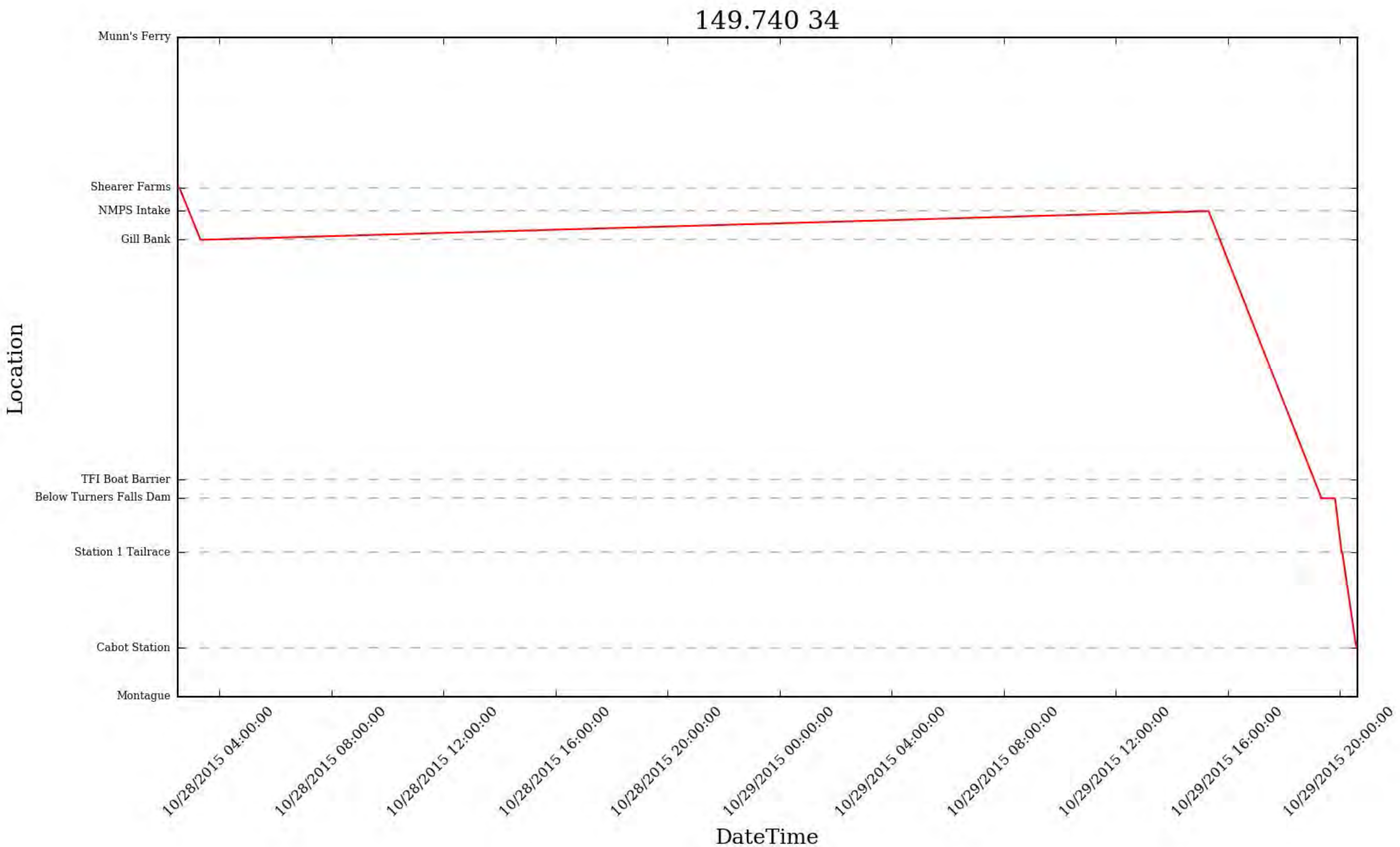


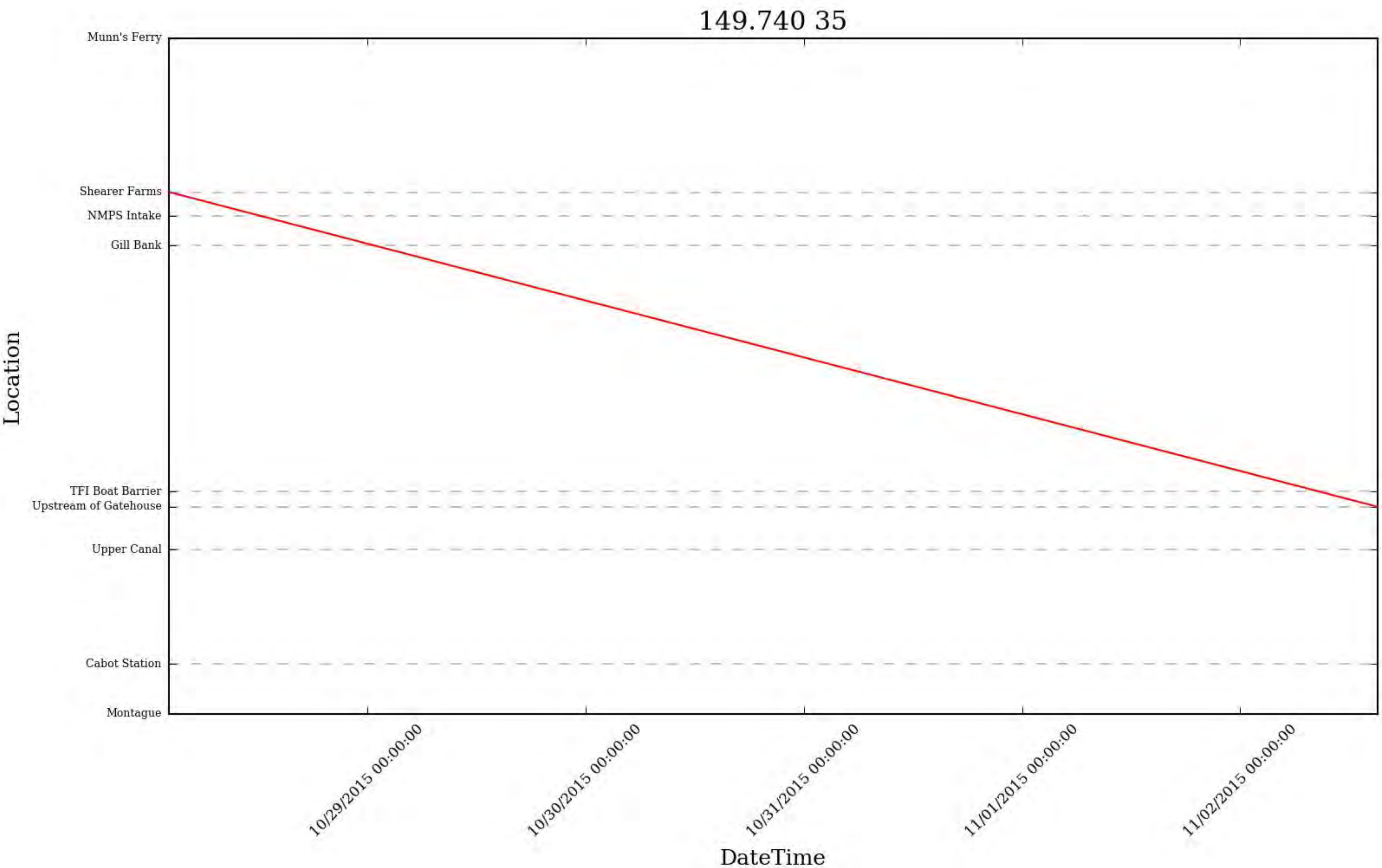
149.740 30
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
10/28/2015 19:00:00
10/28/2015 22:00:00
10/29/2015 01:00:00
10/29/2015 04:00:00
10/29/2015 07:00:00
10/29/2015 10:00:00
10/29/2015 13:00:00
10/29/2015 16:00:00
10/29/2015 19:00:00
DateTime

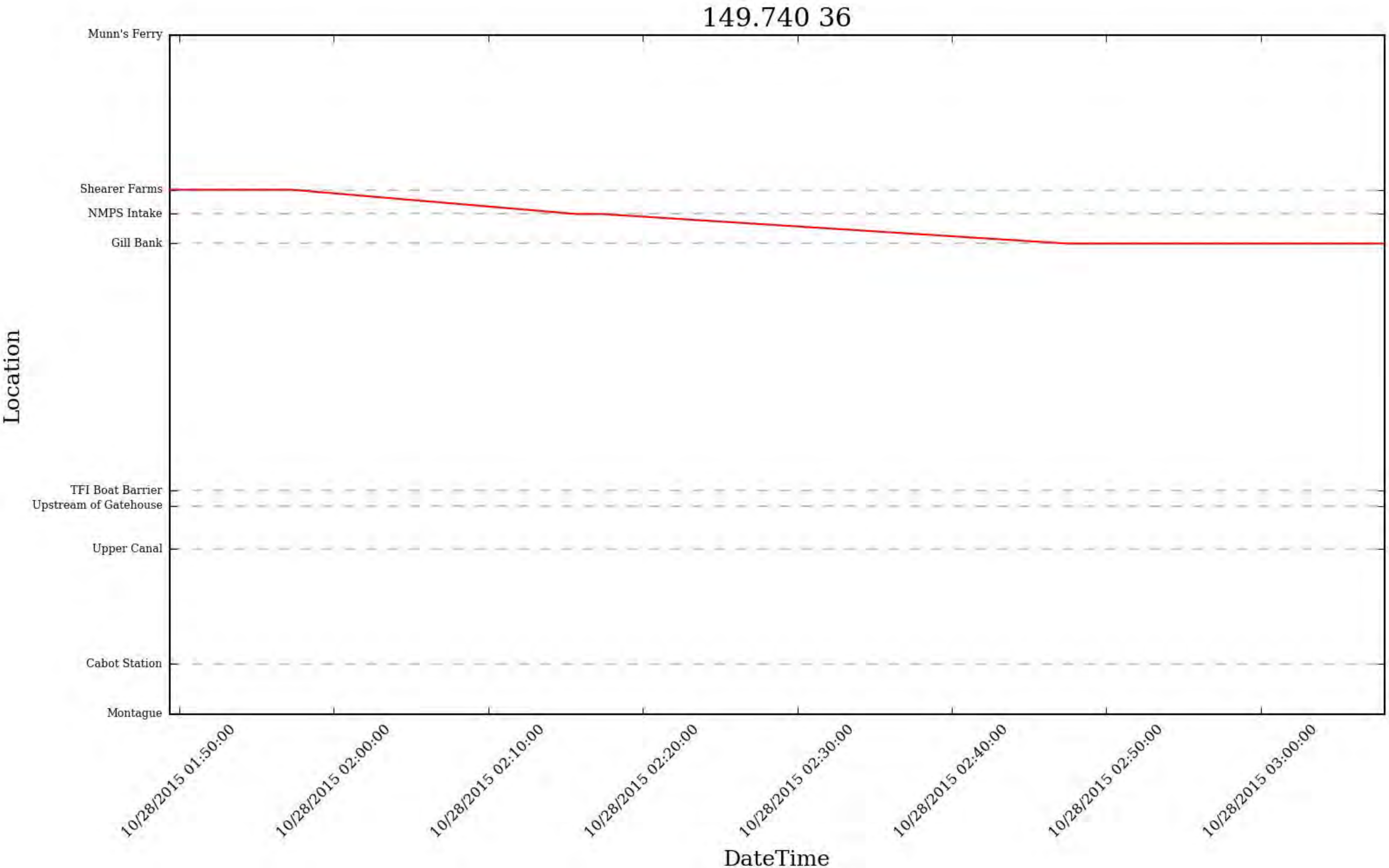

149.740 32
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Below Turners Falls Dam
Station 1 Tailrace
Cabot Station
Montague
Location
10/28/2015 03:00:00
10/28/2015 05:00:00
10/28/2015 07:00:00
10/28/2015 09:00:00
10/28/2015 11:00:00
10/28/2015 13:00:00
10/28/2015 15:00:00
10/28/2015 17:00:00
10/28/2015 19:00:00
DateTime



149.740 33
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Below Turners Falls Dam
Station 1 Tailrace
Cabot Station
Montague
Location
10/28/2015 19:44:00
10/28/2015 19:54:00
10/28/2015 20:04:00
10/28/2015 20:14:00
10/28/2015 20:24:00
10/28/2015 20:34:00
DateTime


149.740 34
Location
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Below Turners Falls Dam
Station 1 Tailrace
Cabot Station
Montague
10/28/2015 04:00:00
10/28/2015 08:00:00
10/28/2015 12:00:00
10/28/2015 16:00:00
10/28/2015 20:00:00
10/29/2015 00:00:00
10/29/2015 04:00:00
10/29/2015 08:00:00
10/29/2015 12:00:00
10/29/2015 16:00:00
10/29/2015 20:00:00
DateTime


149.740 35
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
10/29/2015 00:00:00
10/30/2015 00:00:00
10/31/2015 00:00:00
11/01/2015 00:00:00
11/02/2015 00:00:00
DateTime



149.740 36
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
10/28/2015 01:50:00
10/28/2015 02:00:00
10/28/2015 02:10:00
10/28/2015 02:20:00
10/28/2015 02:30:00
10/28/2015 02:40:00
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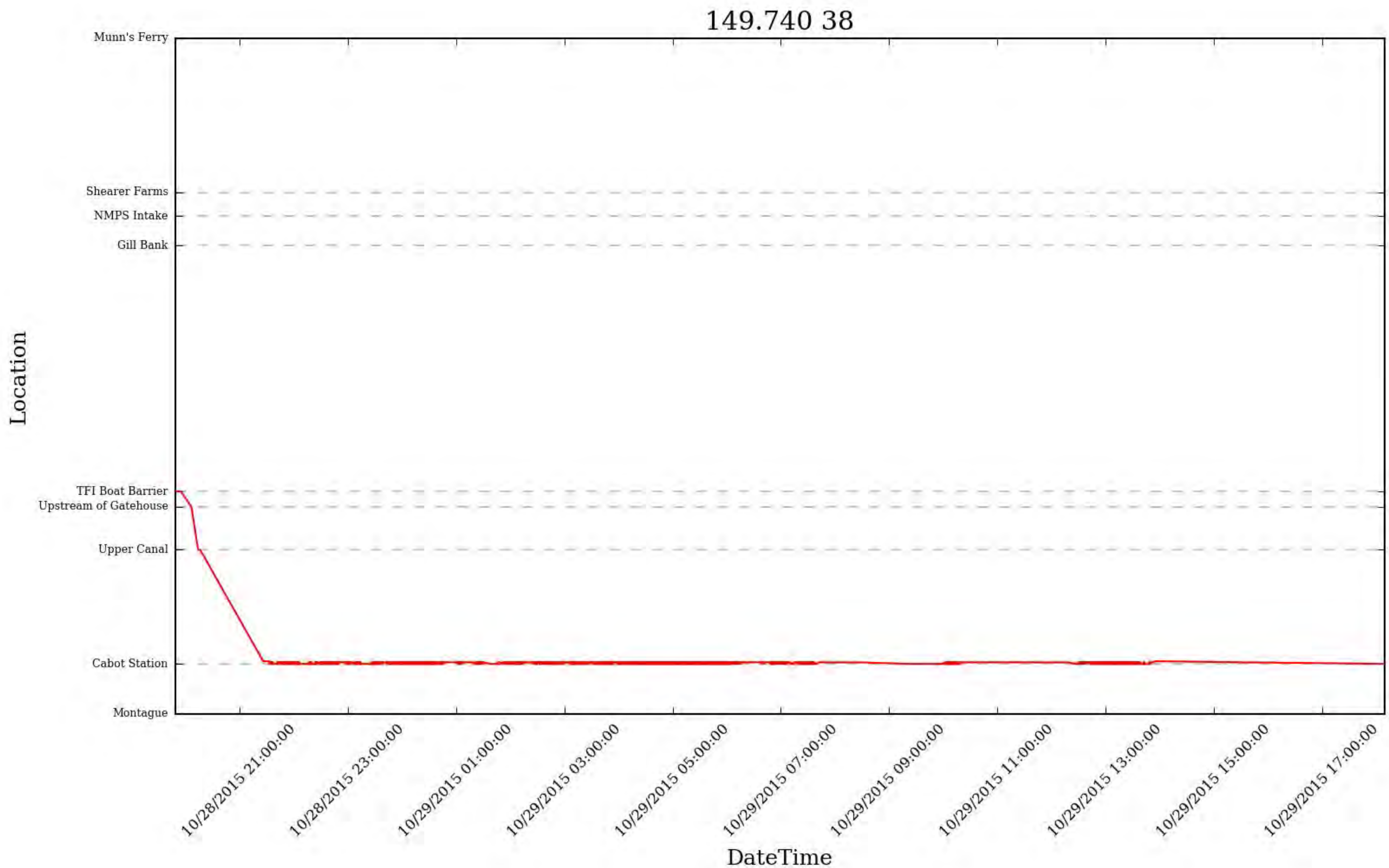
10/28/2015 03:00:00
DateTime



149.740 38
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
Location
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
10/28/2015 21:00:00
10/28/2015 23:00:00
10/29/2015 01:00:00
10/29/2015 03:00:00
10/29/2015 05:00:00
10/29/2015 07:00:00
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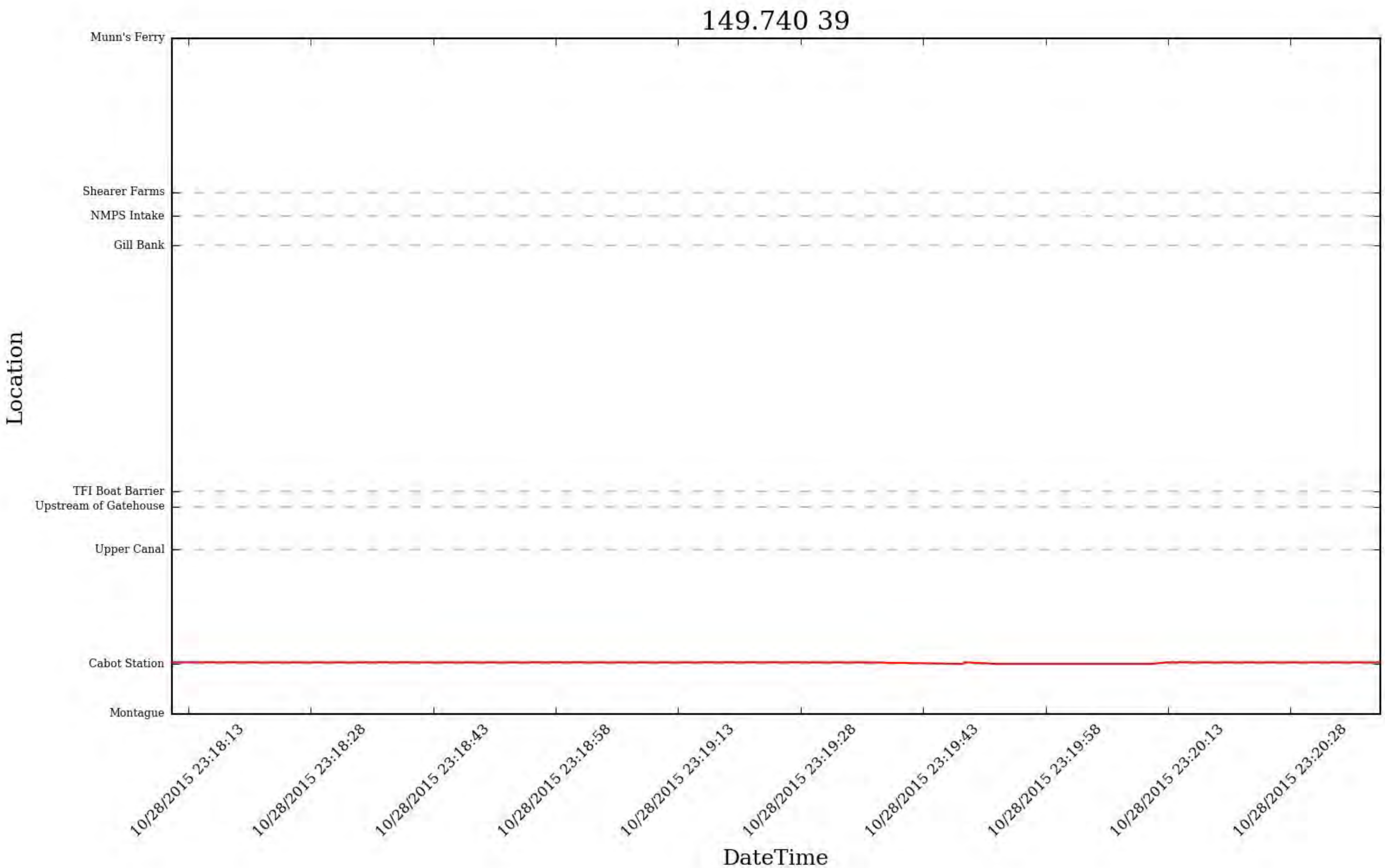
10/29/2015 17:00:00
DateTime



149.740 39
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
10/28/2015 23:18:13
10/28/2015 23:18:28
10/28/2015 23:18:43
10/28/2015 23:18:58
10/28/2015 23:19:13
10/28/2015 23:19:28
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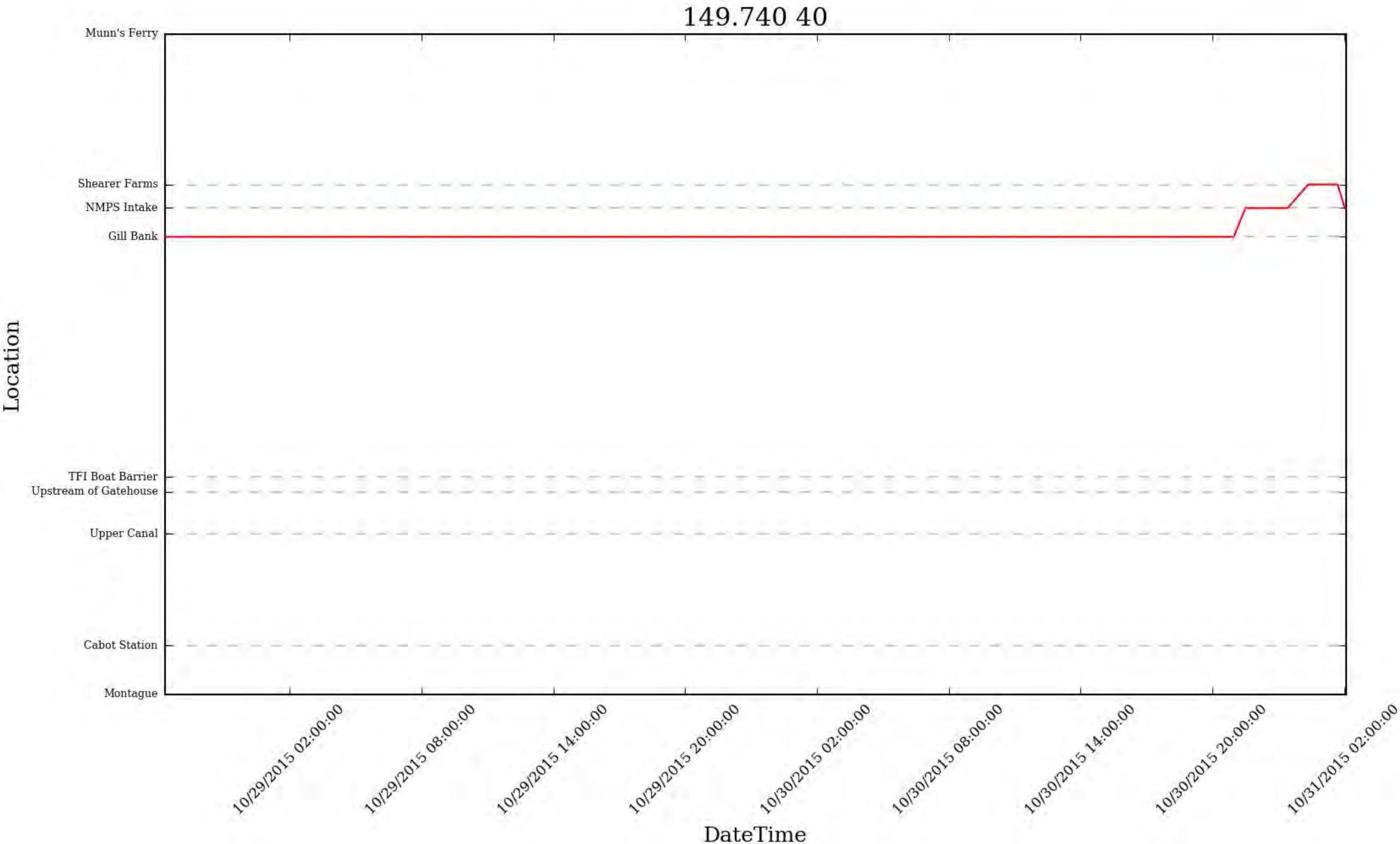
10/28/2015 23:19:58
10/28/2015 23:20:13
10/28/2015 23:20:28
DateTime


149.740 40
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
10/29/2015 02:00:00
10/29/2015 08:00:00
10/29/2015 14:00:00
10/29/2015 20:00:00
10/30/2015 02:00:00
10/30/2015 08:00:00
10/30/2015 14:00:00
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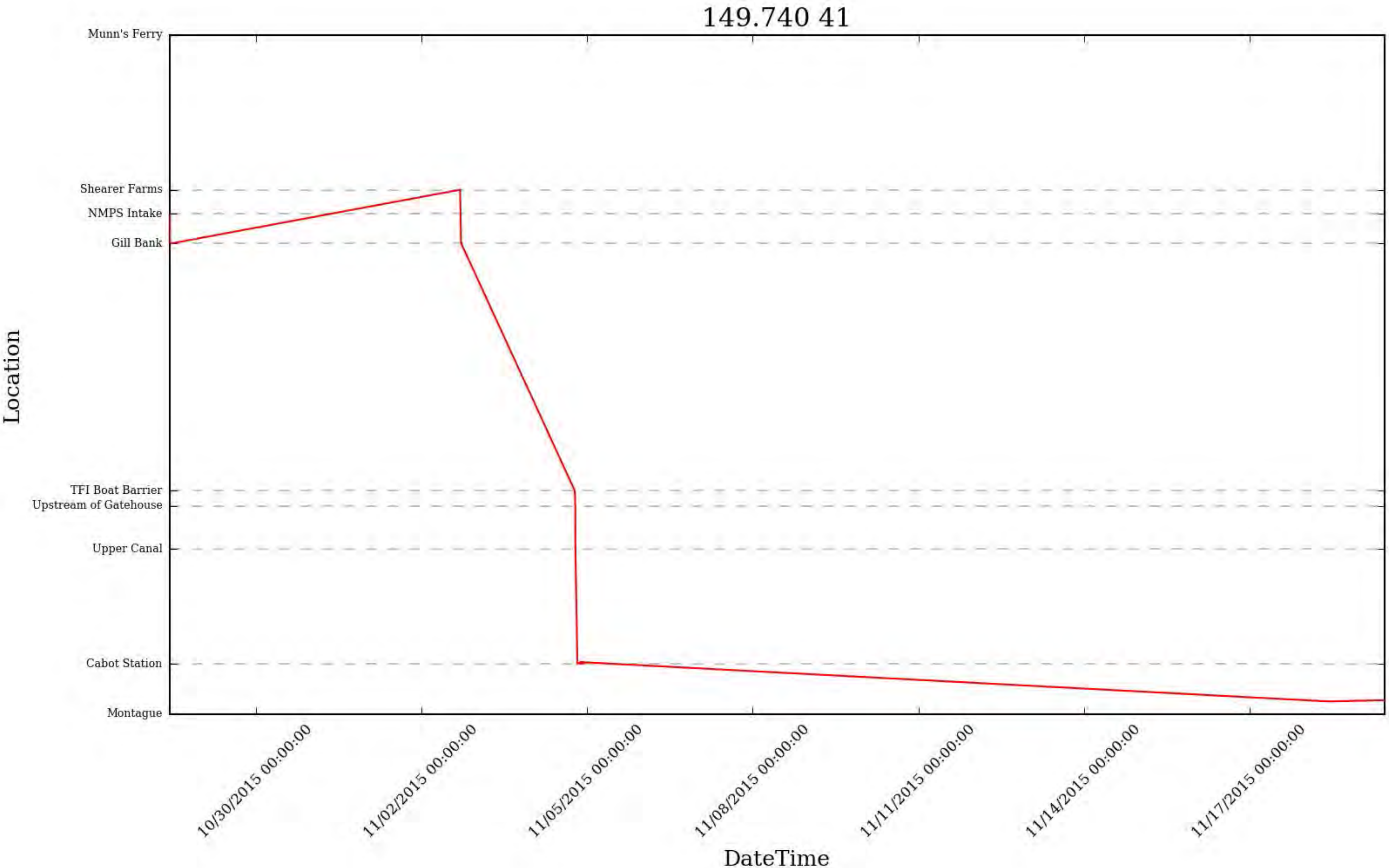
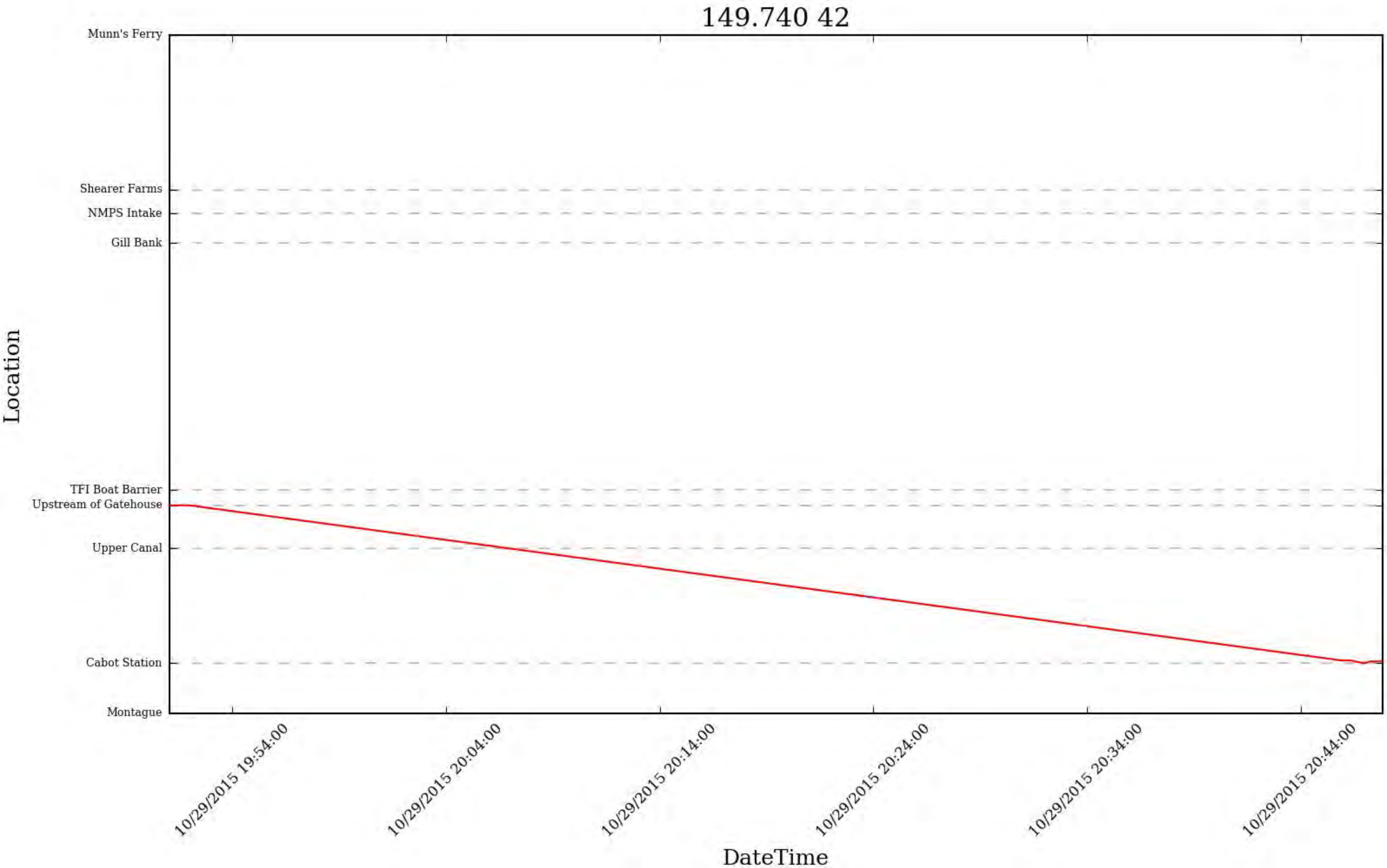
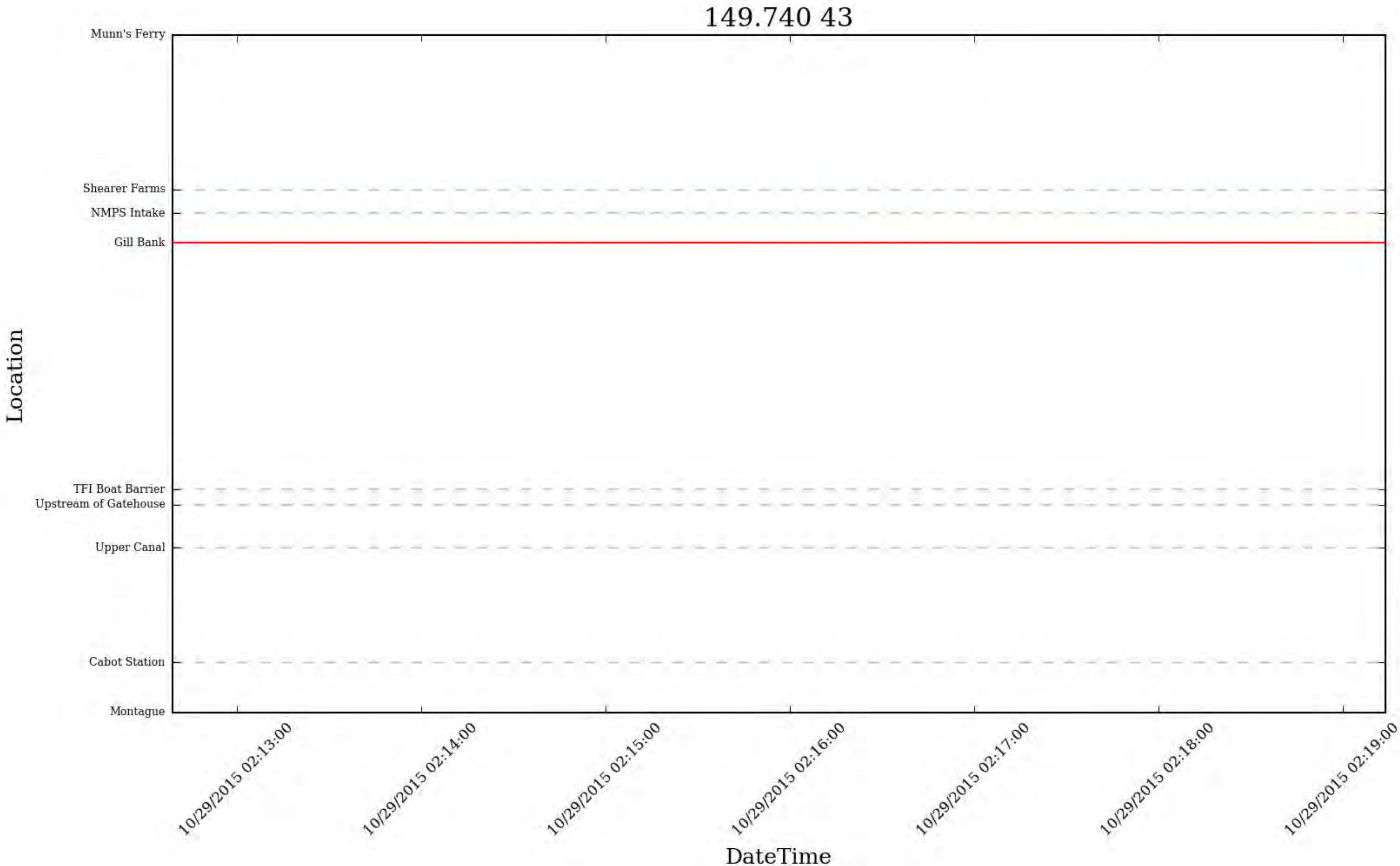
10/31/2015 02:00:00
DateTime



149.740 41
Location
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
10/30/2015 00:00:00
11/02/2015 00:00:00
11/05/2015 00:00:00
11/08/2015 00:00:00
11/11/2015 00:00:00
11/14/2015 00:00:00
11/17/2015 00:00:00
DateTime


149.740 42
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
10/29/2015 19:54:00
10/29/2015 20:04:00
10/29/2015 20:14:00
10/29/2015 20:24:00
10/29/2015 20:34:00
10/29/2015 20:44:00
DateTime



149.740 43
Location
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
10/29/2015 02:13:00
10/29/2015 02:14:00
10/29/2015 02:15:00
10/29/2015 02:16:00
10/29/2015 02:17:00
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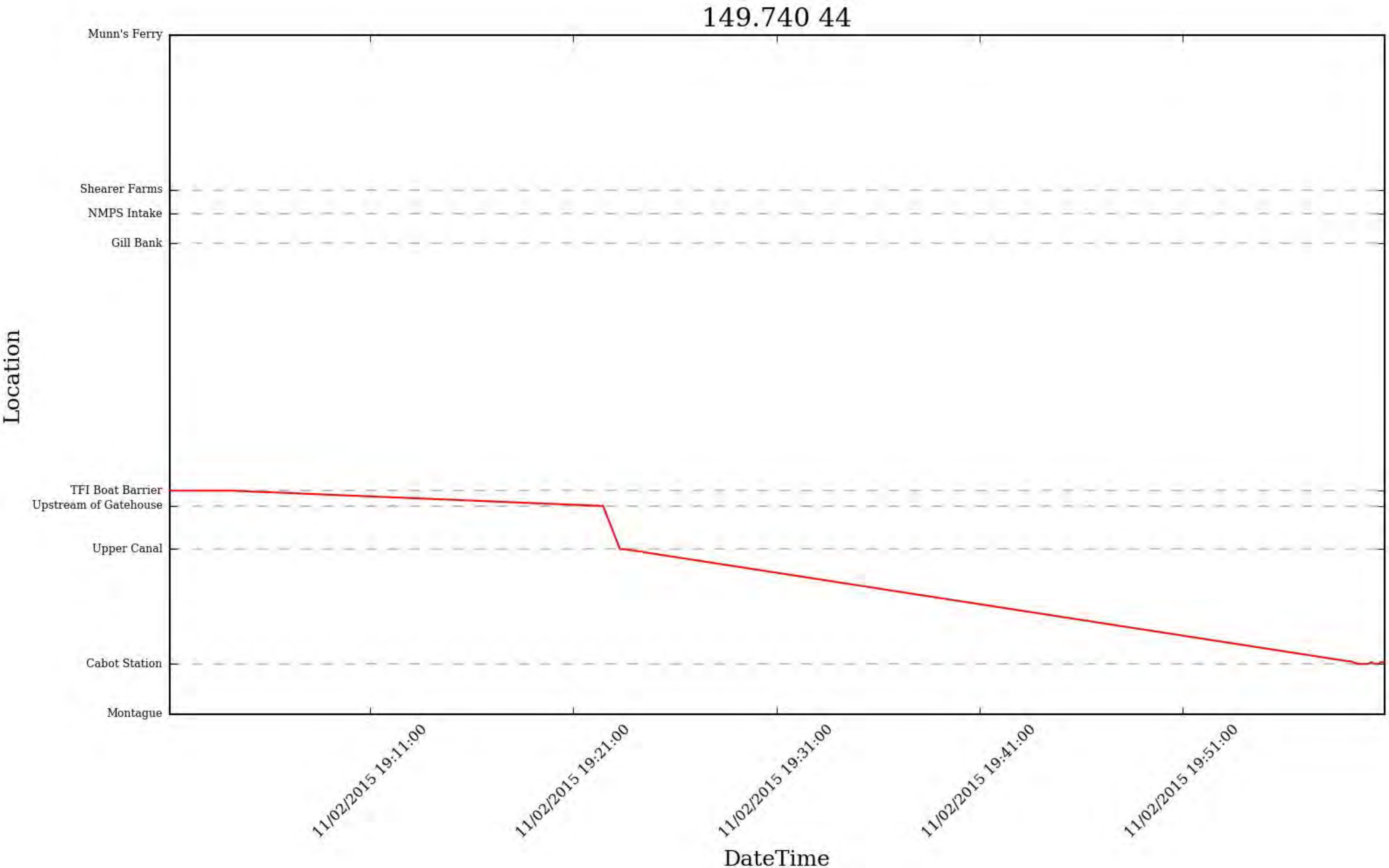
10/29/2015 02:19:00
DateTime



149.740 44
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/02/2015 19:11:00
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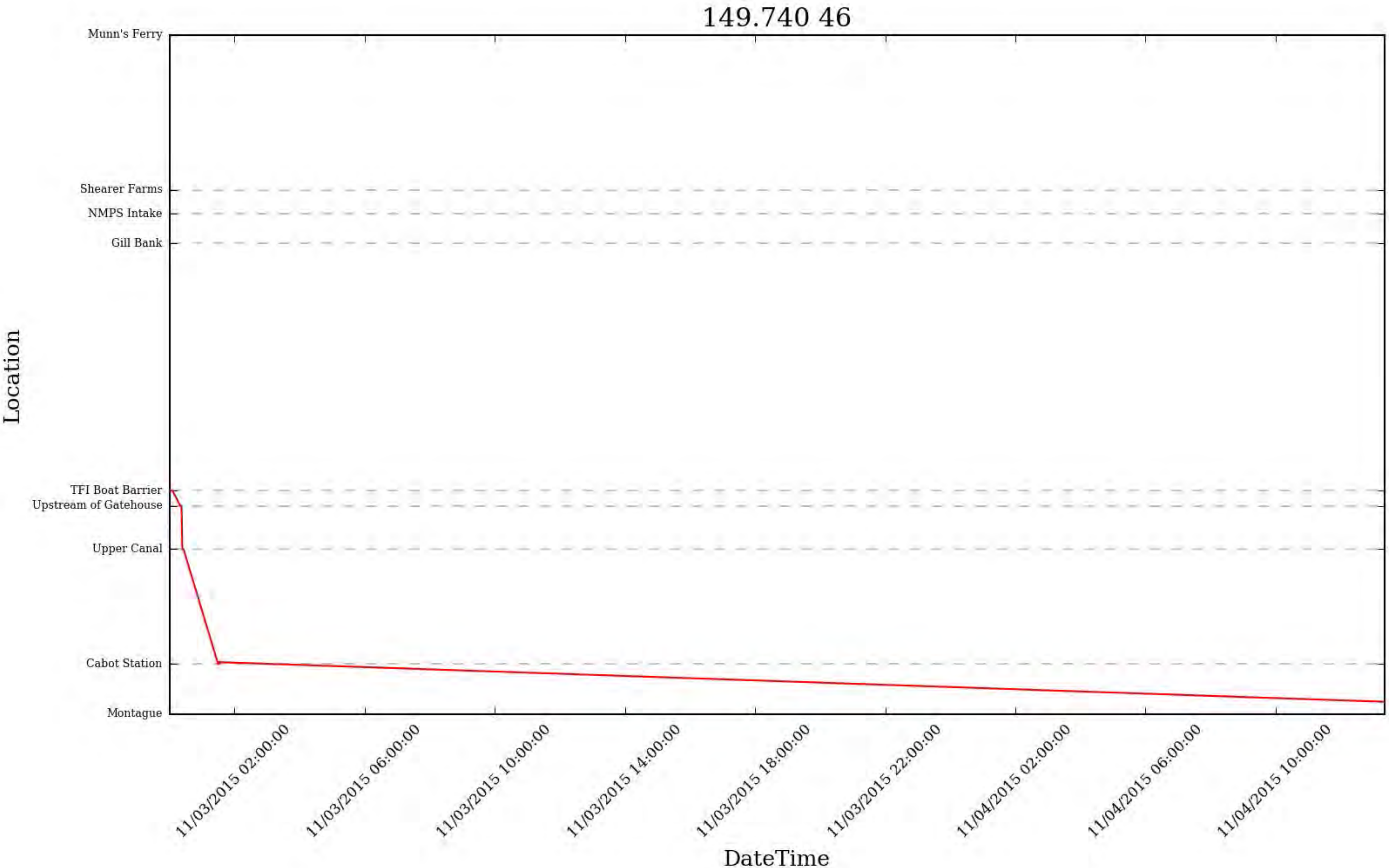
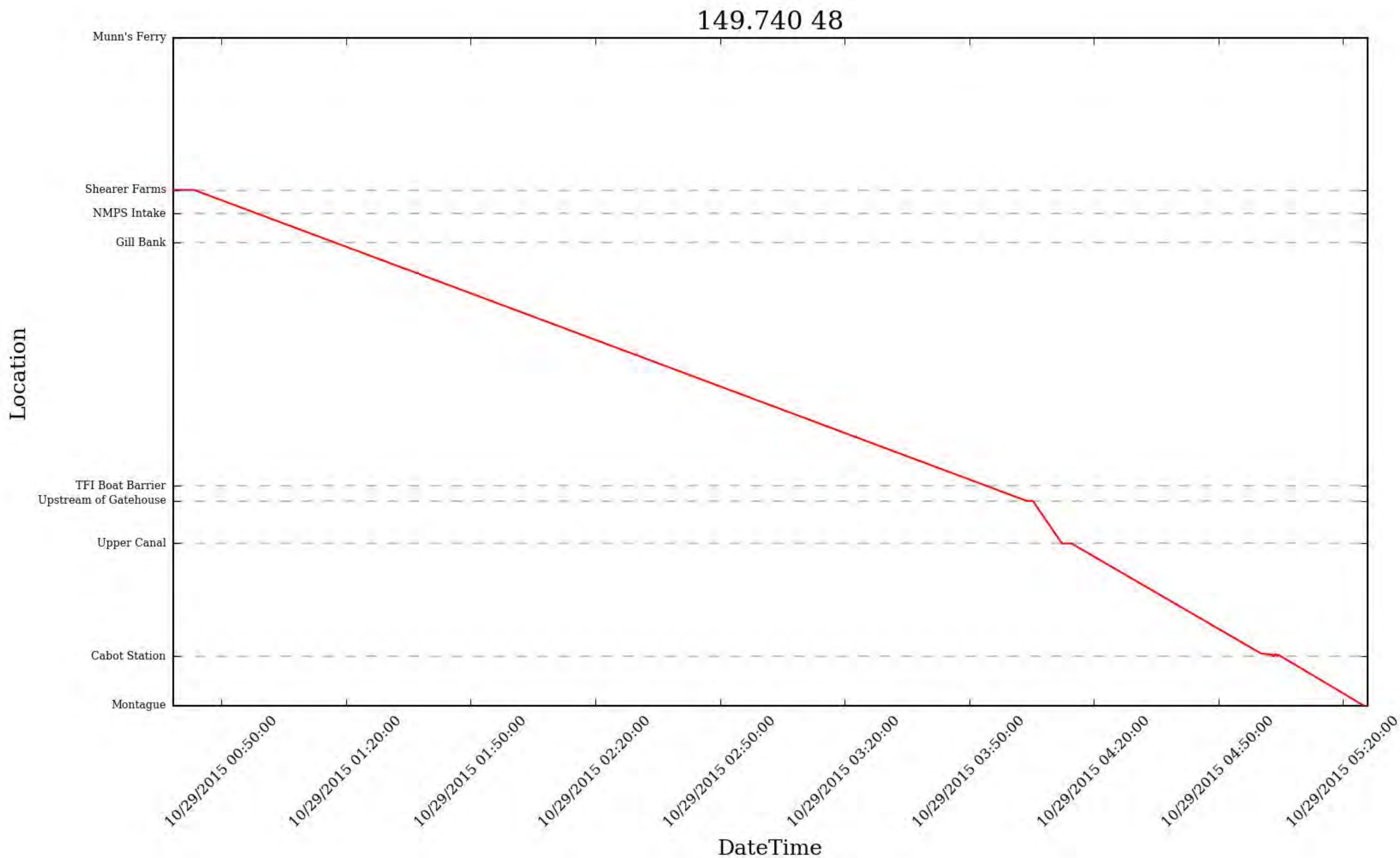
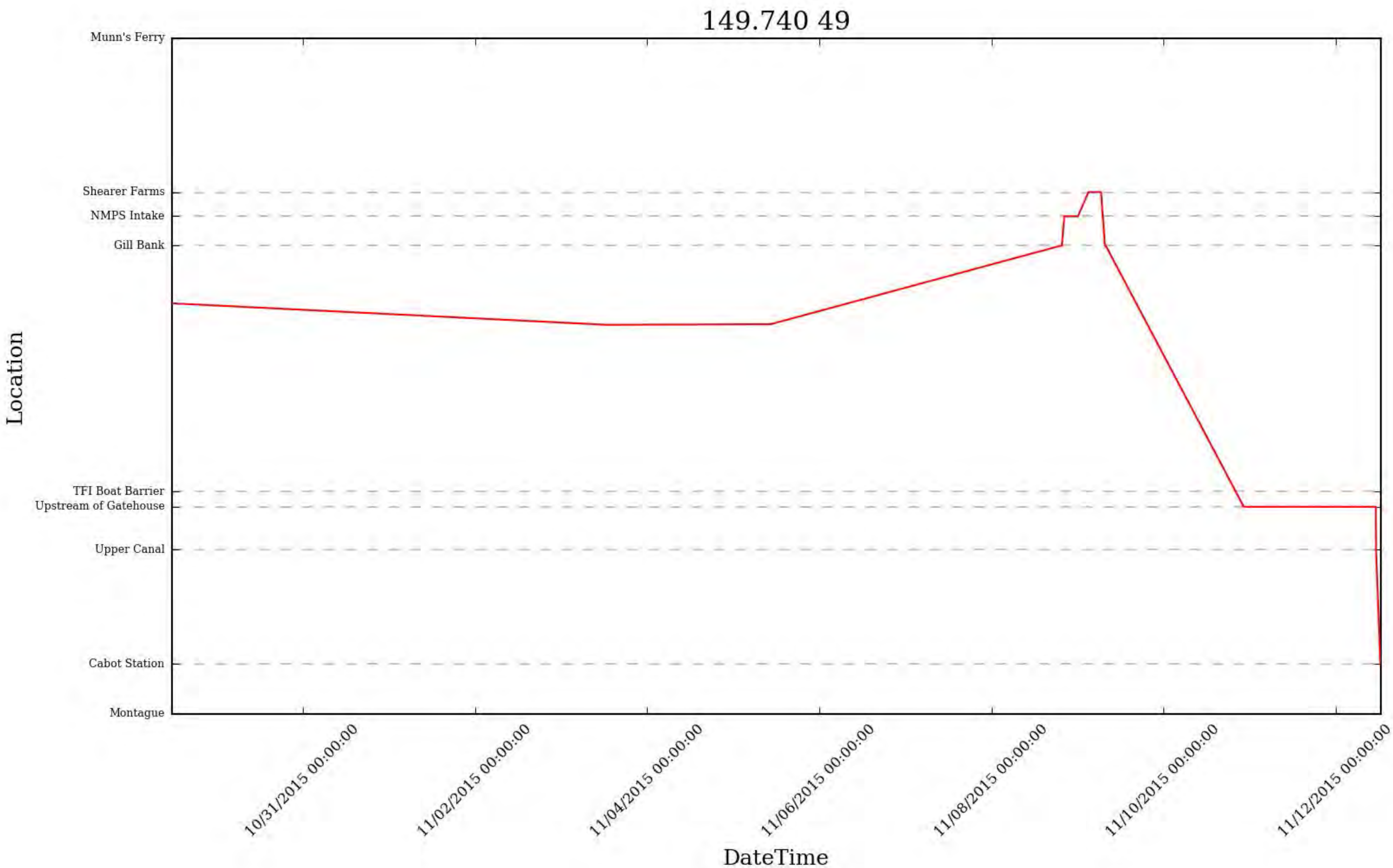
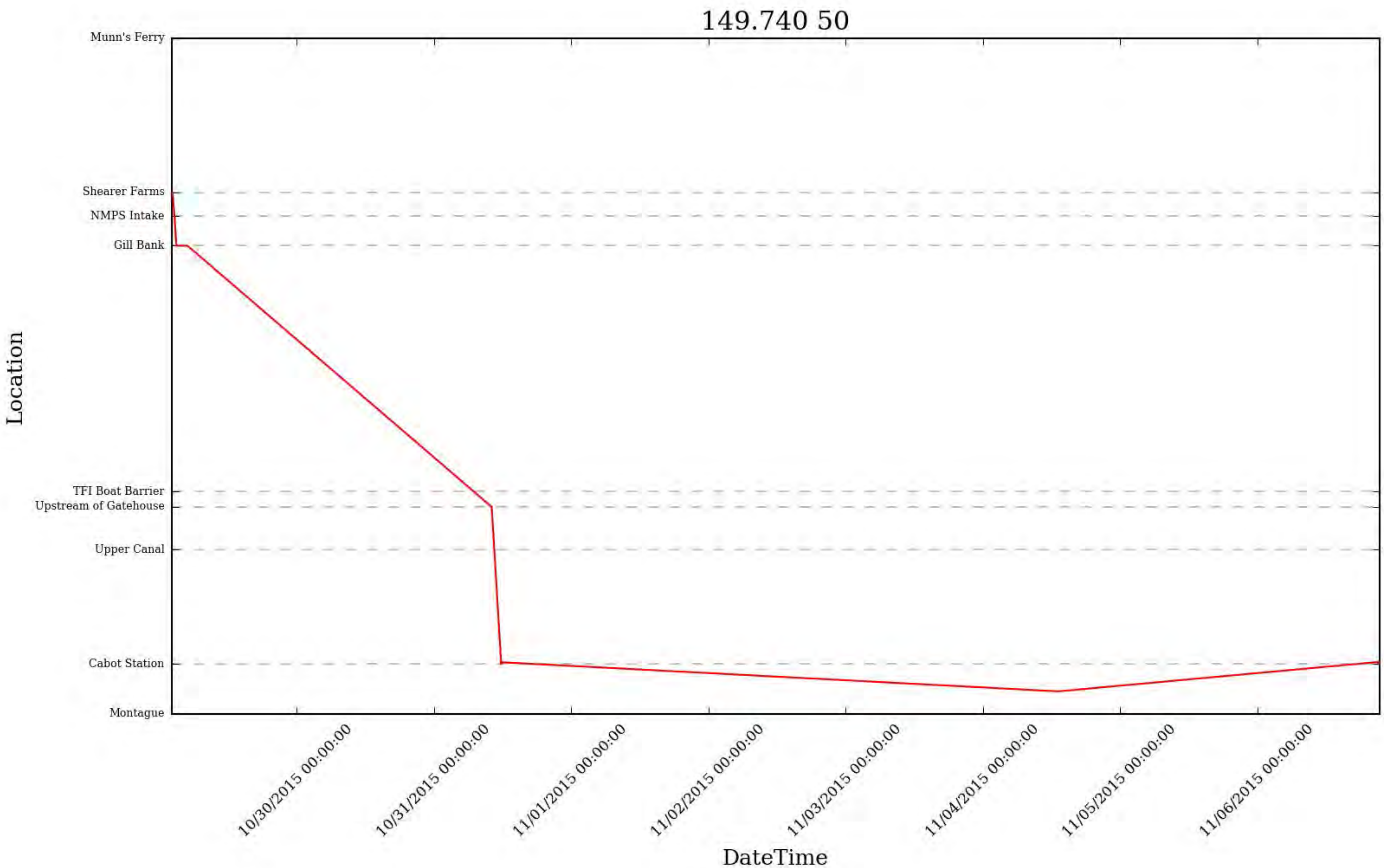
11/02/2015 19:51:00
DateTime



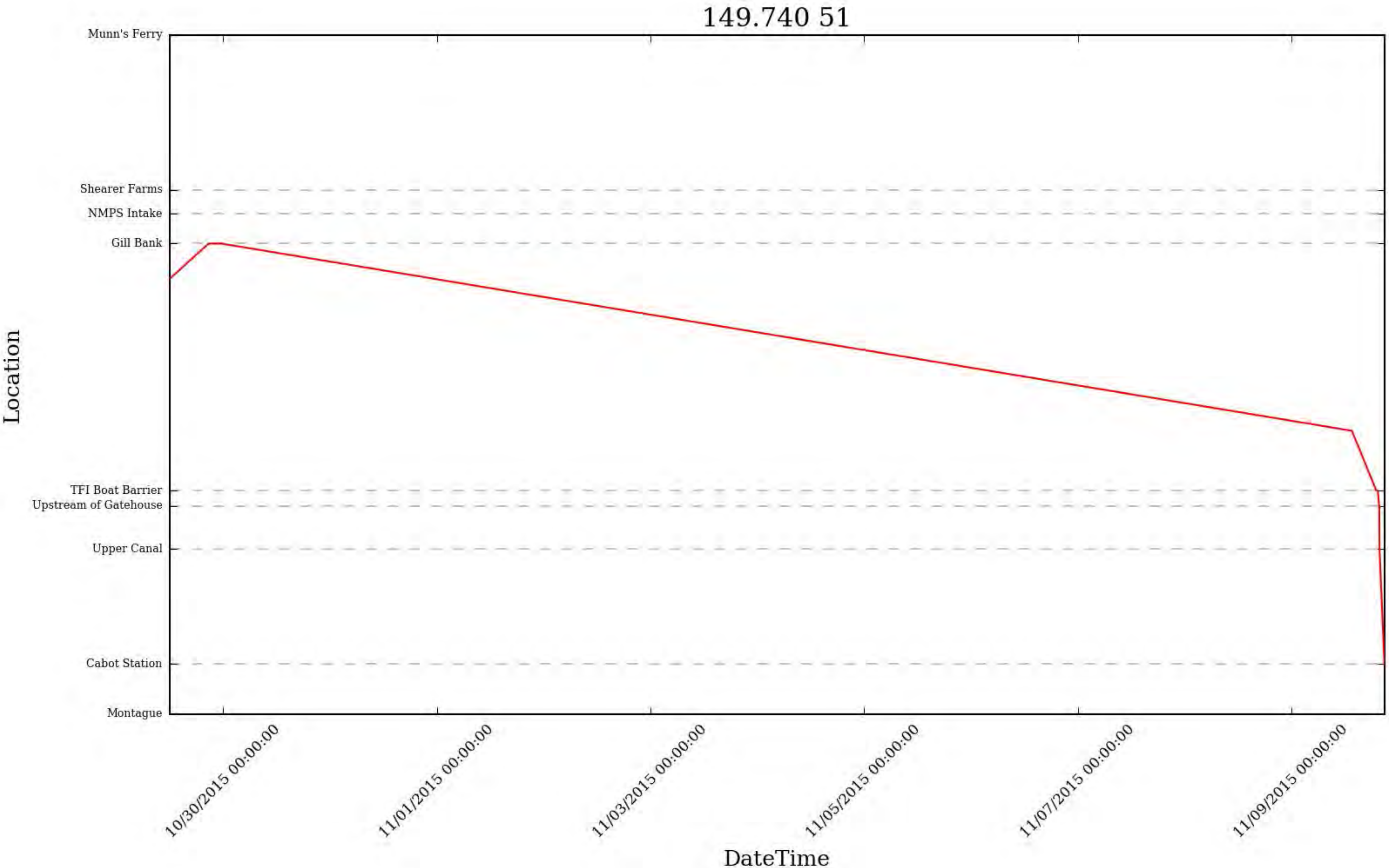
149.740 46
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
Location
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
11/03/2015 02:00:00
11/03/2015 06:00:00
11/03/2015 10:00:00
11/03/2015 14:00:00
11/03/2015 18:00:00
11/03/2015 22:00:00
11/04/2015 02:00:00
11/04/2015 06:00:00
11/04/2015 10:00:00
DateTime

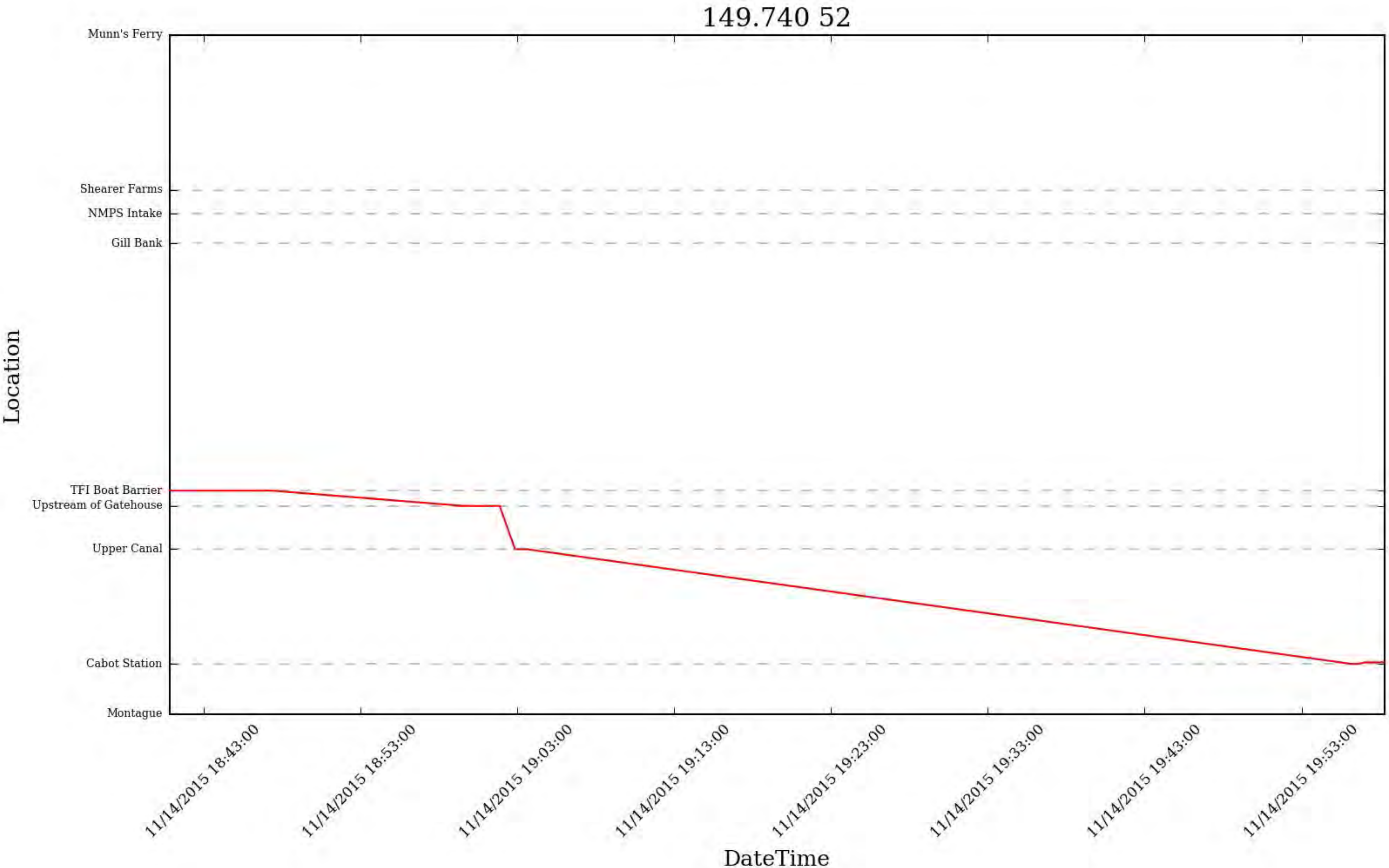

149.740 48
Location
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
10/29/2015 00:50:00
10/29/2015 01:20:00
10/29/2015 01:50:00
10/29/2015 02:20:00
10/29/2015 02:50:00
10/29/2015 03:20:00
10/29/2015 03:50:00
10/29/2015 04:20:00
10/29/2015 04:50:00
10/29/2015 05:20:00
DateTime

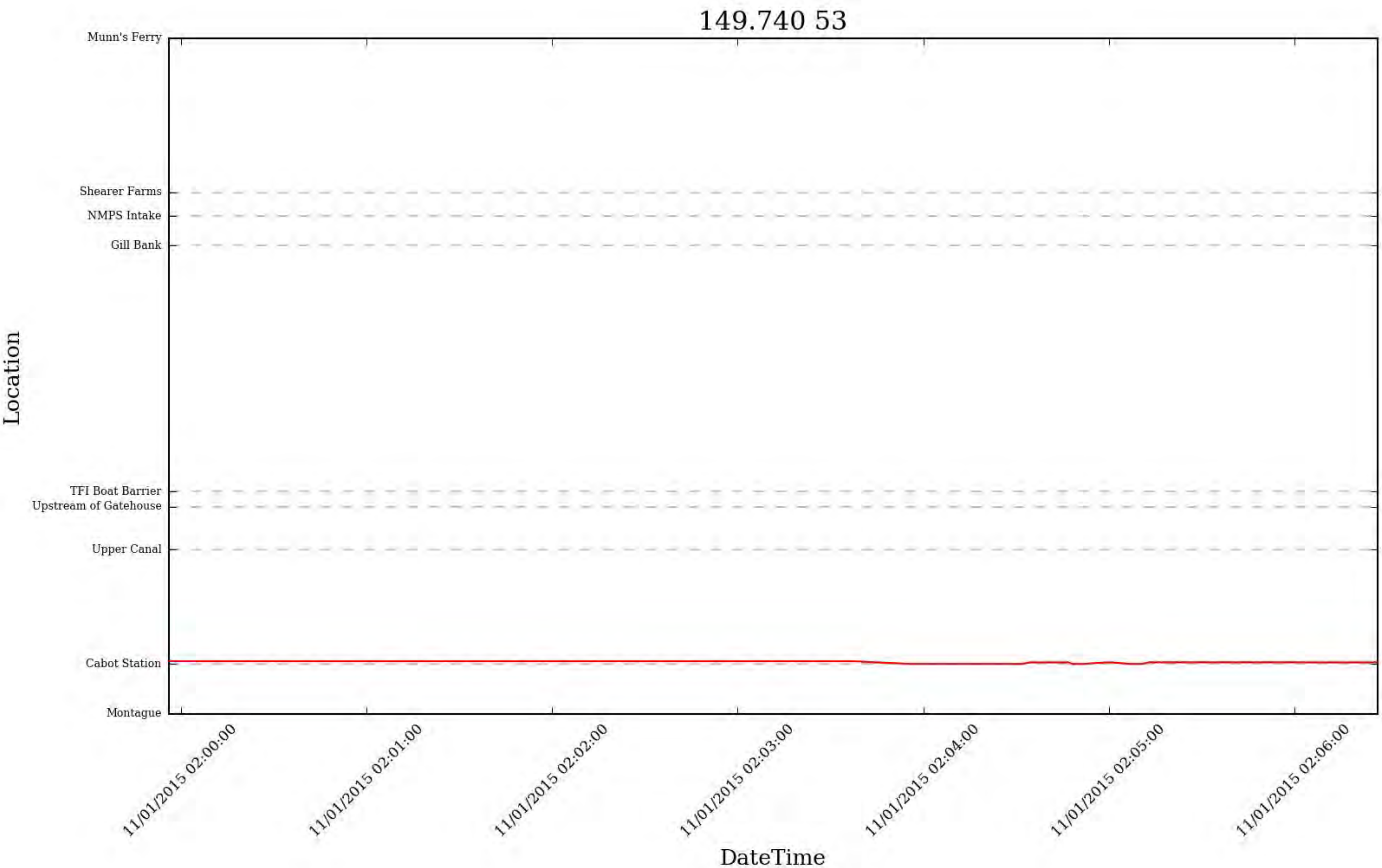

149.740 49
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
10/31/2015 00:00:00
11/02/2015 00:00:00
11/04/2015 00:00:00
11/06/2015 00:00:00
11/08/2015 00:00:00
11/10/2015 00:00:00
11/12/2015 00:00:00
DateTime

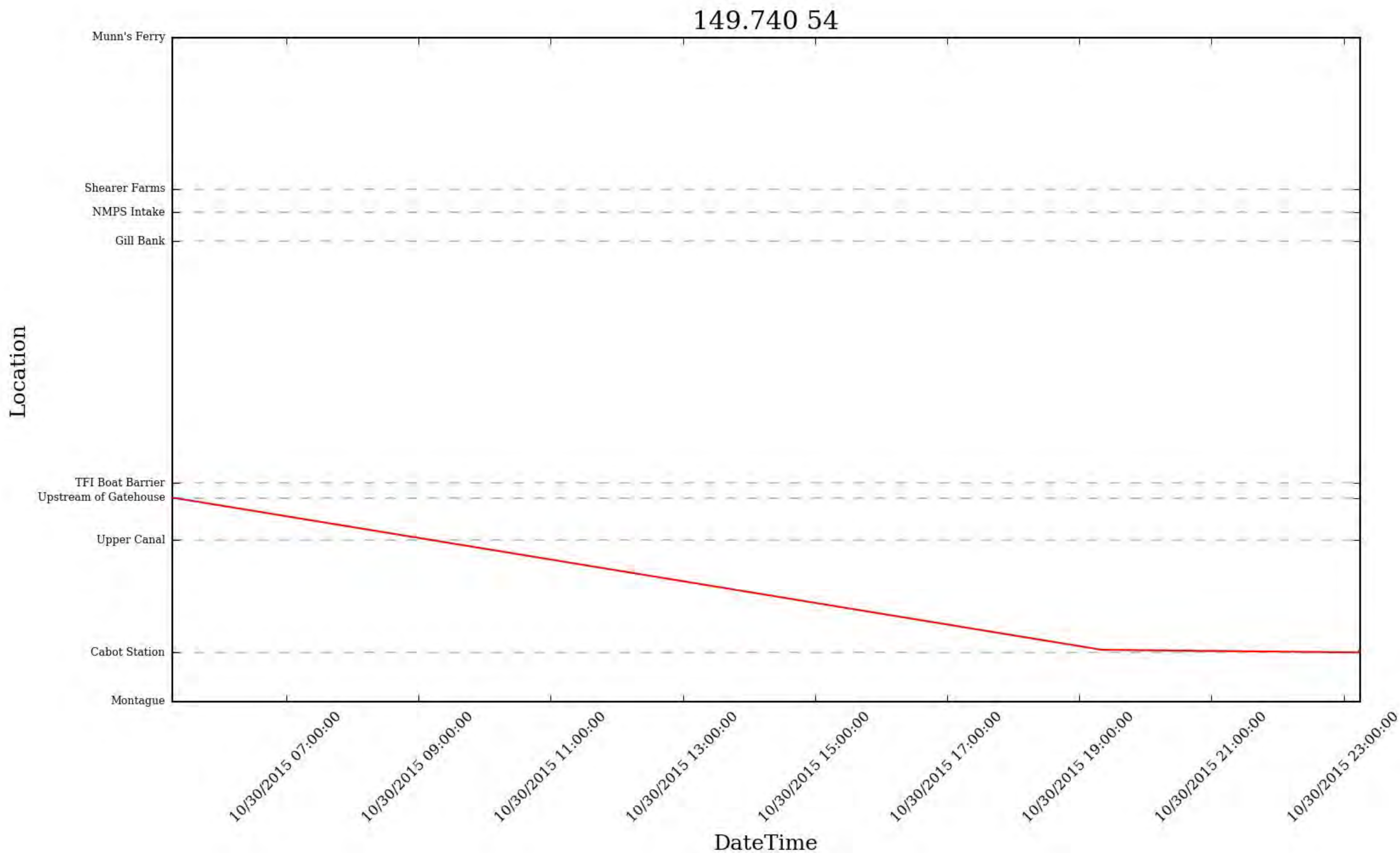


149.740 50
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
10/30/2015 00:00:00
10/31/2015 00:00:00
11/01/2015 00:00:00
11/02/2015 00:00:00
11/03/2015 00:00:00
11/04/2015 00:00:00
11/05/2015 00:00:00
11/06/2015 00:00:00
DateTime

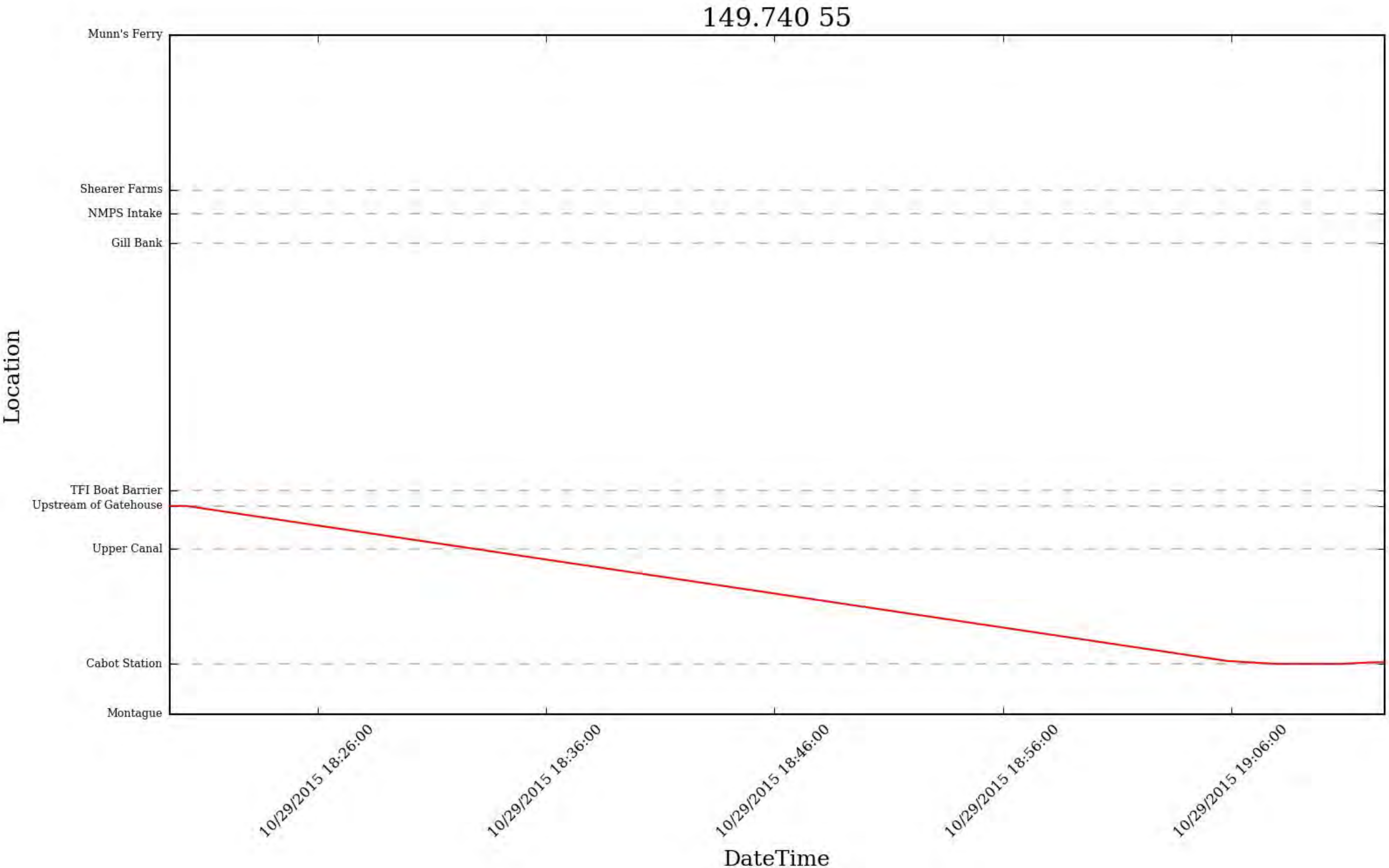

149.740 51
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
10/30/2015 00:00:00
11/01/2015 00:00:00
11/03/2015 00:00:00
11/05/2015 00:00:00
11/07/2015 00:00:00
11/09/2015 00:00:00
DateTime

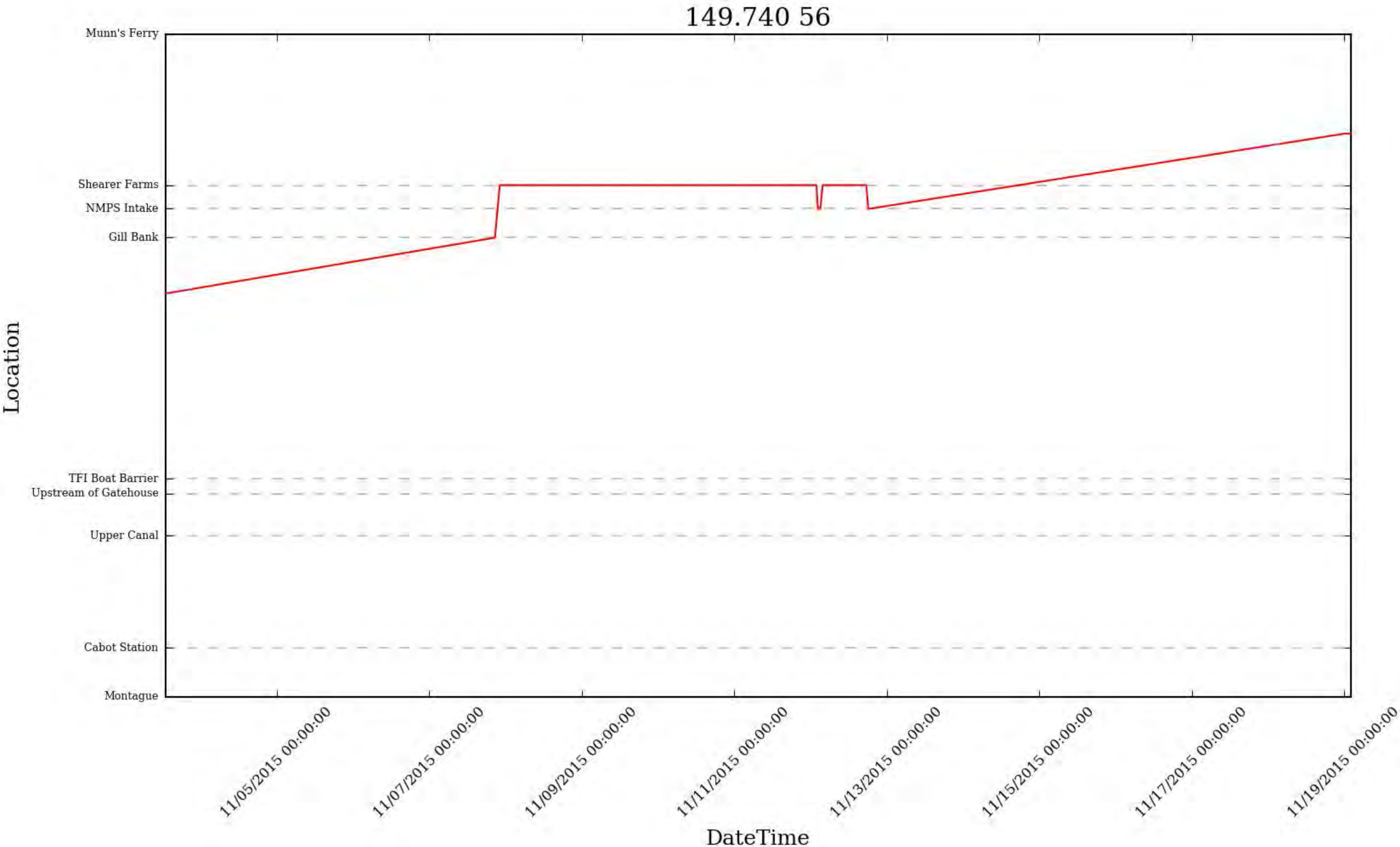

149.740 52
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/14/2015 18:43:00
11/14/2015 18:53:00
11/14/2015 19:03:00
11/14/2015 19:13:00
11/14/2015 19:23:00
11/14/2015 19:33:00
11/14/2015 19:43:00
11/14/2015 19:53:00
DateTime

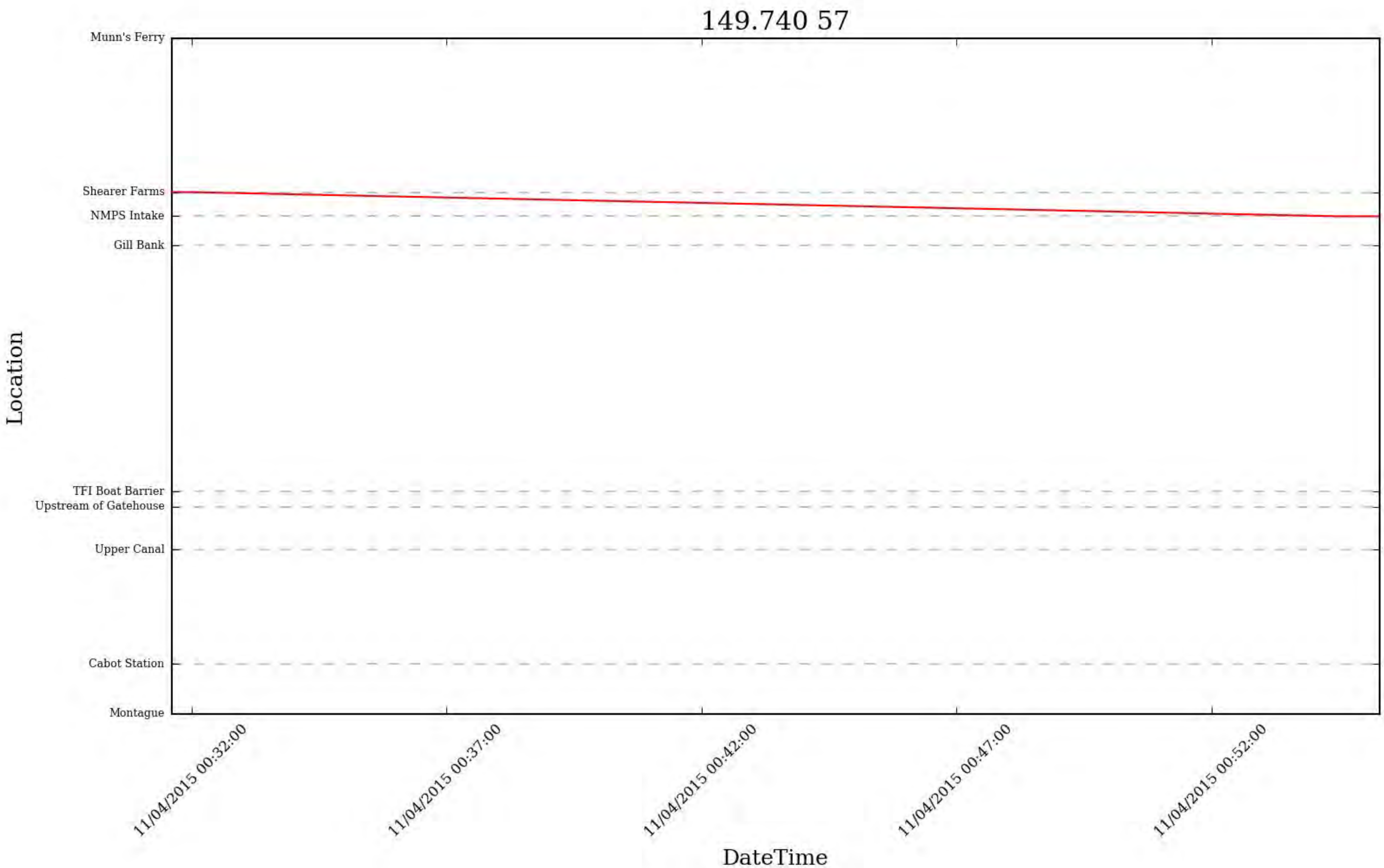

149.740 53
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/01/2015 02:00:00
11/01/2015 02:01:00
11/01/2015 02:02:00
11/01/2015 02:03:00
11/01/2015 02:04:00
11/01/2015 02:05:00
11/01/2015 02:06:00
DateTime



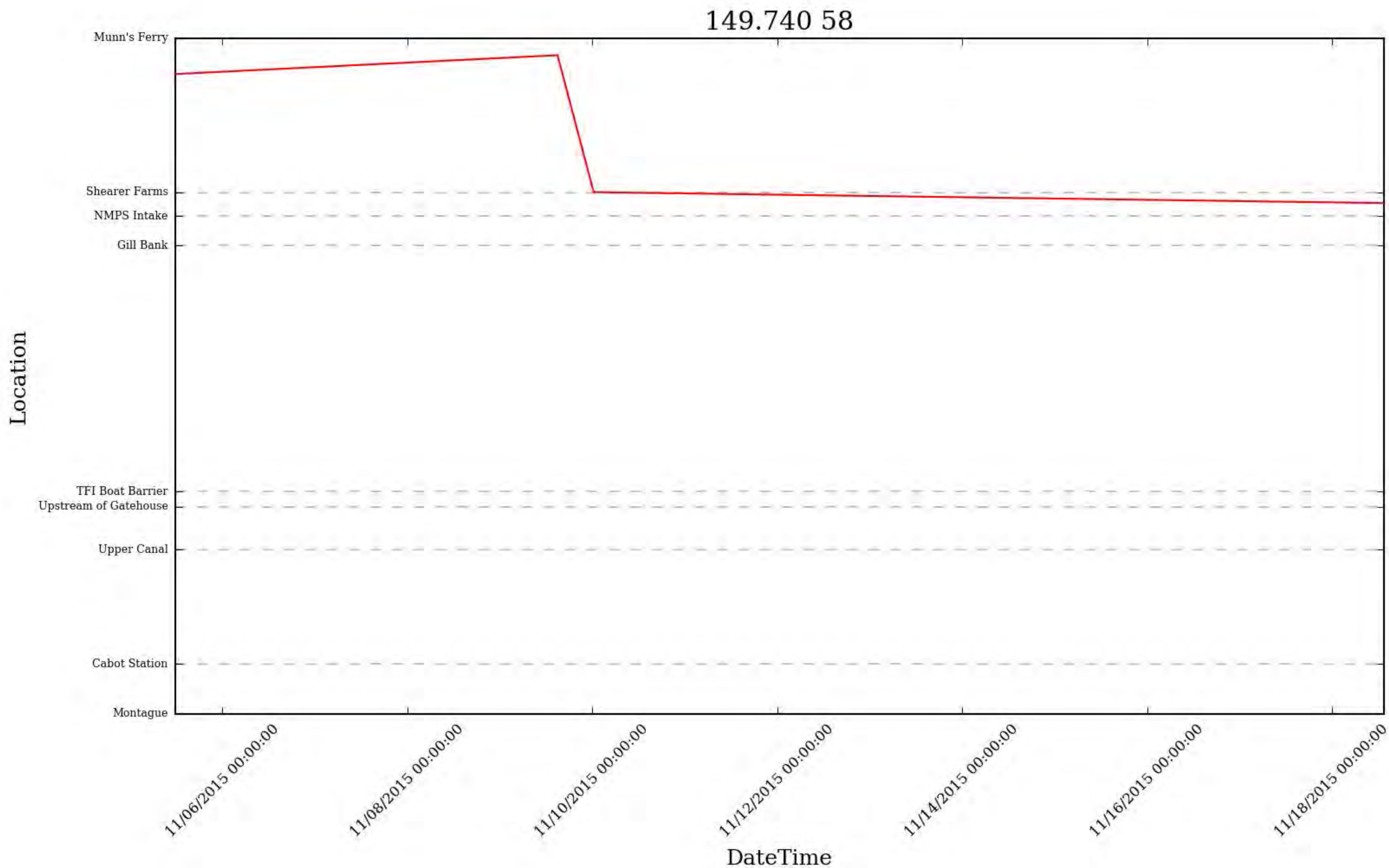
149.740 54
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
10/30/2015 07:00:00
10/30/2015 09:00:00
10/30/2015 11:00:00
10/30/2015 13:00:00
10/30/2015 15:00:00
10/30/2015 17:00:00
10/30/2015 19:00:00
10/30/2015 21:00:00
10/30/2015 23:00:00
DateTime

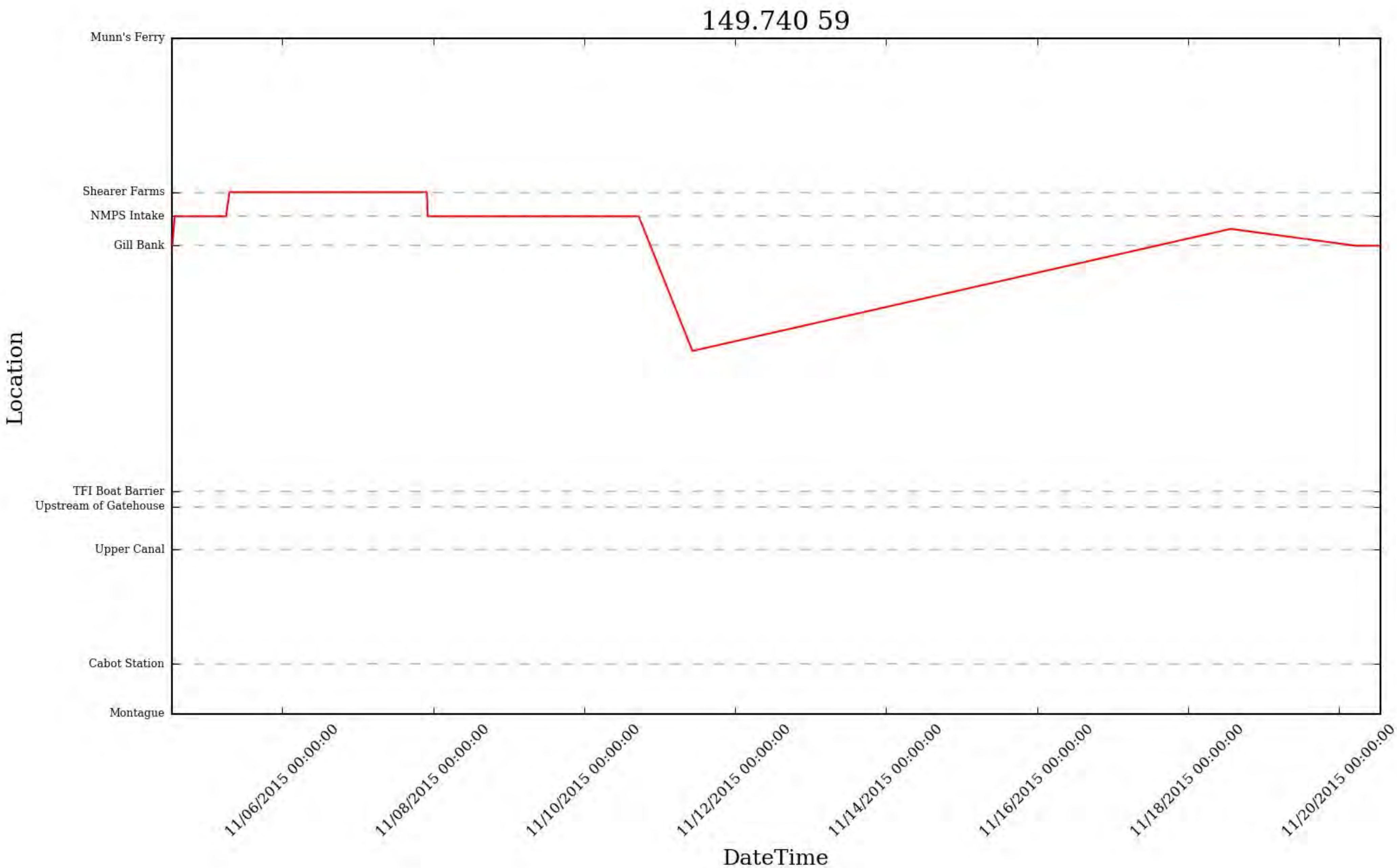

149.740 55
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
10/29/2015 18:26:00
10/29/2015 18:36:00
10/29/2015 18:46:00
10/29/2015 18:56:00
10/29/2015 19:06:00
DateTime


149.740 56
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/05/2015 00:00:00
11/07/2015 00:00:00
11/09/2015 00:00:00
11/11/2015 00:00:00
11/13/2015 00:00:00
11/15/2015 00:00:00
11/17/2015 00:00:00
11/19/2015 00:00:00
DateTime

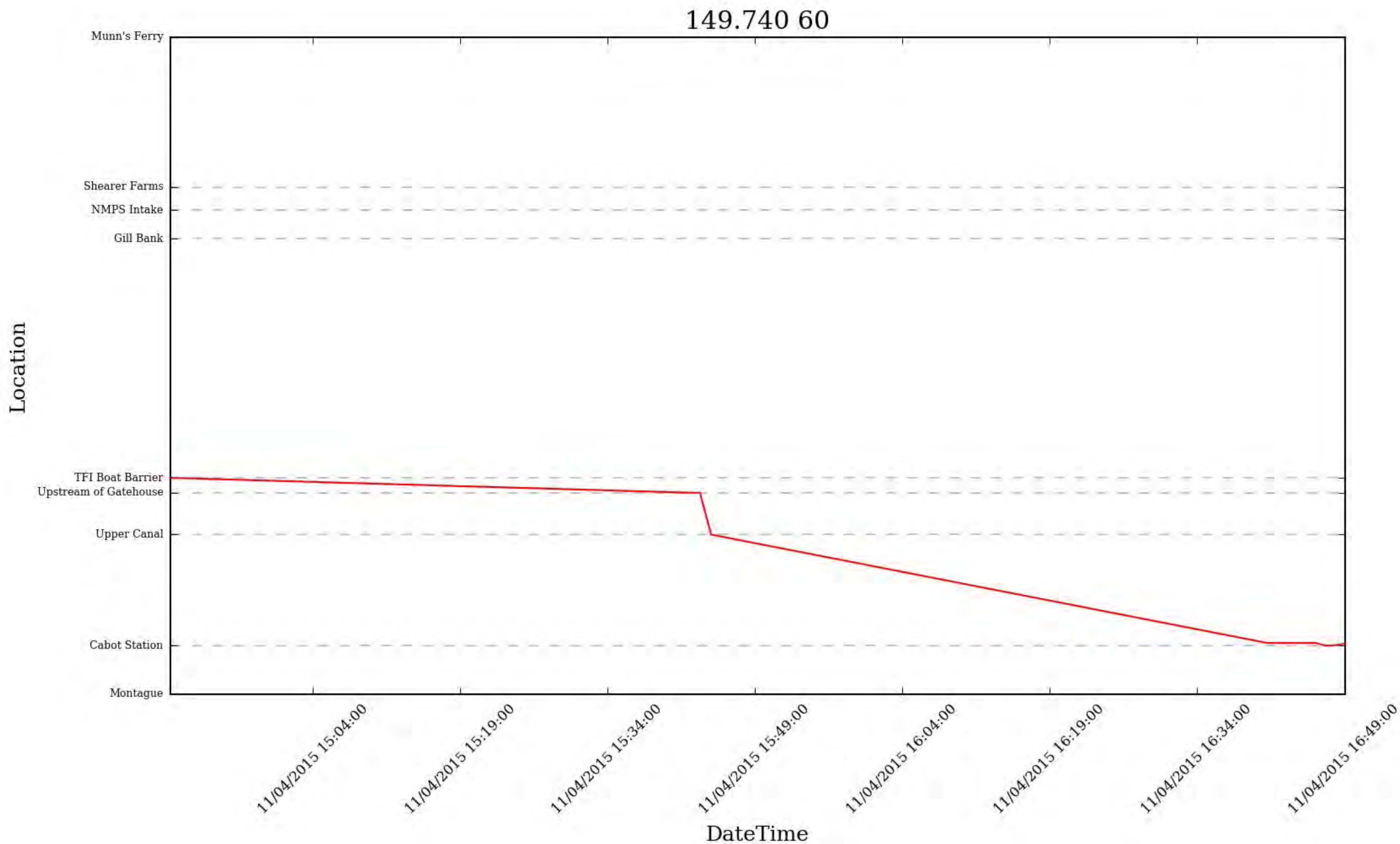


149.740 57
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/04/2015 00:32:00
11/04/2015 00:37:00
11/04/2015 00:42:00
11/04/2015 00:47:00
11/04/2015 00:52:00
DateTime

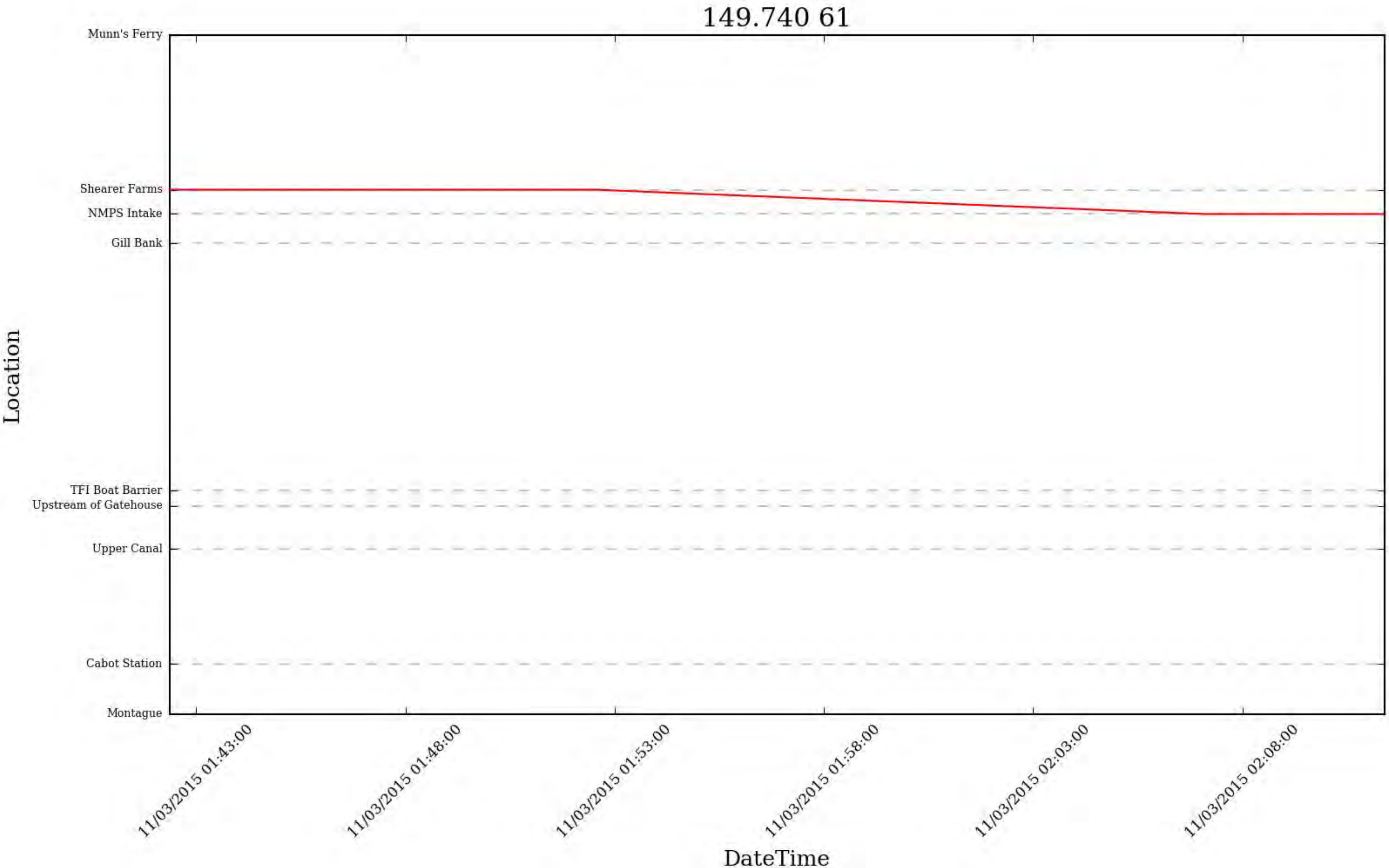

149.740 58
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/06/2015 00:00:00
11/08/2015 00:00:00
11/10/2015 00:00:00
11/12/2015 00:00:00
11/14/2015 00:00:00
11/16/2015 00:00:00
11/18/2015 00:00:00
DateTime



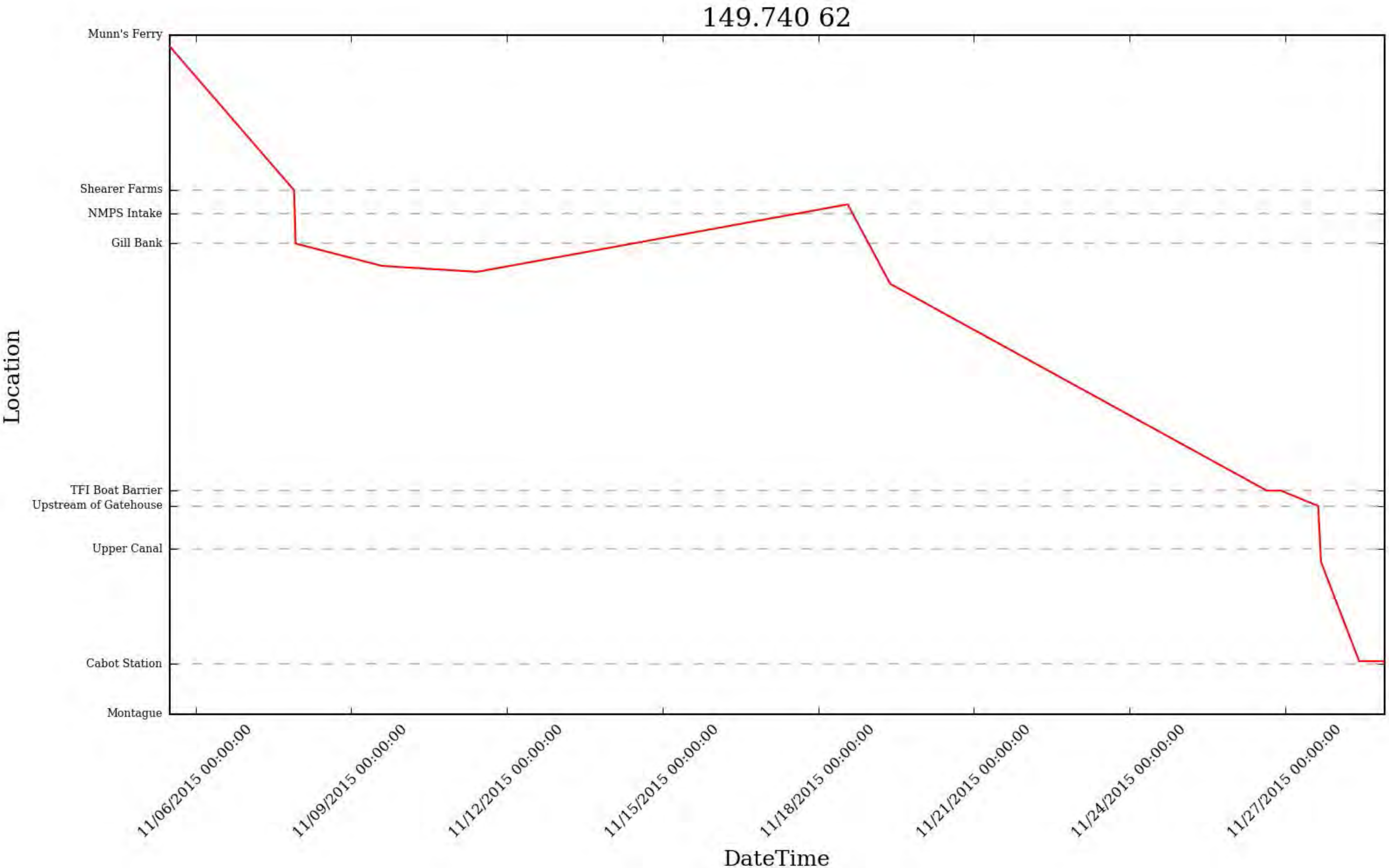
149.740 59
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/06/2015 00:00:00
11/08/2015 00:00:00
11/10/2015 00:00:00
11/12/2015 00:00:00
11/14/2015 00:00:00
11/16/2015 00:00:00
11/18/2015 00:00:00
11/20/2015 00:00:00
DateTime

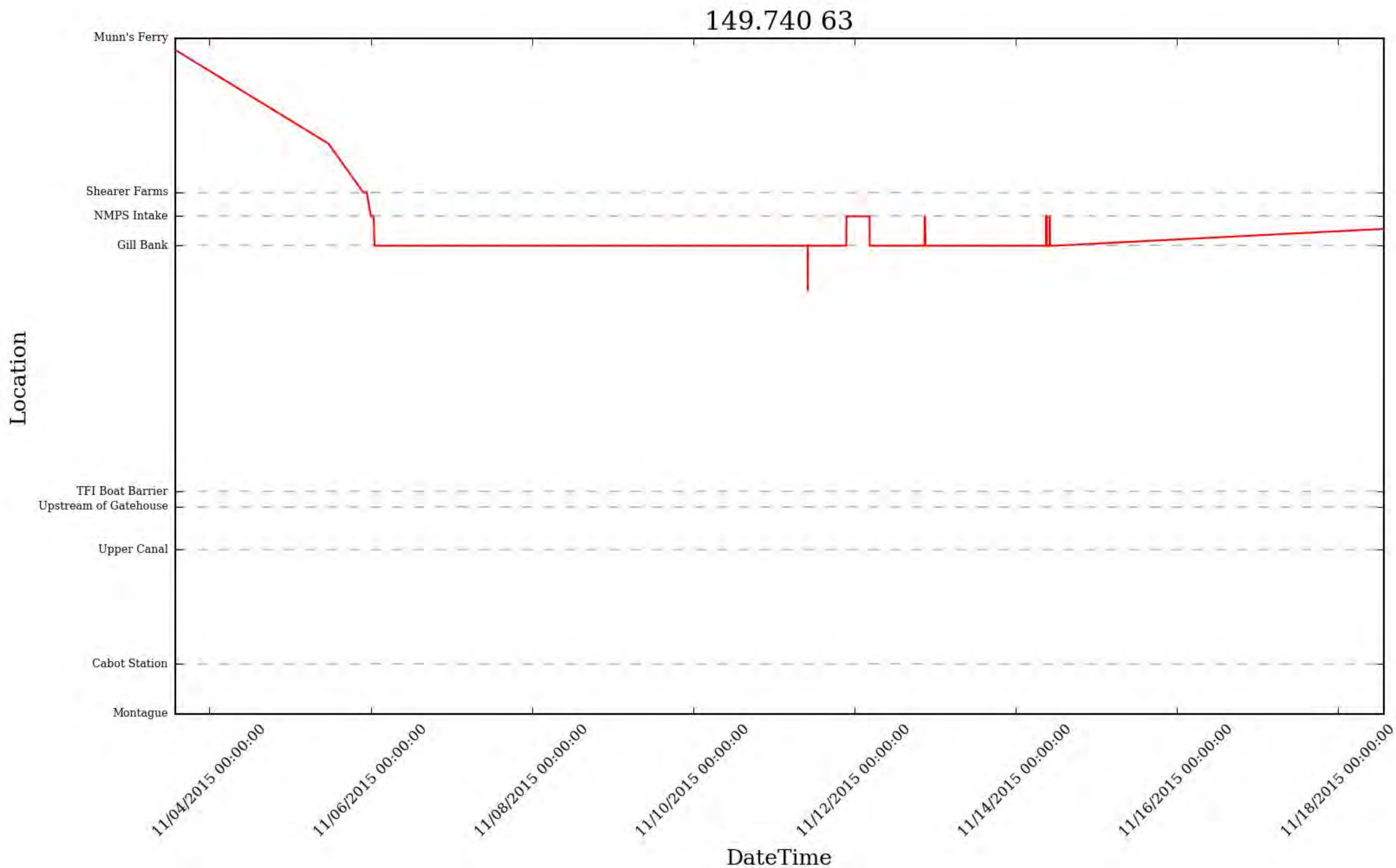


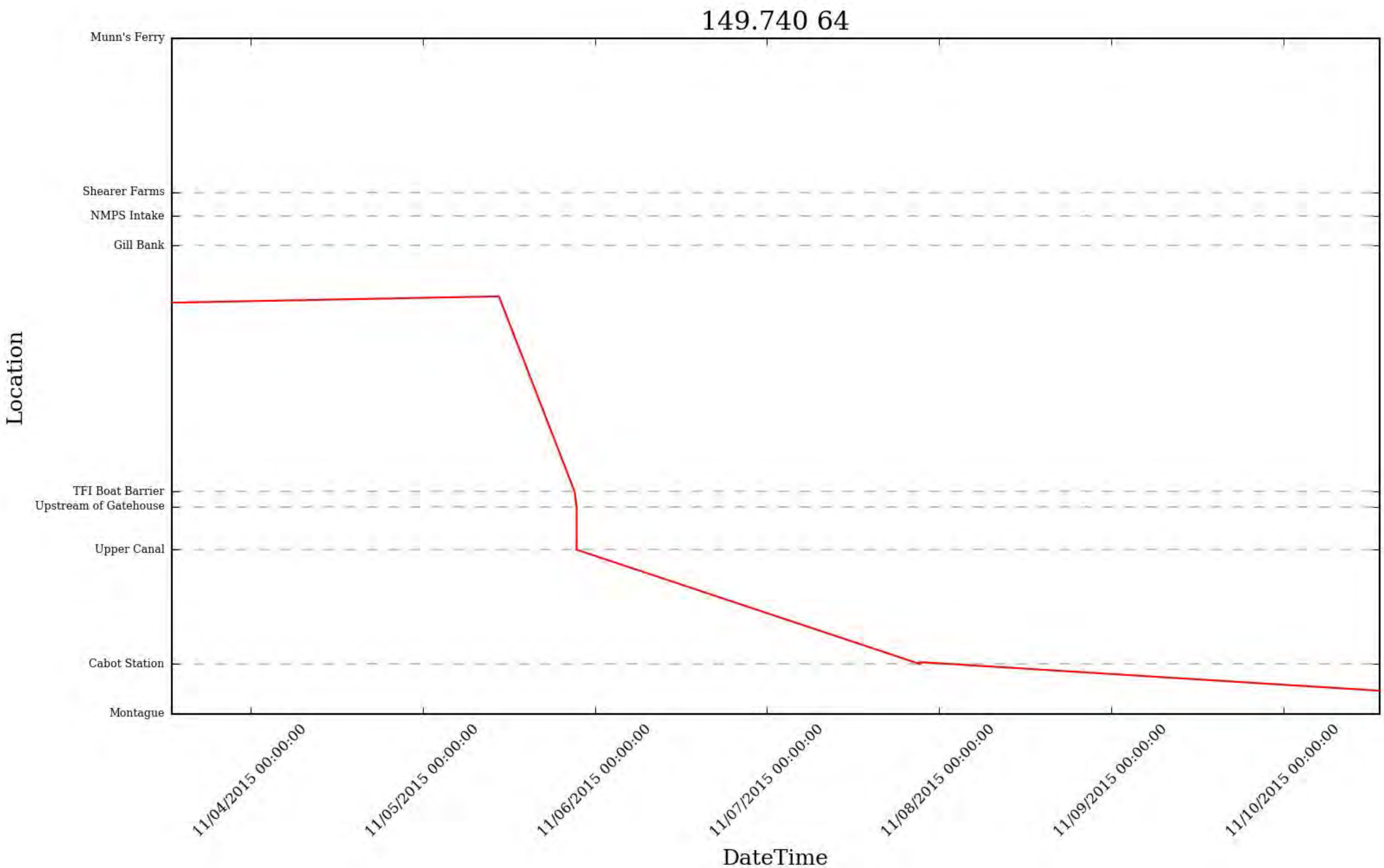
149.740 60
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/04/2015 15:04:00
11/04/2015 15:19:00
11/04/2015 15:34:00
11/04/2015 15:49:00
11/04/2015 16:04:00
11/04/2015 16:19:00
11/04/2015 16:34:00
11/04/2015 16:49:00
DateTime



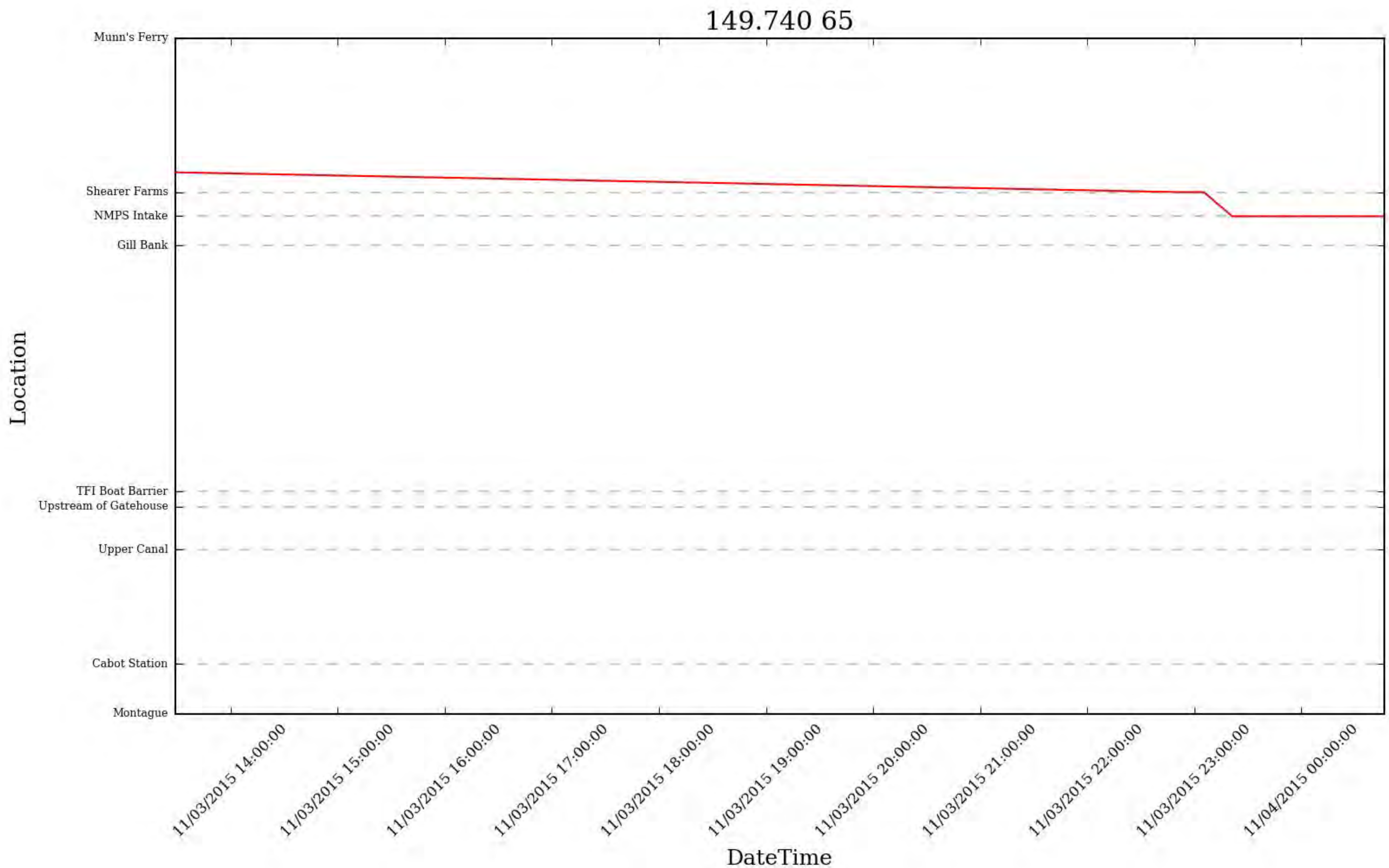
149.740 61
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/03/2015 01:43:00
11/03/2015 01:48:00
11/03/2015 01:53:00
11/03/2015 01:58:00
11/03/2015 02:03:00
11/03/2015 02:08:00
DateTime

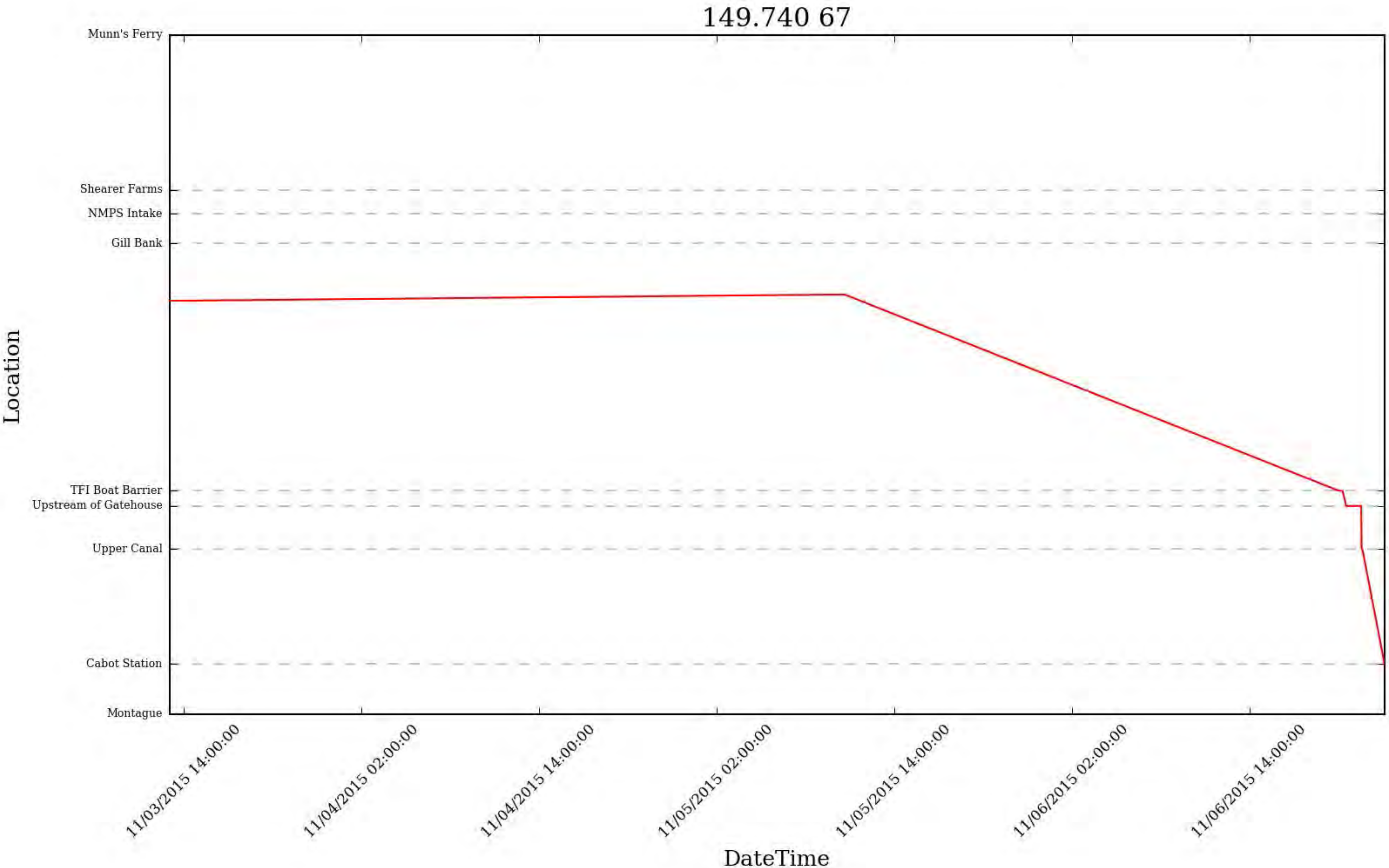

149.740 62
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/06/2015 00:00:00
11/09/2015 00:00:00
11/12/2015 00:00:00
11/15/2015 00:00:00
11/18/2015 00:00:00
11/21/2015 00:00:00
11/24/2015 00:00:00
11/27/2015 00:00:00
DateTime

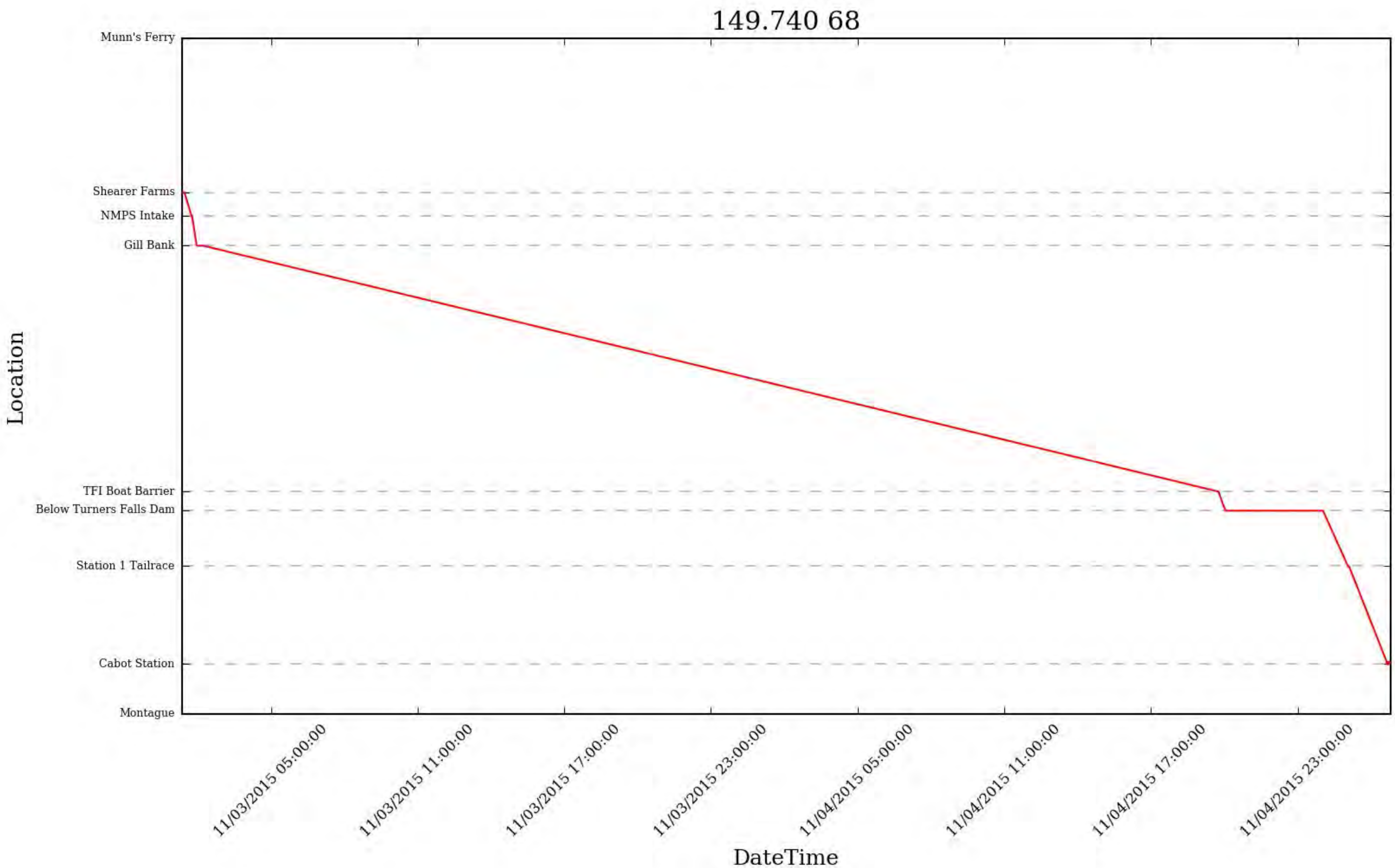

149.740 63
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/04/2015 00:00:00
11/06/2015 00:00:00
11/08/2015 00:00:00
11/10/2015 00:00:00
11/12/2015 00:00:00
11/14/2015 00:00:00
11/16/2015 00:00:00
11/18/2015 00:00:00
DateTime

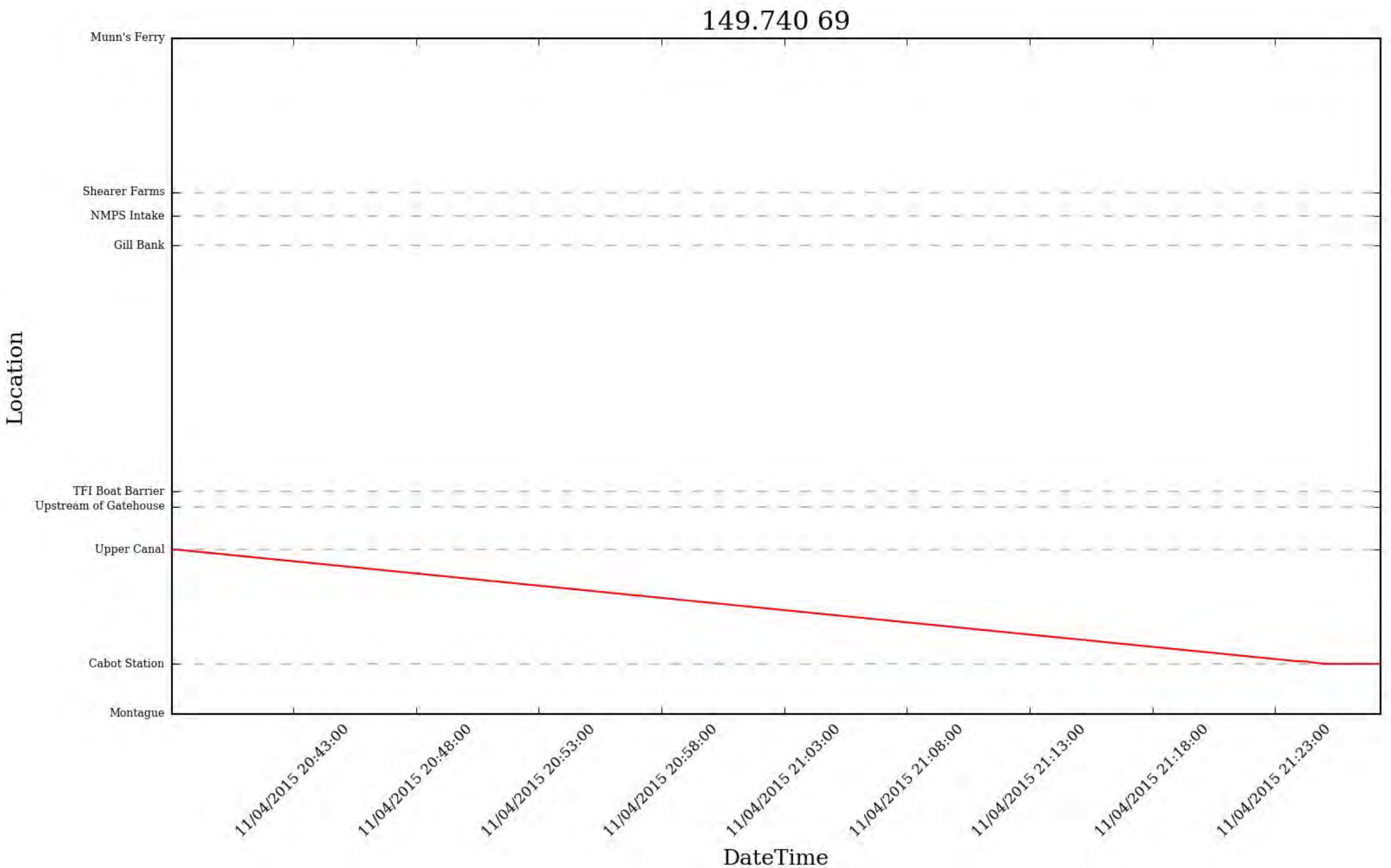


149.740 64
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/04/2015 00:00:00
11/05/2015 00:00:00
11/06/2015 00:00:00
11/07/2015 00:00:00
11/08/2015 00:00:00
11/09/2015 00:00:00
11/10/2015 00:00:00
DateTime

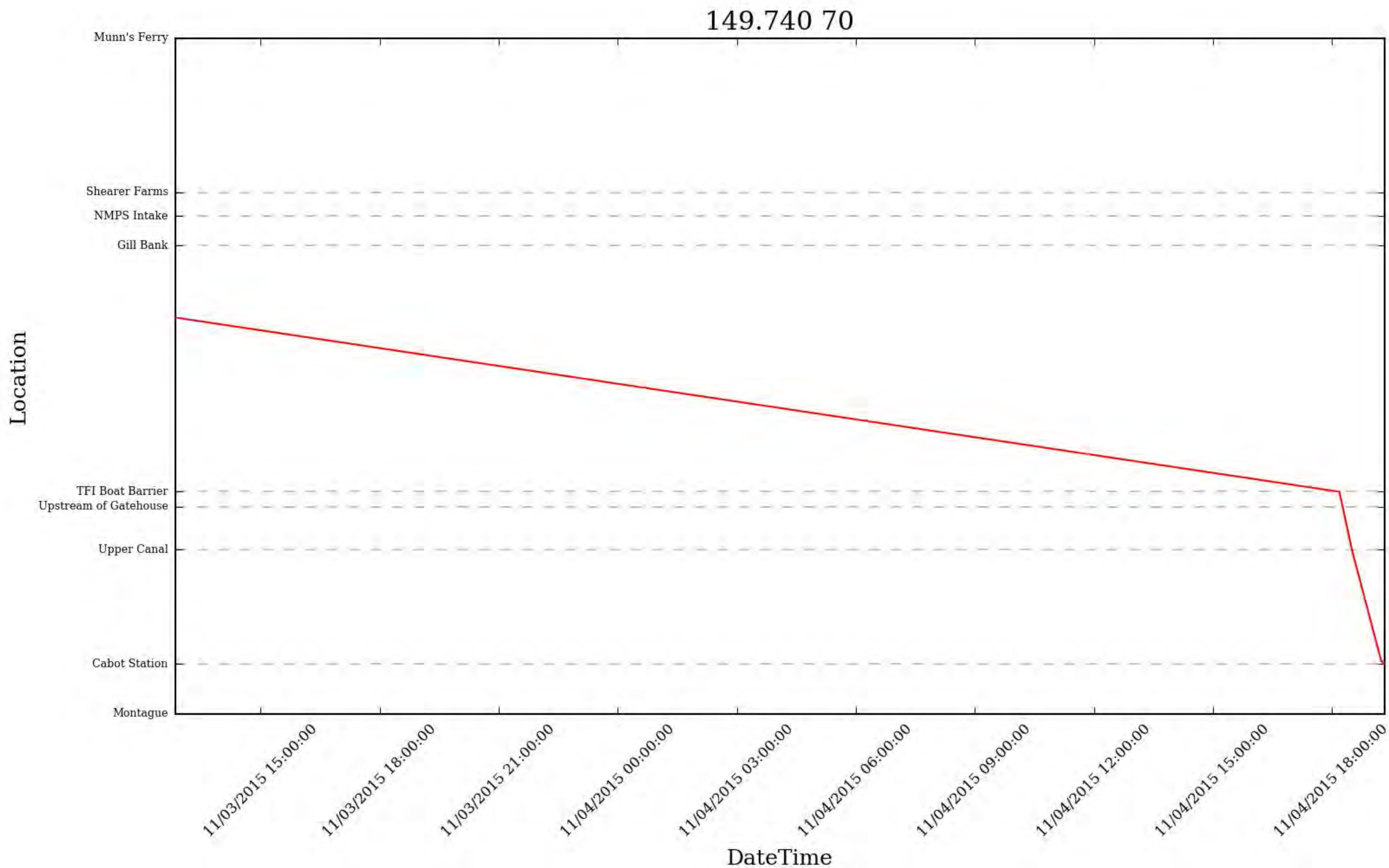

149.740 65
Location
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
11/03/2015 14:00:00
11/03/2015 15:00:00
11/03/2015 16:00:00
11/03/2015 17:00:00
11/03/2015 18:00:00
11/03/2015 19:00:00
11/03/2015 20:00:00
11/03/2015 21:00:00
11/03/2015 22:00:00
11/03/2015 23:00:00
11/04/2015 00:00:00
DateTime


149.740 67
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/03/2015 14:00:00
11/04/2015 02:00:00
11/04/2015 14:00:00
11/05/2015 02:00:00
11/05/2015 14:00:00
11/06/2015 02:00:00
11/06/2015 14:00:00
DateTime

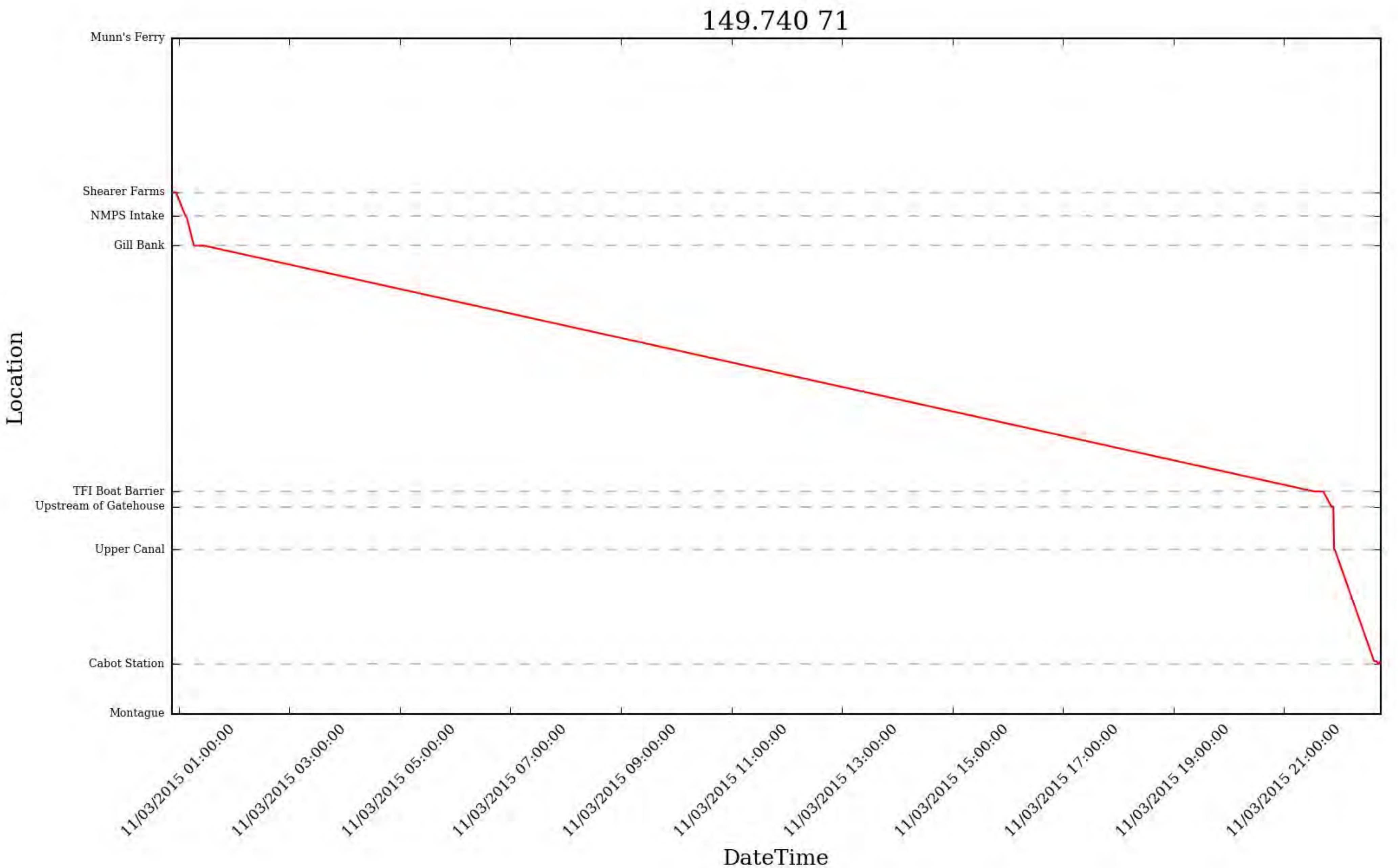

149.740 68
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Below Turners Falls Dam
Station 1 Tailrace
Cabot Station
Montague
Location
11/03/2015 05:00:00
11/03/2015 11:00:00
11/03/2015 17:00:00
11/03/2015 23:00:00
11/04/2015 05:00:00
11/04/2015 11:00:00
11/04/2015 17:00:00
11/04/2015 23:00:00
DateTime

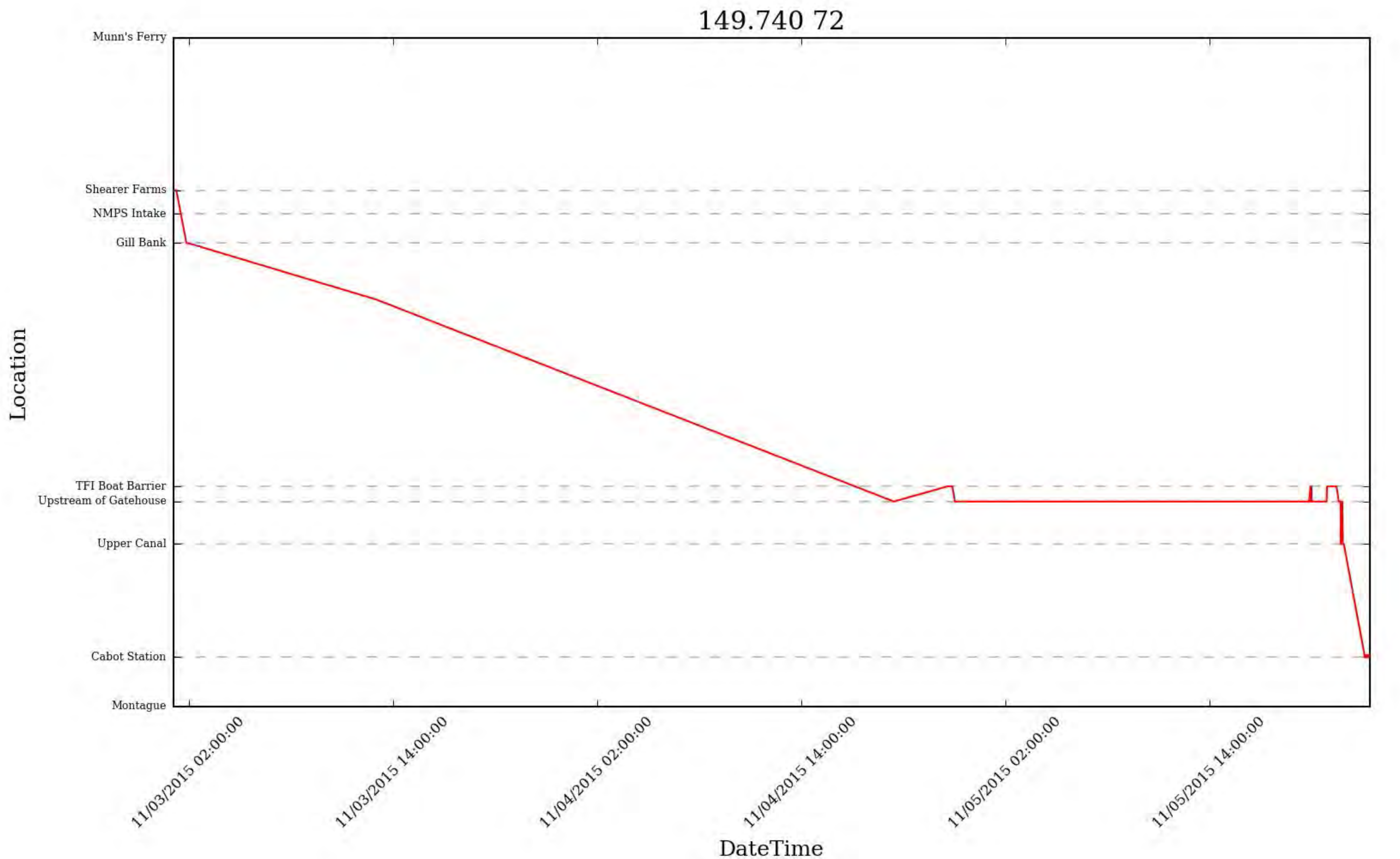


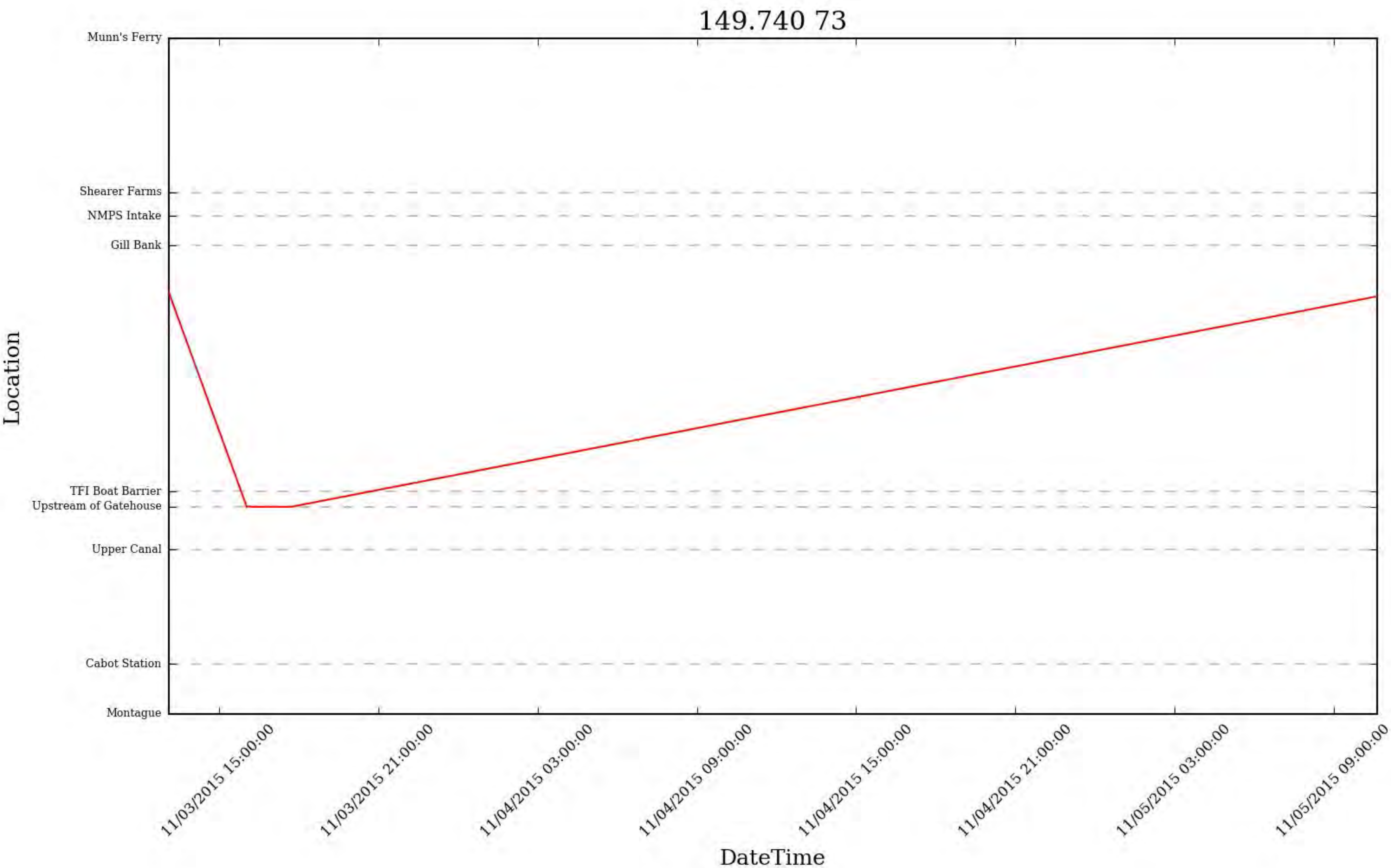
149.740 69
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/04/2015 20:43:00
11/04/2015 20:48:00
11/04/2015 20:53:00
11/04/2015 20:58:00
11/04/2015 21:03:00
11/04/2015 21:08:00
11/04/2015 21:13:00
11/04/2015 21:18:00
11/04/2015 21:23:00
DateTime



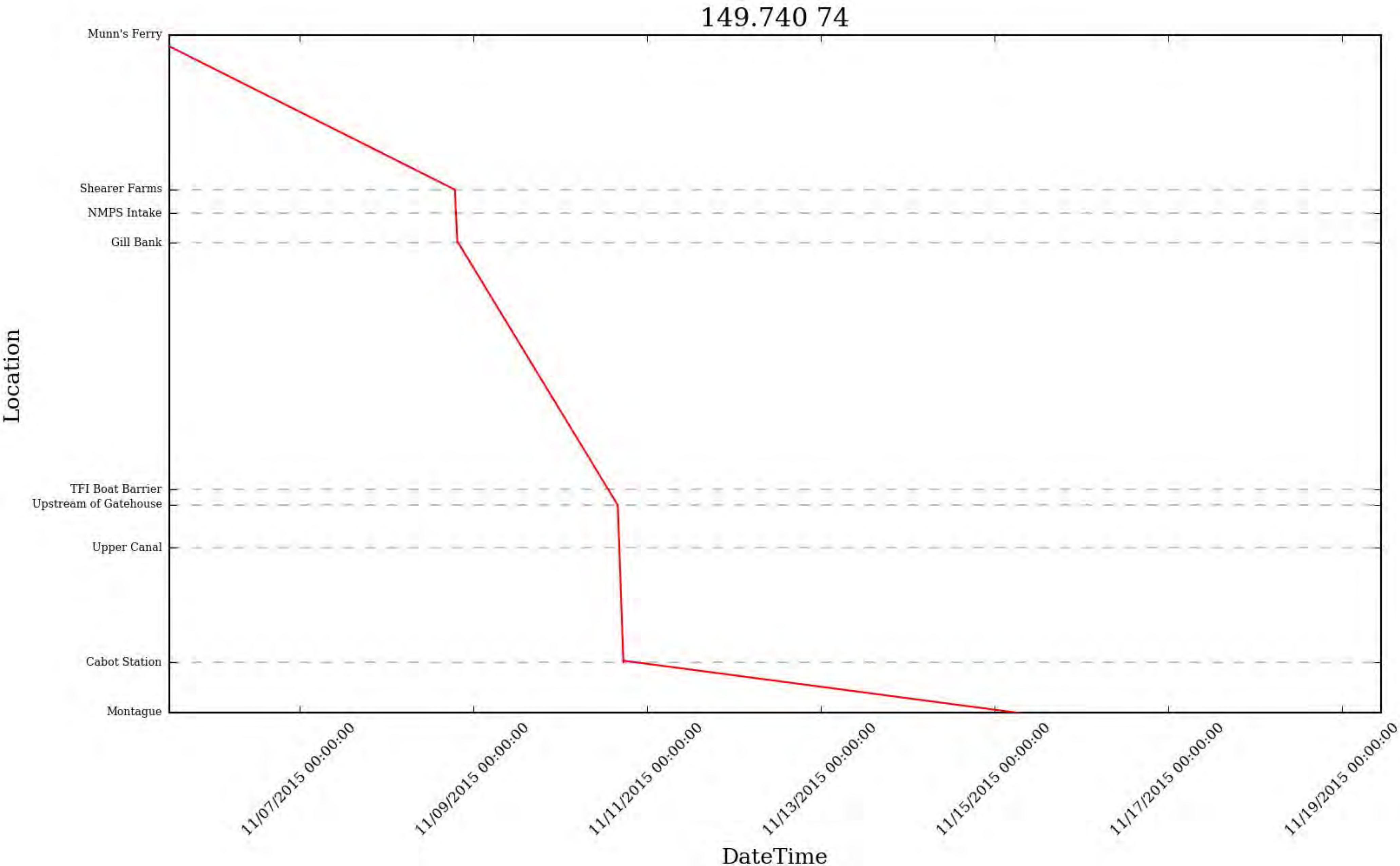
149.740 70
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/03/2015 15:00:00
11/03/2015 18:00:00
11/03/2015 21:00:00
11/04/2015 00:00:00
11/04/2015 03:00:00
11/04/2015 06:00:00
11/04/2015 09:00:00
11/04/2015 12:00:00
11/04/2015 15:00:00
11/04/2015 18:00:00
DateTime


149.740 71
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/03/2015 01:00:00
11/03/2015 03:00:00
11/03/2015 05:00:00
11/03/2015 07:00:00
11/03/2015 09:00:00
11/03/2015 11:00:00
11/03/2015 13:00:00
11/03/2015 15:00:00
11/03/2015 17:00:00
11/03/2015 19:00:00
11/03/2015 21:00:00
DateTime

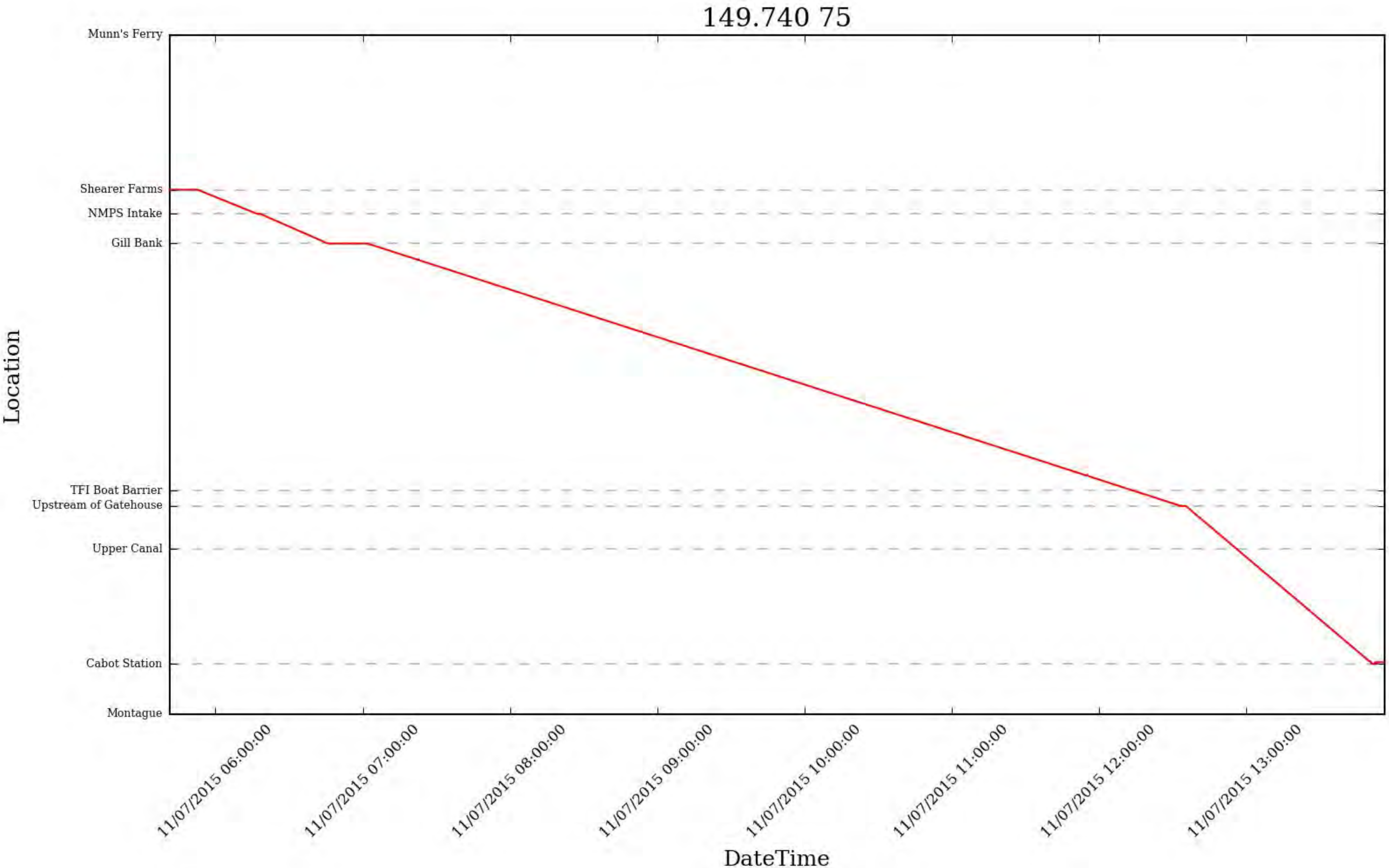

149.740 72
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/03/2015 02:00:00
11/03/2015 14:00:00
11/04/2015 02:00:00
11/04/2015 14:00:00
11/05/2015 02:00:00
11/05/2015 14:00:00
DateTime



149.740 73
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/03/2015 15:00:00
11/03/2015 21:00:00
11/04/2015 03:00:00
11/04/2015 09:00:00
11/04/2015 15:00:00
11/04/2015 21:00:00
11/05/2015 03:00:00
11/05/2015 09:00:00
DateTime



149.740 74
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/07/2015 00:00:00
11/09/2015 00:00:00
11/11/2015 00:00:00
11/13/2015 00:00:00
11/15/2015 00:00:00
11/17/2015 00:00:00
11/19/2015 00:00:00
DateTime



149.740 75
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/07/2015 06:00:00
11/07/2015 07:00:00
11/07/2015 08:00:00
11/07/2015 09:00:00
11/07/2015 10:00:00
11/07/2015 11:00:00
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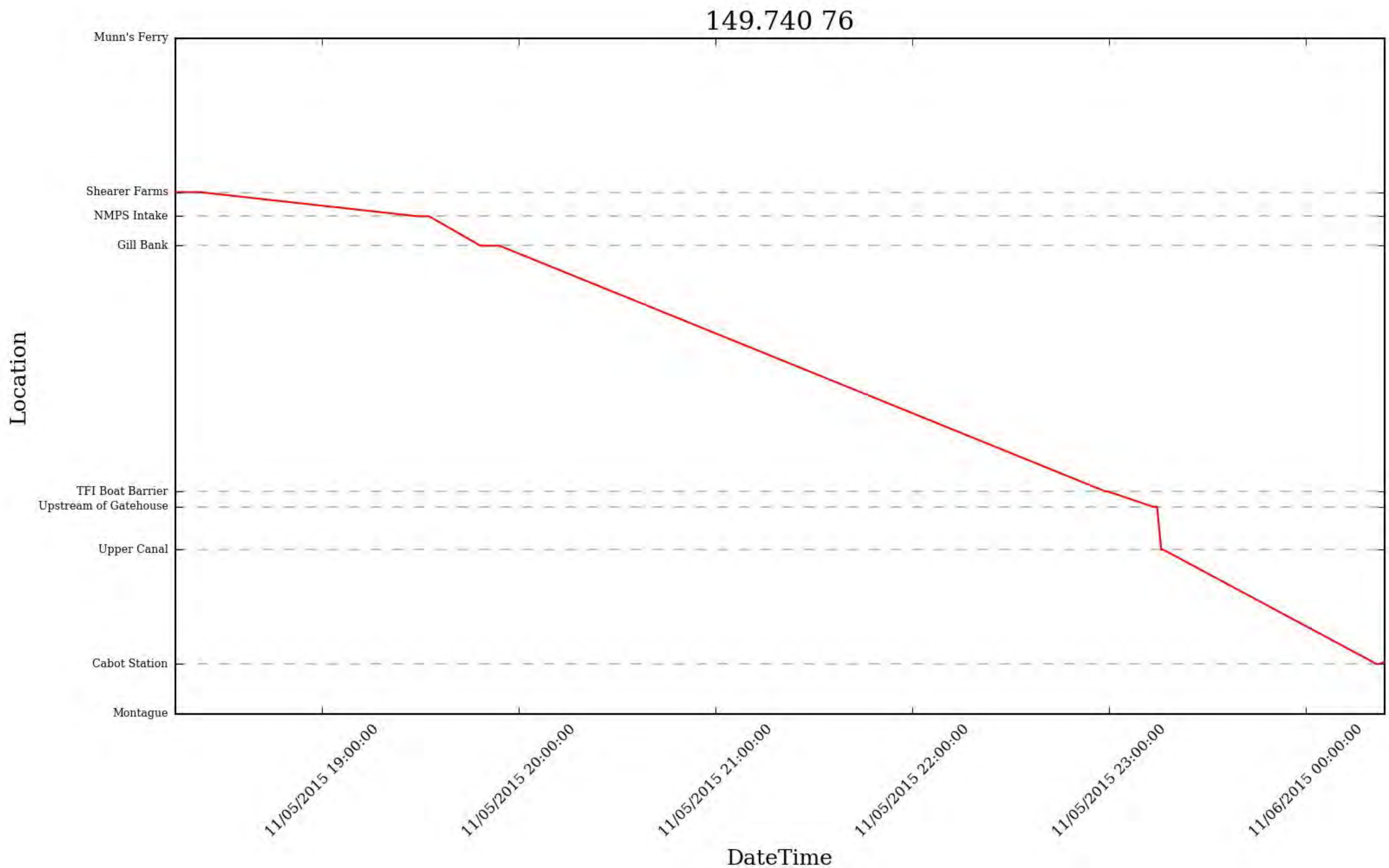
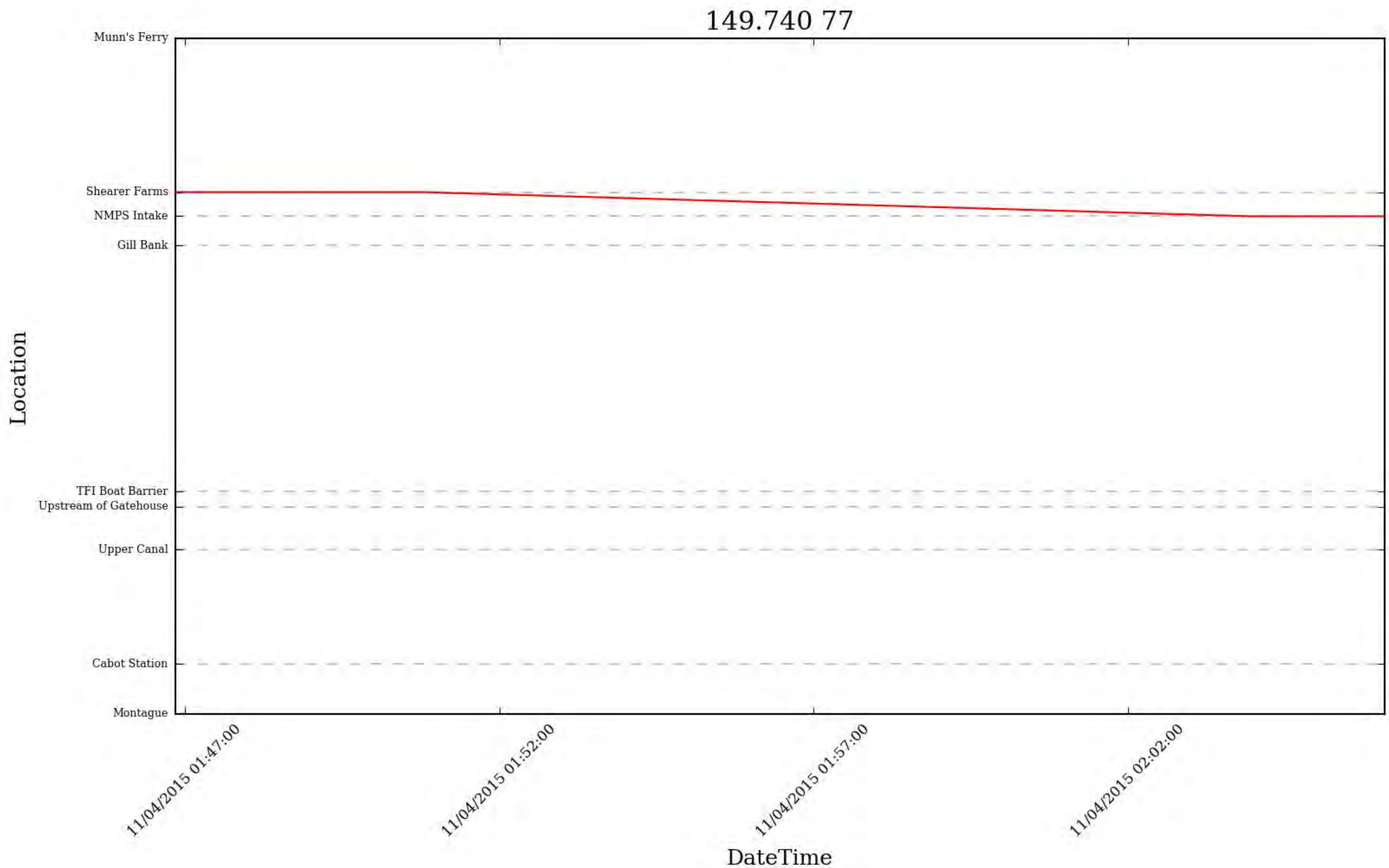
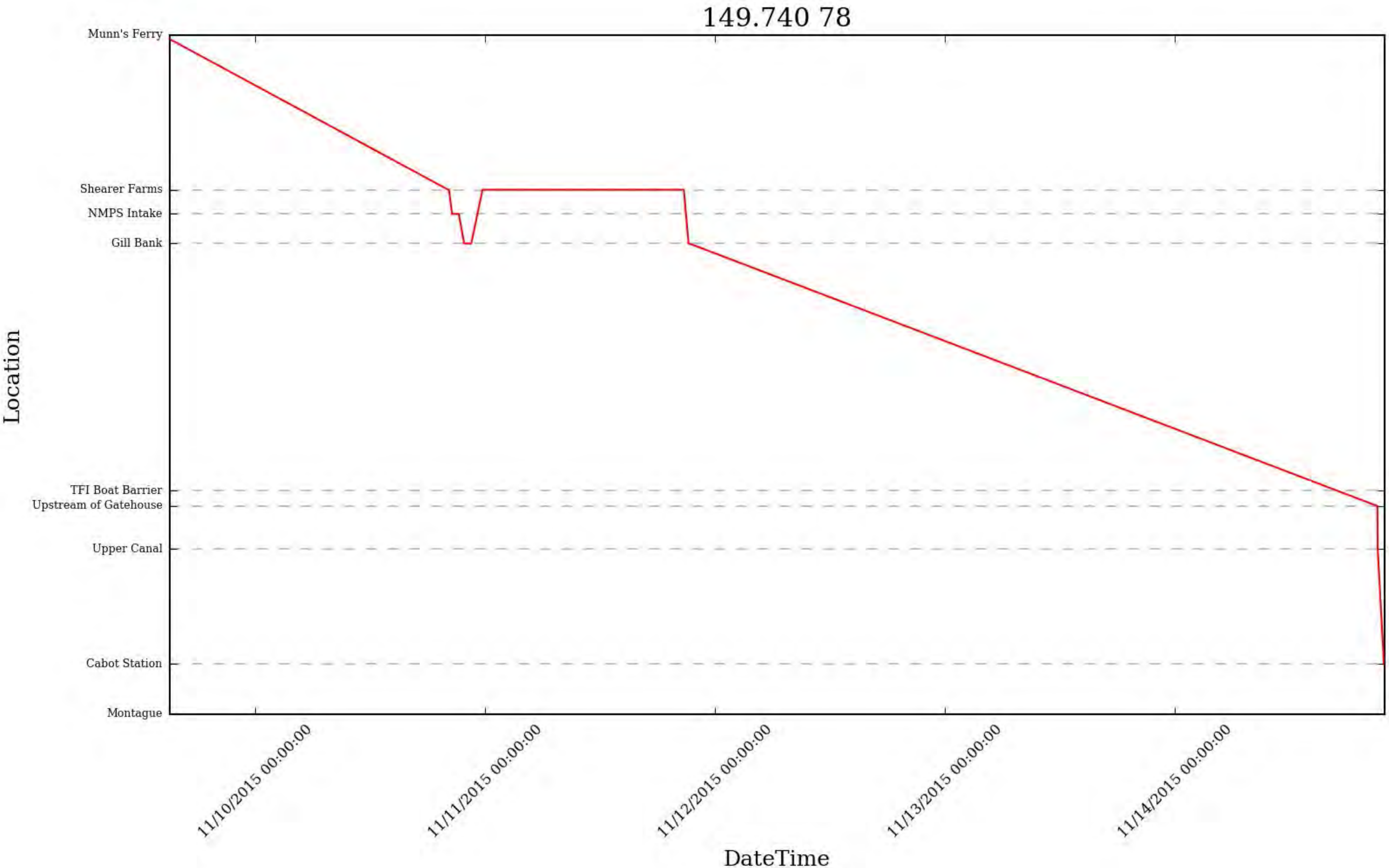
11/07/2015 13:00:00
DateTime

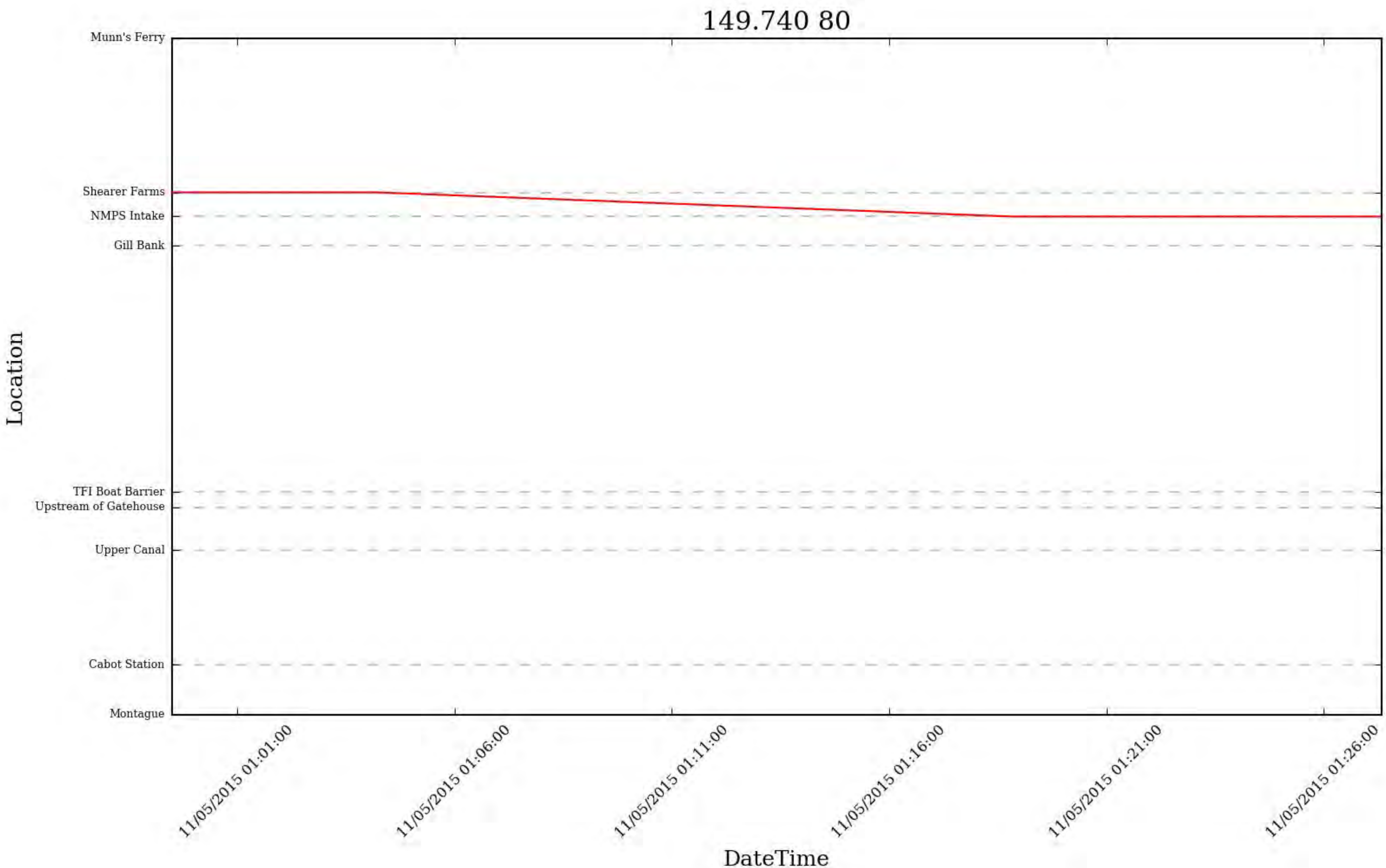

149.740 76
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/05/2015 19:00:00
11/05/2015 20:00:00
11/05/2015 21:00:00
11/05/2015 22:00:00
11/05/2015 23:00:00
11/06/2015 00:00:00
DateTime

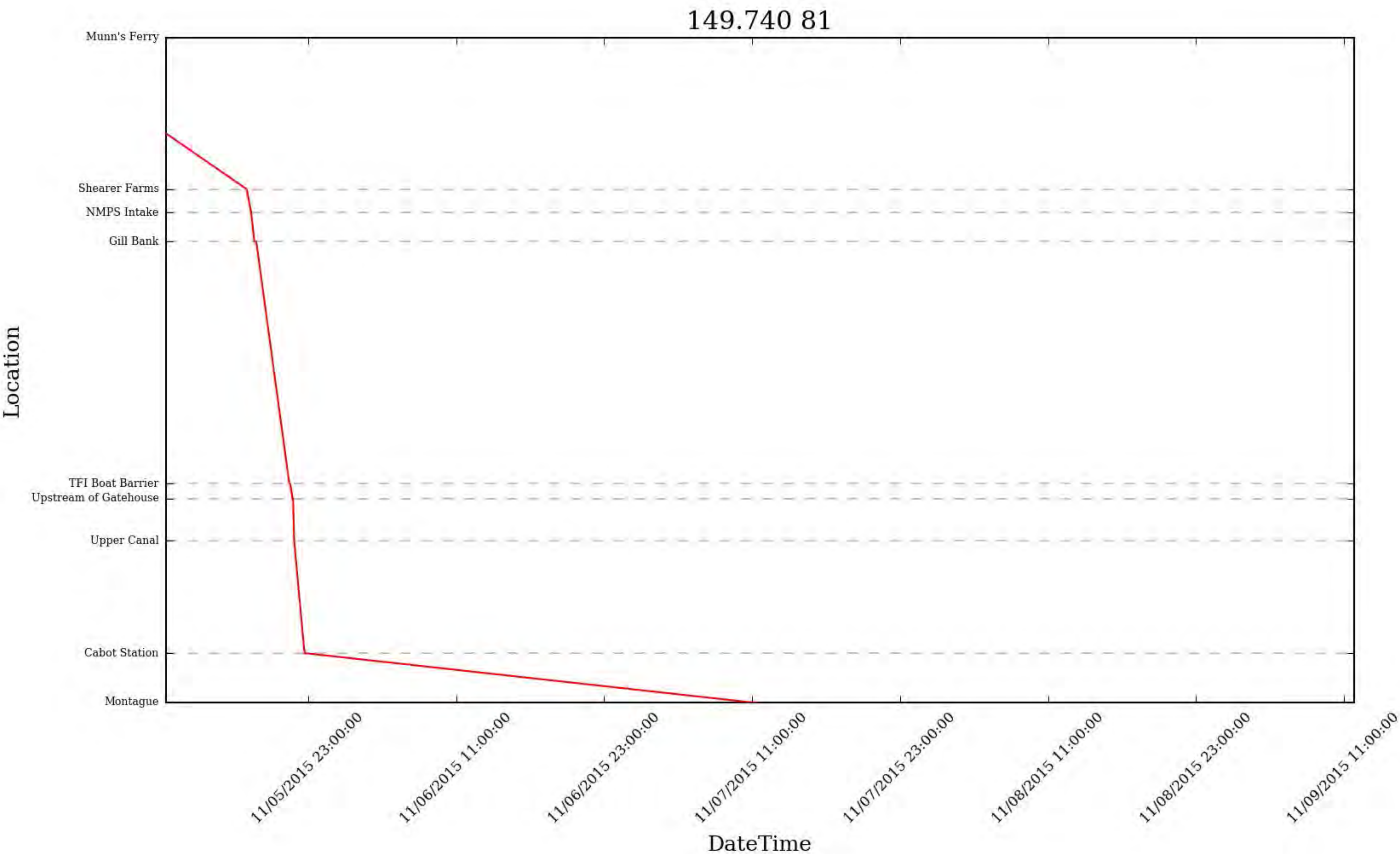


149.740 77
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/04/2015 01:47:00
11/04/2015 01:52:00
11/04/2015 01:57:00
11/04/2015 02:02:00
DateTime

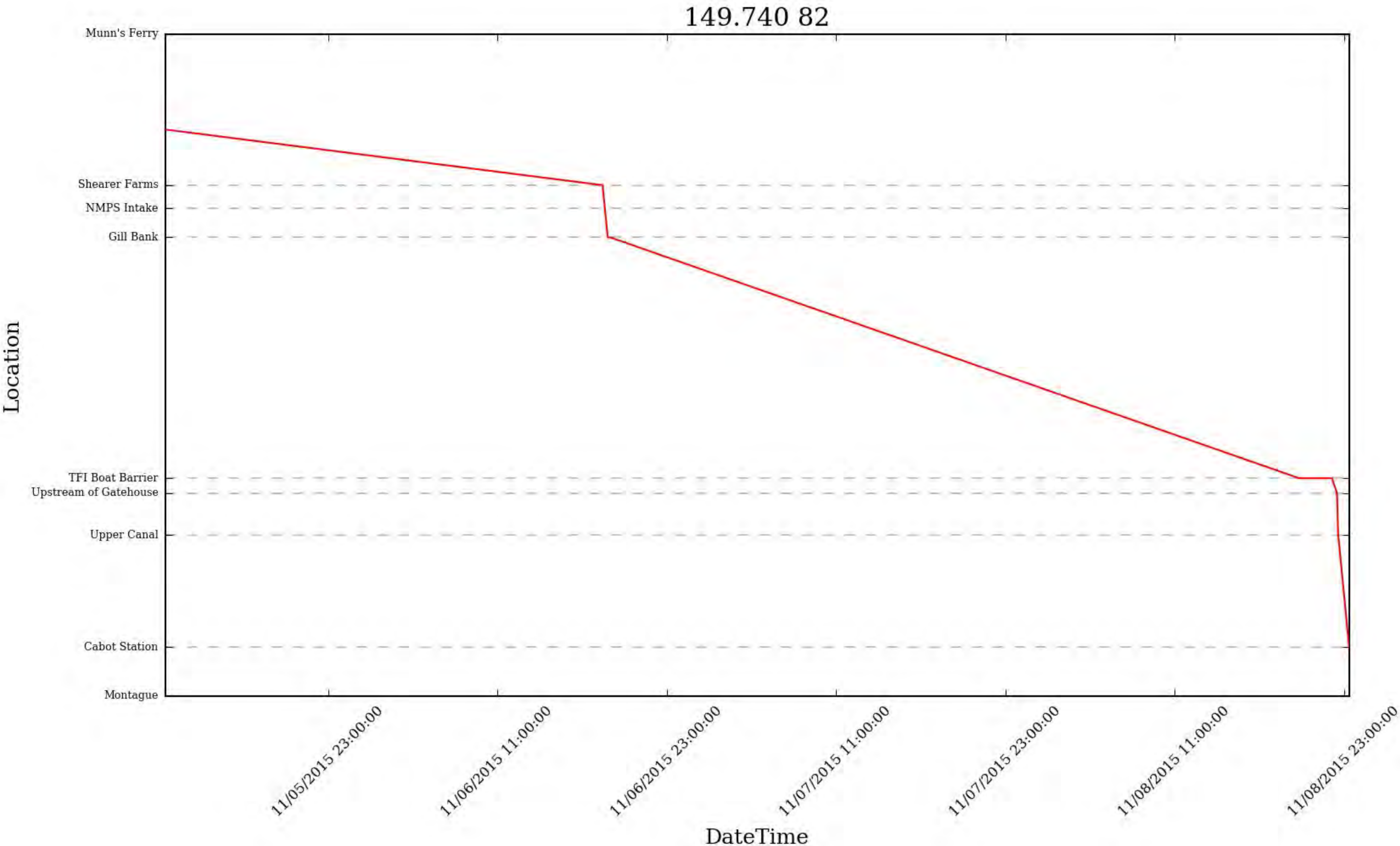


149.740 78
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/10/2015 00:00:00
11/11/2015 00:00:00
11/12/2015 00:00:00
11/13/2015 00:00:00
11/14/2015 00:00:00
DateTime

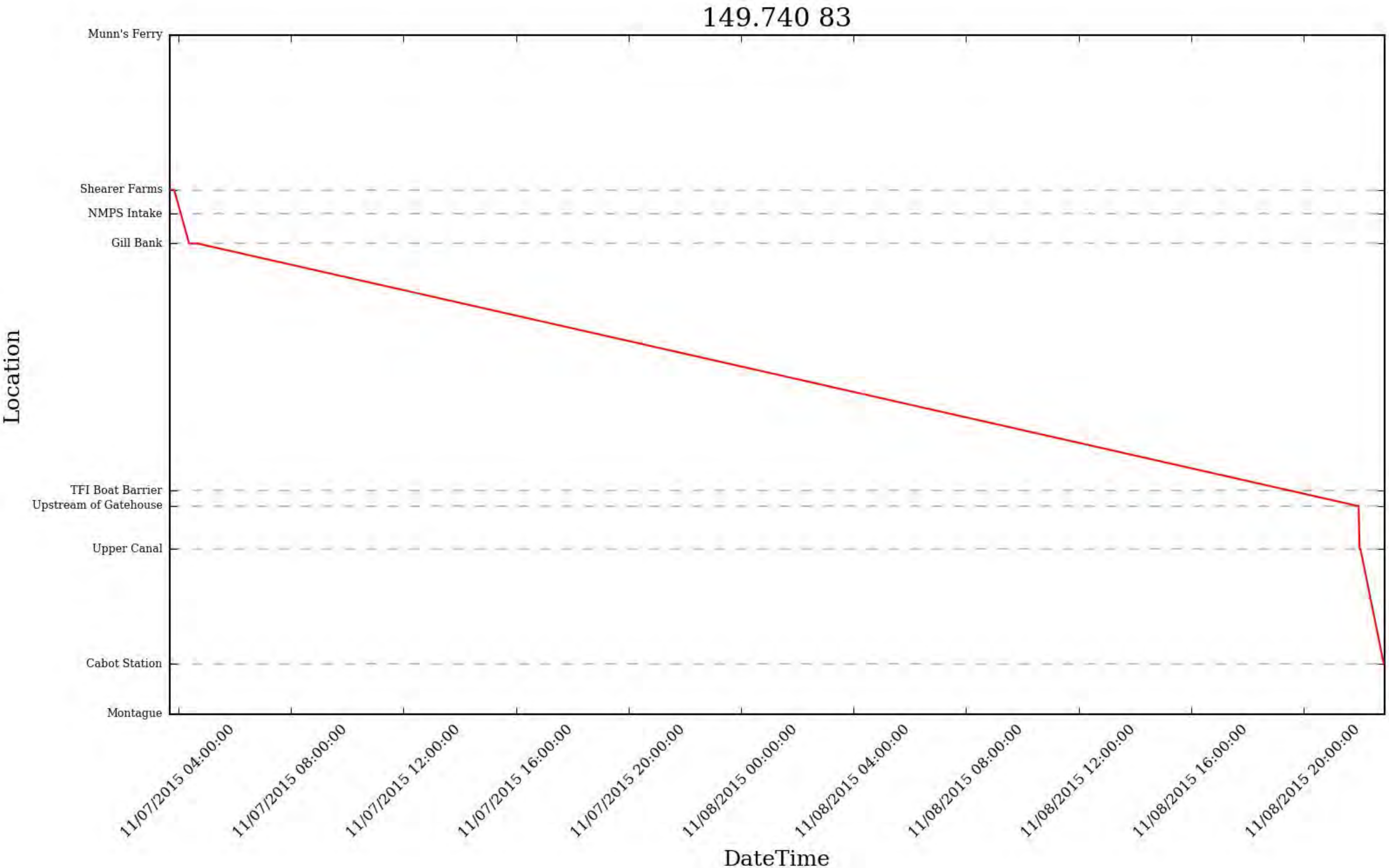

149.740 80
Location
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
11/05/2015 01:01:00
11/05/2015 01:06:00
11/05/2015 01:11:00
11/05/2015 01:16:00
11/05/2015 01:21:00
11/05/2015 01:26:00
DateTime



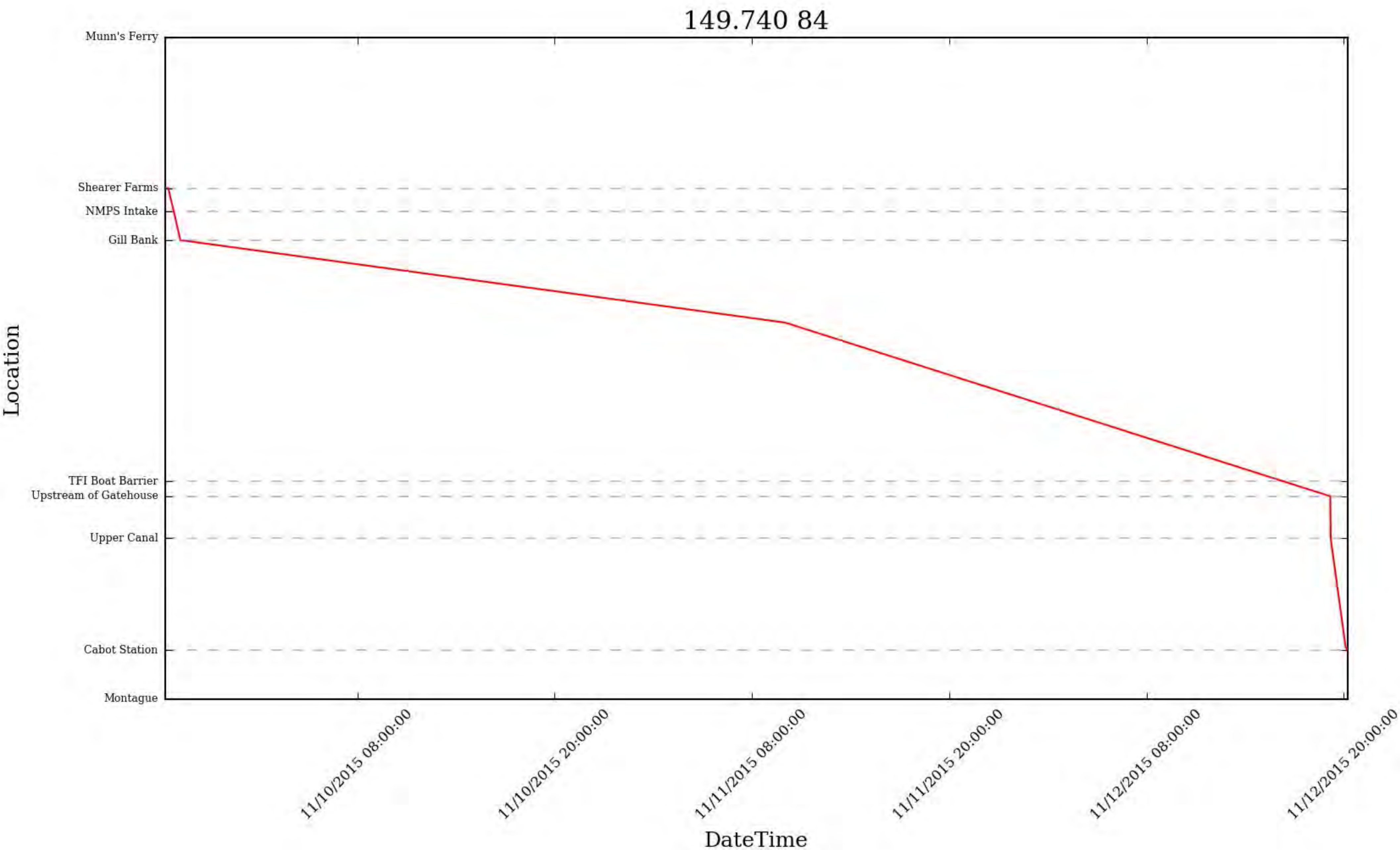
149.740 81
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/05/2015 23:00:00
11/06/2015 11:00:00
11/06/2015 23:00:00
11/07/2015 11:00:00
11/07/2015 23:00:00
11/08/2015 11:00:00
11/08/2015 23:00:00
11/09/2015 11:00:00
DateTime



149.740 82
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/05/2015 23:00:00
11/06/2015 11:00:00
11/06/2015 23:00:00
11/07/2015 11:00:00
11/07/2015 23:00:00
11/08/2015 11:00:00
11/08/2015 23:00:00
DateTime



149.740 83
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/07/2015 04:00:00
11/07/2015 08:00:00
11/07/2015 12:00:00
11/07/2015 16:00:00
11/07/2015 20:00:00
11/08/2015 00:00:00
11/08/2015 04:00:00
11/08/2015 08:00:00
11/08/2015 12:00:00
11/08/2015 16:00:00
11/08/2015 20:00:00
DateTime


149.740 84
Location
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
11/10/2015 08:00:00
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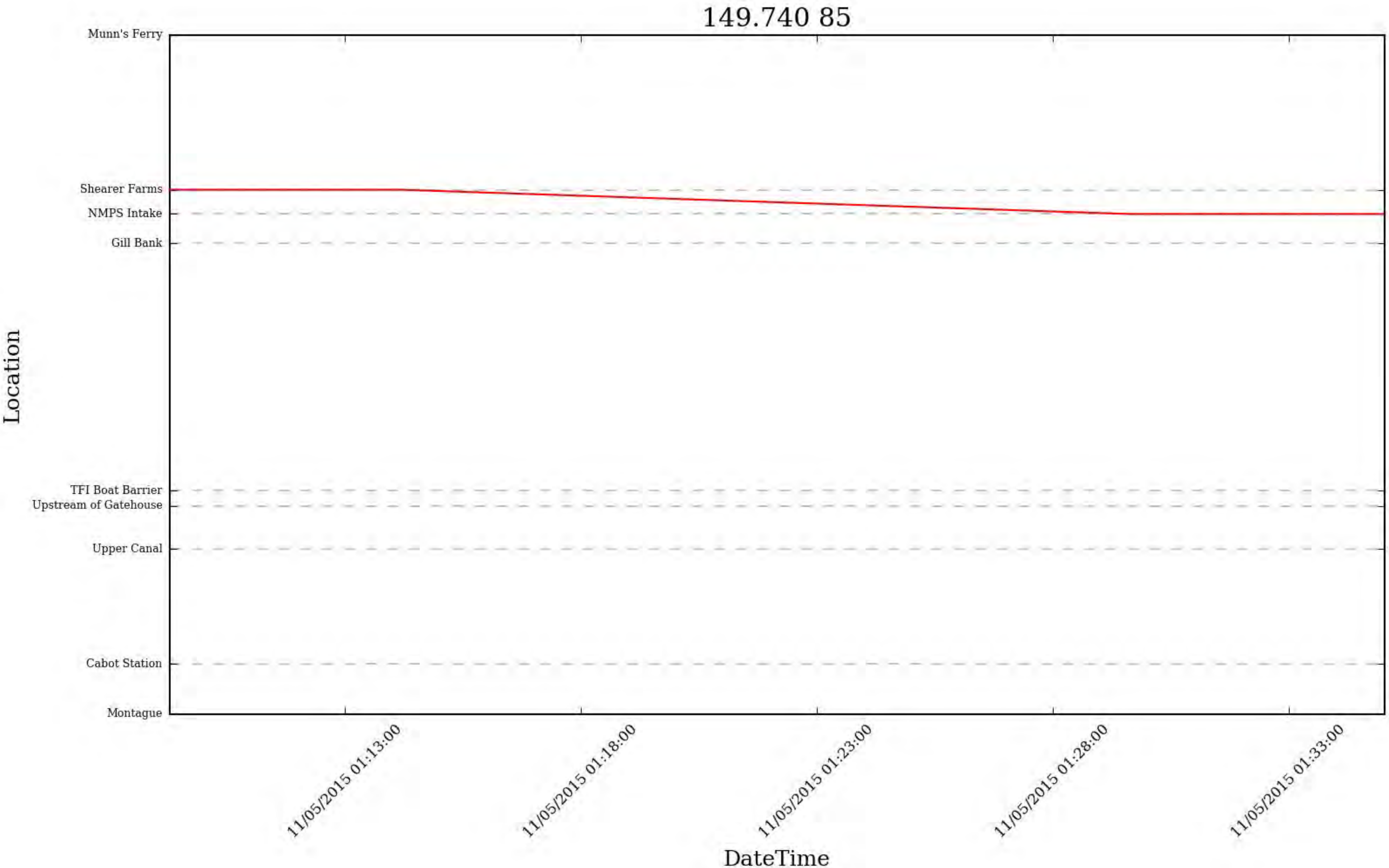
11/11/2015 20:00:00
11/12/2015 08:00:00
11/12/2015 20:00:00
DateTime


149.740 85
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
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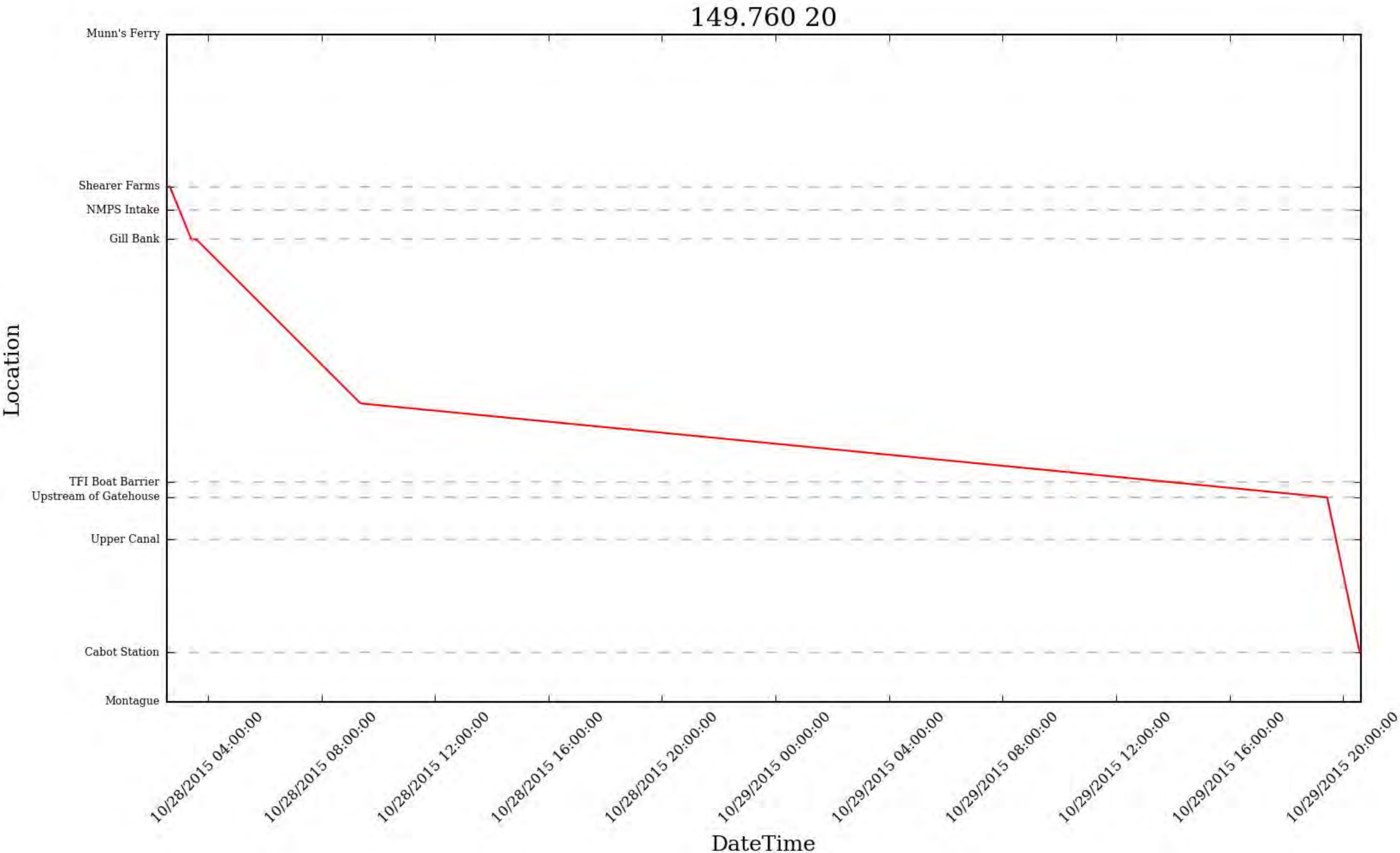
11/05/2015 01:18:00
11/05/2015 01:23:00
11/05/2015 01:28:00
11/05/2015 01:33:00
DateTime


149.760 20
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
10/28/2015 04:00:00
10/28/2015 08:00:00
10/28/2015 12:00:00
10/28/2015 16:00:00
10/28/2015 20:00:00
10/29/2015 00:00:00
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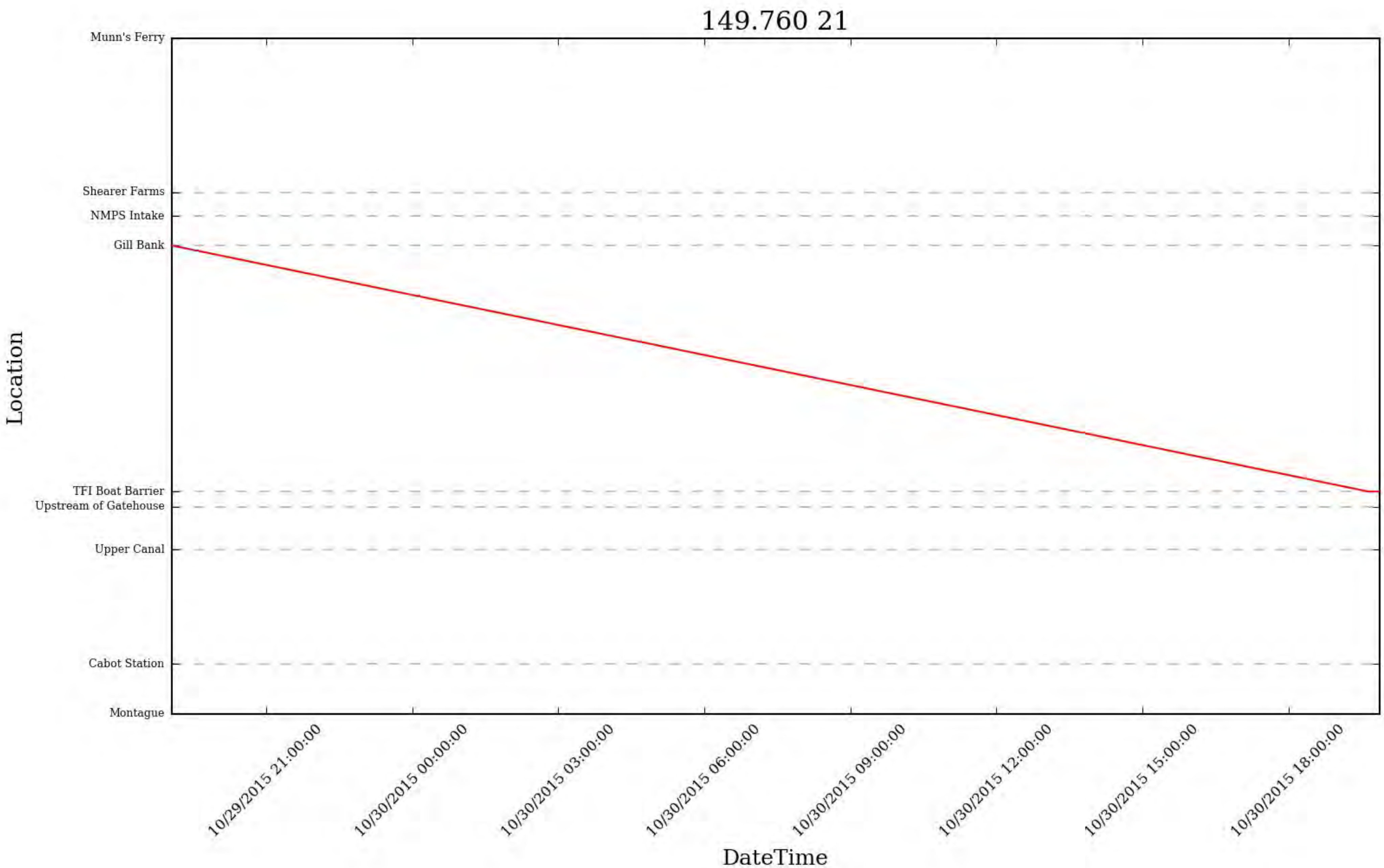
10/29/2015 16:00:00
10/29/2015 20:00:00
DateTime



149.760 21
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
10/29/2015 21:00:00
10/30/2015 00:00:00
10/30/2015 03:00:00
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10/30/2015 12:00:00
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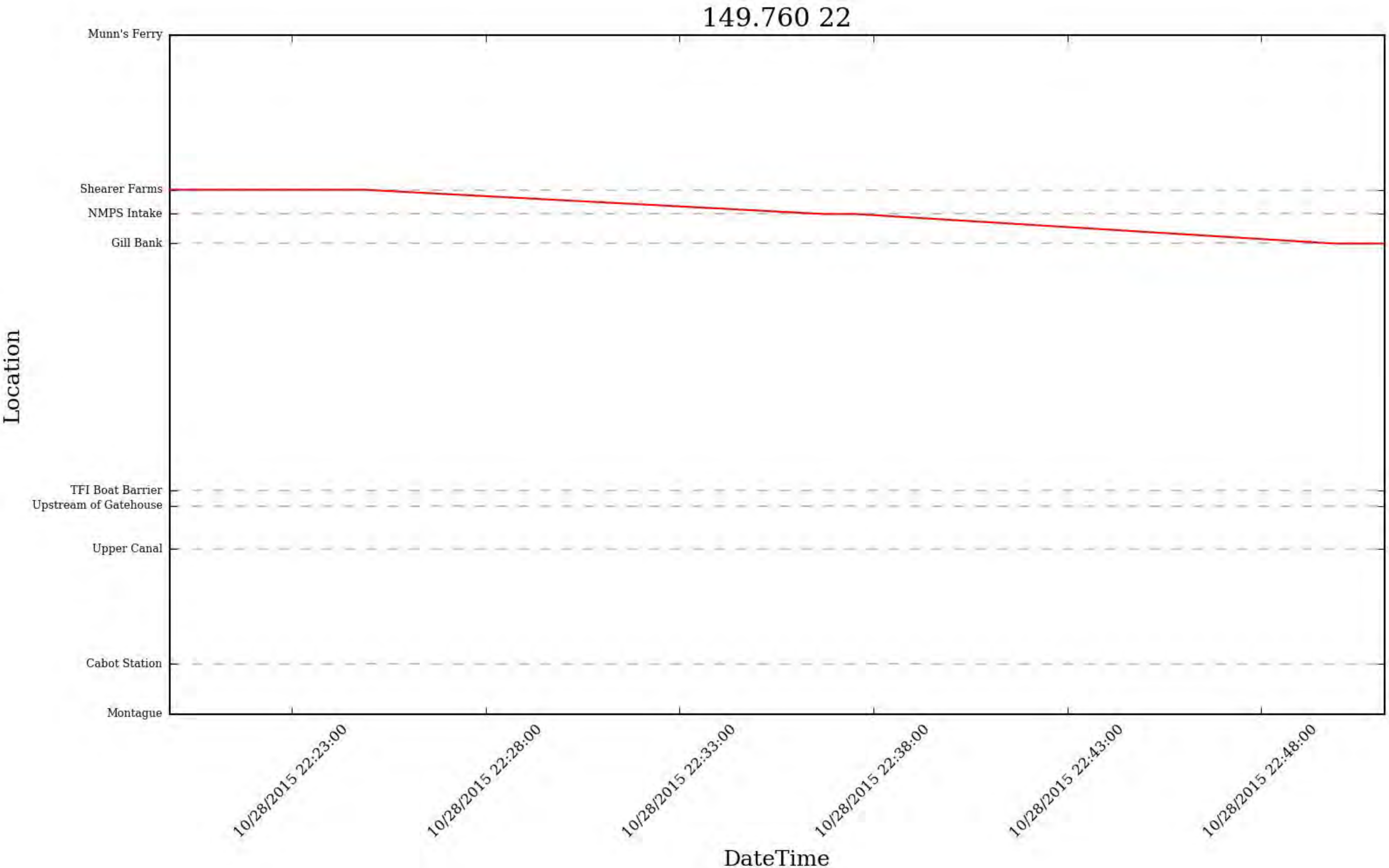
10/30/2015 18:00:00
DateTime



149.760 22
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
10/28/2015 22:23:00
10/28/2015 22:28:00
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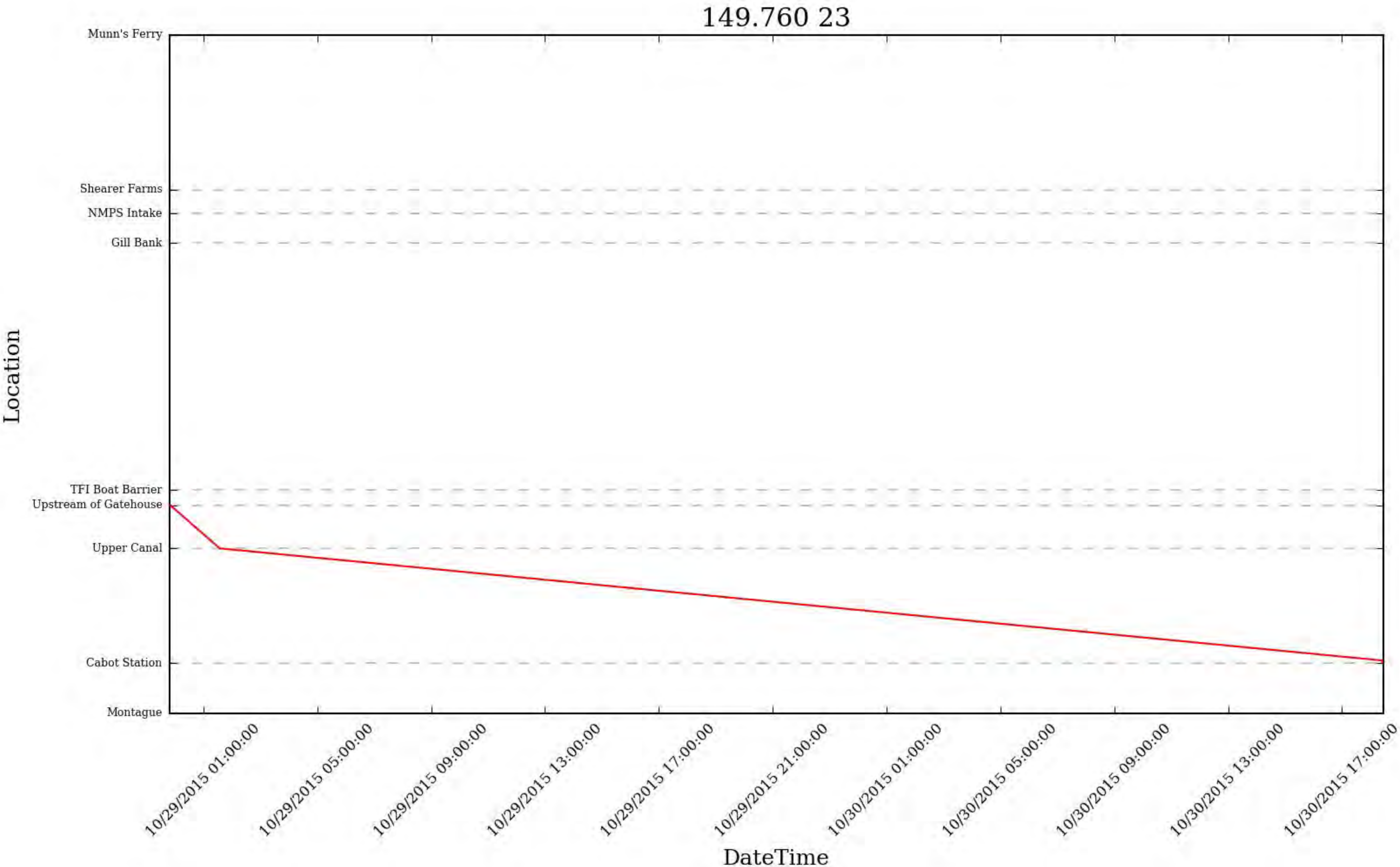
10/28/2015 22:43:00
10/28/2015 22:48:00
DateTime


149.760 23
Location
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
10/29/2015 01:00:00
10/29/2015 05:00:00
10/29/2015 09:00:00
10/29/2015 13:00:00
10/29/2015 17:00:00
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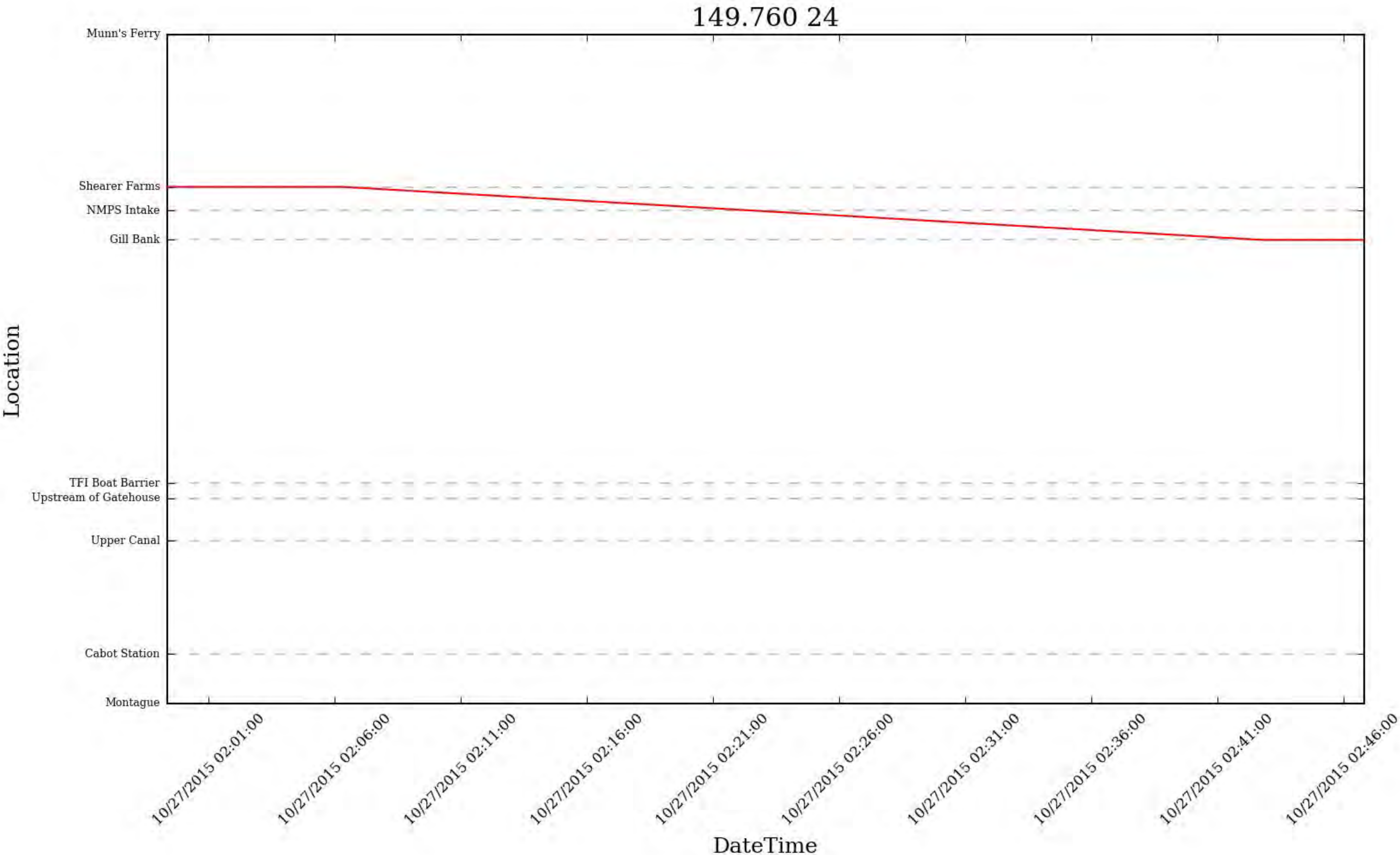
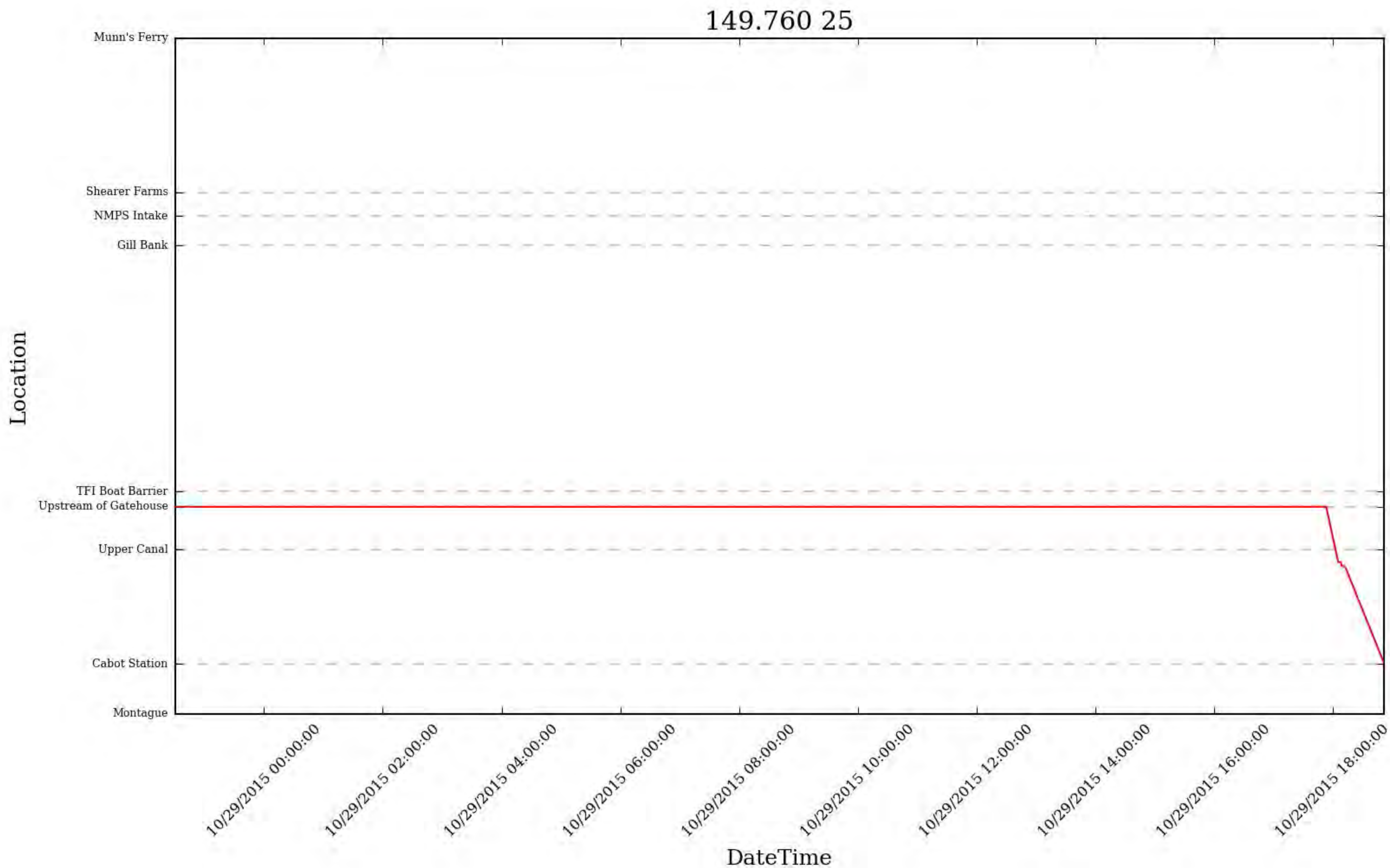
10/30/2015 09:00:00
10/30/2015 13:00:00
10/30/2015 17:00:00
DateTime


149.760 24
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
10/27/2015 02:01:00
10/27/2015 02:06:00
10/27/2015 02:11:00
10/27/2015 02:16:00
10/27/2015 02:21:00
10/27/2015 02:26:00
10/27/2015 02:31:00
10/27/2015 02:36:00
10/27/2015 02:41:00
10/27/2015 02:46:00
DateTime


149.760 25
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
10/29/2015 00:00:00
10/29/2015 02:00:00
10/29/2015 04:00:00
10/29/2015 06:00:00
10/29/2015 08:00:00
10/29/2015 10:00:00
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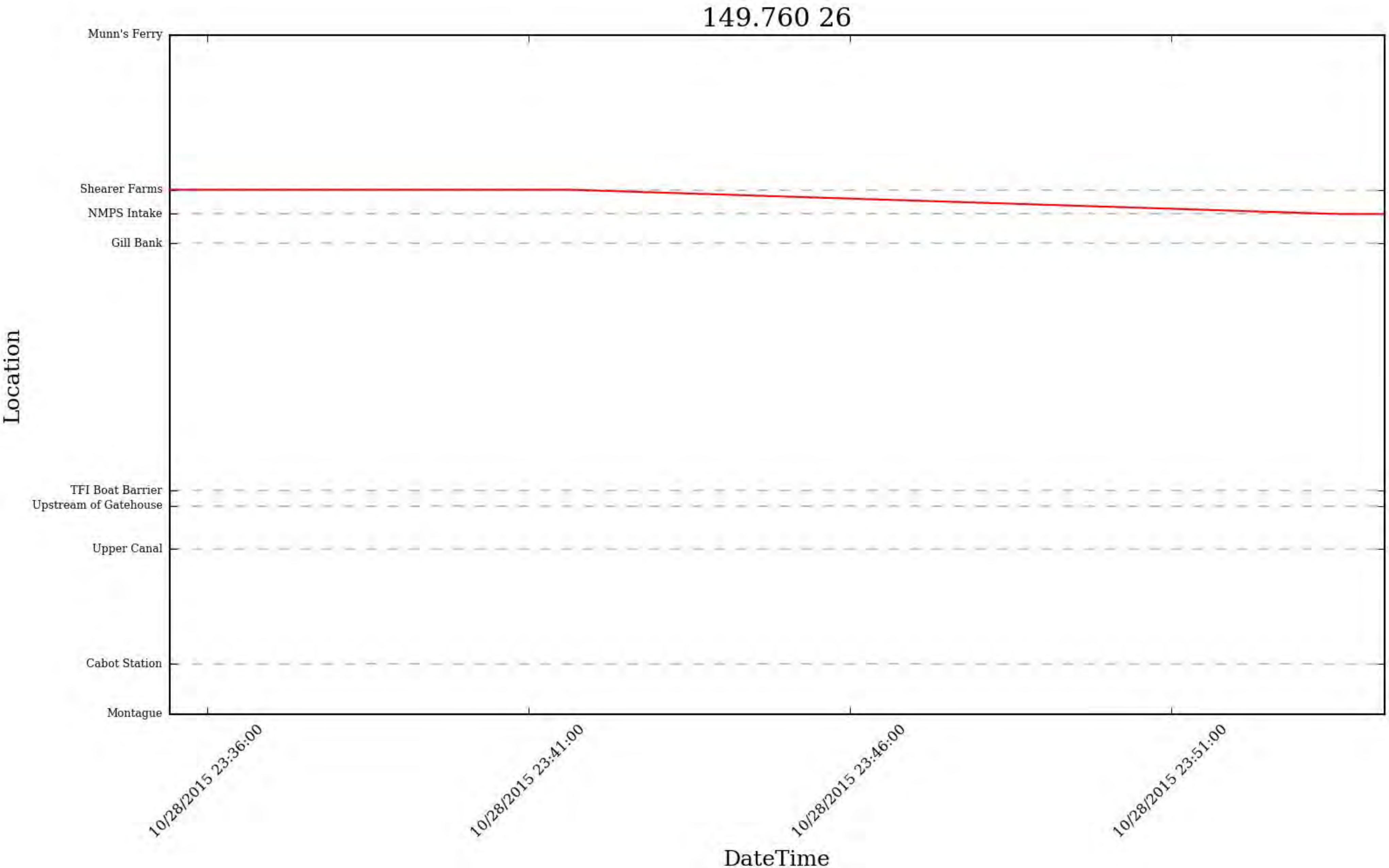
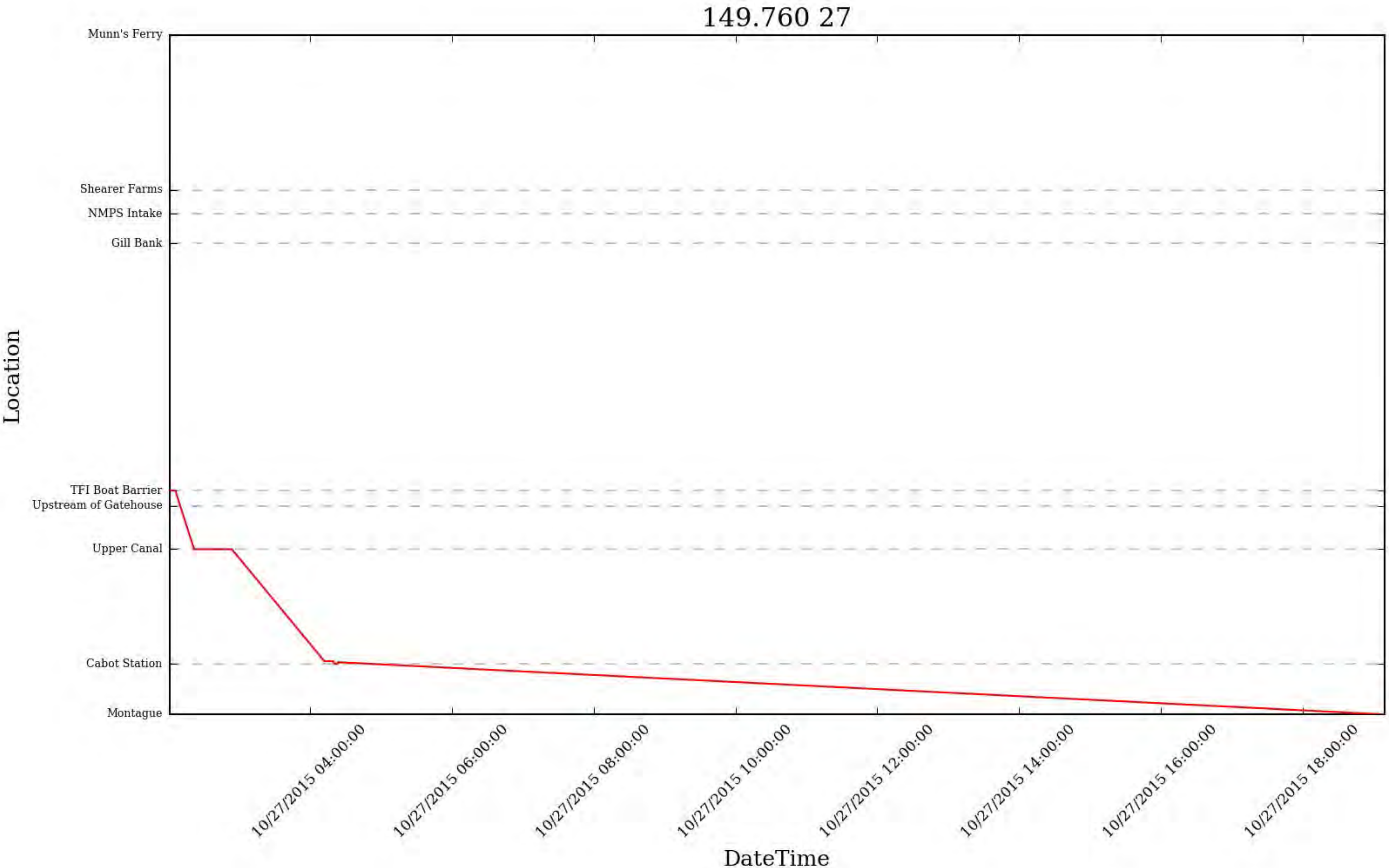
10/29/2015 18:00:00
DateTime


149.760 26
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
10/28/2015 23:36:00
10/28/2015 23:41:00
10/28/2015 23:46:00
10/28/2015 23:51:00
DateTime



149.760 27
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
Location
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
10/27/2015 04:00:00
10/27/2015 06:00:00
10/27/2015 08:00:00
10/27/2015 10:00:00
10/27/2015 12:00:00
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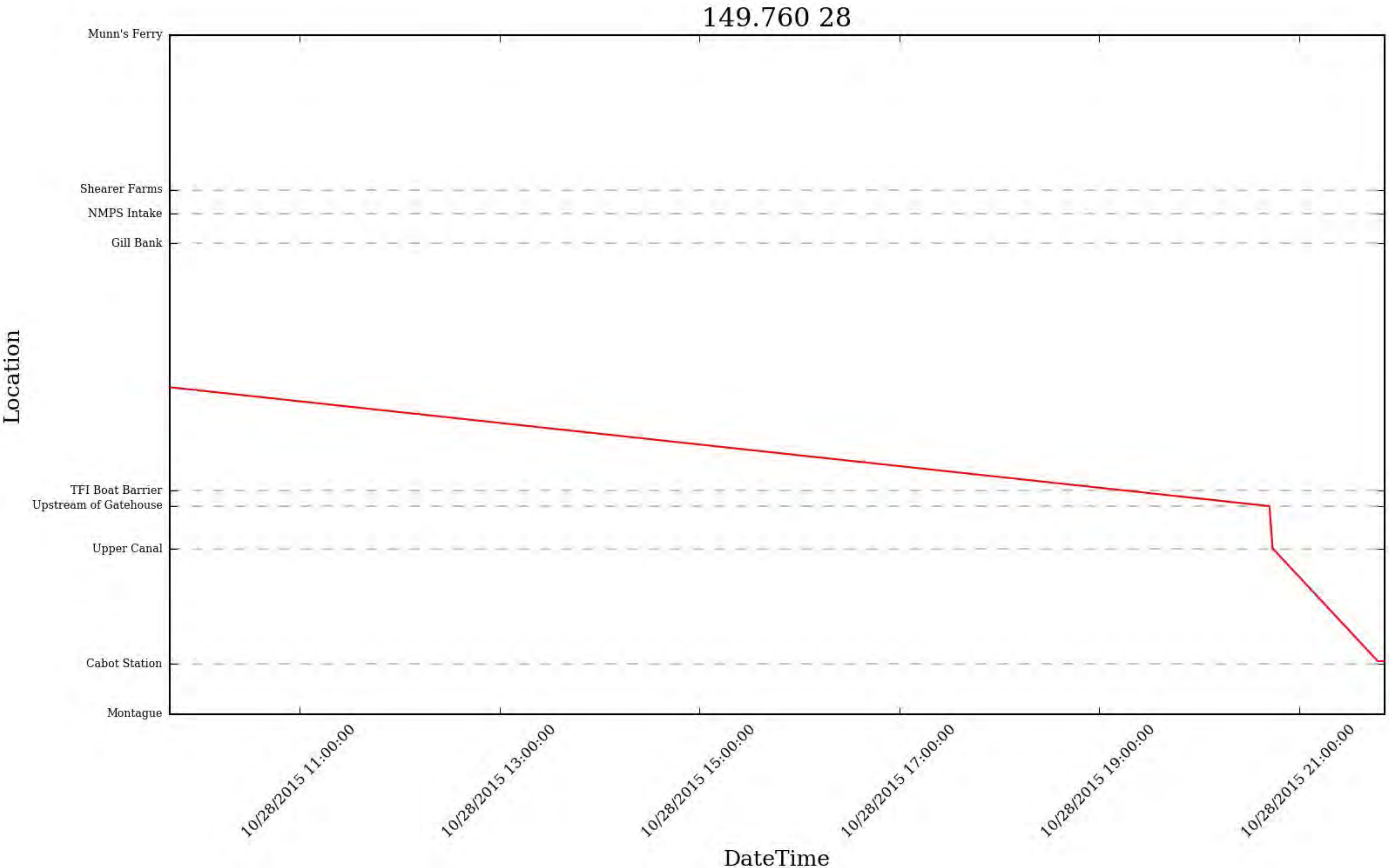
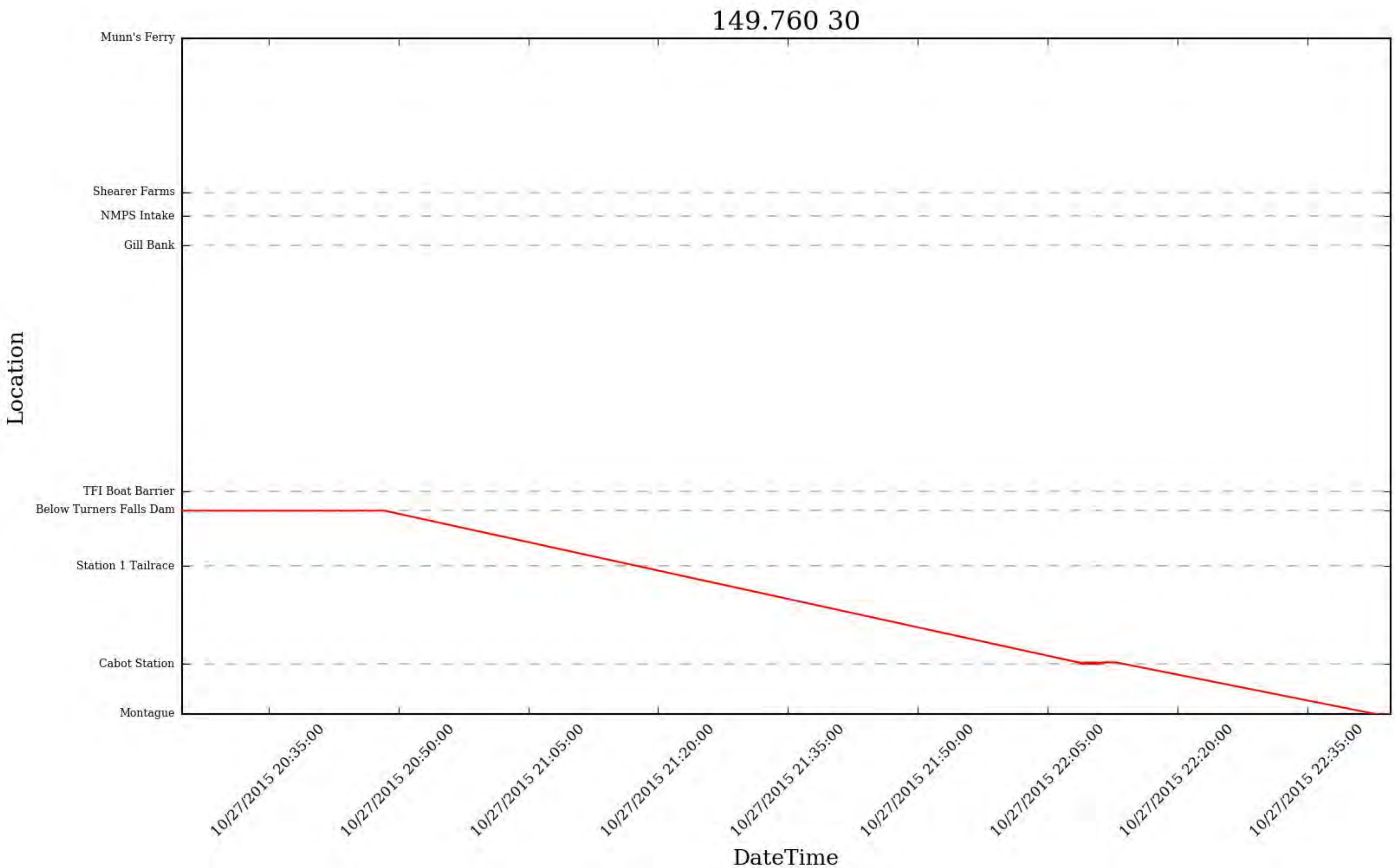
10/27/2015 18:00:00
DateTime


149.760 28
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
Location
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
10/28/2015 11:00:00
10/28/2015 13:00:00
10/28/2015 15:00:00
10/28/2015 17:00:00
10/28/2015 19:00:00
10/28/2015 21:00:00
DateTime



149.760 30
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Below Turners Falls Dam
Station 1 Tailrace
Cabot Station
Montague
Location
10/27/2015 20:35:00
10/27/2015 20:50:00
10/27/2015 21:05:00
10/27/2015 21:20:00
10/27/2015 21:35:00
10/27/2015 21:50:00
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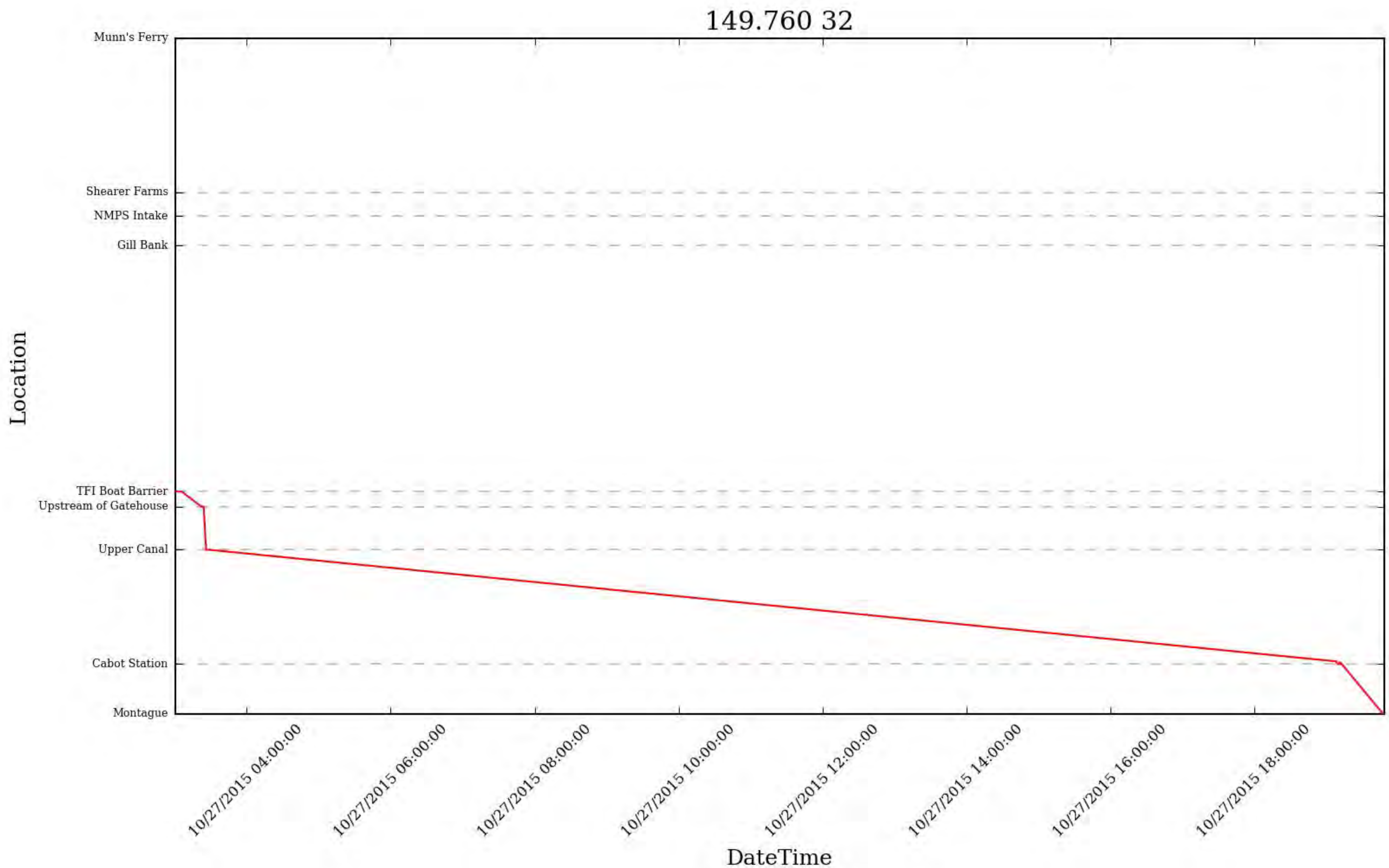
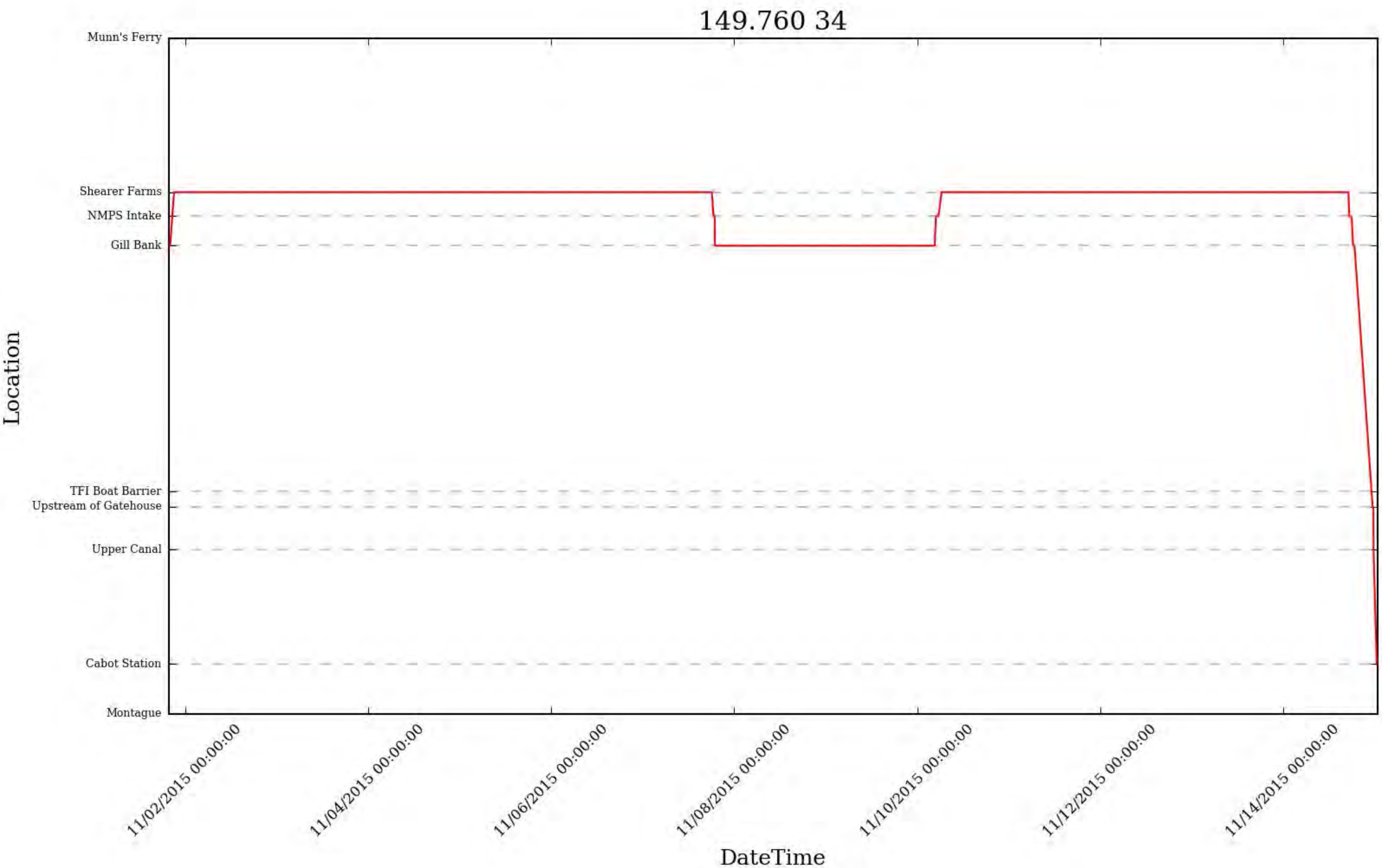
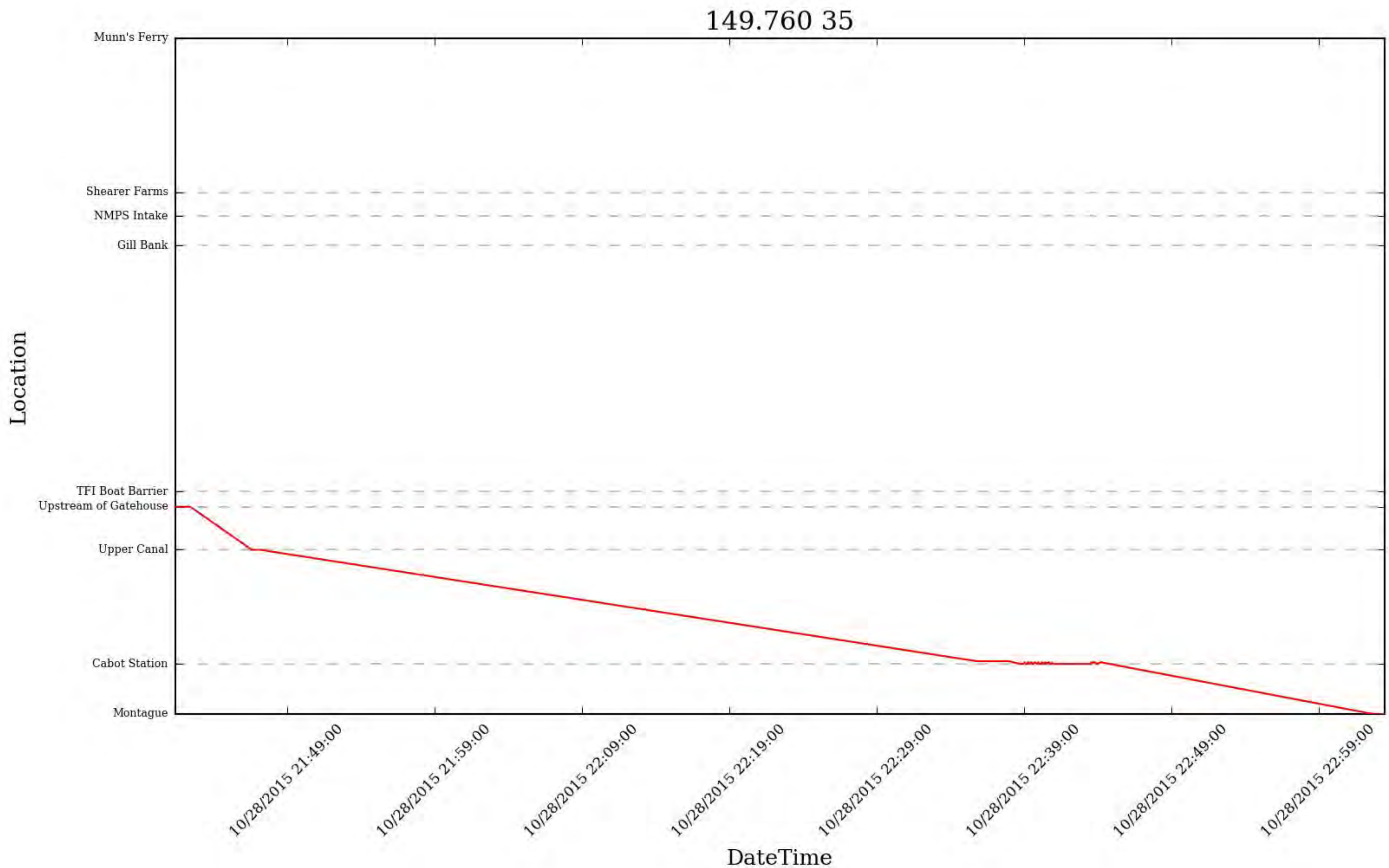
10/27/2015 22:35:00
DateTime



149.760 32
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
10/27/2015 04:00:00
10/27/2015 06:00:00
10/27/2015 08:00:00
10/27/2015 10:00:00
10/27/2015 12:00:00
10/27/2015 14:00:00
10/27/2015 16:00:00
10/27/2015 18:00:00
DateTime


149.760 34
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/02/2015 00:00:00
11/04/2015 00:00:00
11/06/2015 00:00:00
11/08/2015 00:00:00
11/10/2015 00:00:00
11/12/2015 00:00:00
11/14/2015 00:00:00
DateTime


149.760 35
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
10/28/2015 21:49:00
10/28/2015 21:59:00
10/28/2015 22:09:00
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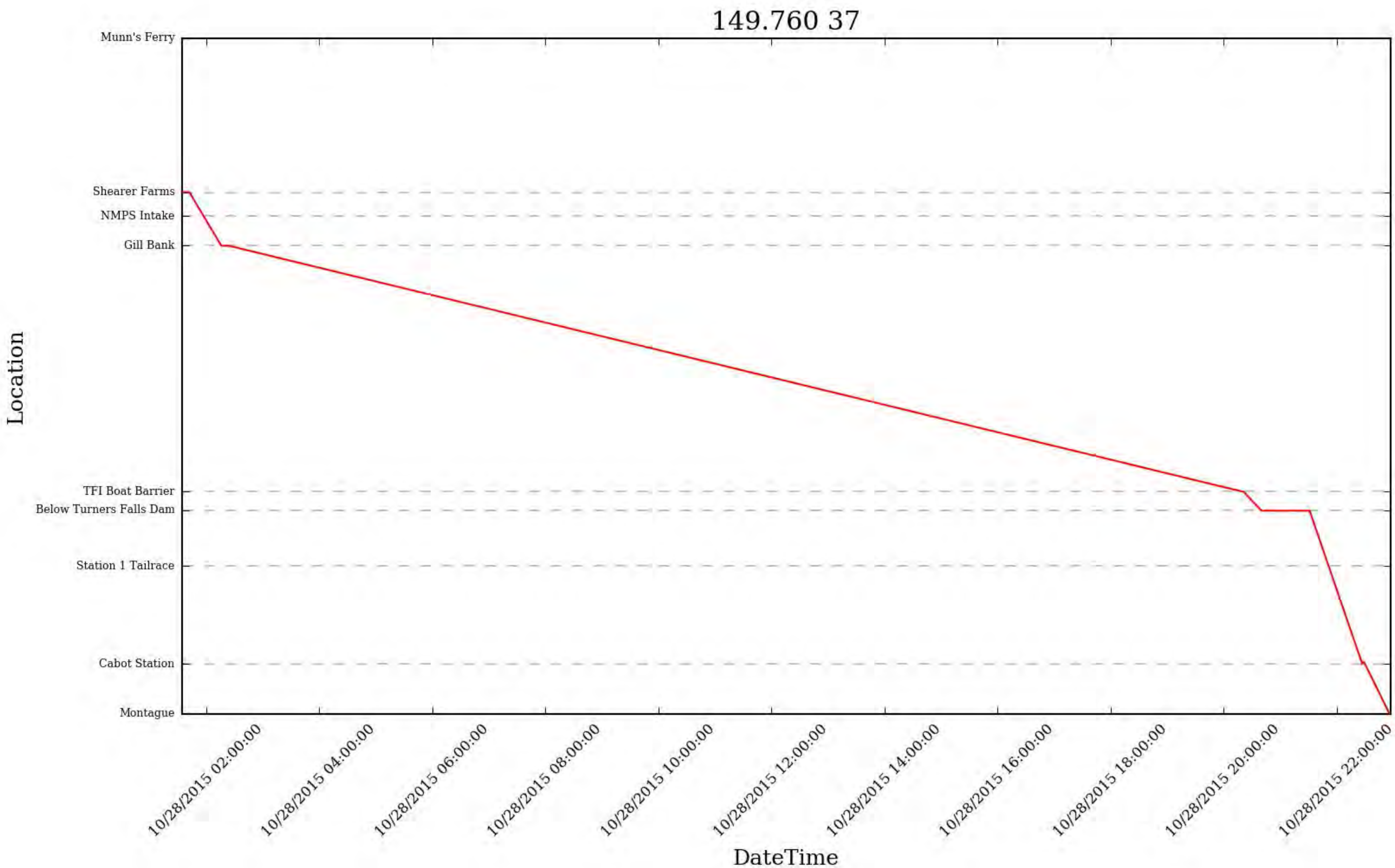
10/28/2015 22:59:00
DateTime


149.760 37
Location
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Below Turners Falls Dam
Station 1 Tailrace
Cabot Station
Montague
10/28/2015 02:00:00
10/28/2015 04:00:00
10/28/2015 06:00:00
10/28/2015 08:00:00
10/28/2015 10:00:00
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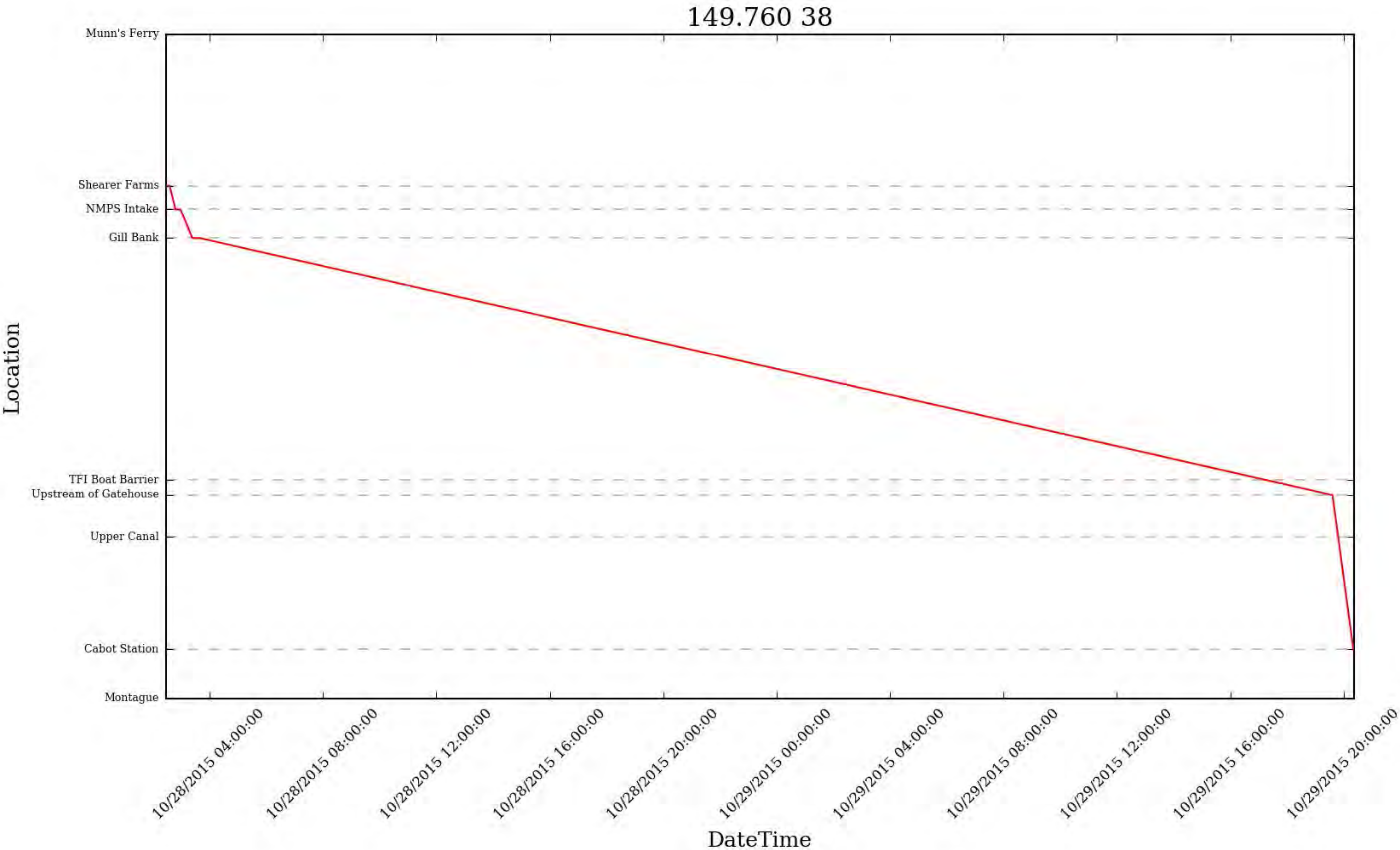
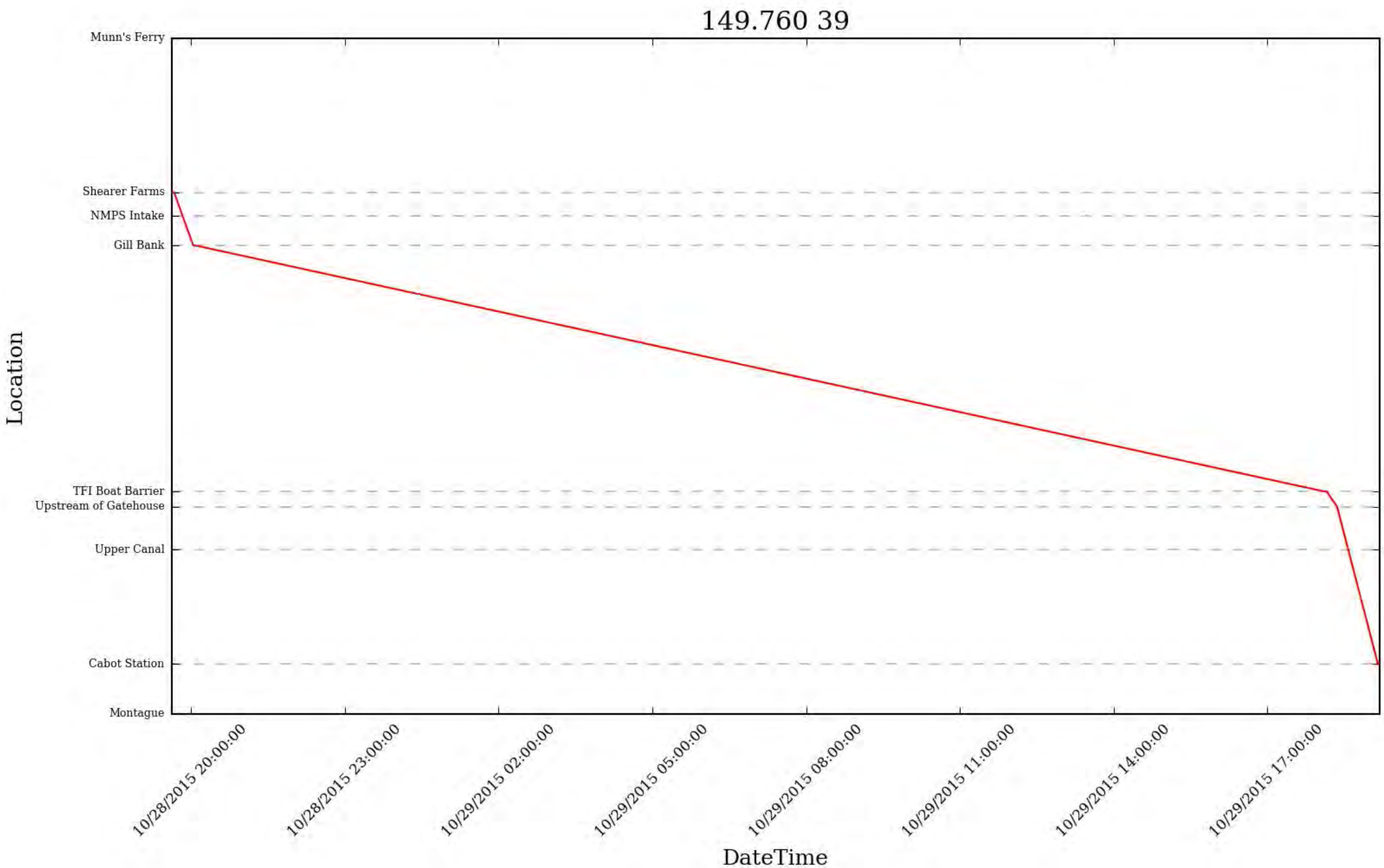
10/28/2015 14:00:00
10/28/2015 16:00:00
10/28/2015 18:00:00
10/28/2015 20:00:00
10/28/2015 22:00:00
DateTime


149.760 38
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
10/28/2015 04:00:00
10/28/2015 08:00:00
10/28/2015 12:00:00
10/28/2015 16:00:00
10/28/2015 20:00:00
10/29/2015 00:00:00
10/29/2015 04:00:00
10/29/2015 08:00:00
10/29/2015 12:00:00
10/29/2015 16:00:00
10/29/2015 20:00:00
DateTime



149.760 39
Location
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
10/28/2015 20:00:00
10/28/2015 23:00:00
10/29/2015 02:00:00
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10/29/2015 08:00:00
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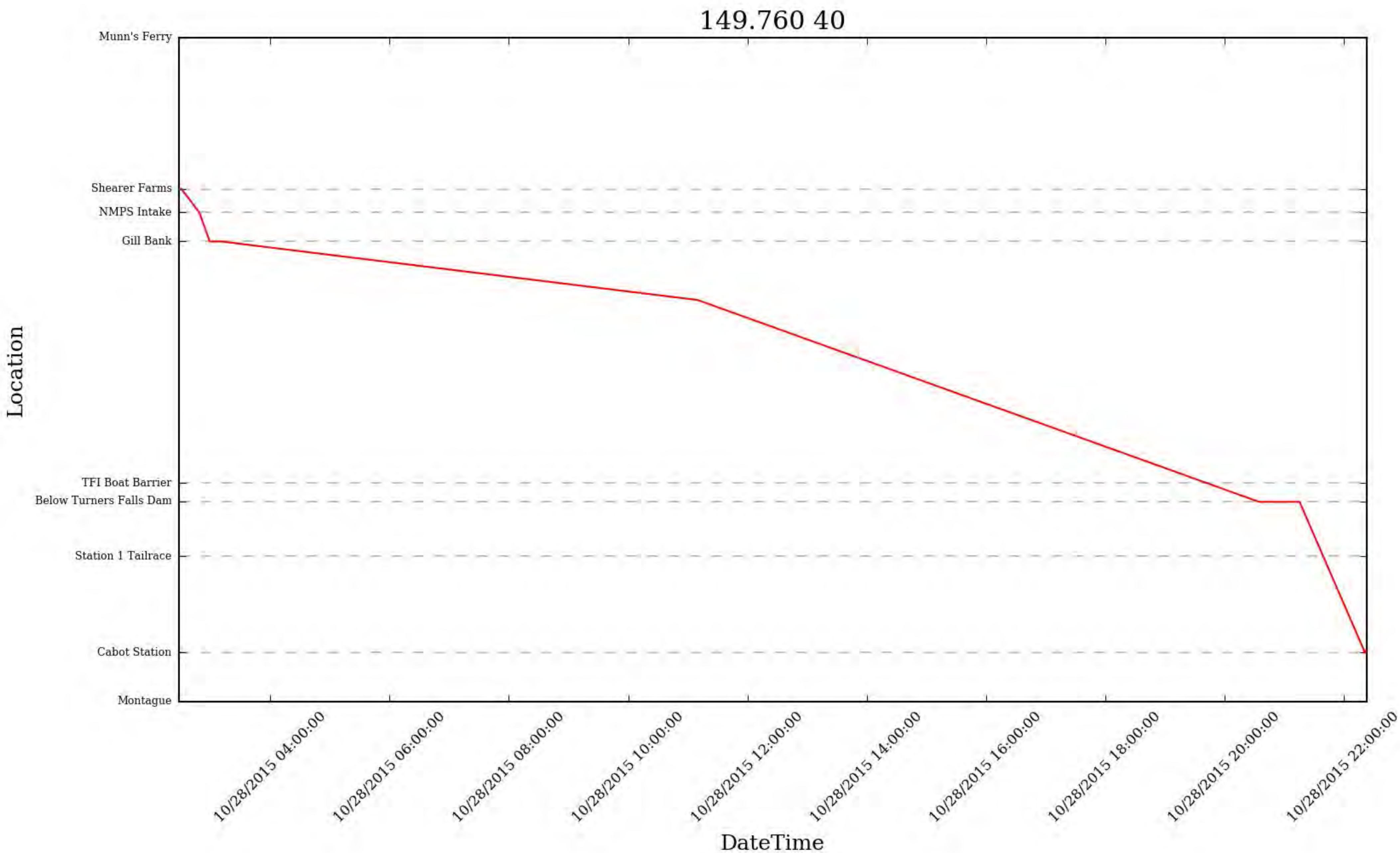
10/29/2015 14:00:00
10/29/2015 17:00:00
DateTime


149.760 40
Location
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Below Turners Falls Dam
Station 1 Tailrace
Cabot Station
Montague
10/28/2015 04:00:00
10/28/2015 06:00:00
10/28/2015 08:00:00
10/28/2015 10:00:00
10/28/2015 12:00:00
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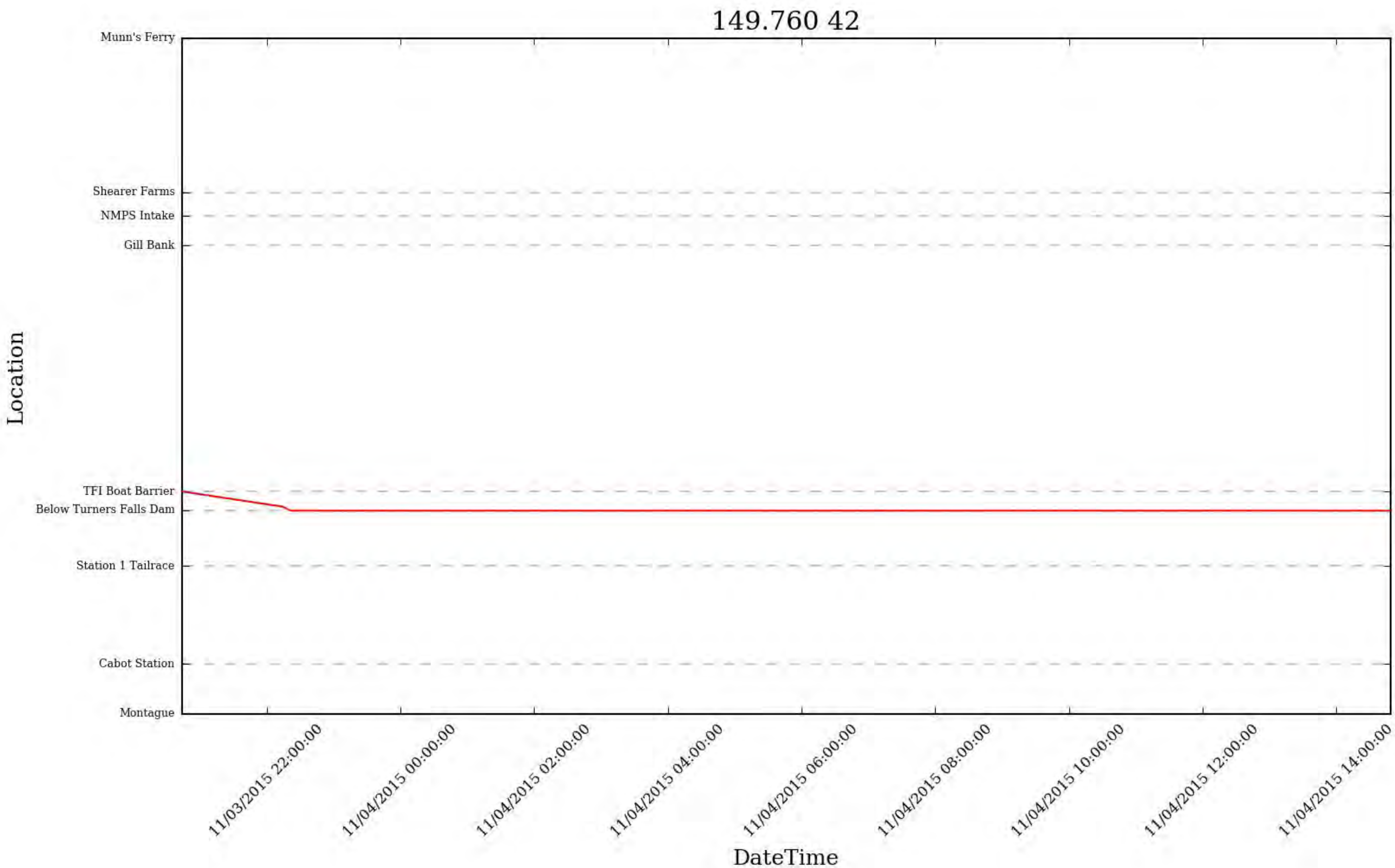
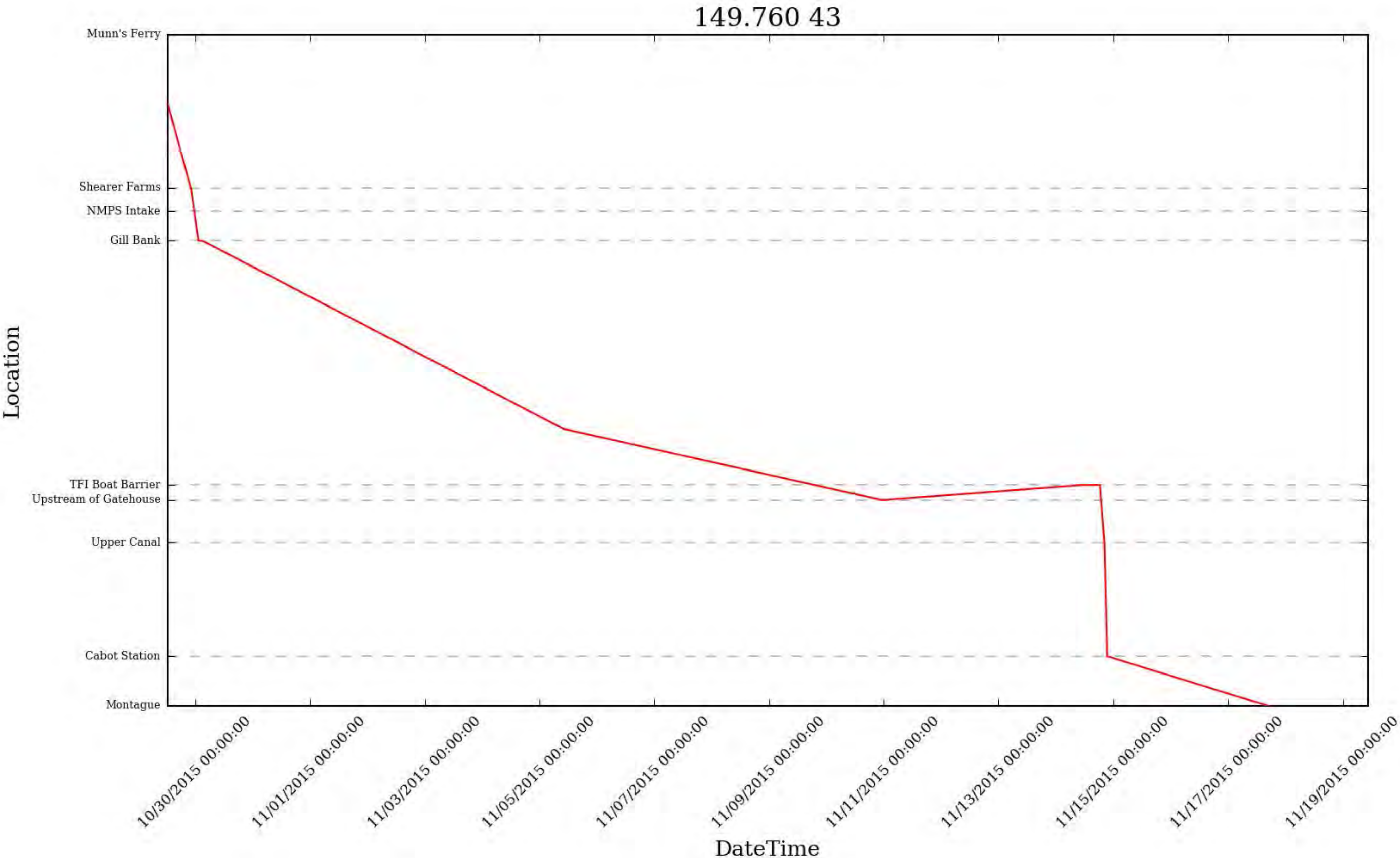
10/28/2015 18:00:00
10/28/2015 20:00:00
10/28/2015 22:00:00
DateTime


149.760 42
Location
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Below Turners Falls Dam
Station 1 Tailrace
Cabot Station
Montague
11/03/2015 22:00:00
11/04/2015 00:00:00
11/04/2015 02:00:00
11/04/2015 04:00:00
11/04/2015 06:00:00
11/04/2015 08:00:00
11/04/2015 10:00:00
11/04/2015 12:00:00
11/04/2015 14:00:00
DateTime



149.760 43
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
10/30/2015 00:00:00
11/01/2015 00:00:00
11/03/2015 00:00:00
11/05/2015 00:00:00
11/07/2015 00:00:00
11/09/2015 00:00:00
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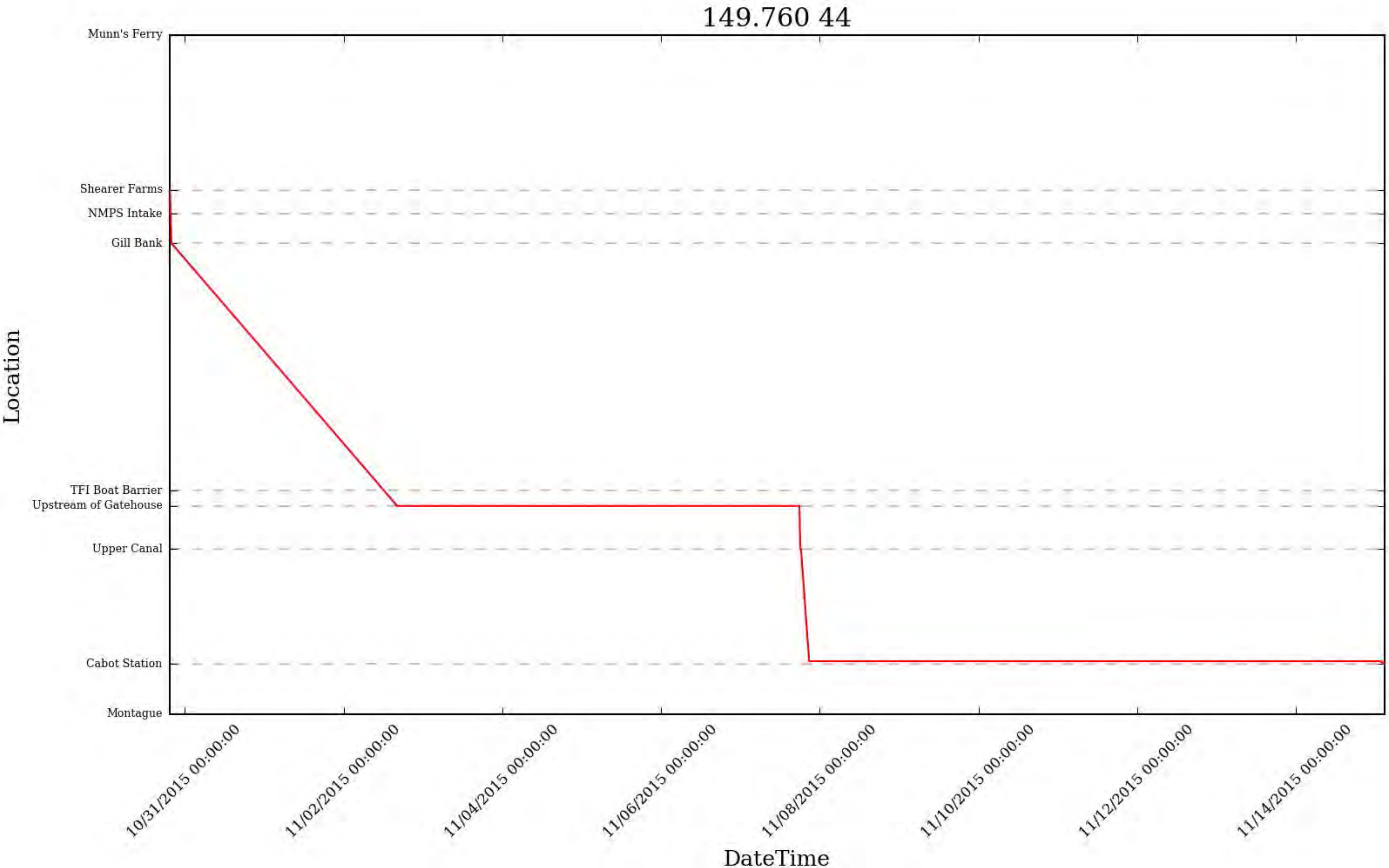
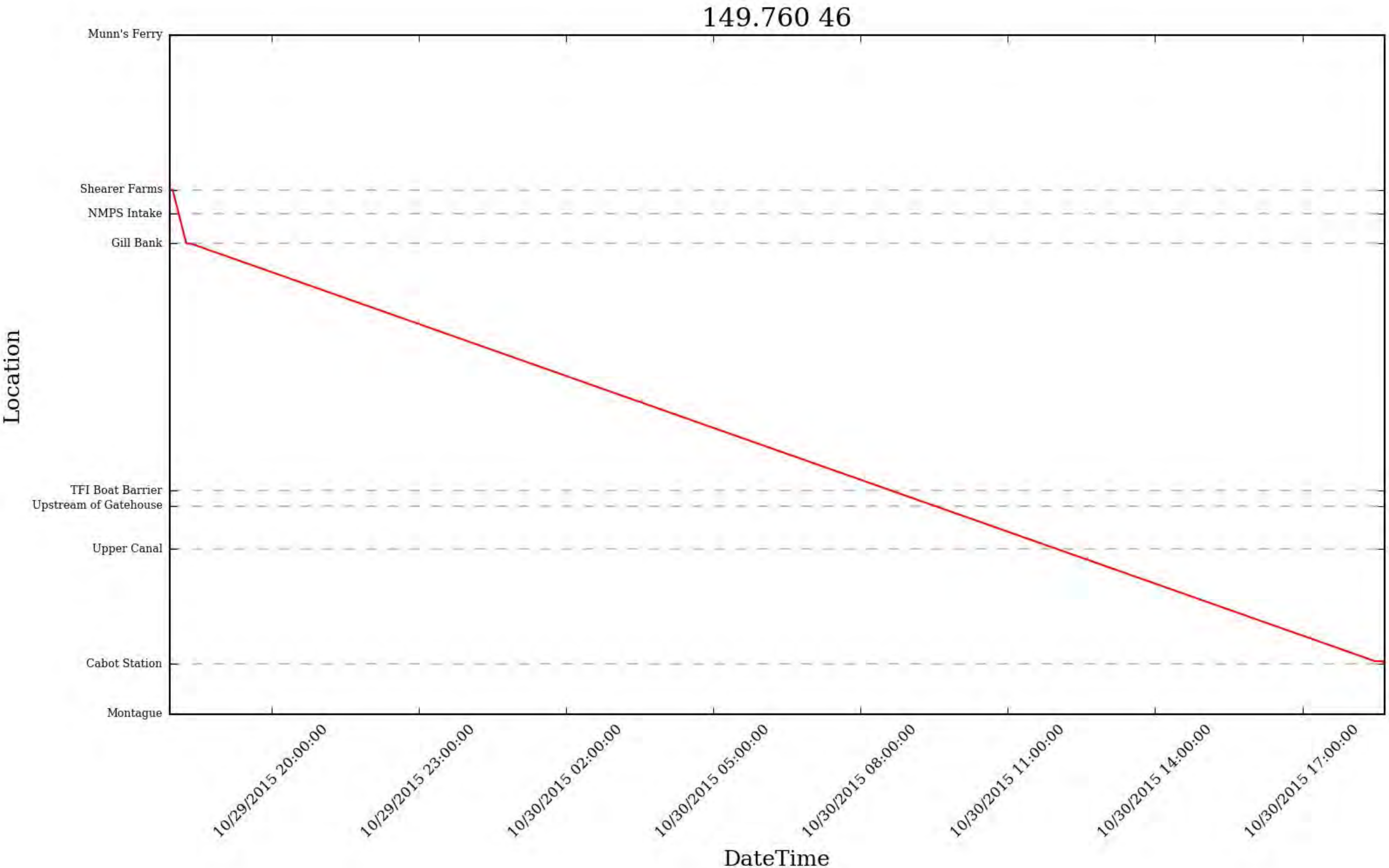
11/19/2015 00:00:00
DateTime



149.760 44
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
10/31/2015 00:00:00
11/02/2015 00:00:00
11/04/2015 00:00:00
11/06/2015 00:00:00
11/08/2015 00:00:00
11/10/2015 00:00:00
11/12/2015 00:00:00
11/14/2015 00:00:00
DateTime


149.760 46
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
10/29/2015 20:00:00
10/29/2015 23:00:00
10/30/2015 02:00:00
10/30/2015 05:00:00
10/30/2015 08:00:00
10/30/2015 11:00:00
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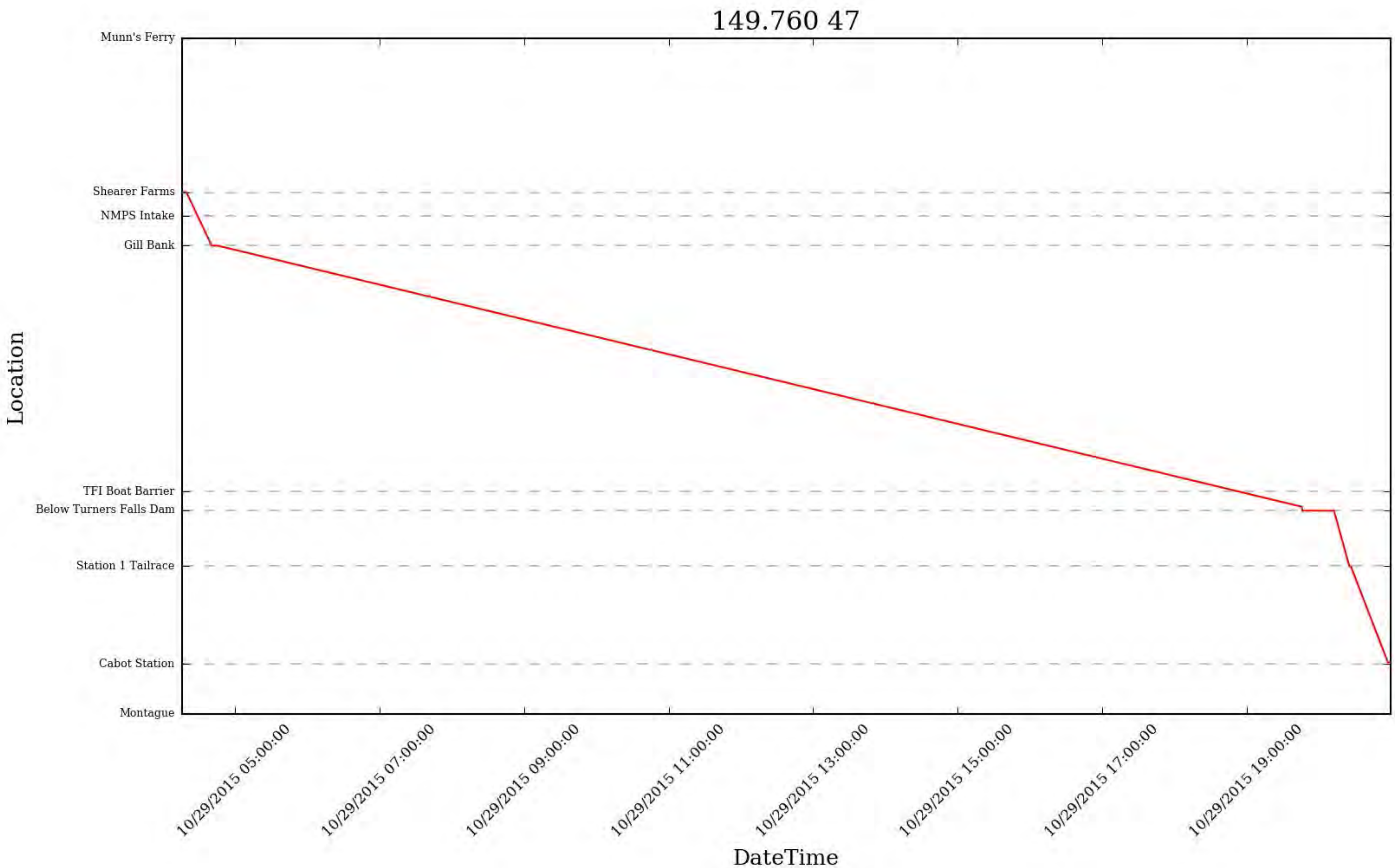
10/30/2015 17:00:00
DateTime



149.760 47
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Below Turners Falls Dam
Station 1 Tailrace
Cabot Station
Montague
Location
10/29/2015 05:00:00
10/29/2015 07:00:00
10/29/2015 09:00:00
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10/29/2015 13:00:00
10/29/2015 15:00:00
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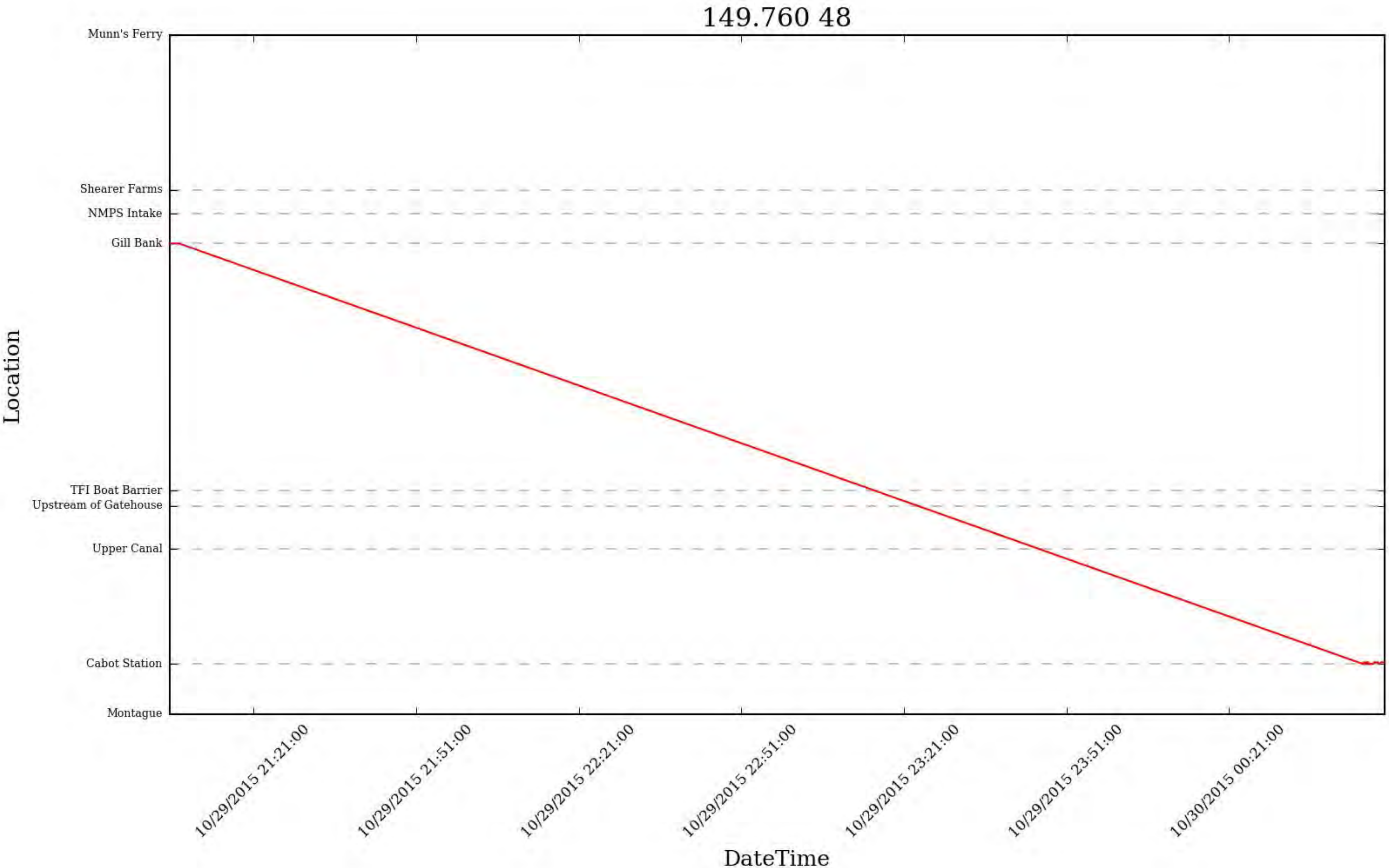
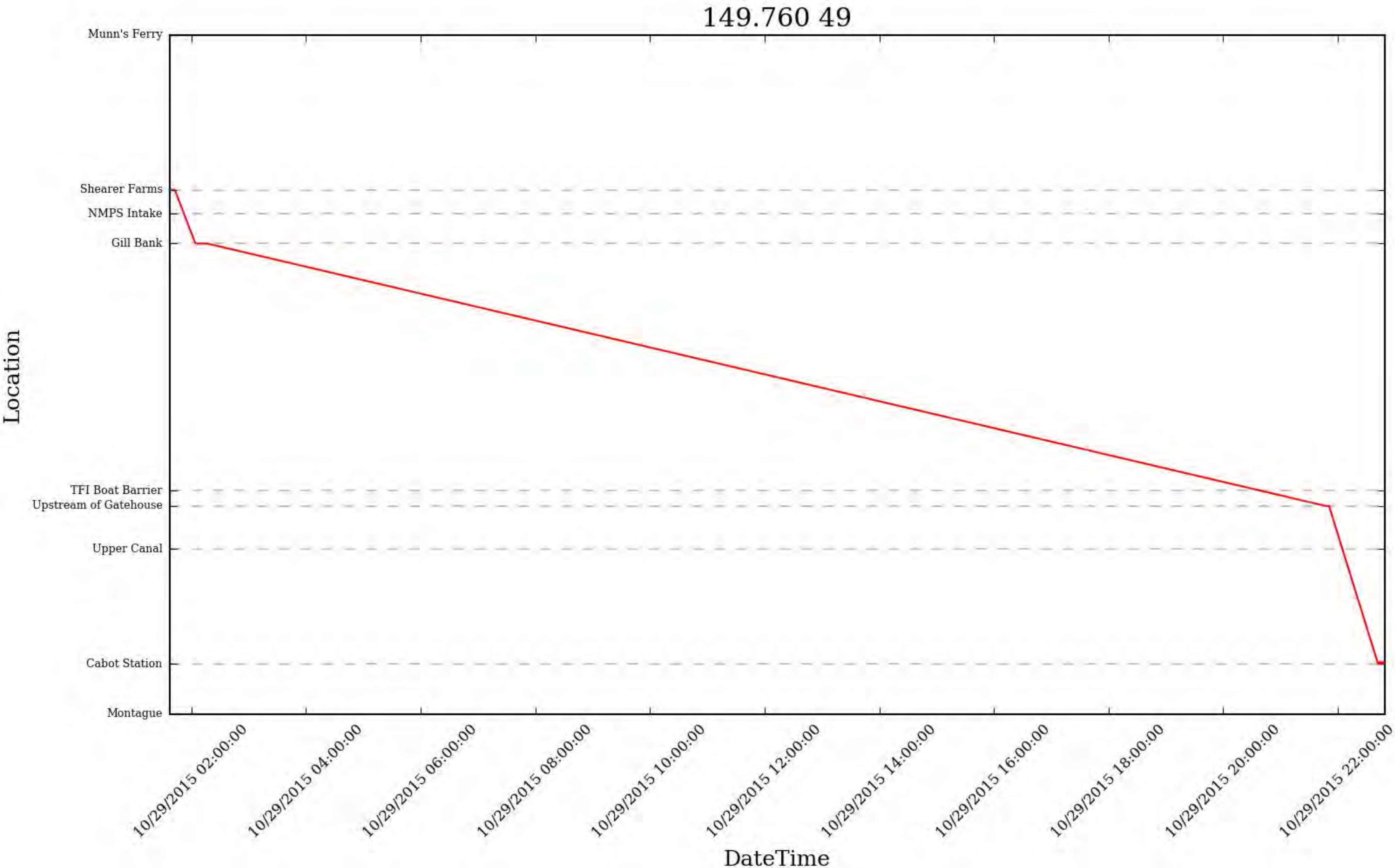
10/29/2015 19:00:00
DateTime



149.760 48
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
10/29/2015 21:21:00
10/29/2015 21:51:00
10/29/2015 22:21:00
10/29/2015 22:51:00
10/29/2015 23:21:00
10/29/2015 23:51:00
10/30/2015 00:21:00
DateTime


149.760 49
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
10/29/2015 02:00:00
10/29/2015 04:00:00
10/29/2015 06:00:00
10/29/2015 08:00:00
10/29/2015 10:00:00
10/29/2015 12:00:00
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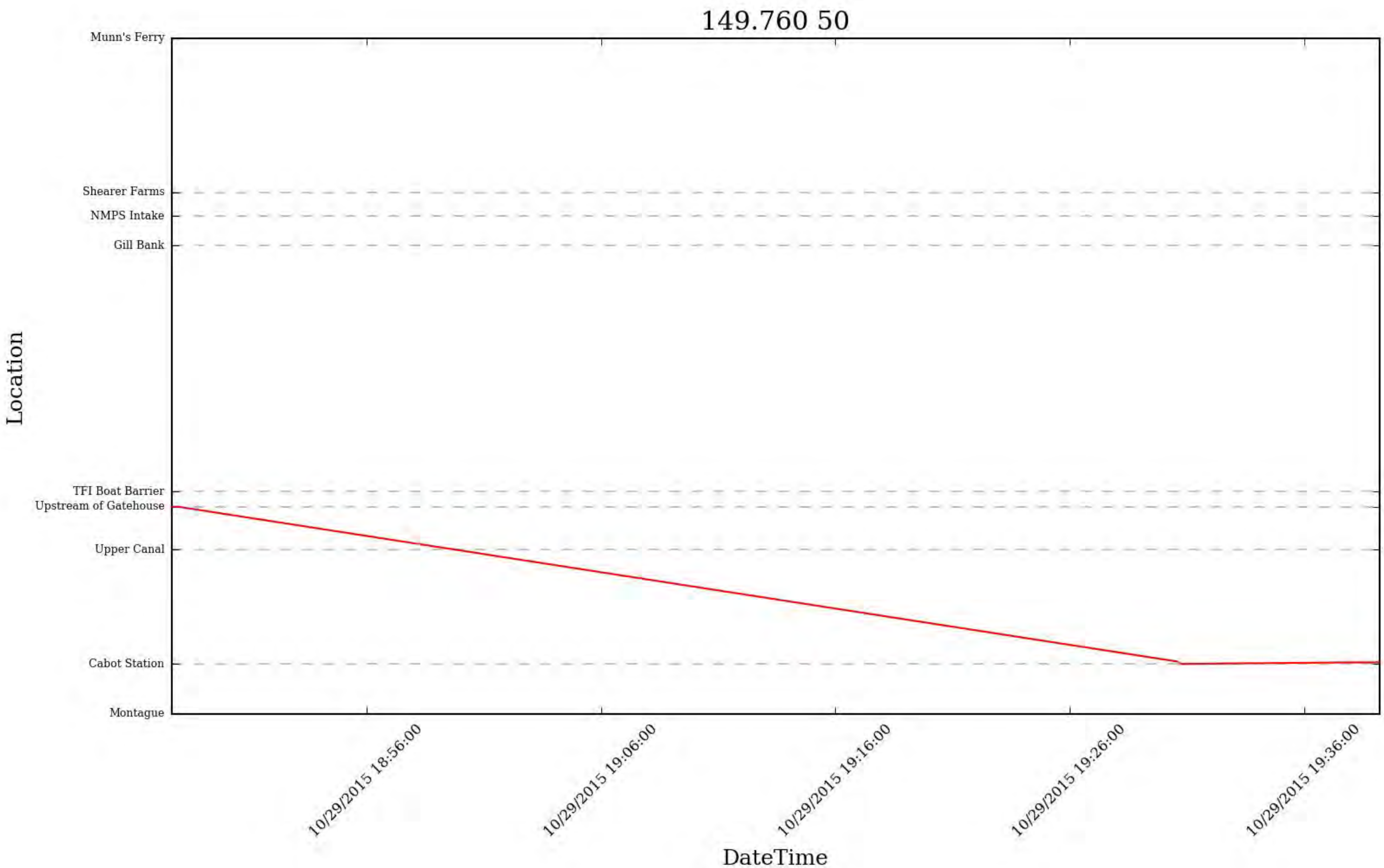
10/29/2015 22:00:00
DateTime


149.760 50
Location
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
10/29/2015 18:56:00
10/29/2015 19:06:00
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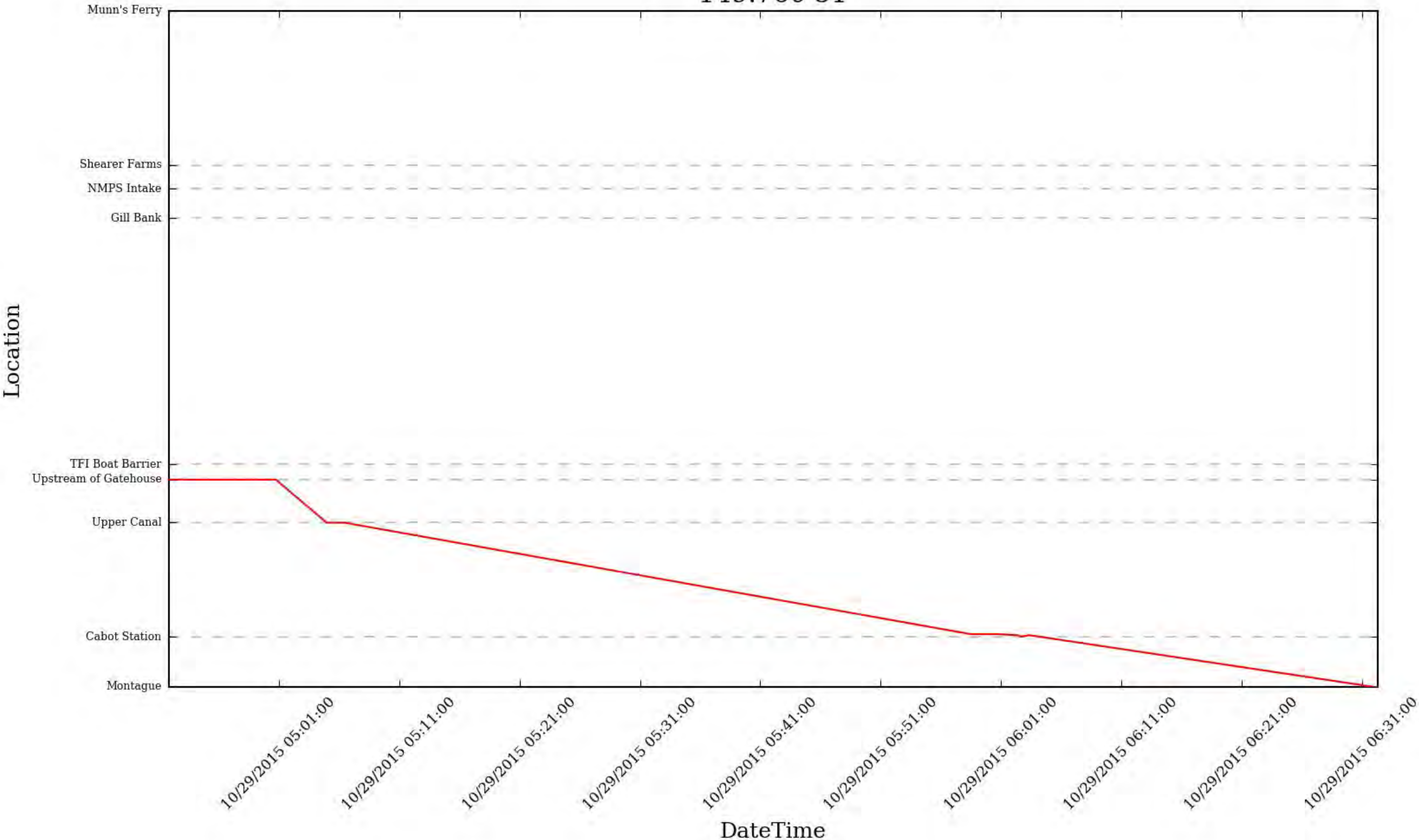
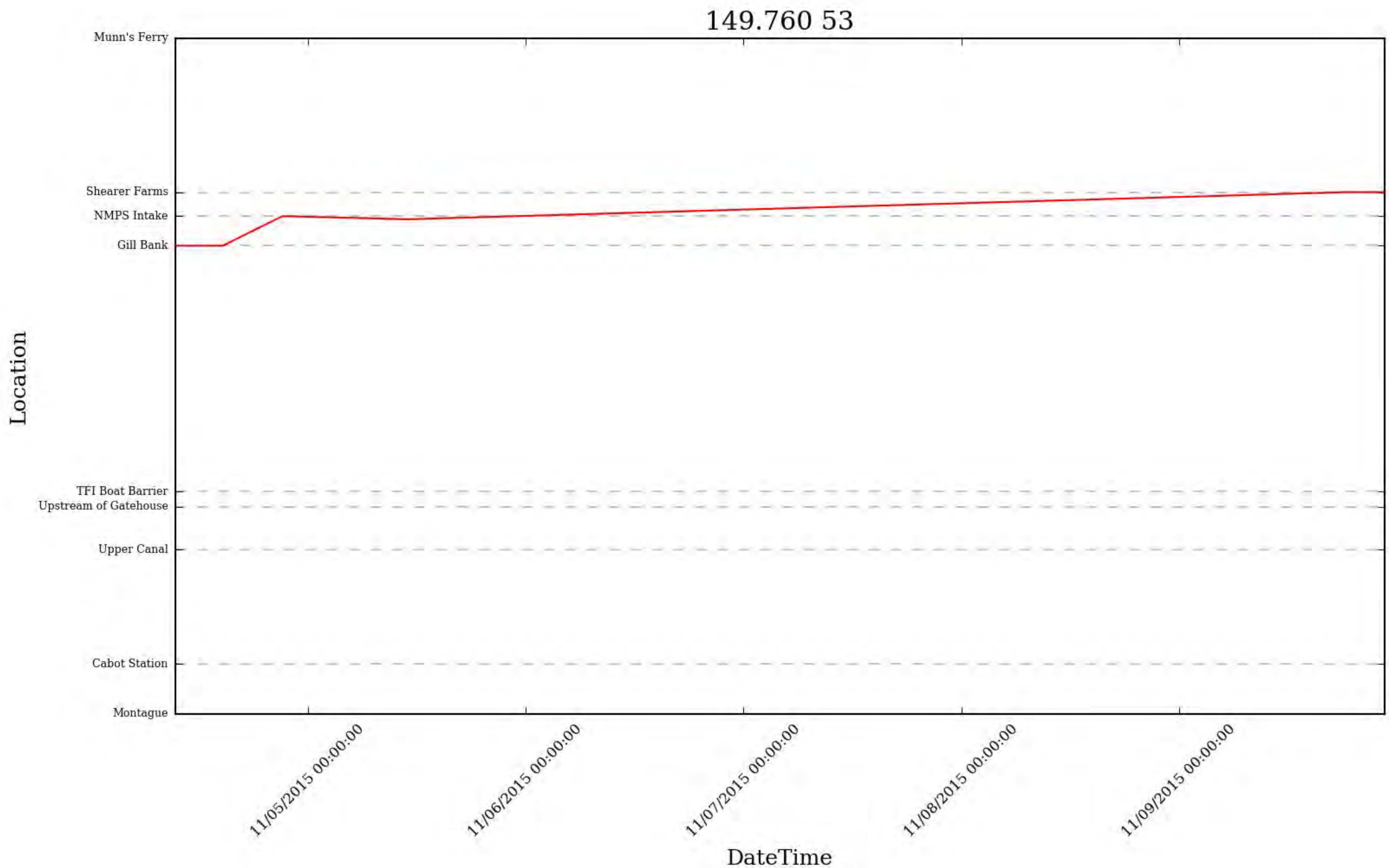
10/29/2015 19:26:00
10/29/2015 19:36:00
DateTime

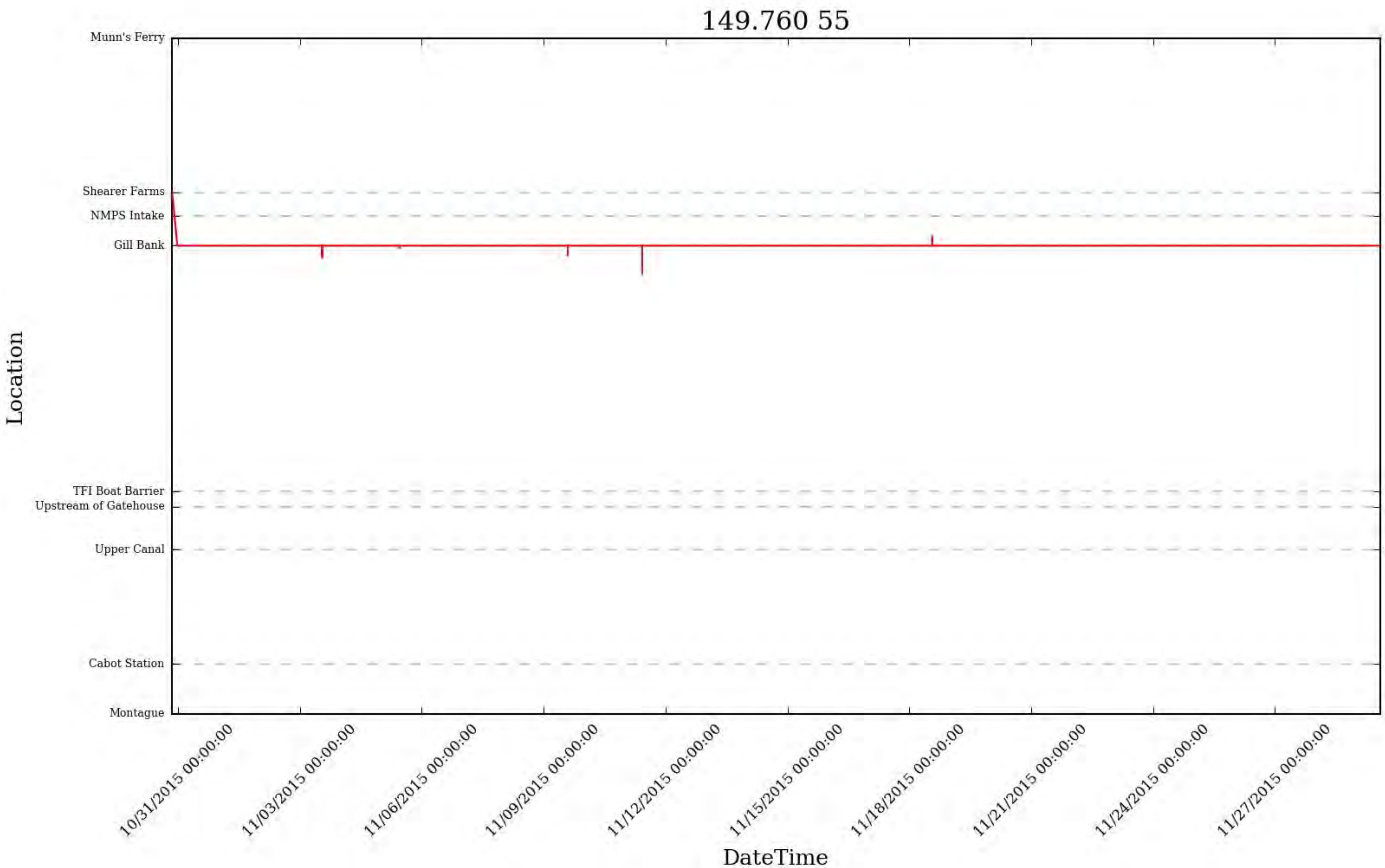
149.760 51



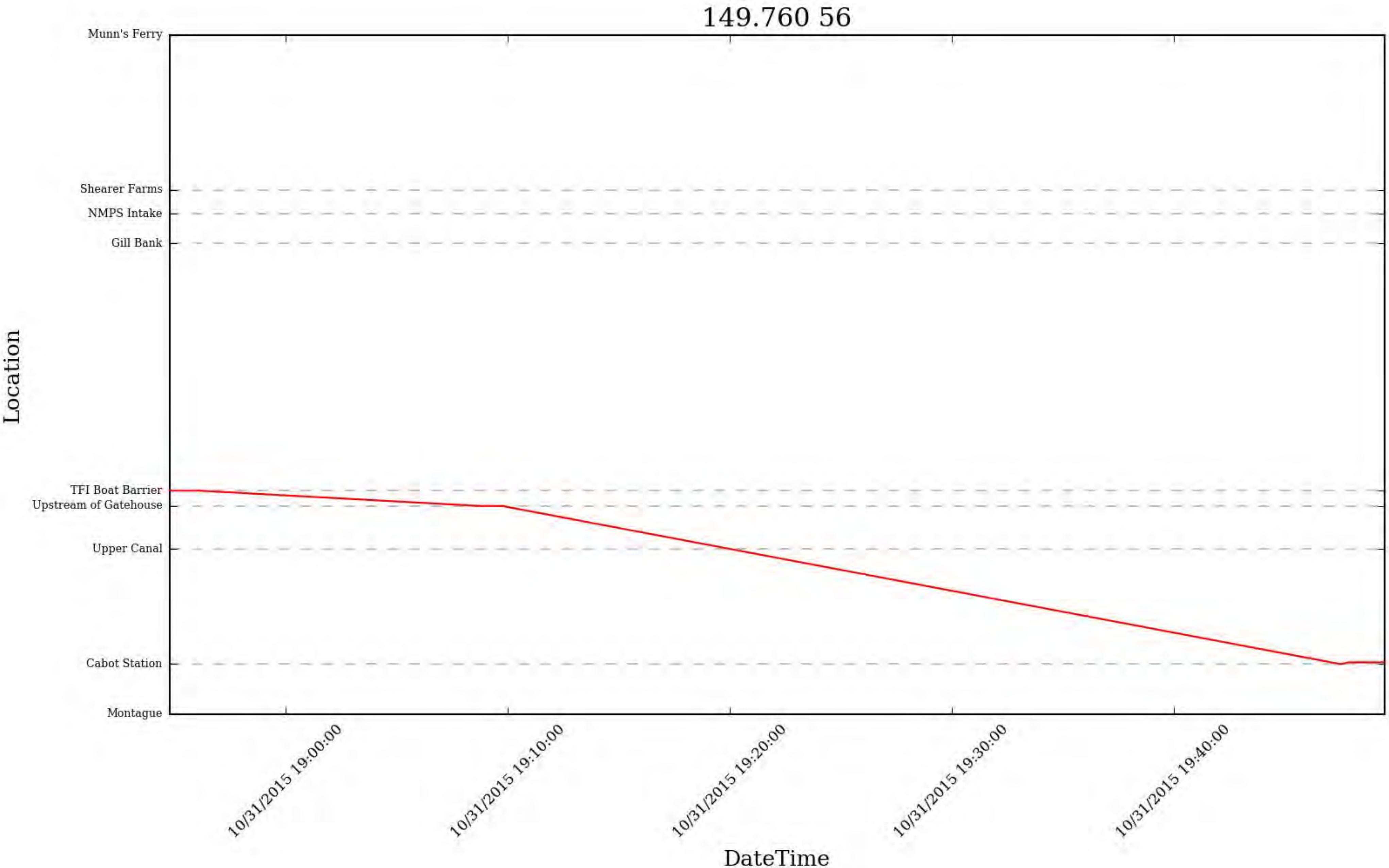
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
10/29/2015 05:01:00
10/29/2015 05:11:00
10/29/2015 05:21:00
10/29/2015 05:31:00
10/29/2015 05:41:00
10/29/2015 05:51:00
10/29/2015 06:01:00
10/29/2015 06:11:00
10/29/2015 06:21:00
10/29/2015 06:31:00
DateTime



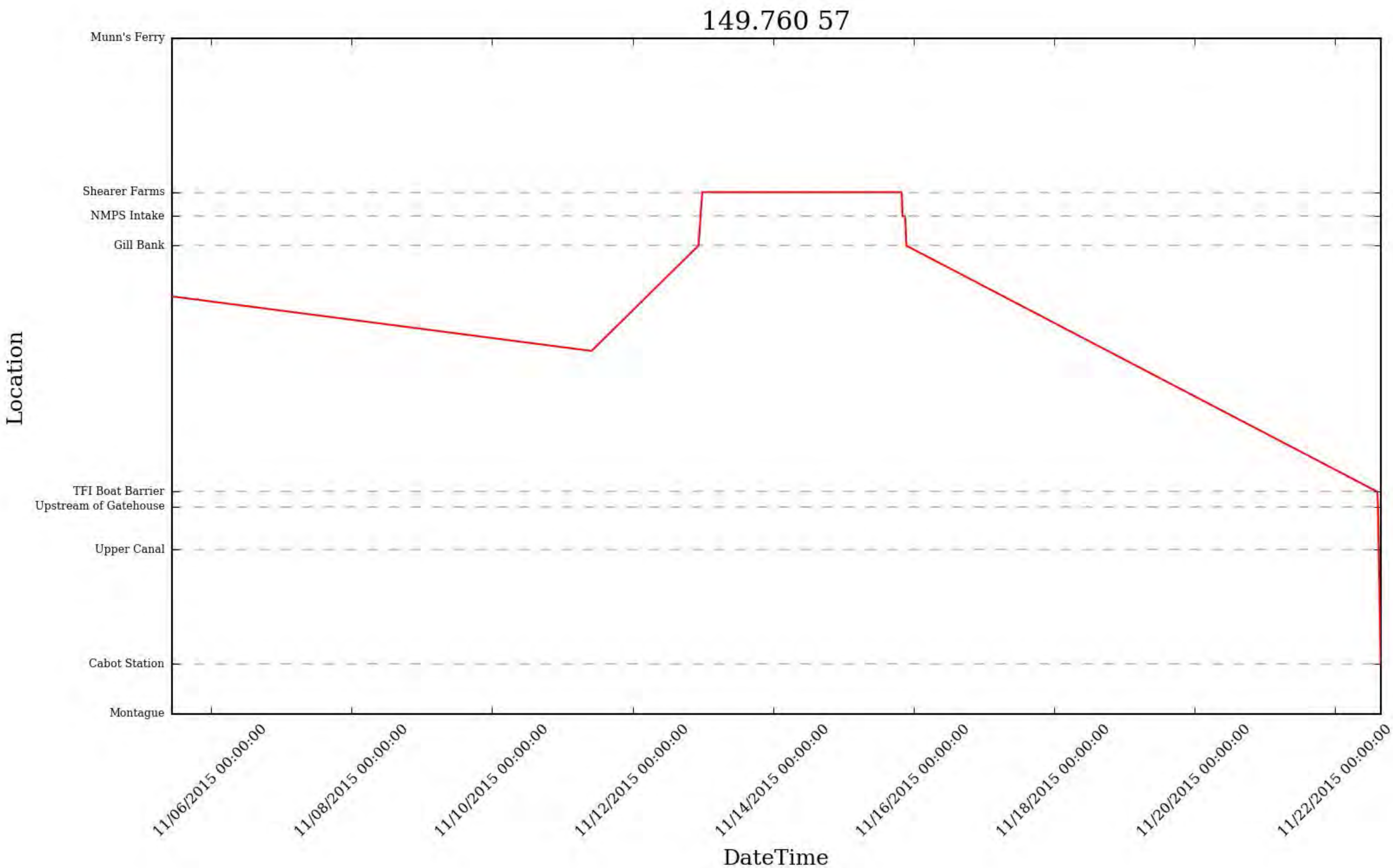
149.760 53
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/05/2015 00:00:00
11/06/2015 00:00:00
11/07/2015 00:00:00
11/08/2015 00:00:00
11/09/2015 00:00:00
DateTime



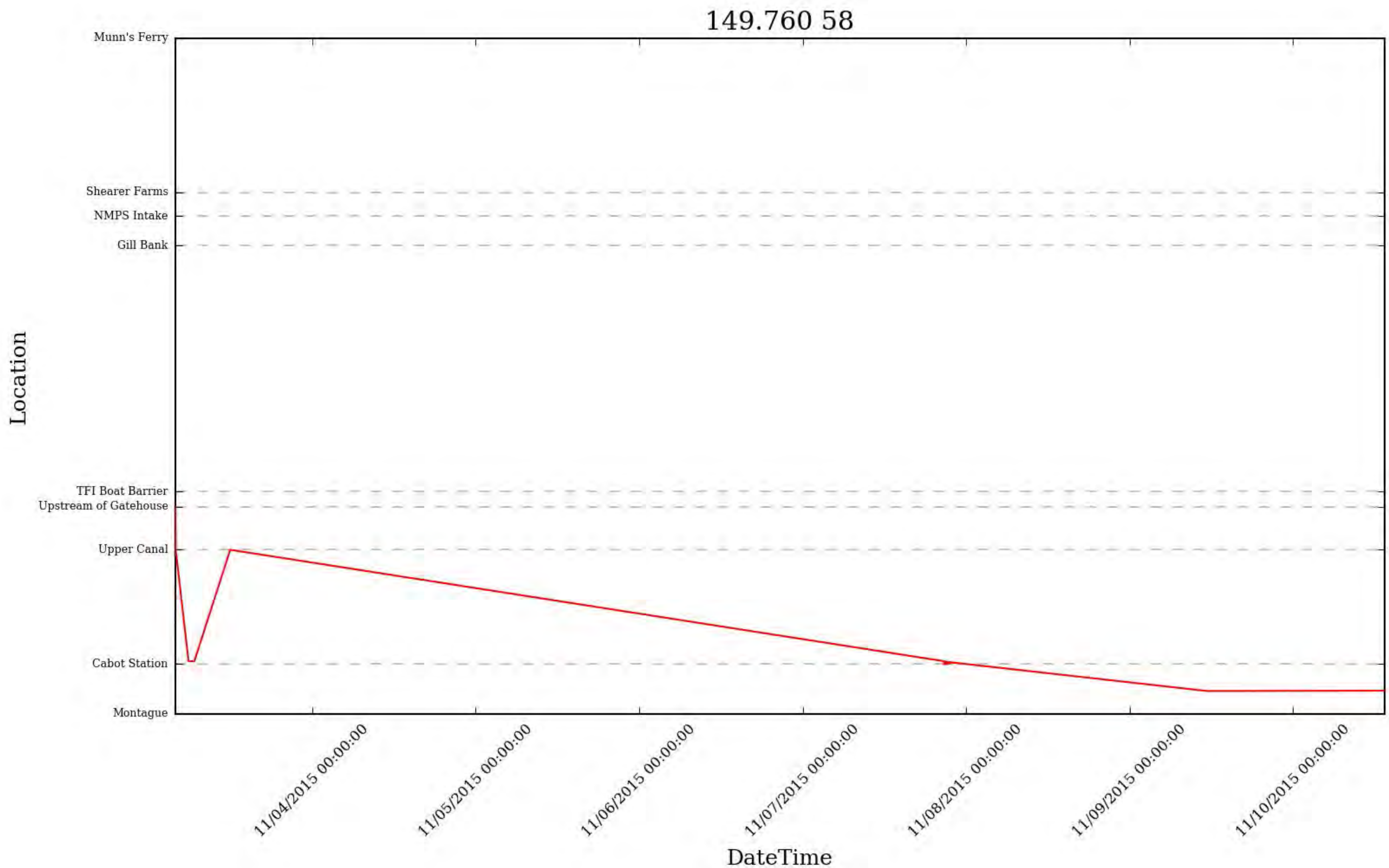
149.760 55
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
10/31/2015 00:00:00
11/03/2015 00:00:00
11/06/2015 00:00:00
11/09/2015 00:00:00
11/12/2015 00:00:00
11/15/2015 00:00:00
11/18/2015 00:00:00
11/21/2015 00:00:00
11/24/2015 00:00:00
11/27/2015 00:00:00
DateTime

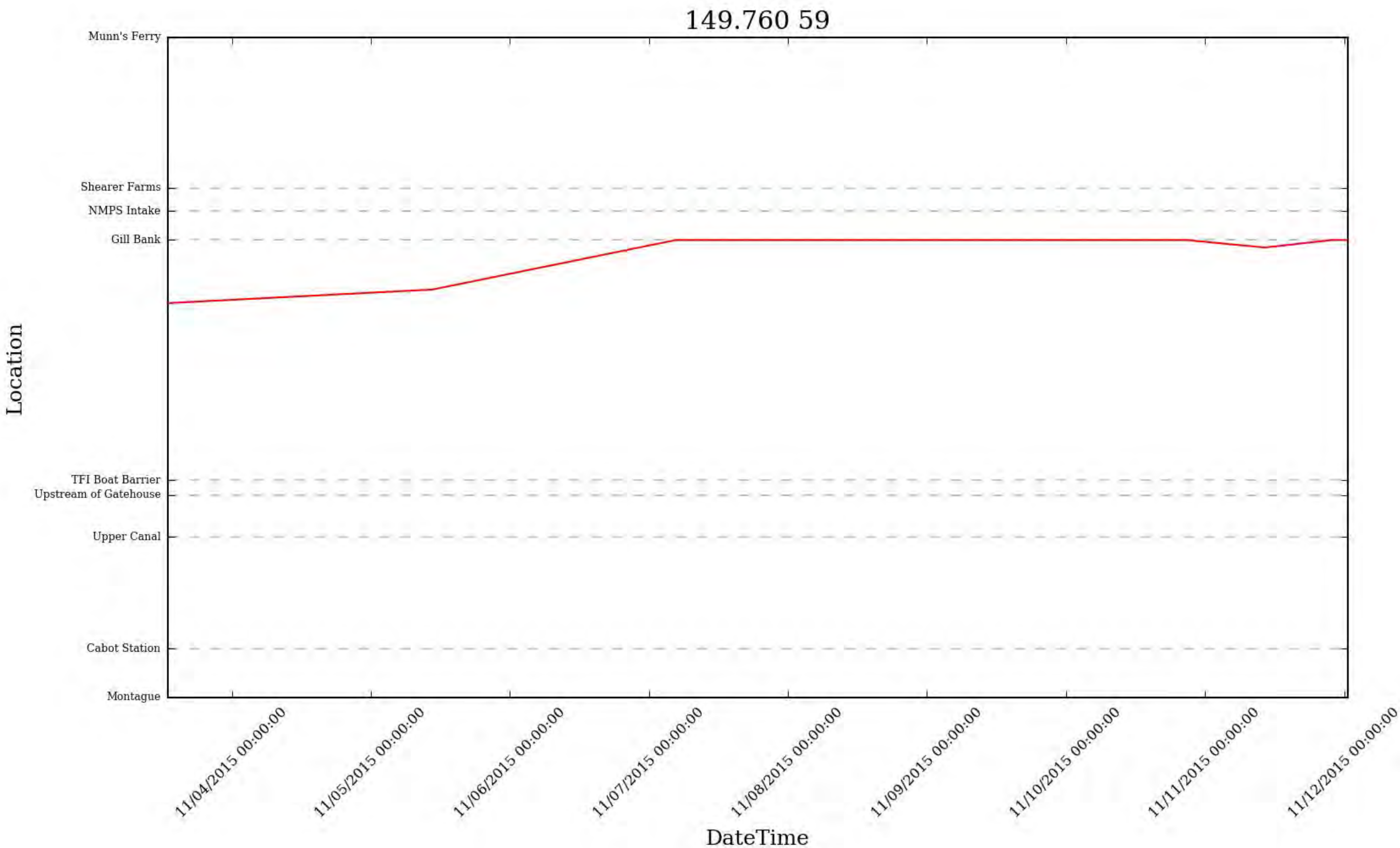


149.760 56
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
10/31/2015 19:00:00
10/31/2015 19:10:00
10/31/2015 19:20:00
10/31/2015 19:30:00
10/31/2015 19:40:00
DateTime

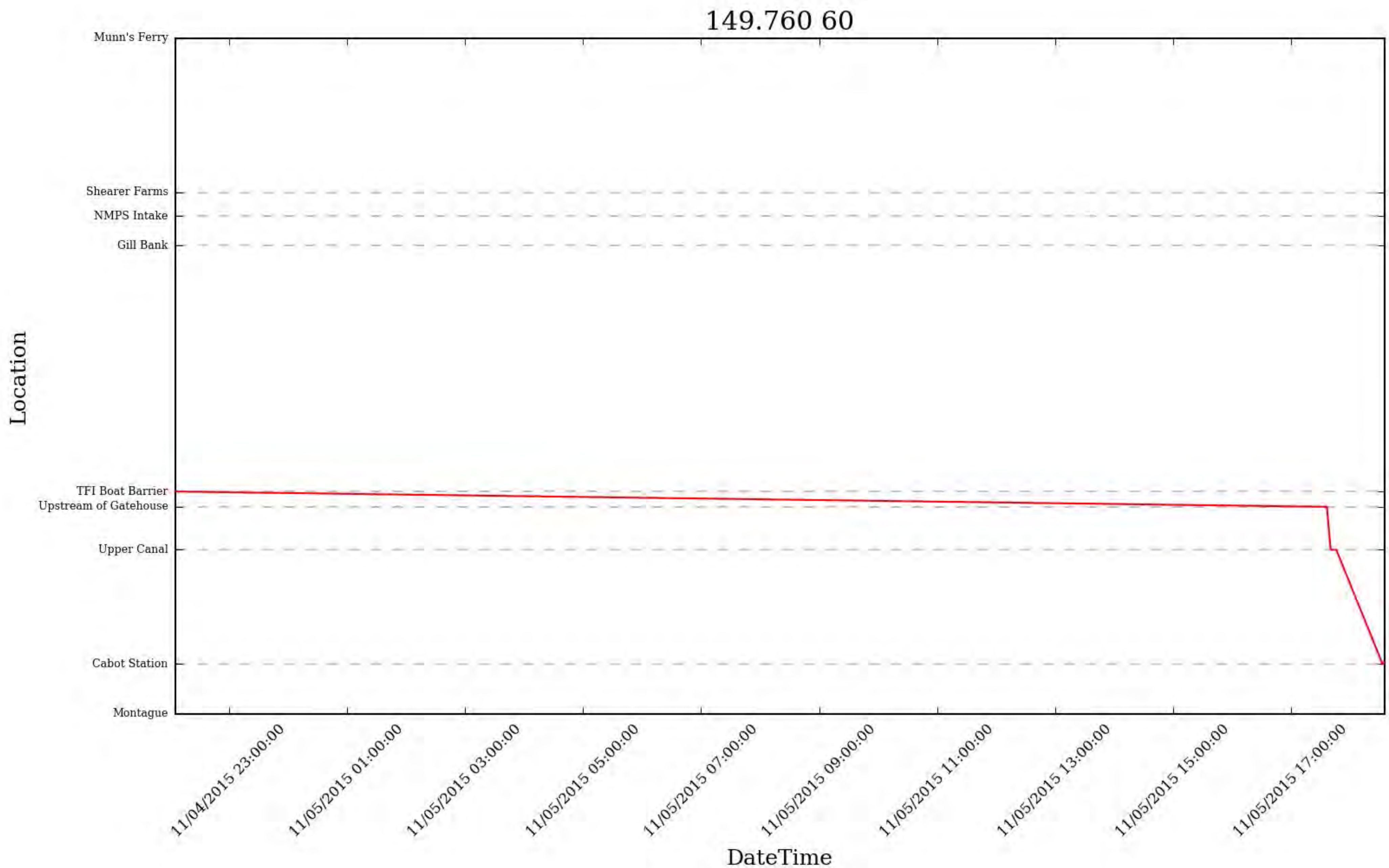


149.760 57
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/06/2015 00:00:00
11/08/2015 00:00:00
11/10/2015 00:00:00
11/12/2015 00:00:00
11/14/2015 00:00:00
11/16/2015 00:00:00
11/18/2015 00:00:00
11/20/2015 00:00:00
11/22/2015 00:00:00
DateTime


149.760 58
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/04/2015 00:00:00
11/05/2015 00:00:00
11/06/2015 00:00:00
11/07/2015 00:00:00
11/08/2015 00:00:00
11/09/2015 00:00:00
11/10/2015 00:00:00
DateTime



149.760 59
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/04/2015 00:00:00
11/05/2015 00:00:00
11/06/2015 00:00:00
11/07/2015 00:00:00
11/08/2015 00:00:00
11/09/2015 00:00:00
11/10/2015 00:00:00
11/11/2015 00:00:00
11/12/2015 00:00:00
DateTime


149.760 60
Location
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
11/04/2015 23:00:00
11/05/2015 01:00:00
11/05/2015 03:00:00
11/05/2015 05:00:00
11/05/2015 07:00:00
11/05/2015 09:00:00
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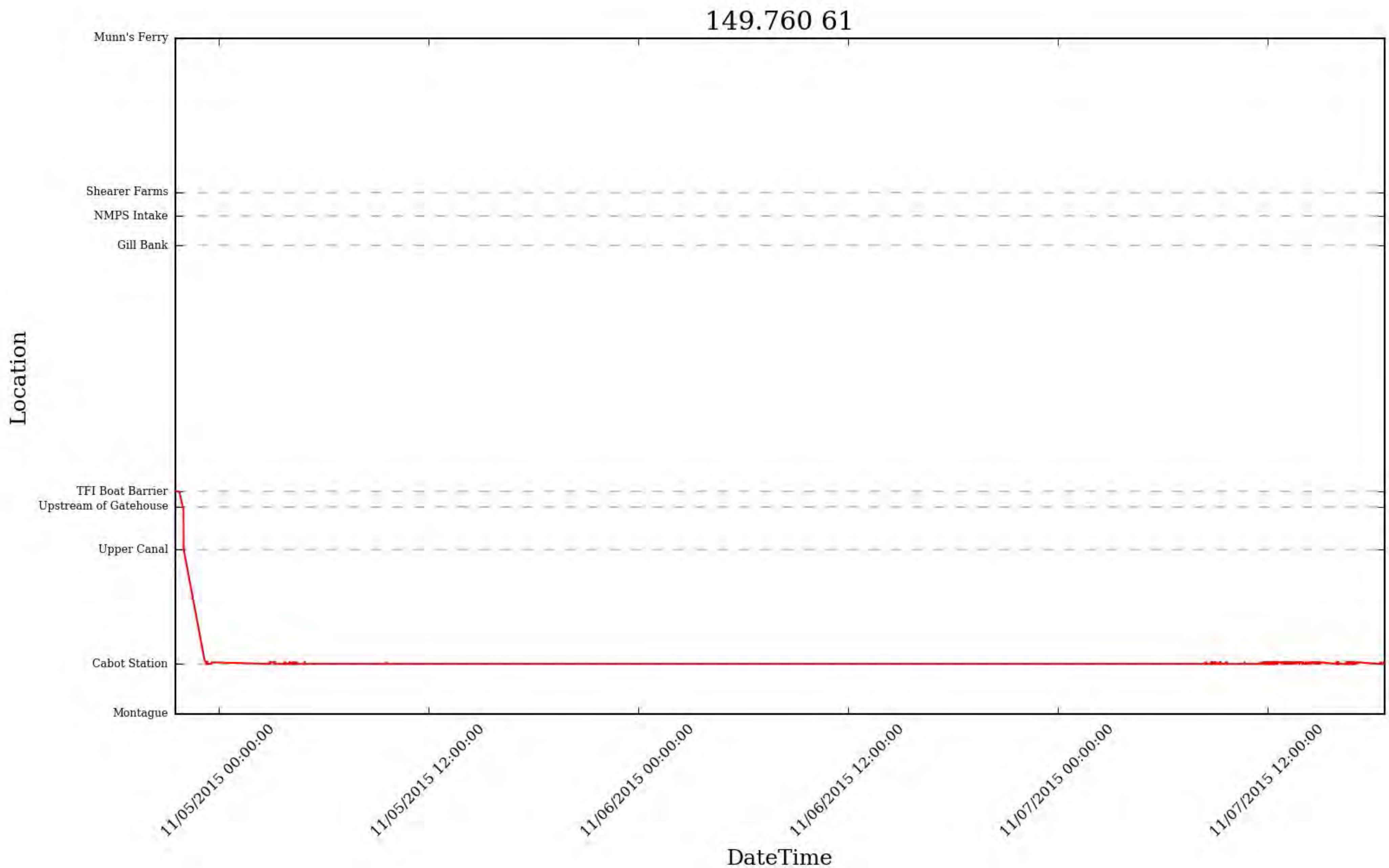
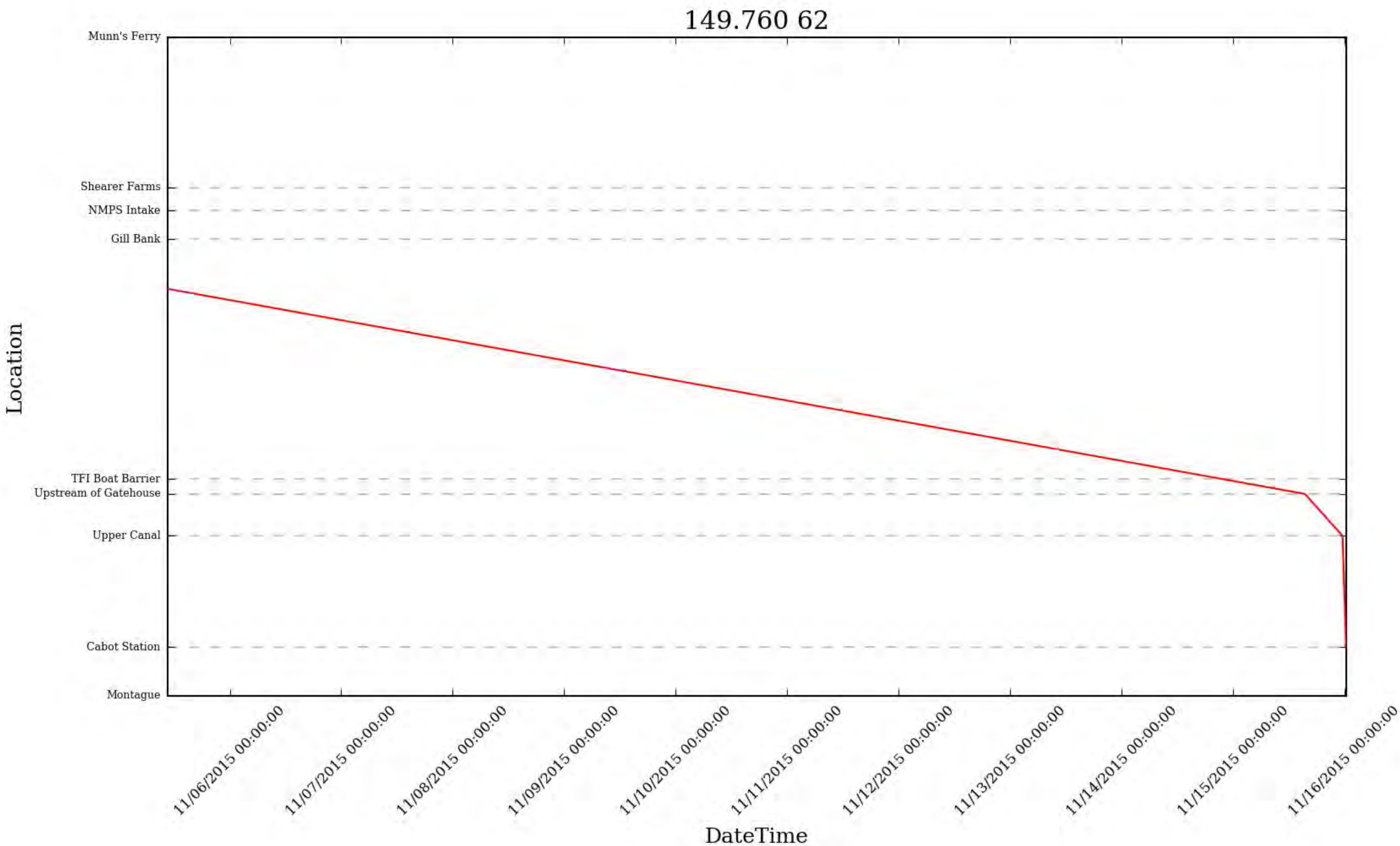
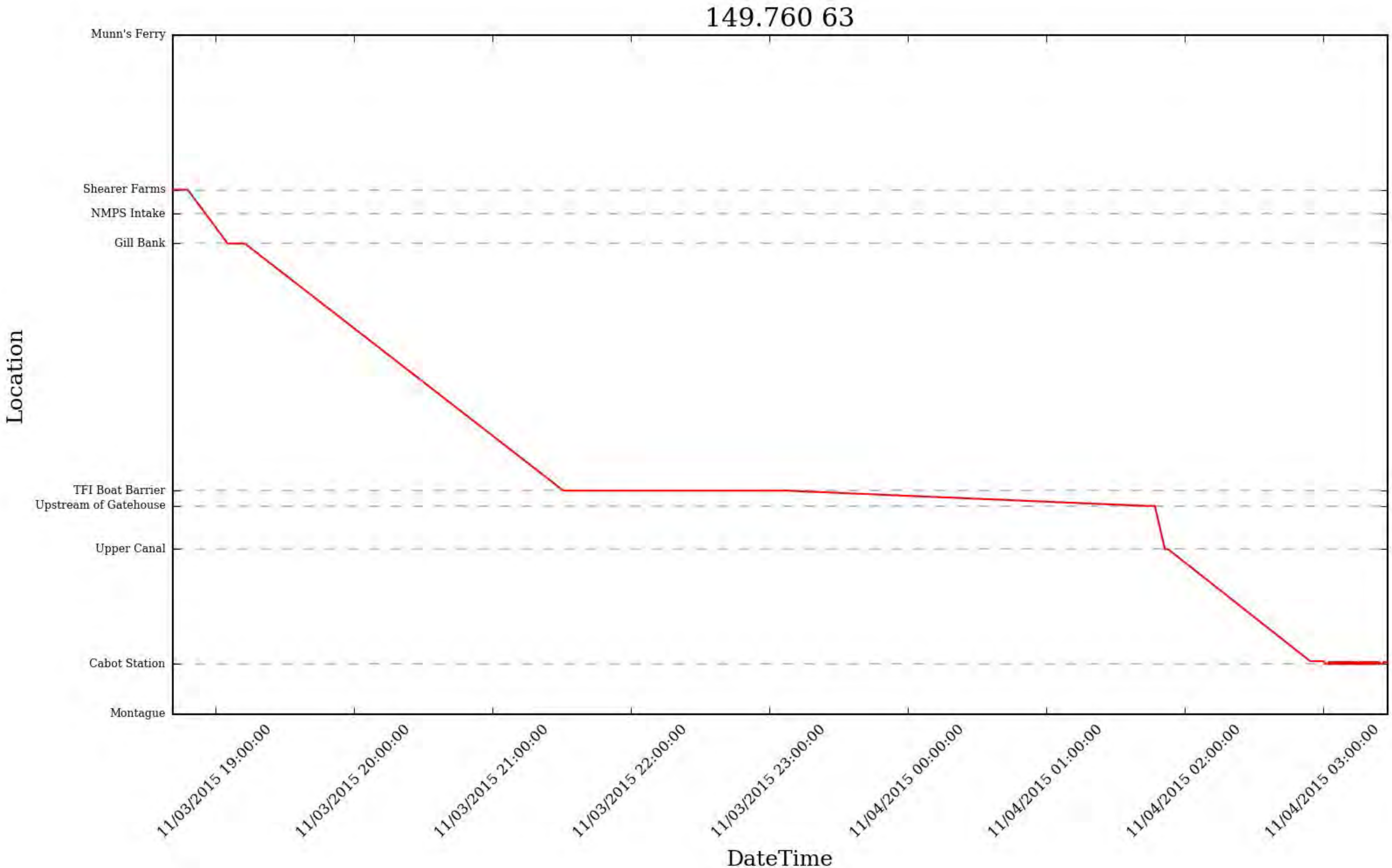
11/05/2015 13:00:00
11/05/2015 15:00:00
11/05/2015 17:00:00
DateTime


149.760 61
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/05/2015 00:00:00
11/05/2015 12:00:00
11/06/2015 00:00:00
11/06/2015 12:00:00
11/07/2015 00:00:00
11/07/2015 12:00:00
DateTime


149.760 62
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/06/2015 00:00:00
11/07/2015 00:00:00
11/08/2015 00:00:00
11/09/2015 00:00:00
11/10/2015 00:00:00
11/11/2015 00:00:00
11/12/2015 00:00:00
11/13/2015 00:00:00
11/14/2015 00:00:00
11/15/2015 00:00:00
11/16/2015 00:00:00
DateTime



149.760 63
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/03/2015 19:00:00
11/03/2015 20:00:00
11/03/2015 21:00:00
11/03/2015 22:00:00
11/03/2015 23:00:00
11/04/2015 00:00:00
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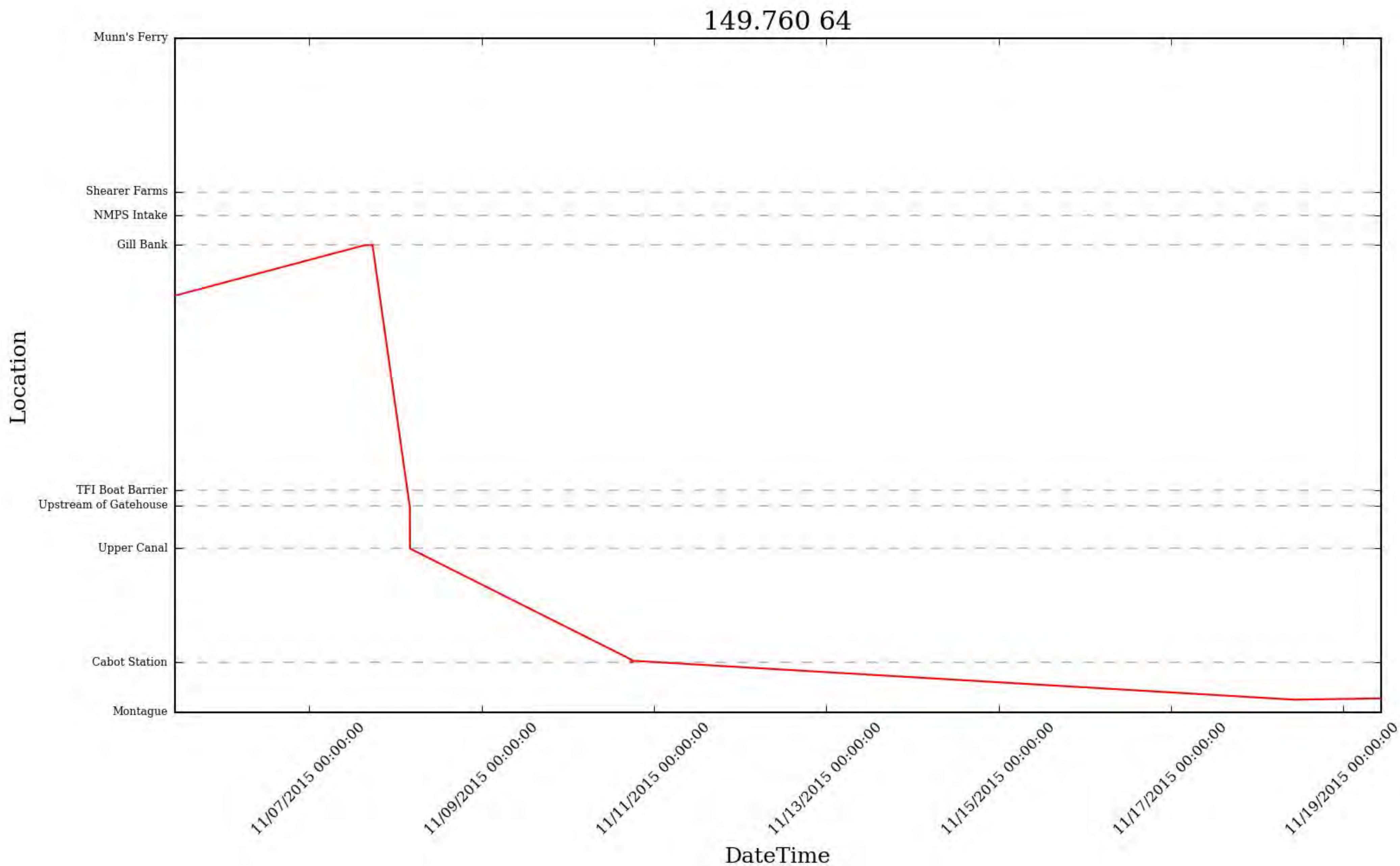
11/04/2015 03:00:00
DateTime



149.760 64
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/07/2015 00:00:00
11/09/2015 00:00:00
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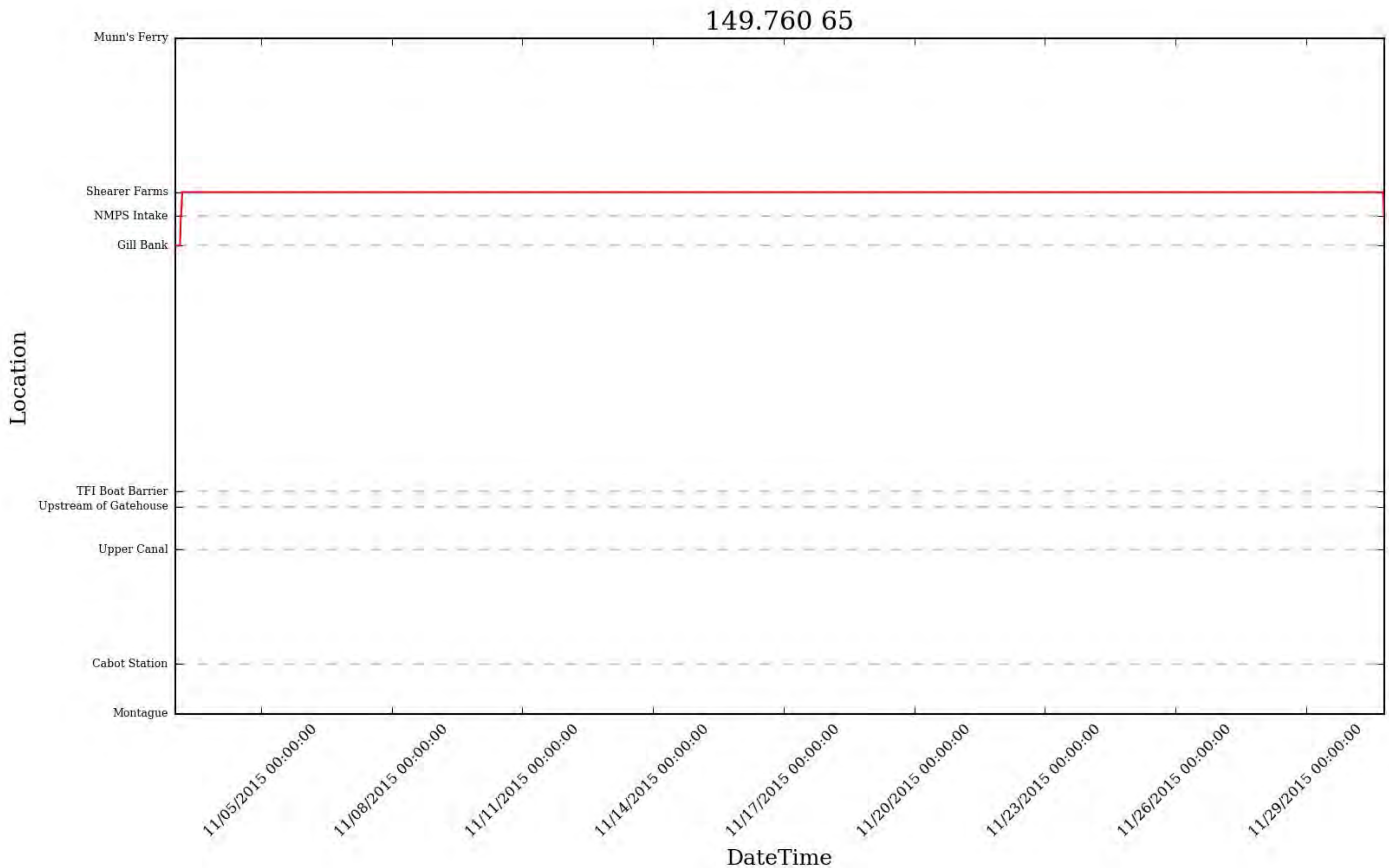
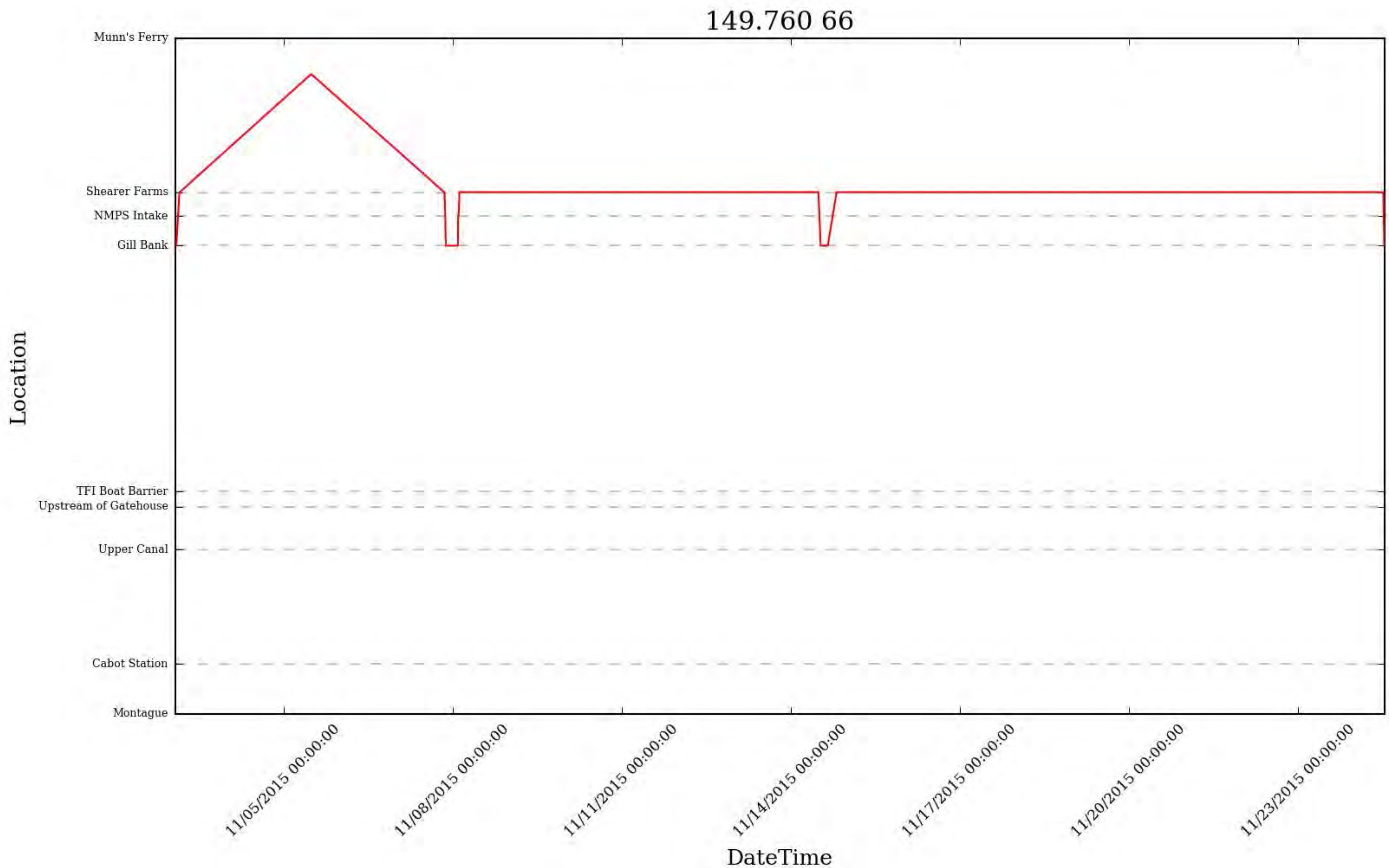
11/15/2015 00:00:00
11/17/2015 00:00:00
11/19/2015 00:00:00
DateTime


149.760 65
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/05/2015 00:00:00
11/08/2015 00:00:00
11/11/2015 00:00:00
11/14/2015 00:00:00
11/17/2015 00:00:00
11/20/2015 00:00:00
11/23/2015 00:00:00
11/26/2015 00:00:00
11/29/2015 00:00:00
DateTime



149.760 66
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/05/2015 00:00:00
11/08/2015 00:00:00
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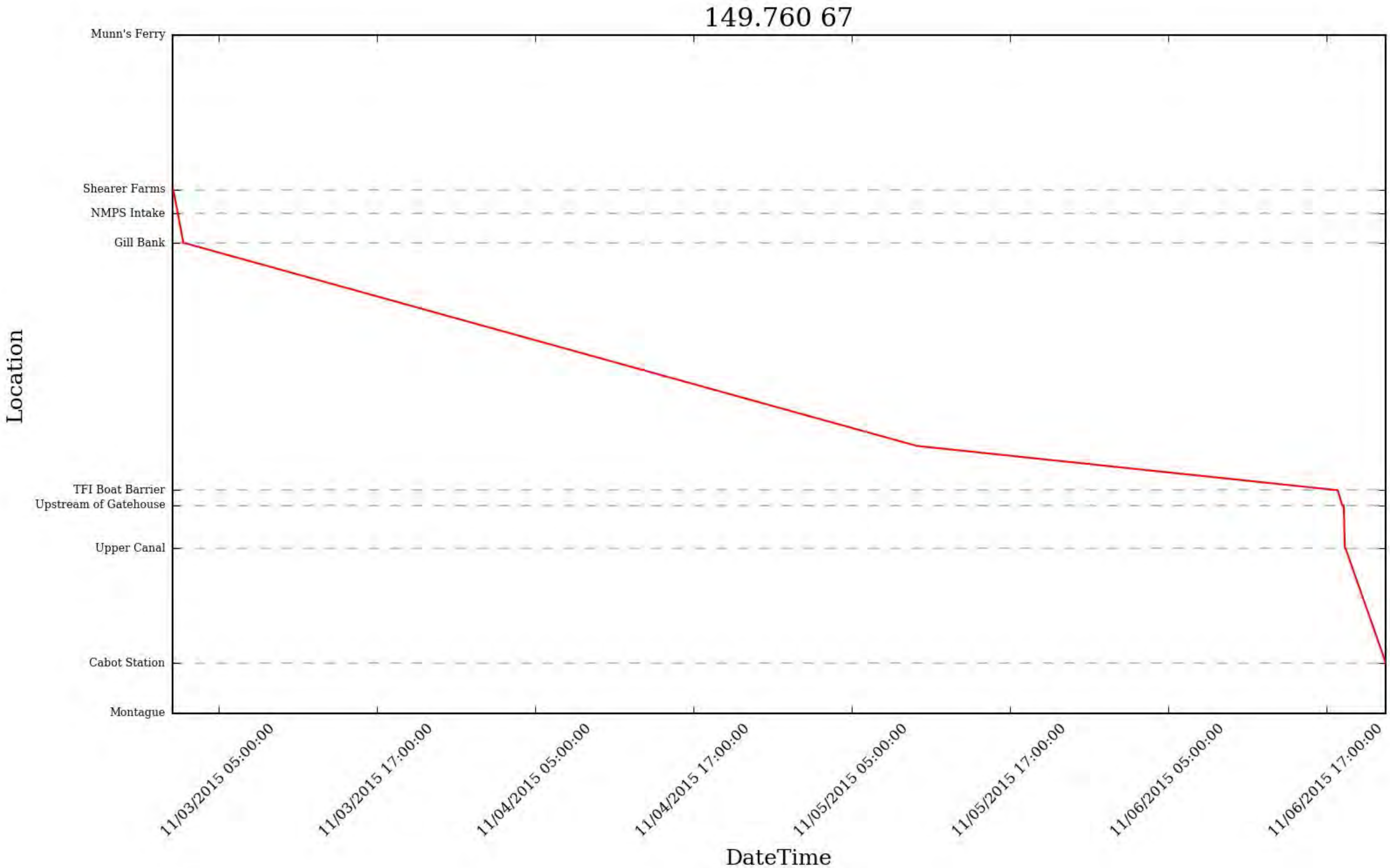
11/17/2015 00:00:00
11/20/2015 00:00:00
11/23/2015 00:00:00
DateTime



149.760 67
Location
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
11/03/2015 05:00:00
11/03/2015 17:00:00
11/04/2015 05:00:00
11/04/2015 17:00:00
11/05/2015 05:00:00
11/05/2015 17:00:00
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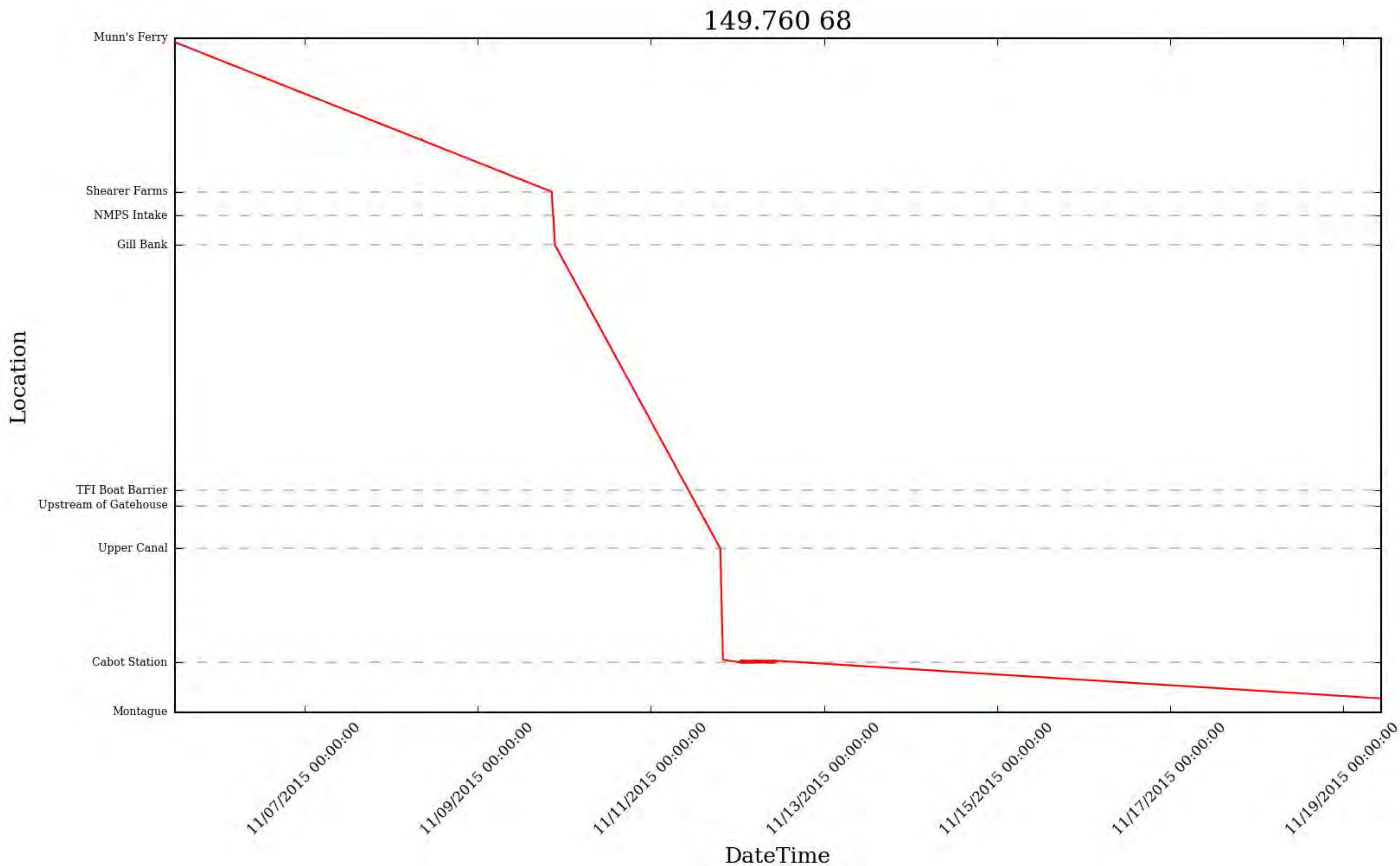
11/06/2015 17:00:00
DateTime



149.760 68
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/07/2015 00:00:00
11/09/2015 00:00:00
11/11/2015 00:00:00
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11/15/2015 00:00:00
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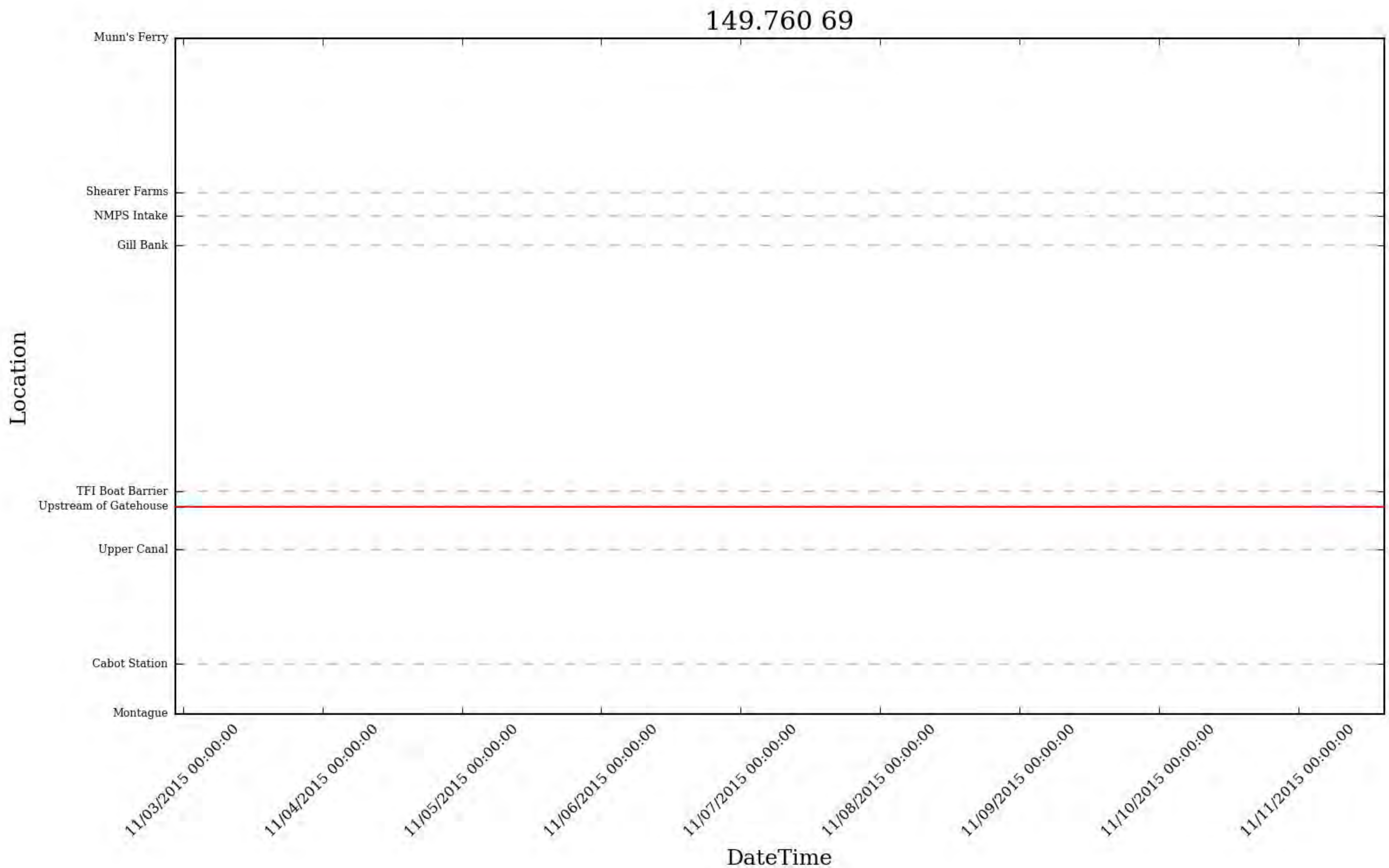
11/19/2015 00:00:00
DateTime



149.760 69
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/03/2015 00:00:00
11/04/2015 00:00:00
11/05/2015 00:00:00
11/06/2015 00:00:00
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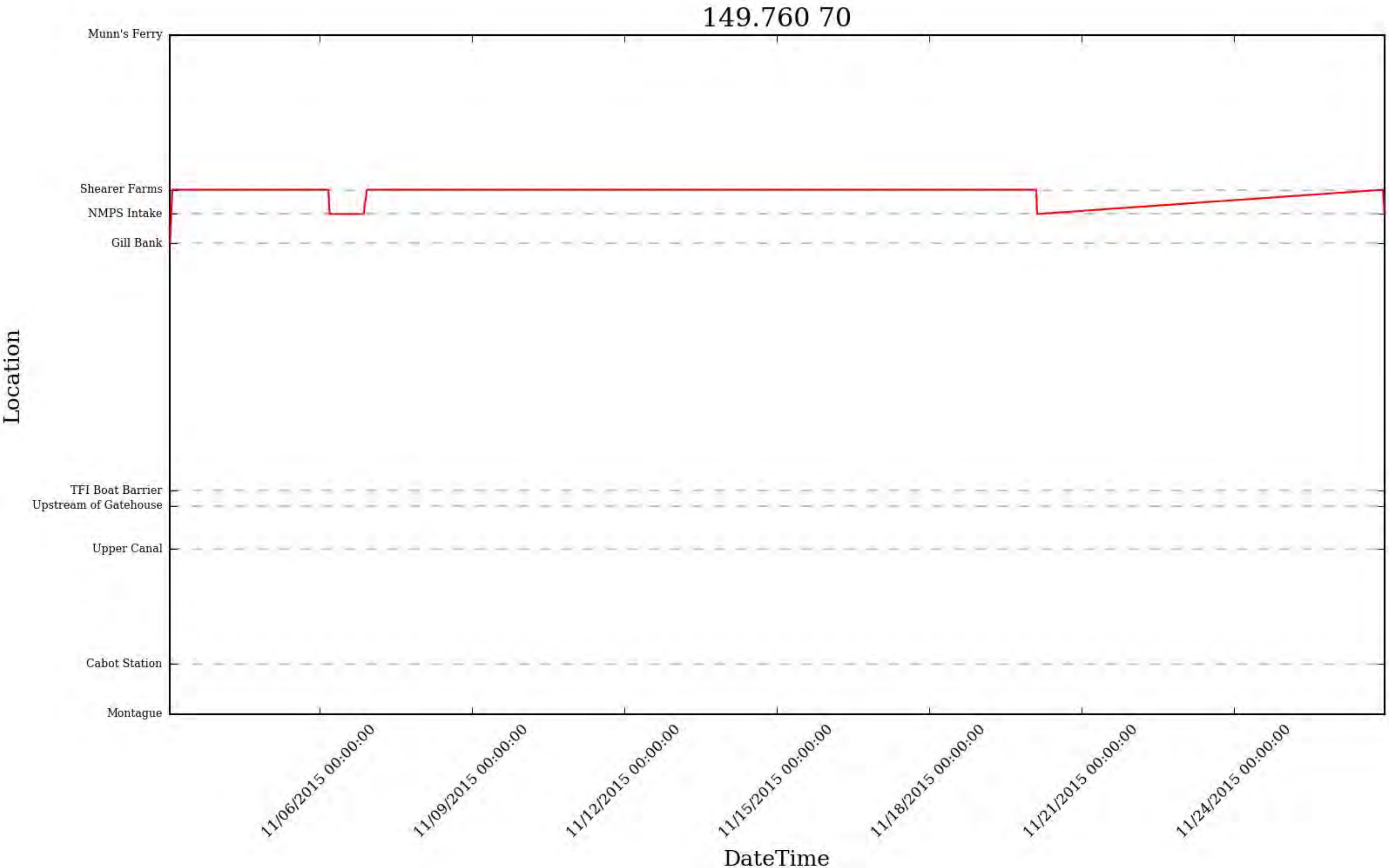
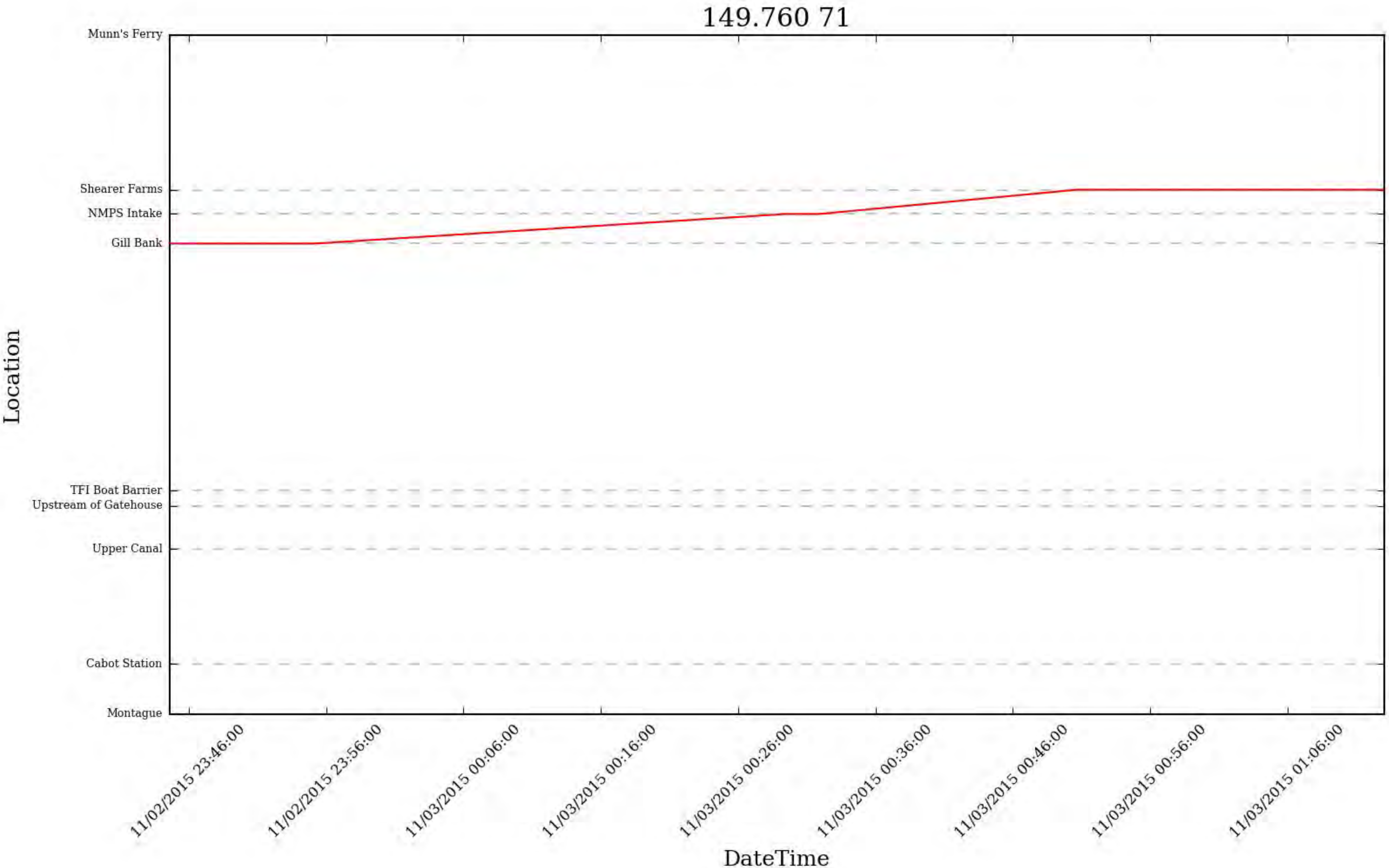
11/10/2015 00:00:00
11/11/2015 00:00:00
DateTime



149.760 70
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/06/2015 00:00:00
11/09/2015 00:00:00
11/12/2015 00:00:00
11/15/2015 00:00:00
11/18/2015 00:00:00
11/21/2015 00:00:00
11/24/2015 00:00:00
DateTime



149.760 71
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/02/2015 23:46:00
11/02/2015 23:56:00
11/03/2015 00:06:00
11/03/2015 00:16:00
11/03/2015 00:26:00
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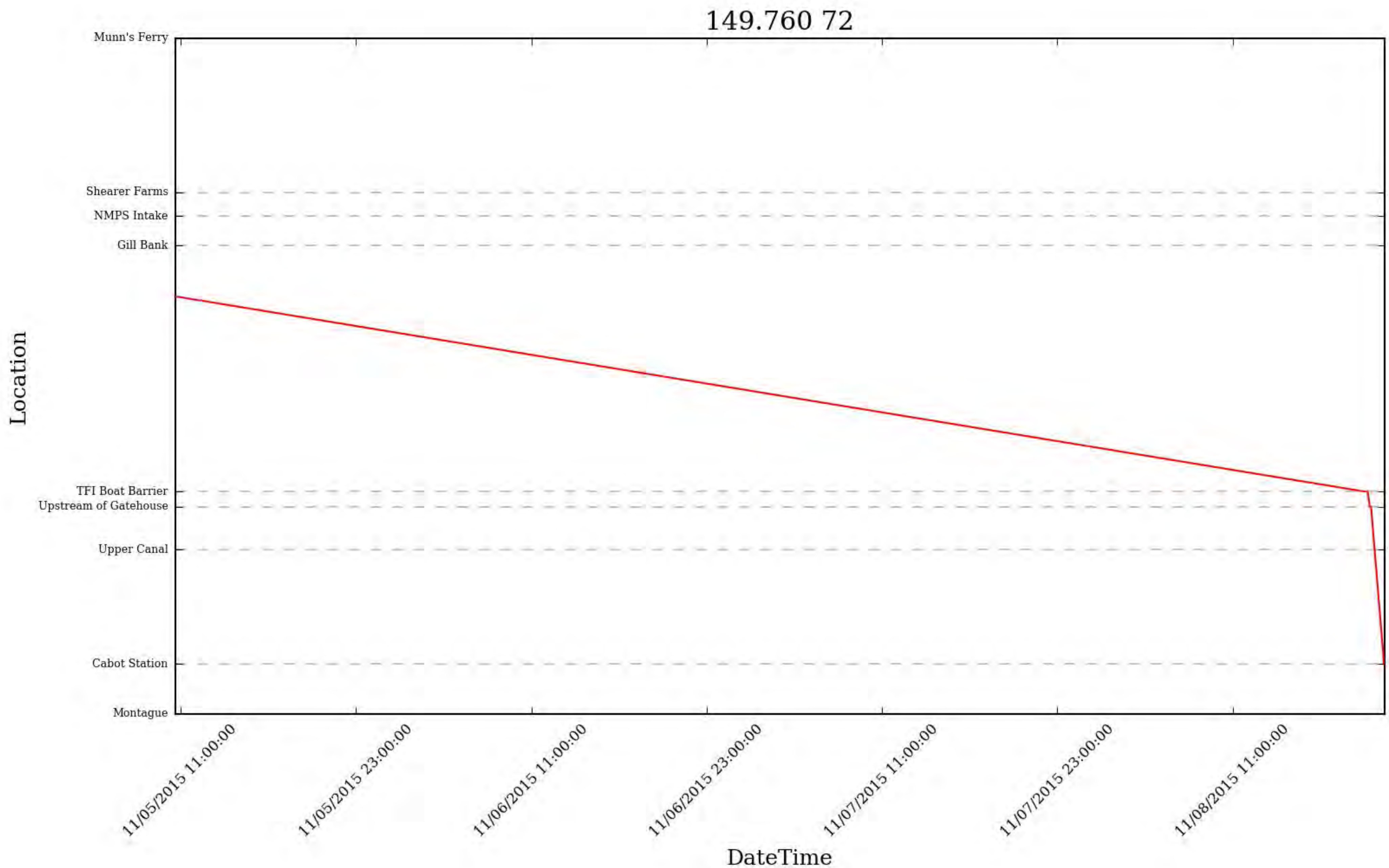
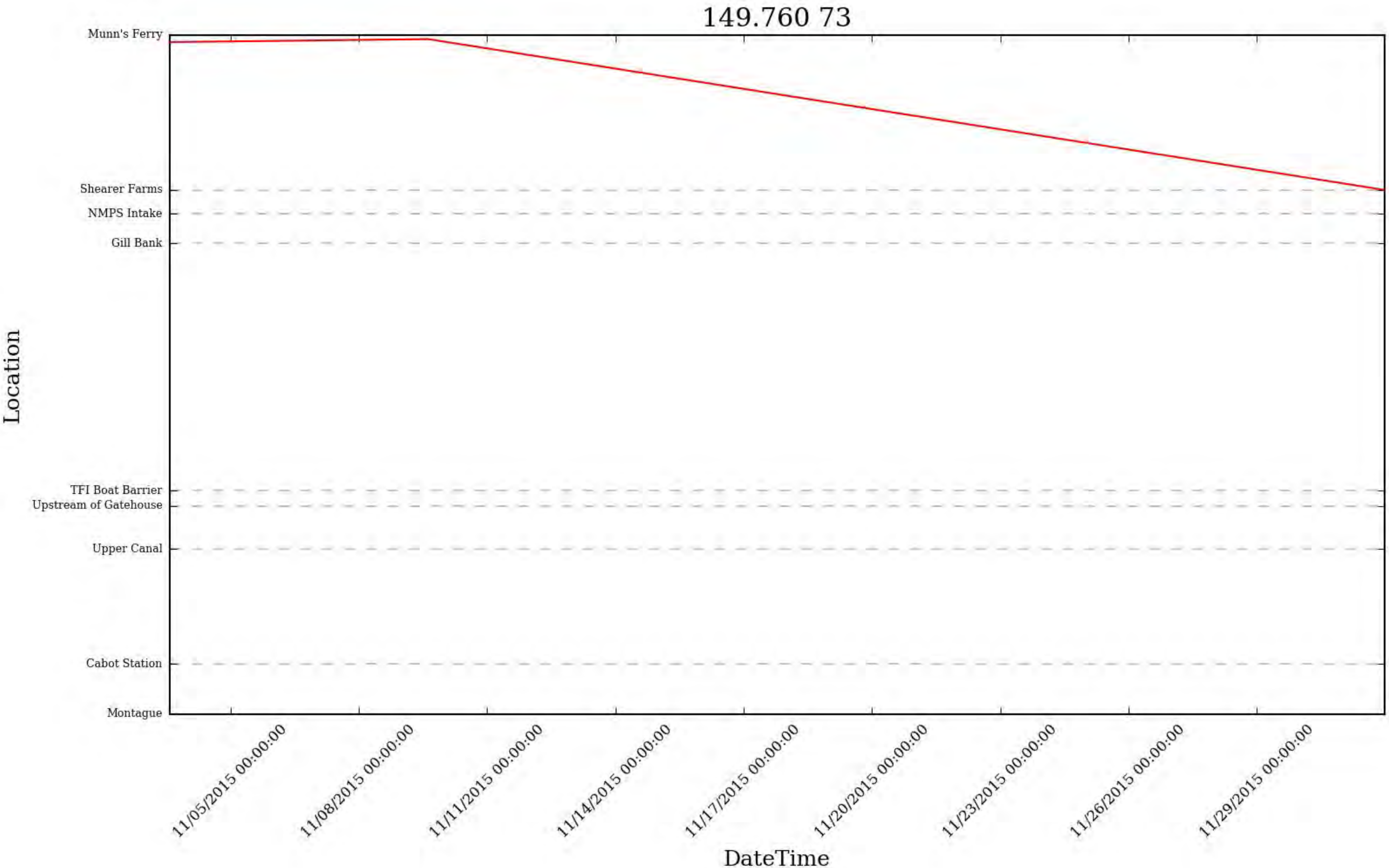
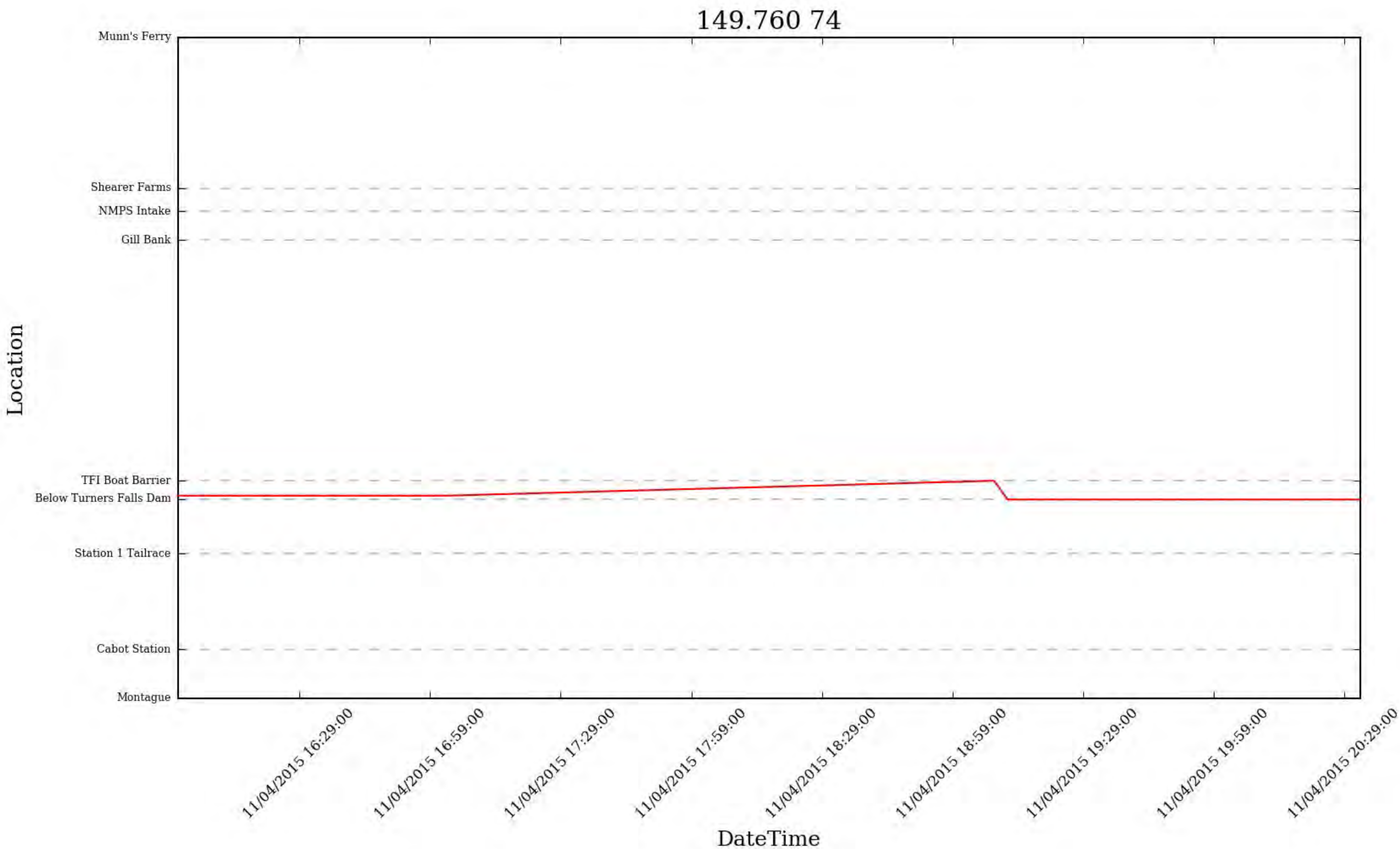
11/03/2015 00:46:00
11/03/2015 00:56:00
11/03/2015 01:06:00
DateTime

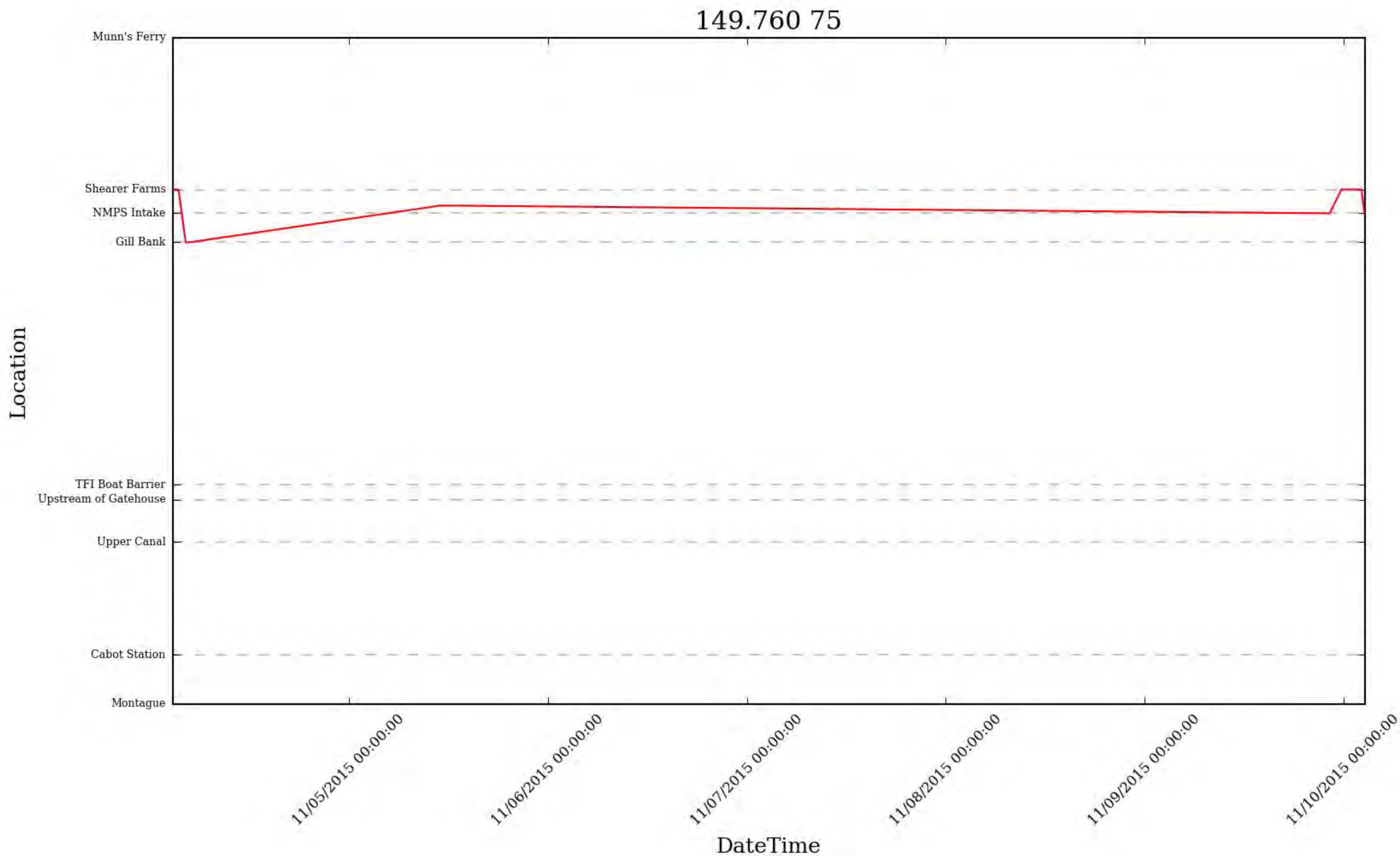

149.760 72
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/05/2015 11:00:00
11/05/2015 23:00:00
11/06/2015 11:00:00
11/06/2015 23:00:00
11/07/2015 11:00:00
11/07/2015 23:00:00
11/08/2015 11:00:00
DateTime



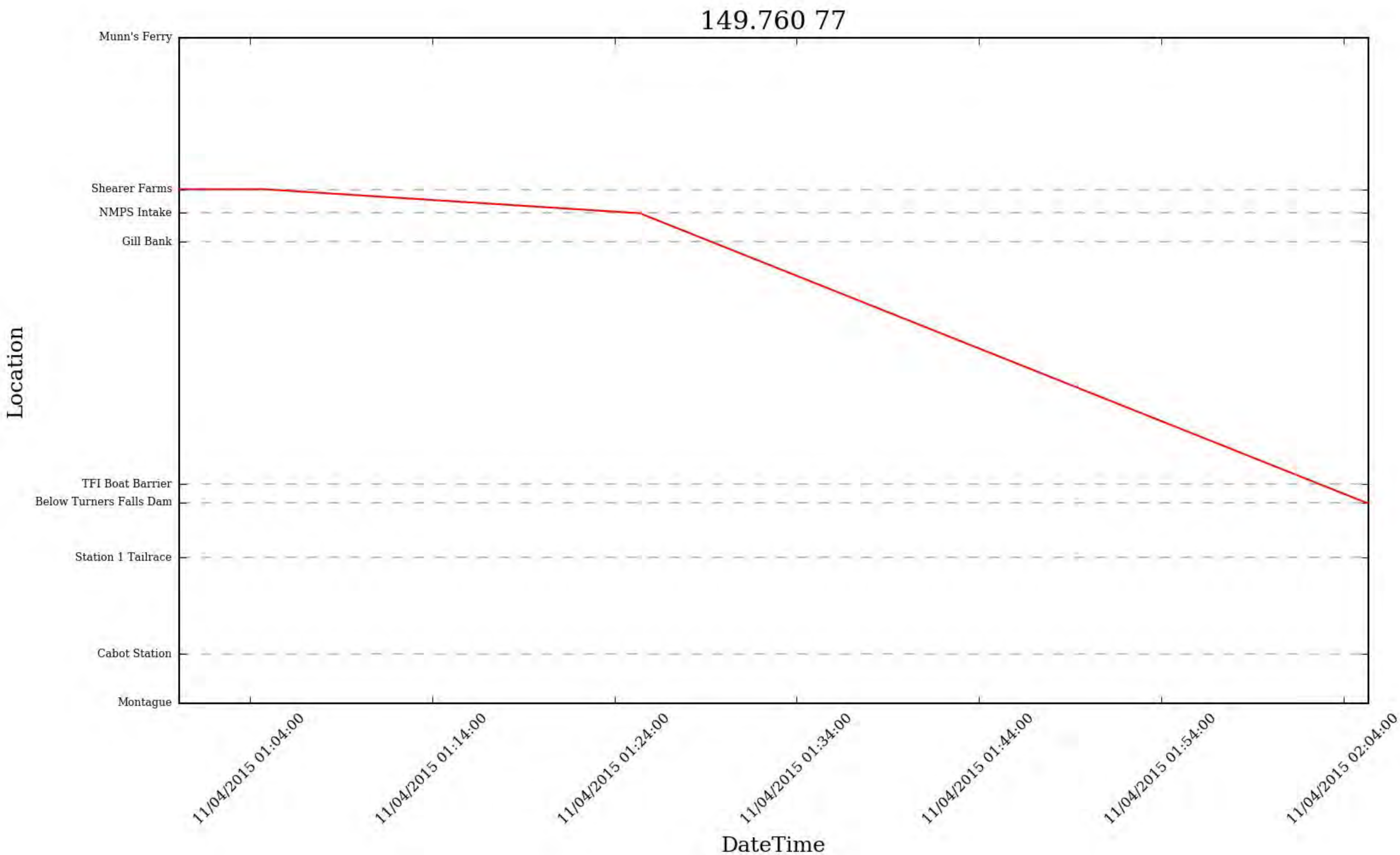
149.760 73
Location
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
11/05/2015 00:00:00
11/08/2015 00:00:00
11/11/2015 00:00:00
11/14/2015 00:00:00
11/17/2015 00:00:00
11/20/2015 00:00:00
11/23/2015 00:00:00
11/26/2015 00:00:00
11/29/2015 00:00:00
DateTime



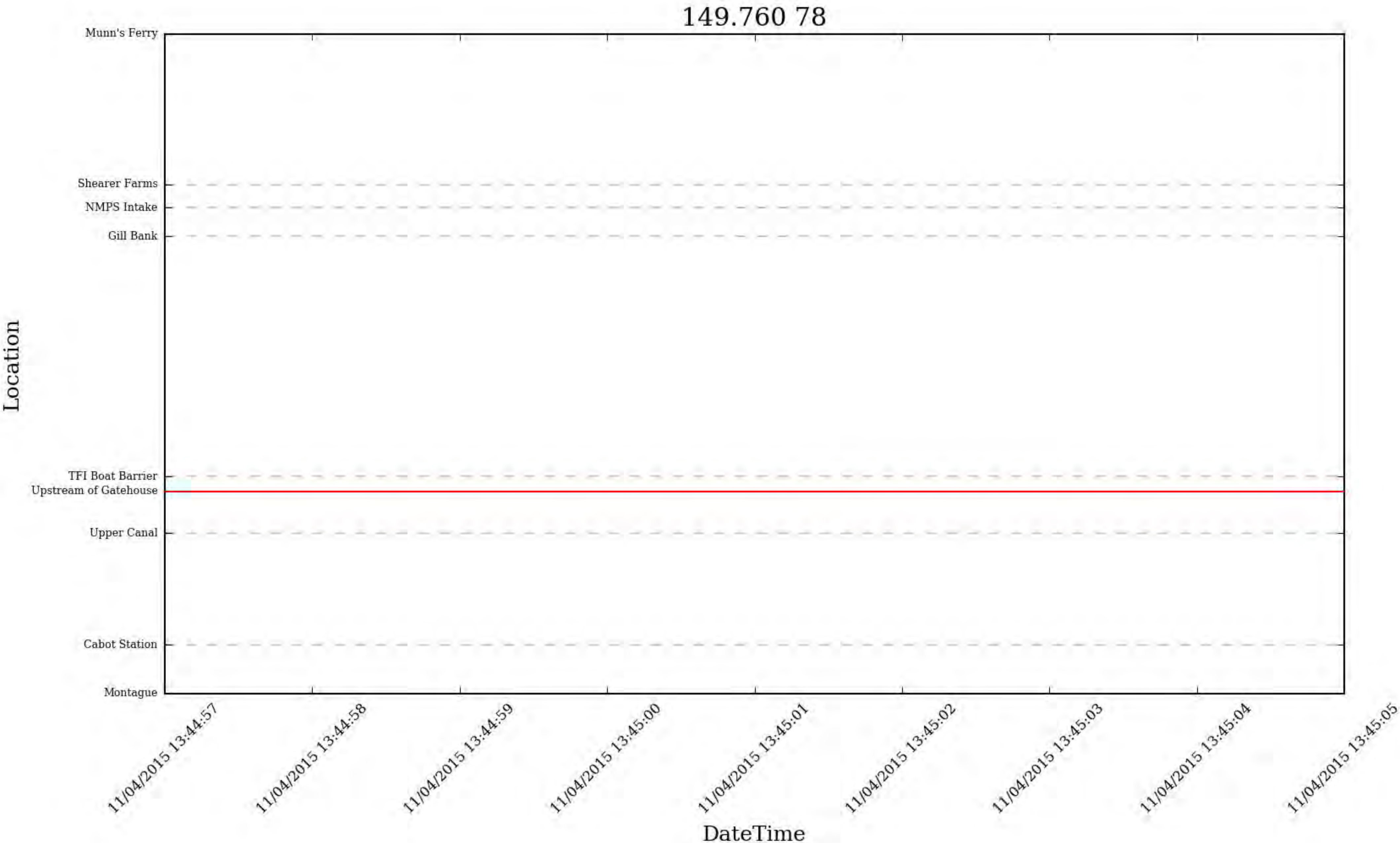
149.760 74
Location
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Below Turners Falls Dam
Station 1 Tailrace
Cabot Station
Montague
11/04/2015 16:29:00
11/04/2015 16:59:00
11/04/2015 17:29:00
11/04/2015 17:59:00
11/04/2015 18:29:00
11/04/2015 18:59:00
11/04/2015 19:29:00
11/04/2015 19:59:00
11/04/2015 20:29:00
DateTime



149.760 75
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/05/2015 00:00:00
11/06/2015 00:00:00
11/07/2015 00:00:00
11/08/2015 00:00:00
11/09/2015 00:00:00
11/10/2015 00:00:00
DateTime



149.760 77
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Below Turners Falls Dam
Station 1 Tailrace
Cabot Station
Montague
Location
11/04/2015 01:04:00
11/04/2015 01:14:00
11/04/2015 01:24:00
11/04/2015 01:34:00
11/04/2015 01:44:00
11/04/2015 01:54:00
11/04/2015 02:04:00
DateTime



149.760 78
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
Location
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
11/04/2015 13:44:57
11/04/2015 13:44:58
11/04/2015 13:44:59
11/04/2015 13:45:00
11/04/2015 13:45:01
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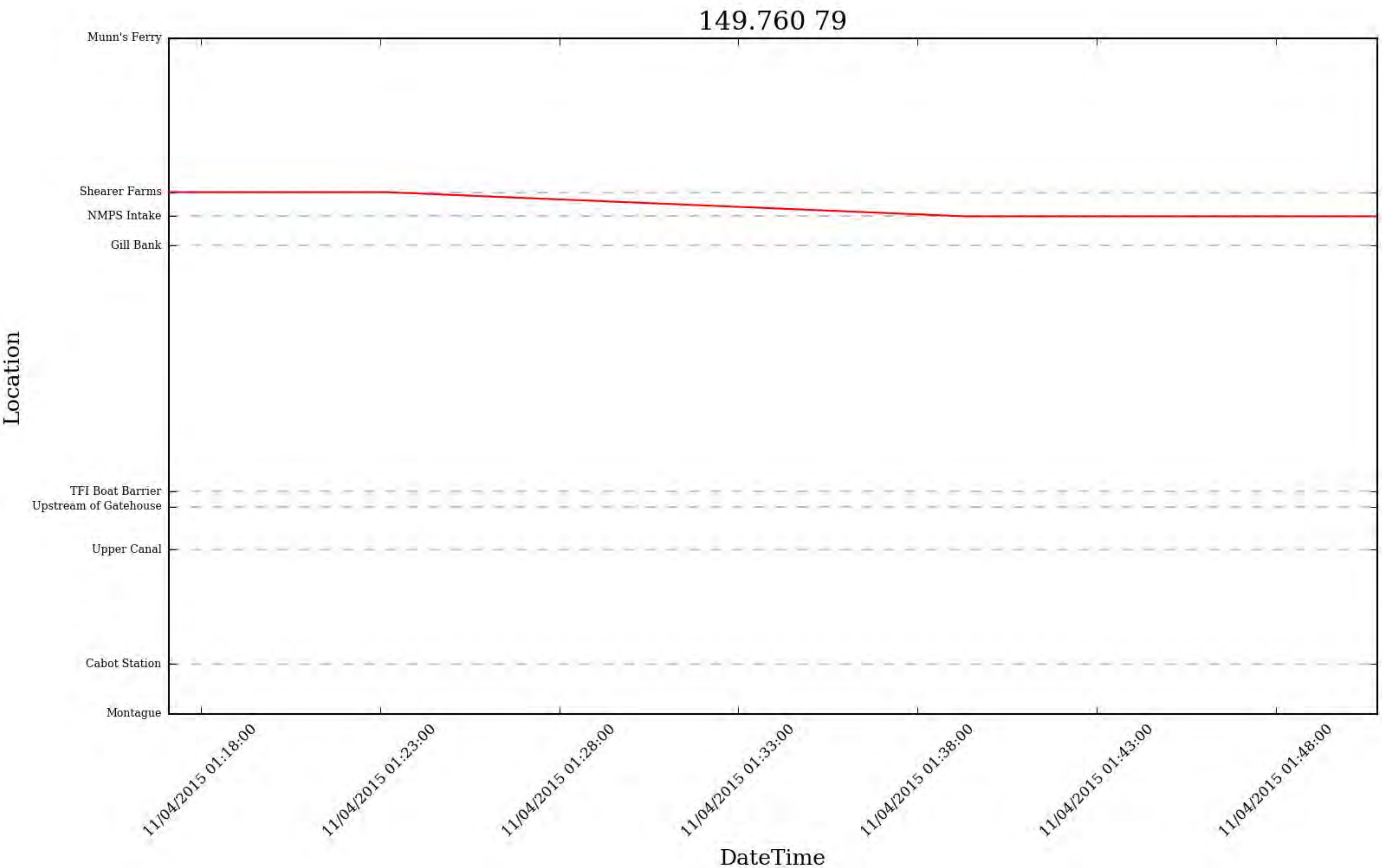
11/04/2015 13:45:03
11/04/2015 13:45:04
11/04/2015 13:45:05
DateTime


149.760 79
Location
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
11/04/2015 01:18:00
11/04/2015 01:23:00
11/04/2015 01:28:00
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11/04/2015 01:38:00
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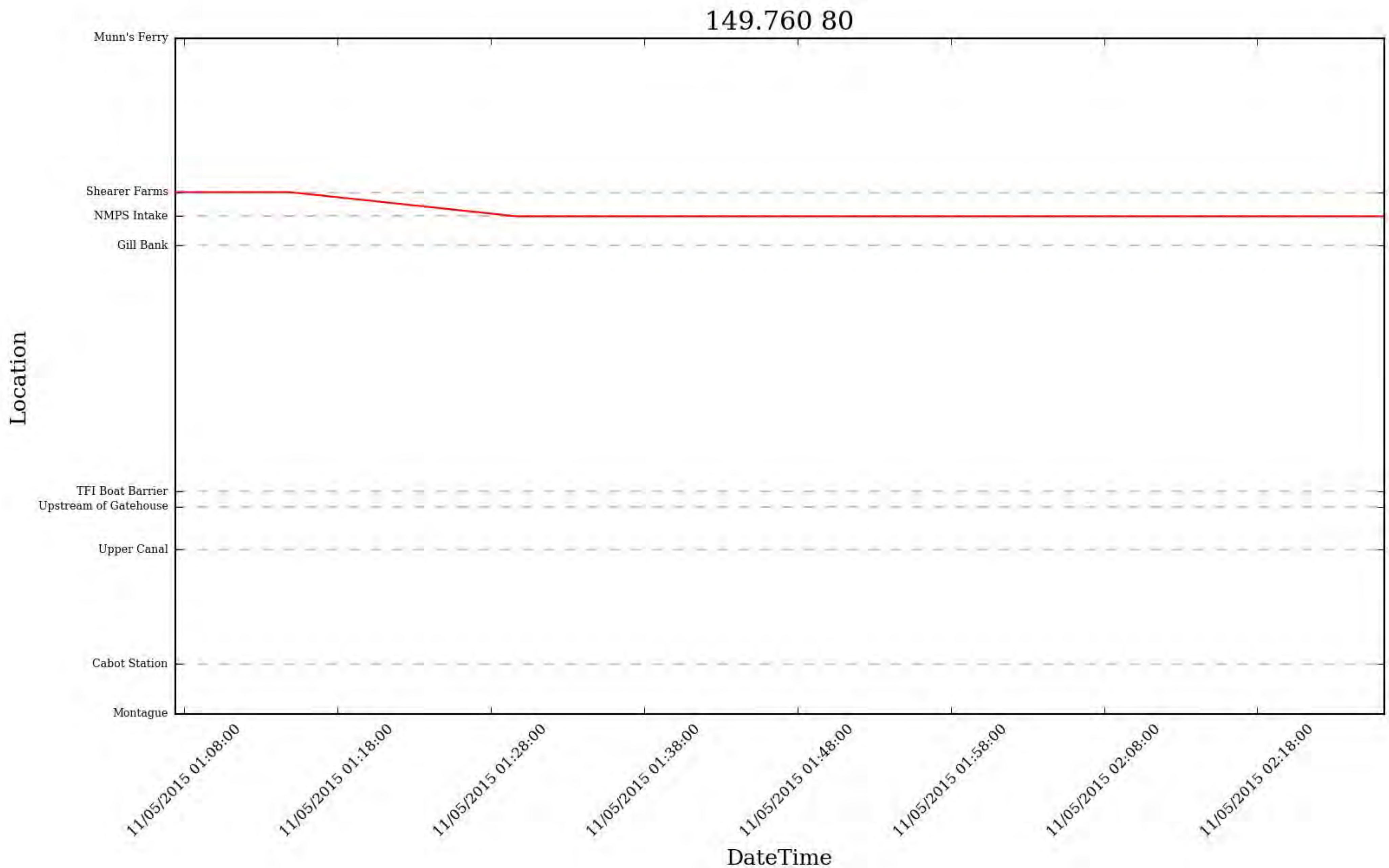
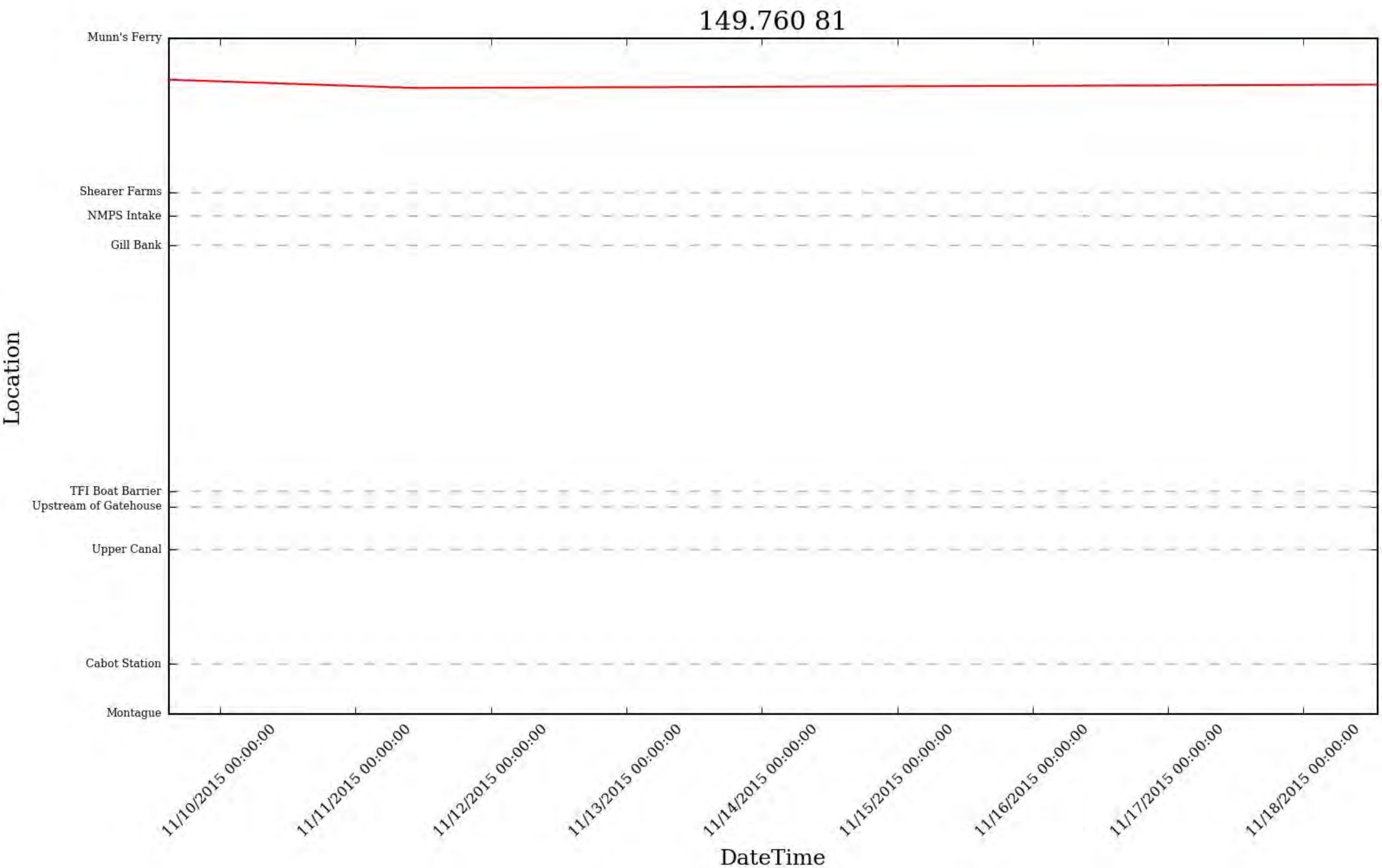
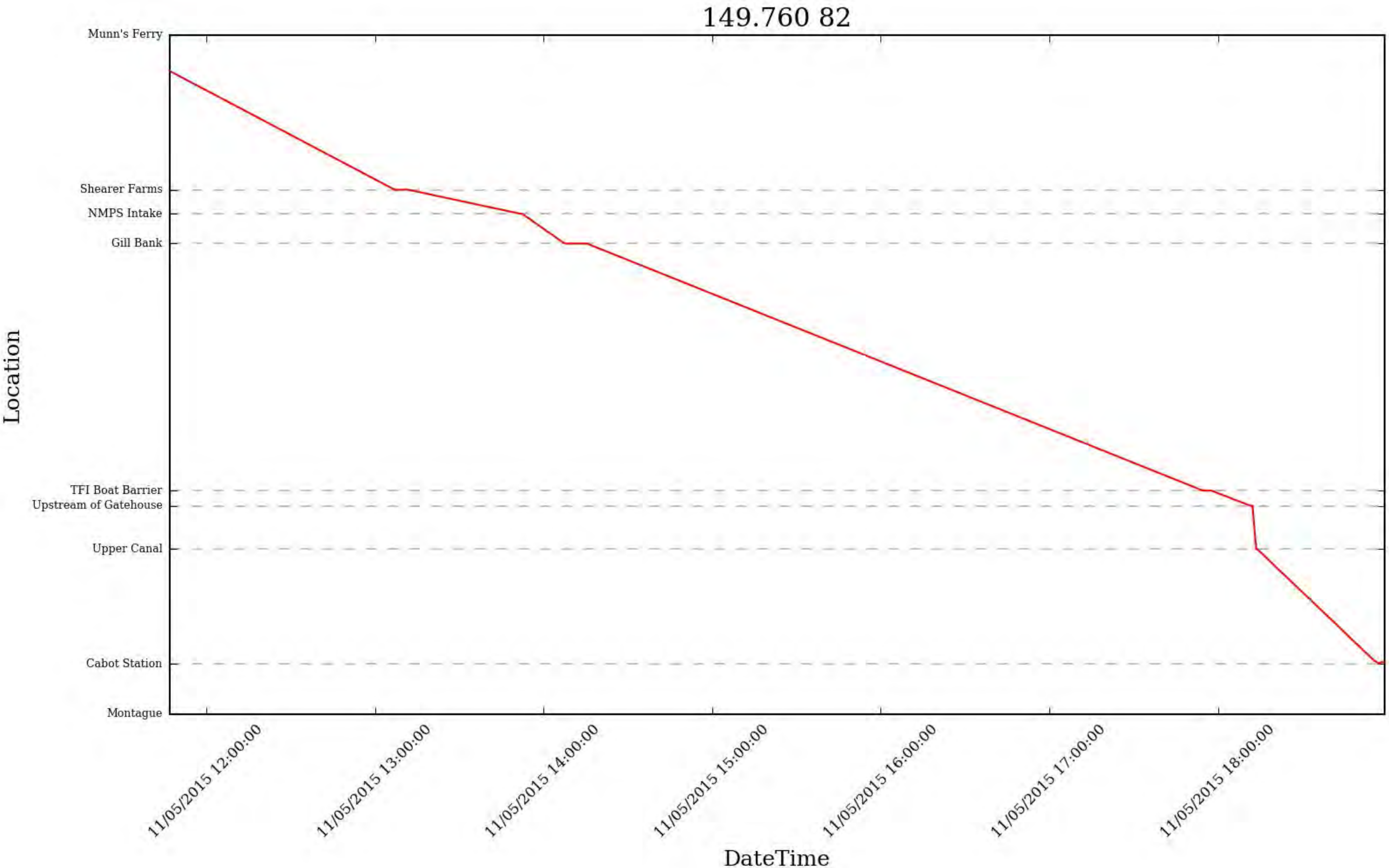
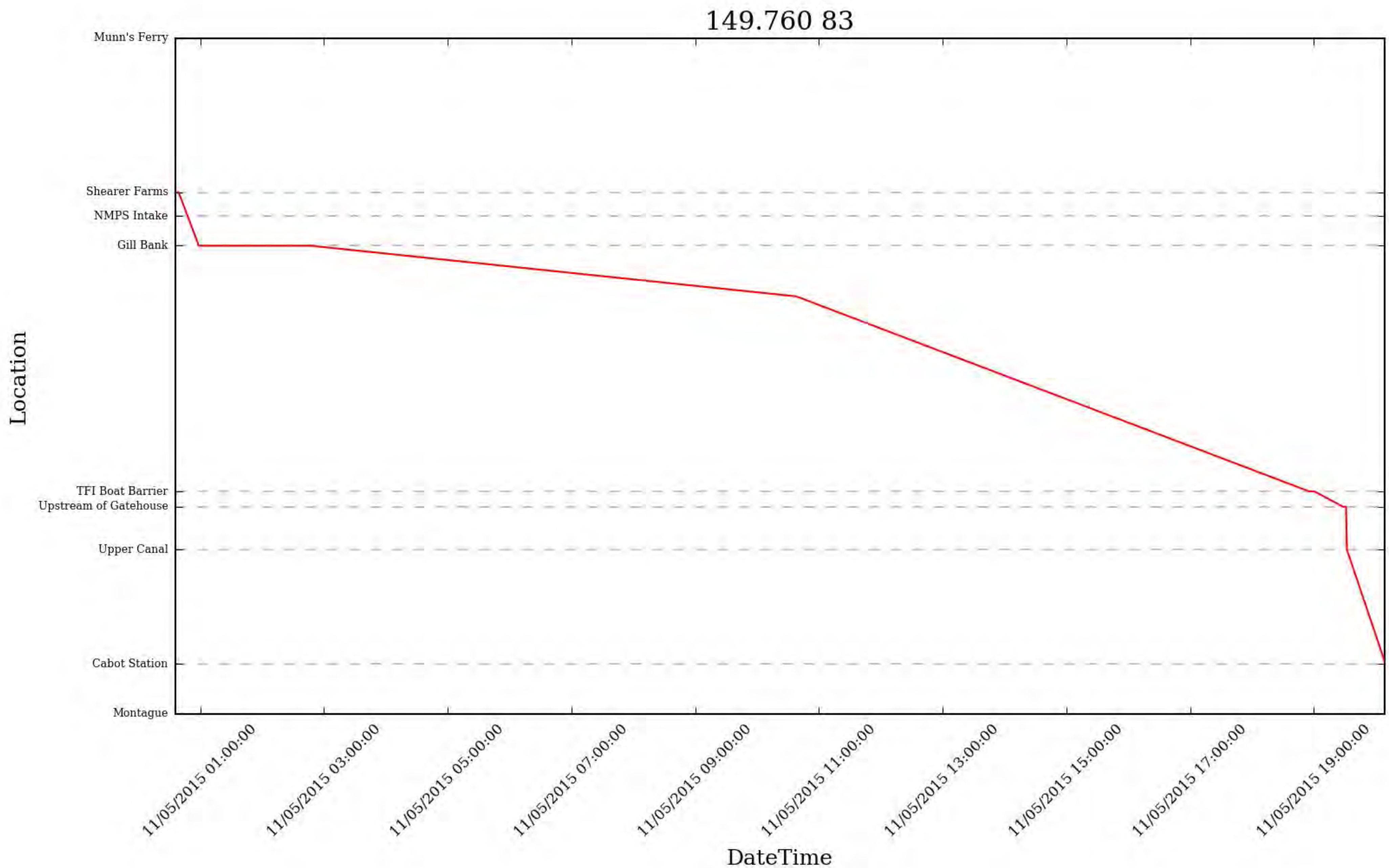
11/04/2015 01:48:00
DateTime

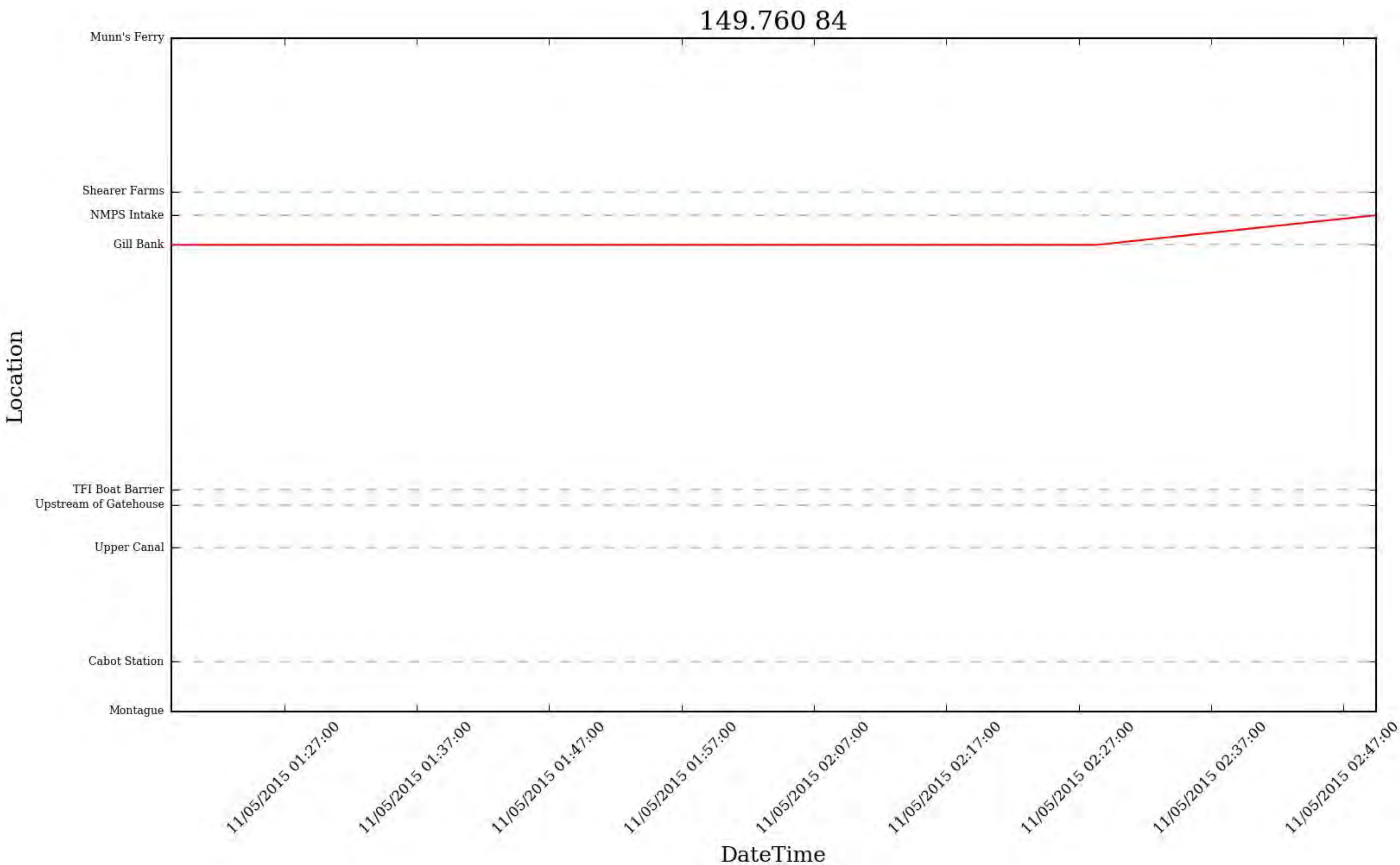


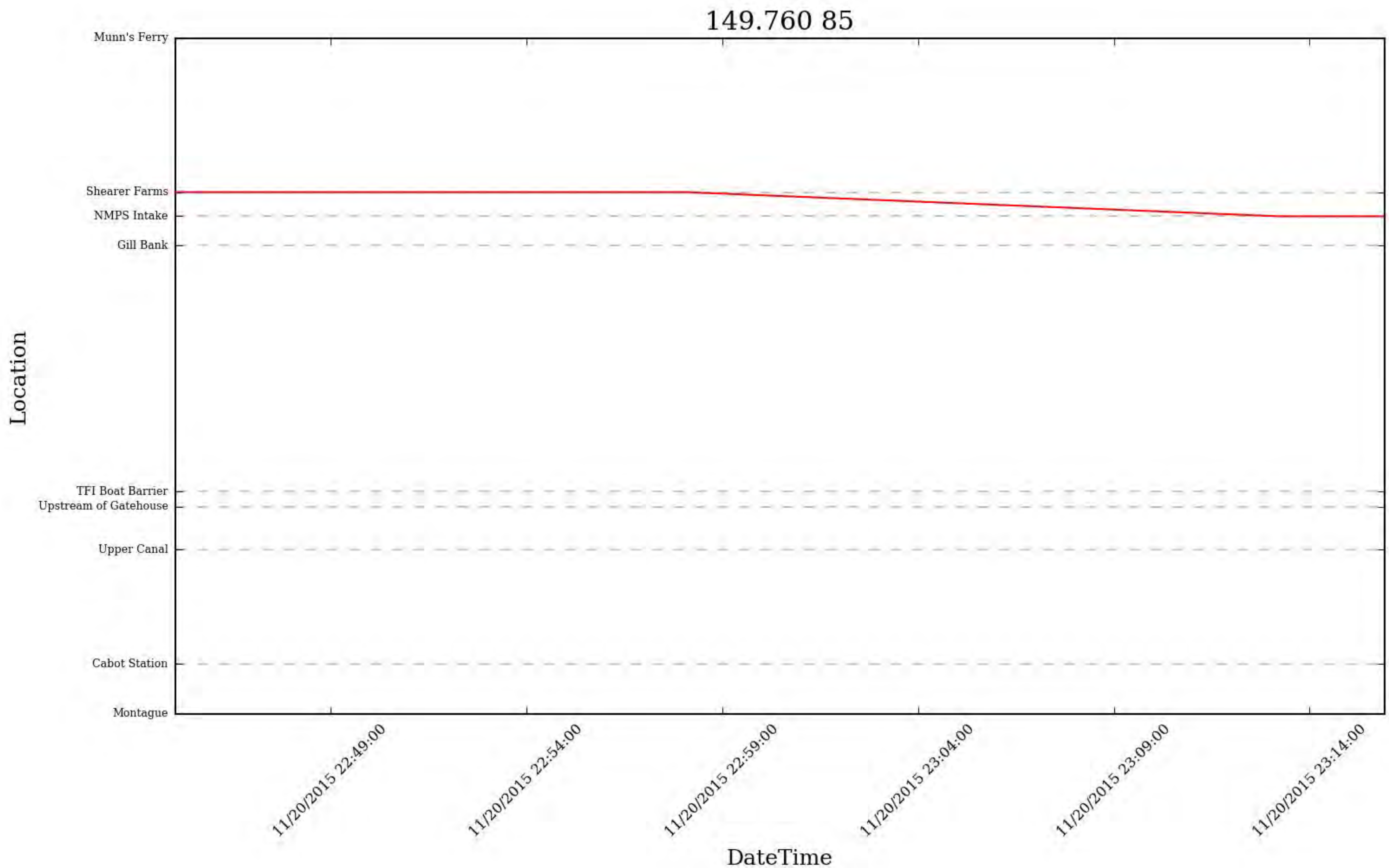
149.760 80
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/05/2015 01:08:00
11/05/2015 01:18:00
11/05/2015 01:28:00
11/05/2015 01:38:00
11/05/2015 01:48:00
11/05/2015 01:58:00
11/05/2015 02:08:00
11/05/2015 02:18:00
DateTime

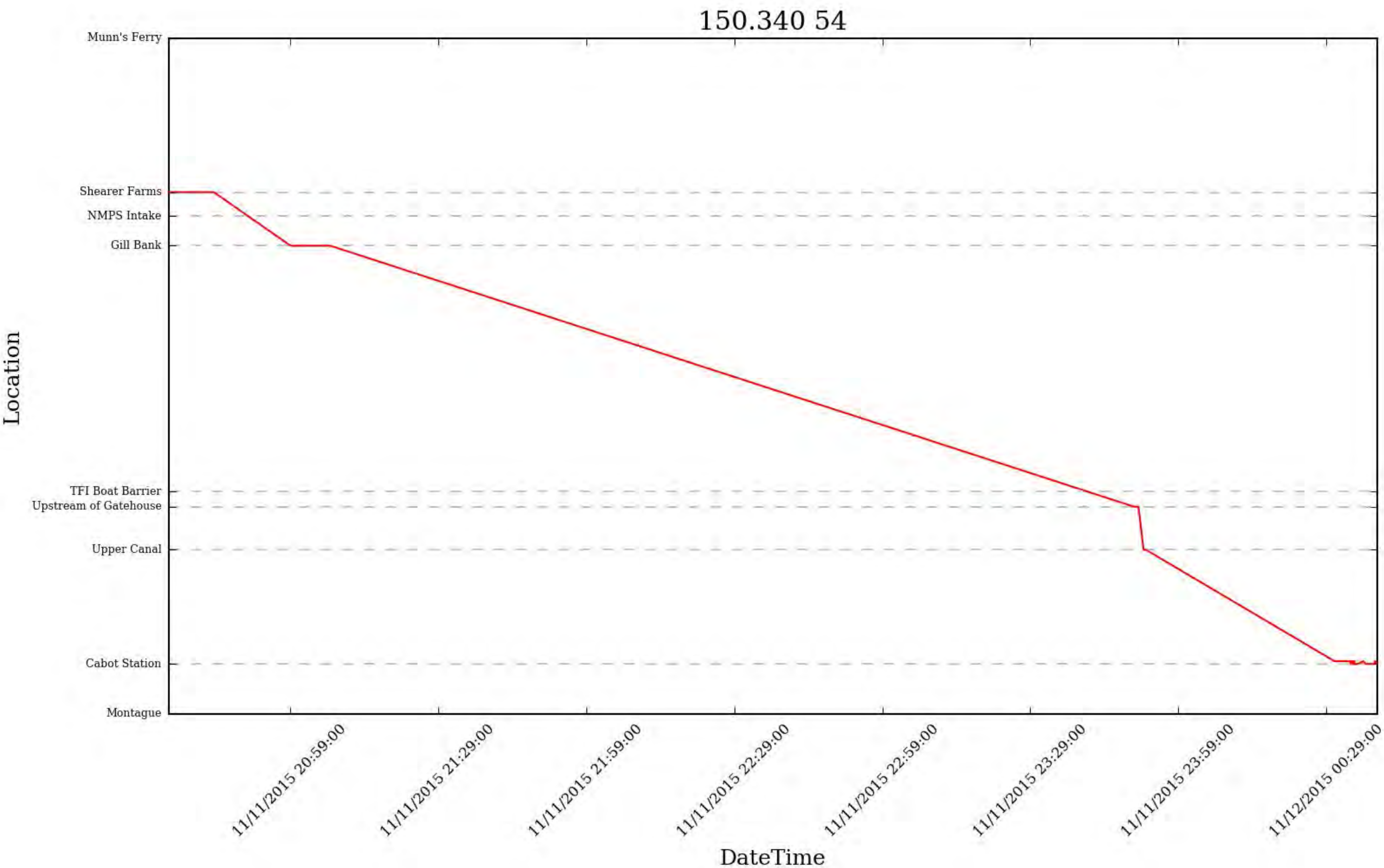

149.760 81
Location
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
11/10/2015 00:00:00
11/11/2015 00:00:00
11/12/2015 00:00:00
11/13/2015 00:00:00
11/14/2015 00:00:00
11/15/2015 00:00:00
11/16/2015 00:00:00
11/17/2015 00:00:00
11/18/2015 00:00:00
DateTime

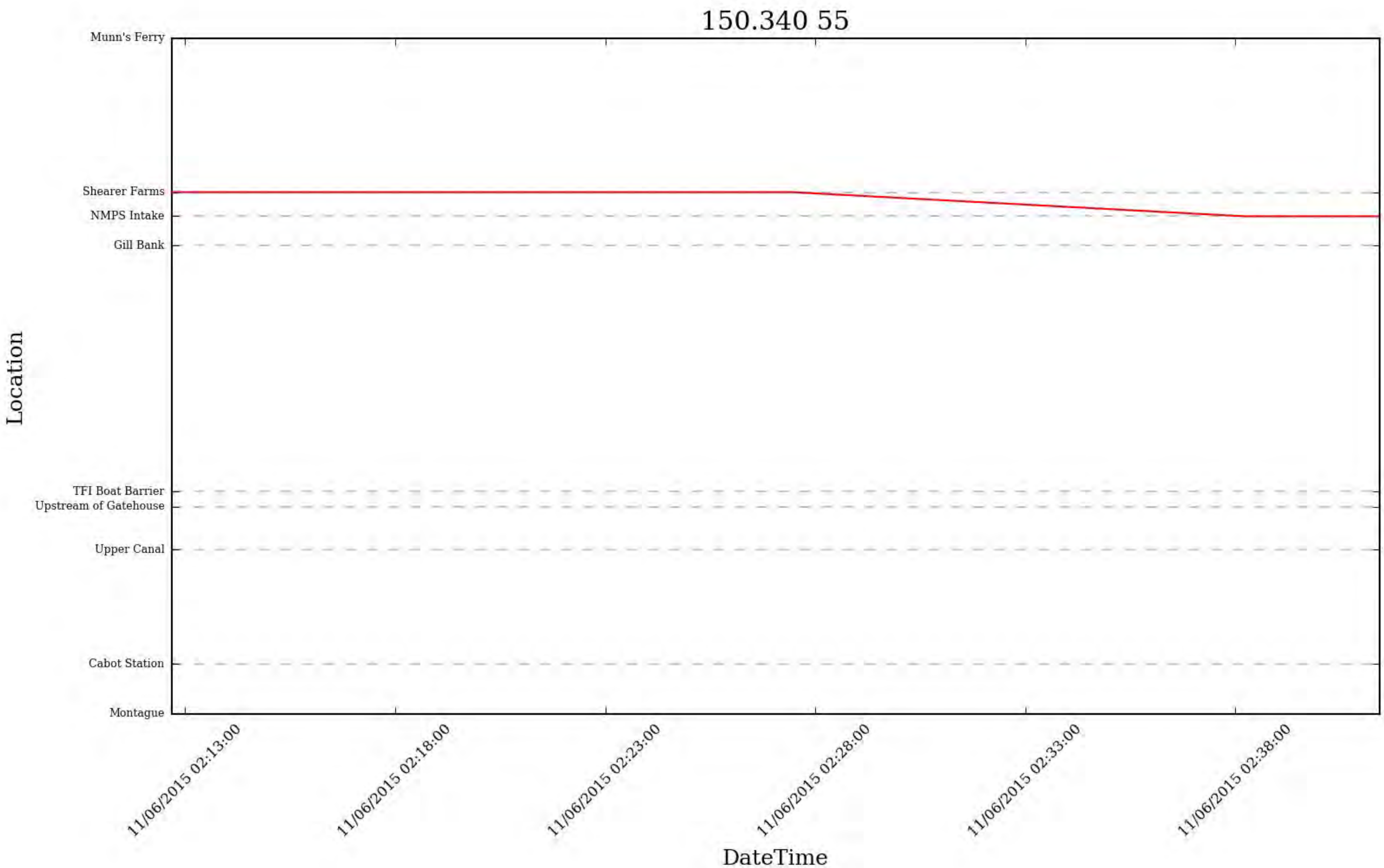

149.760 82
Location
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
11/05/2015 12:00:00
11/05/2015 13:00:00
11/05/2015 14:00:00
11/05/2015 15:00:00
11/05/2015 16:00:00
11/05/2015 17:00:00
11/05/2015 18:00:00
DateTime

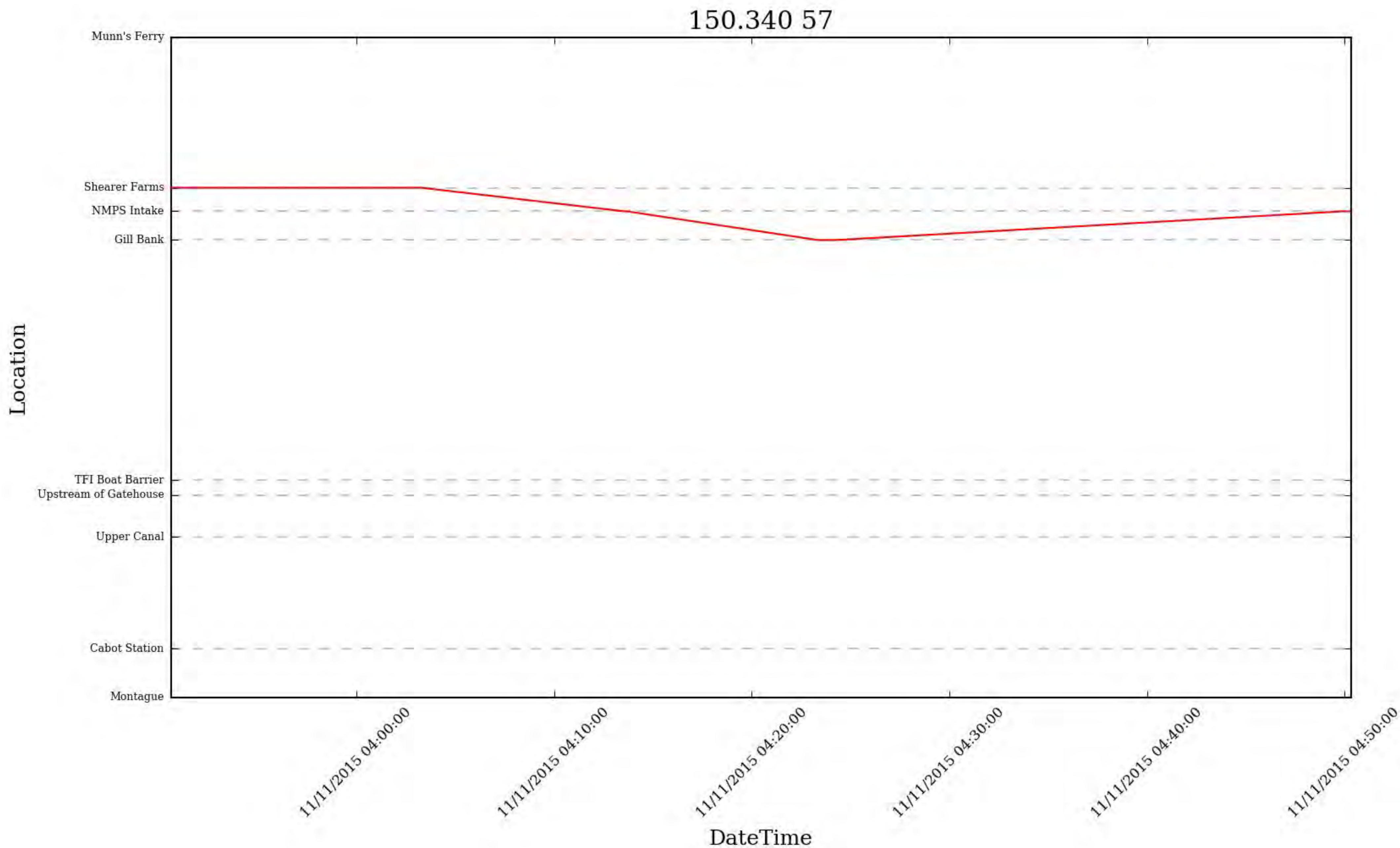

149.760 83
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/05/2015 01:00:00
11/05/2015 03:00:00
11/05/2015 05:00:00
11/05/2015 07:00:00
11/05/2015 09:00:00
11/05/2015 11:00:00
11/05/2015 13:00:00
11/05/2015 15:00:00
11/05/2015 17:00:00
11/05/2015 19:00:00
DateTime

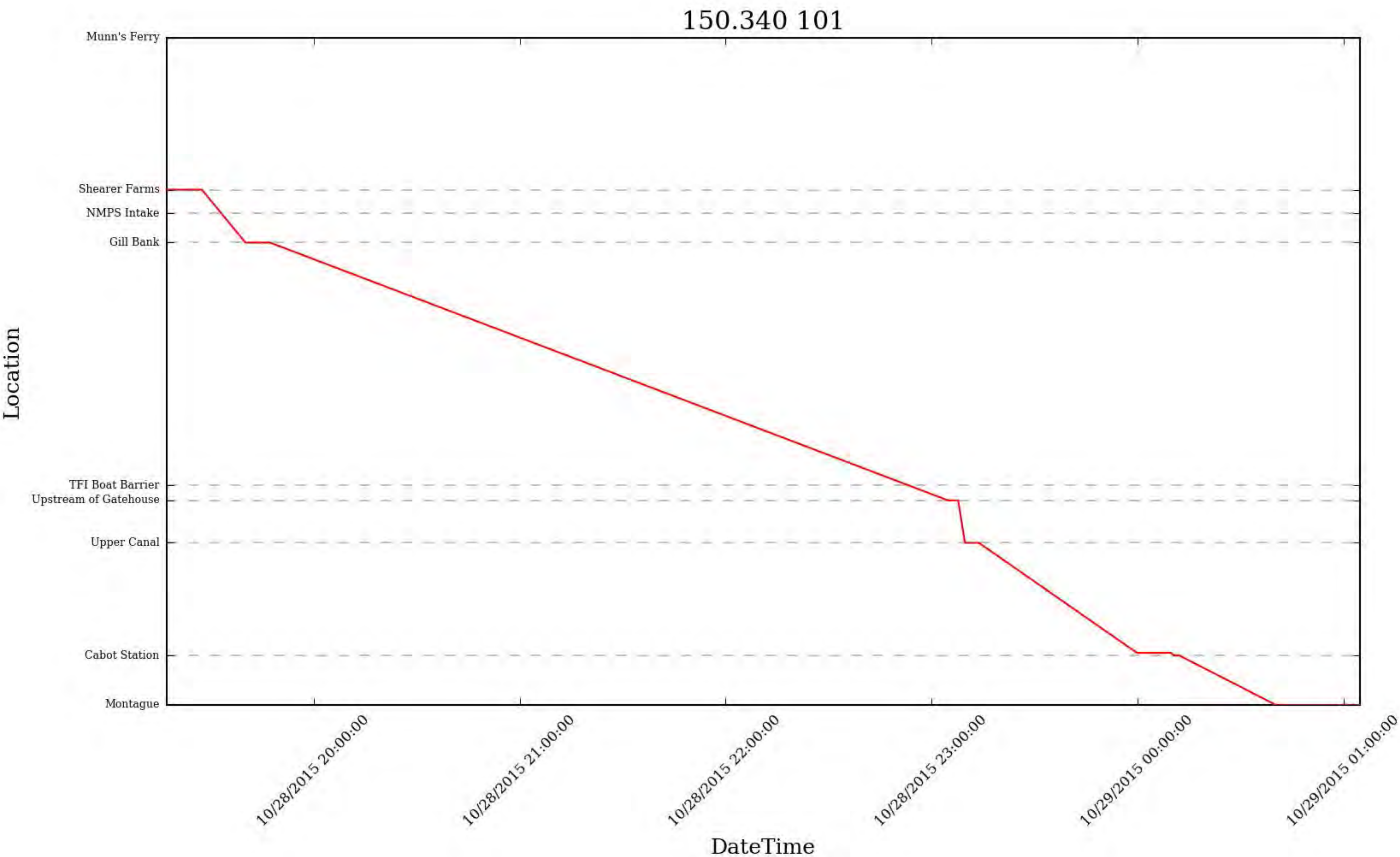

149.760 84
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/05/2015 01:27:00
11/05/2015 01:37:00
11/05/2015 01:47:00
11/05/2015 01:57:00
11/05/2015 02:07:00
11/05/2015 02:17:00
11/05/2015 02:27:00
11/05/2015 02:37:00
11/05/2015 02:47:00
DateTime


149.760 85
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/20/2015 22:49:00
11/20/2015 22:54:00
11/20/2015 22:59:00
11/20/2015 23:04:00
11/20/2015 23:09:00
11/20/2015 23:14:00
DateTime

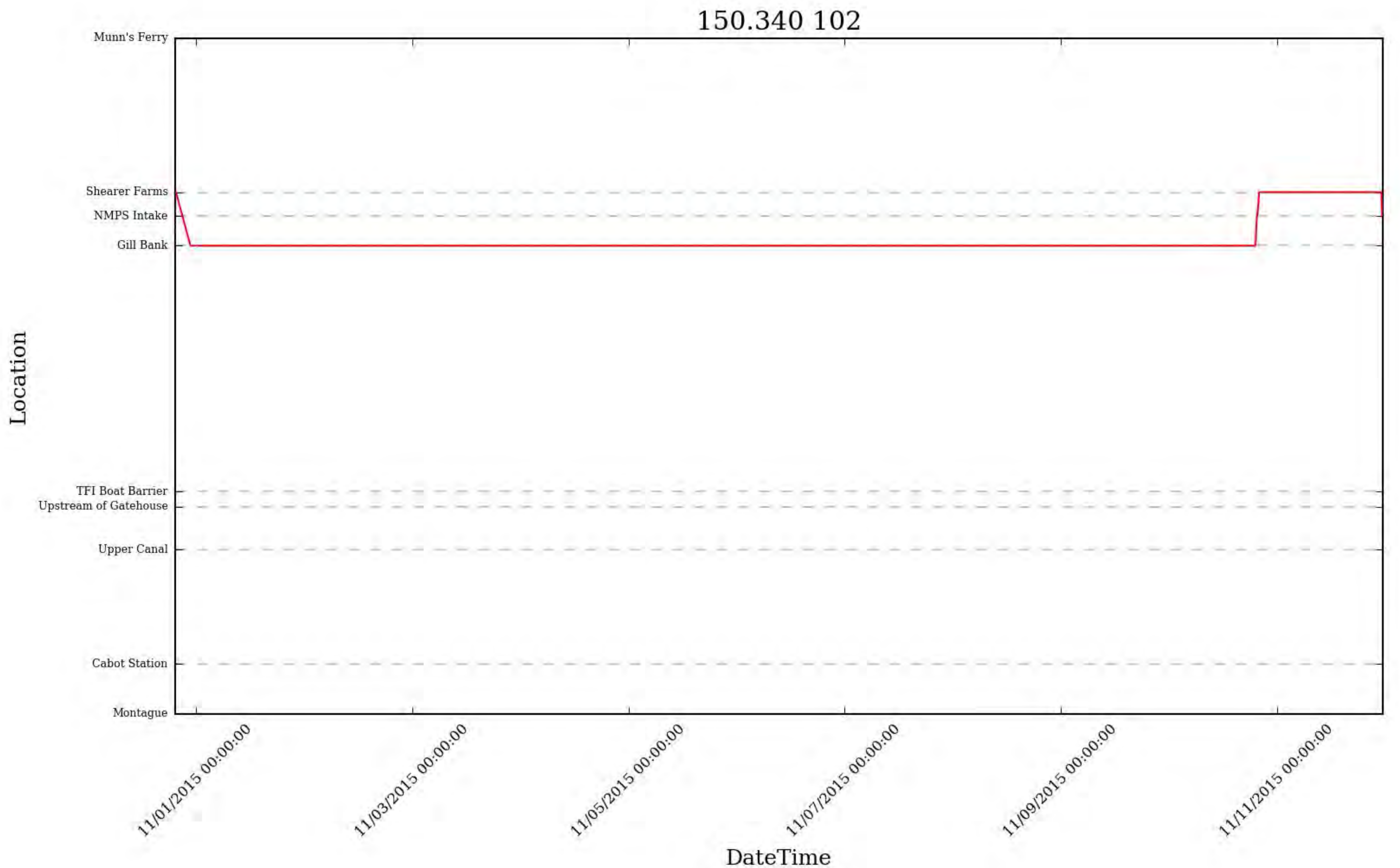

150.340 54
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/11/2015 20:59:00
11/11/2015 21:29:00
11/11/2015 21:59:00
11/11/2015 22:29:00
11/11/2015 22:59:00
11/11/2015 23:29:00
11/11/2015 23:59:00
11/12/2015 00:29:00
DateTime

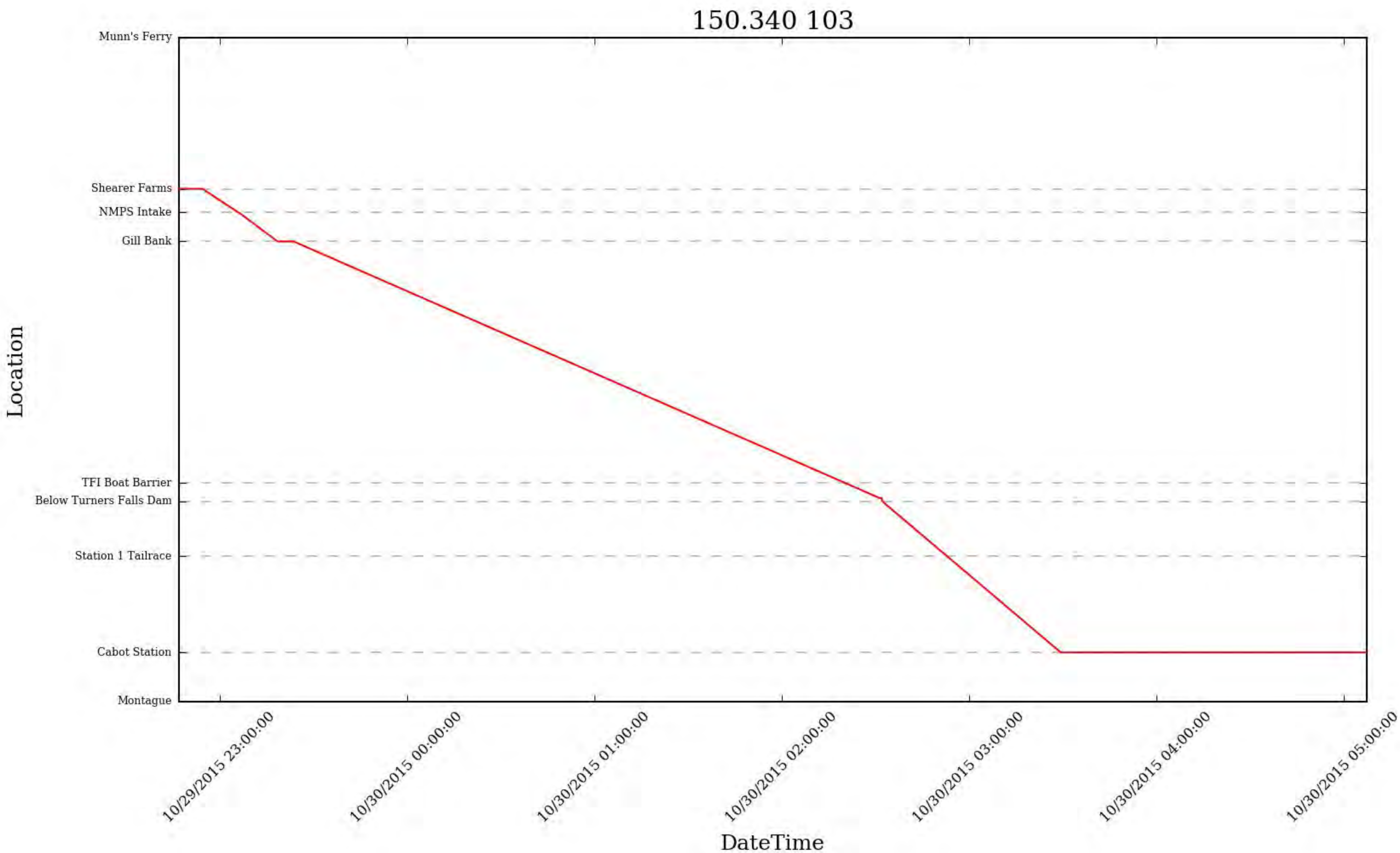

150.340 55
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/06/2015 02:13:00
11/06/2015 02:18:00
11/06/2015 02:23:00
11/06/2015 02:28:00
11/06/2015 02:33:00
11/06/2015 02:38:00
DateTime

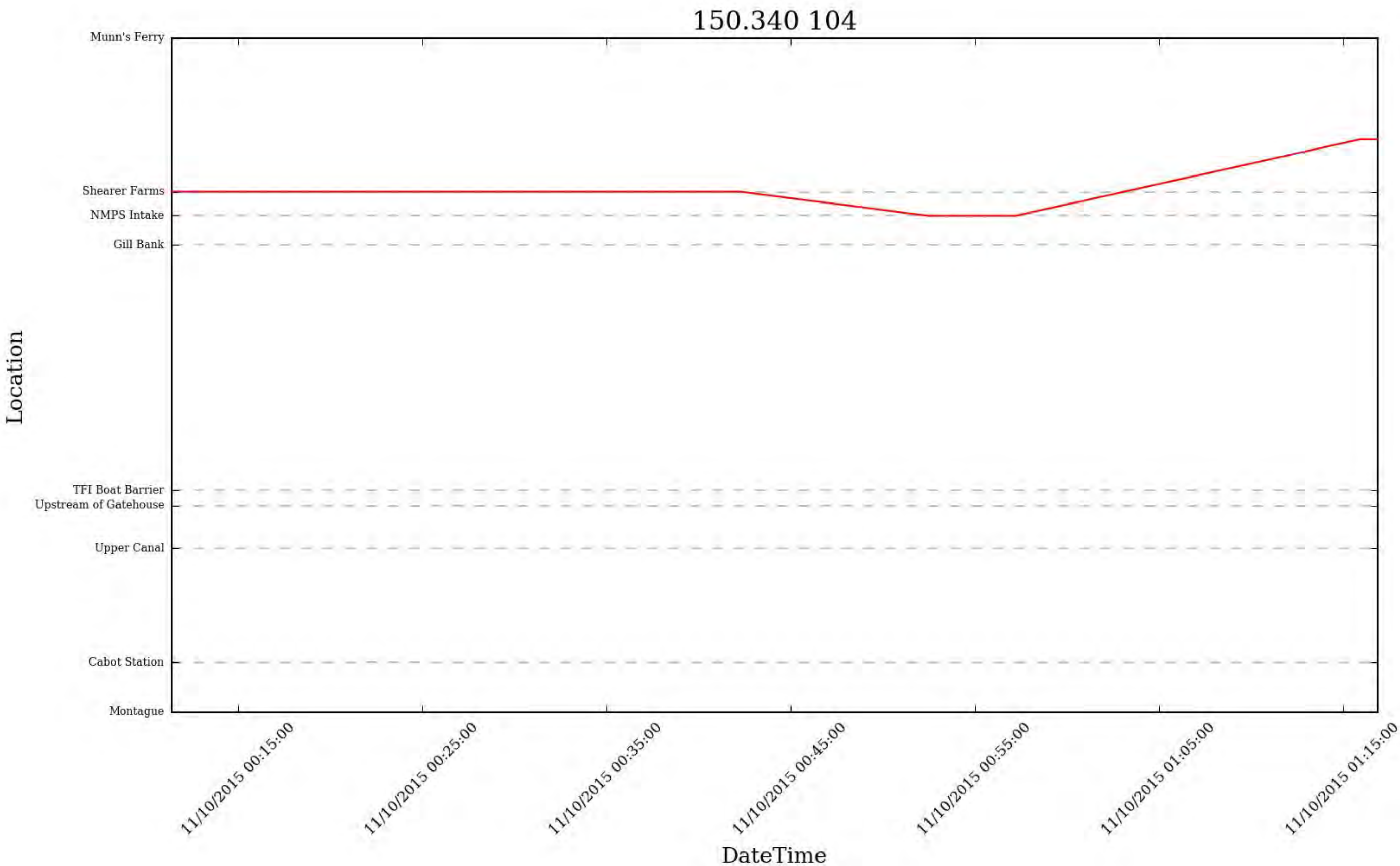

150.340 57
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/11/2015 04:00:00
11/11/2015 04:10:00
11/11/2015 04:20:00
11/11/2015 04:30:00
11/11/2015 04:40:00
11/11/2015 04:50:00
DateTime

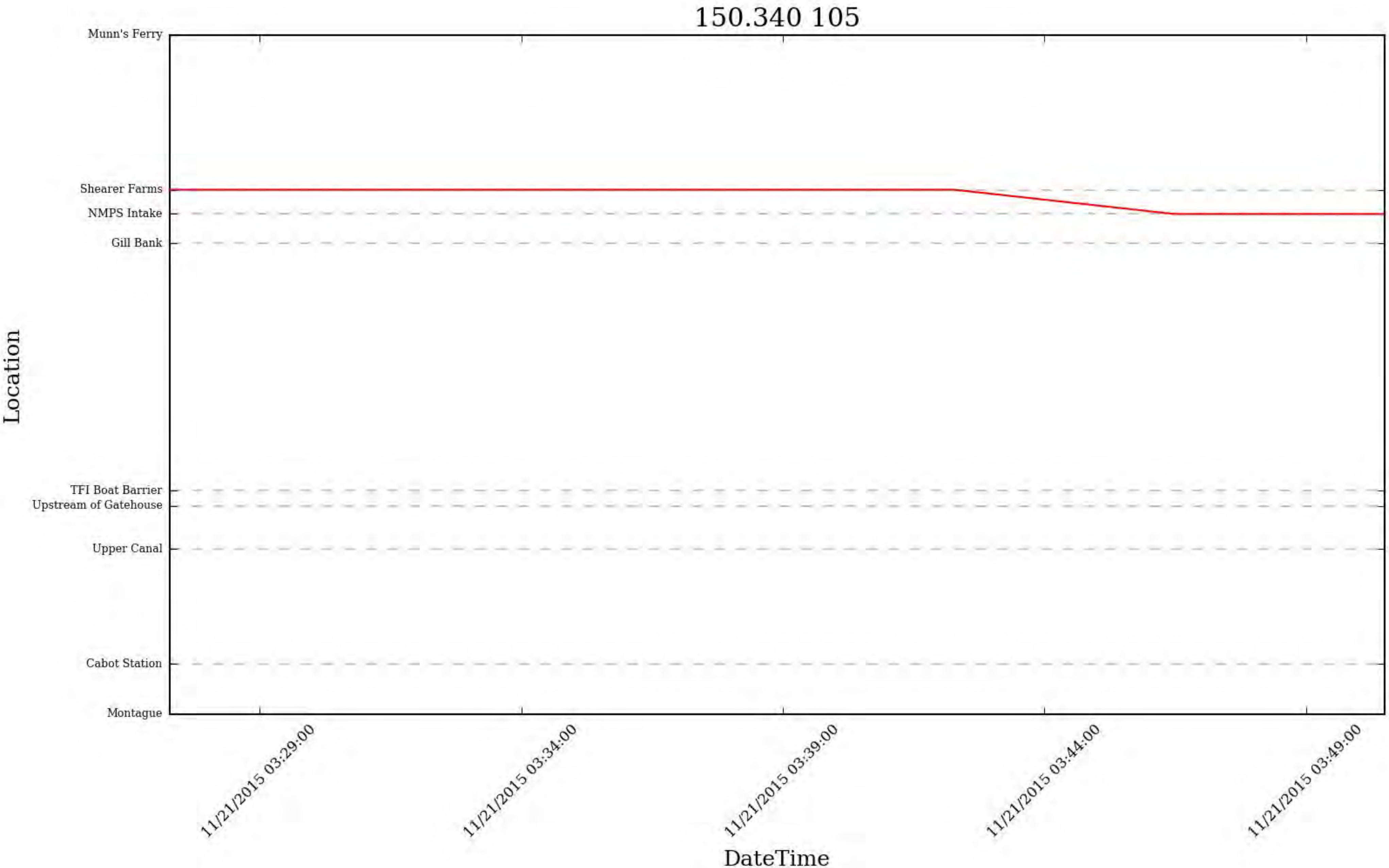


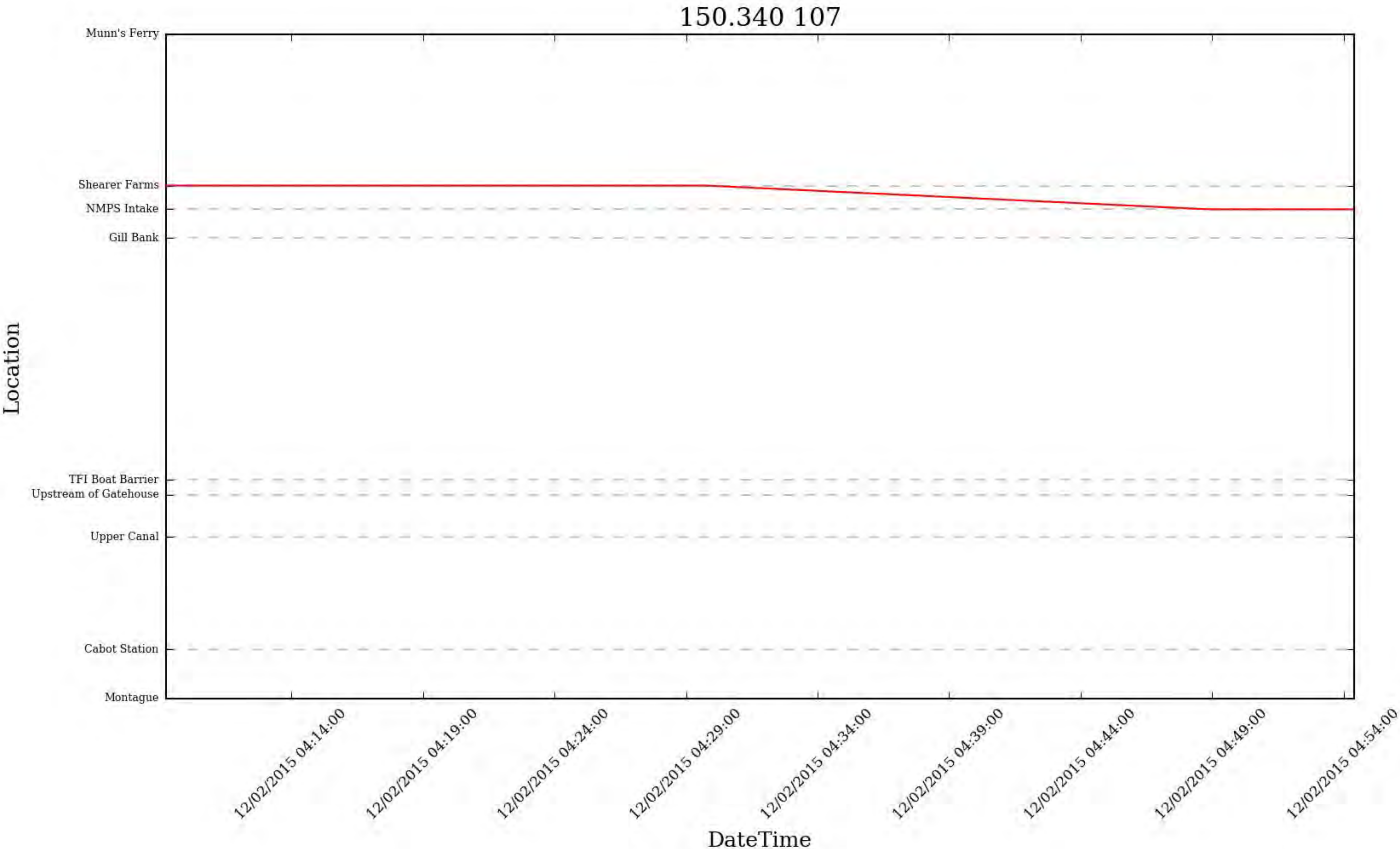
150.340 101
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
10/28/2015 20:00:00
10/28/2015 21:00:00
10/28/2015 22:00:00
10/28/2015 23:00:00
10/29/2015 00:00:00
10/29/2015 01:00:00
DateTime


150.340 102
Location
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
11/01/2015 00:00:00
11/03/2015 00:00:00
11/05/2015 00:00:00
11/07/2015 00:00:00
11/09/2015 00:00:00
11/11/2015 00:00:00
DateTime

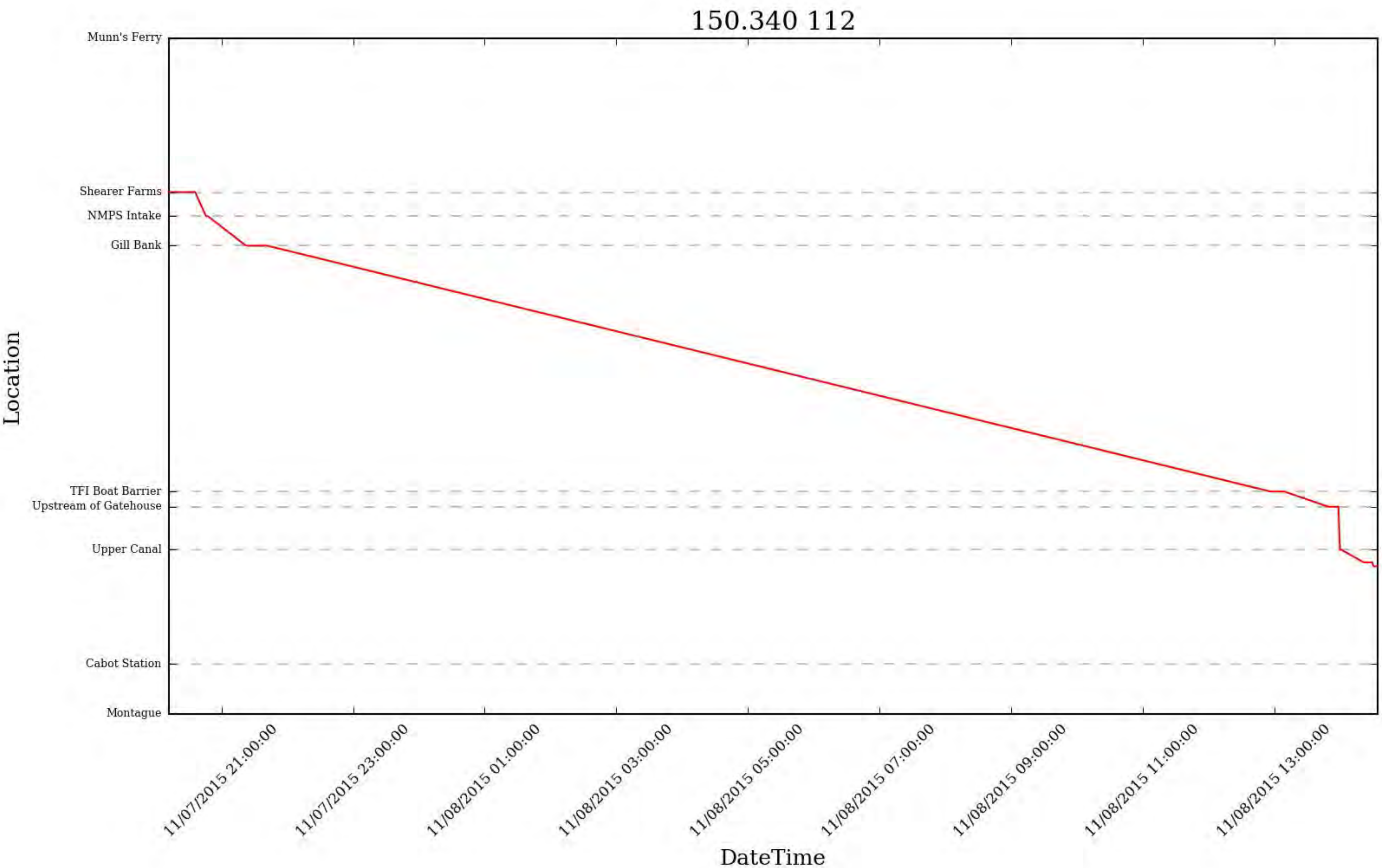

150.340 103
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Below Turners Falls Dam
Station 1 Tailrace
Cabot Station
Montague
Location
10/29/2015 23:00:00
10/30/2015 00:00:00
10/30/2015 01:00:00
10/30/2015 02:00:00
10/30/2015 03:00:00
10/30/2015 04:00:00
10/30/2015 05:00:00
DateTime

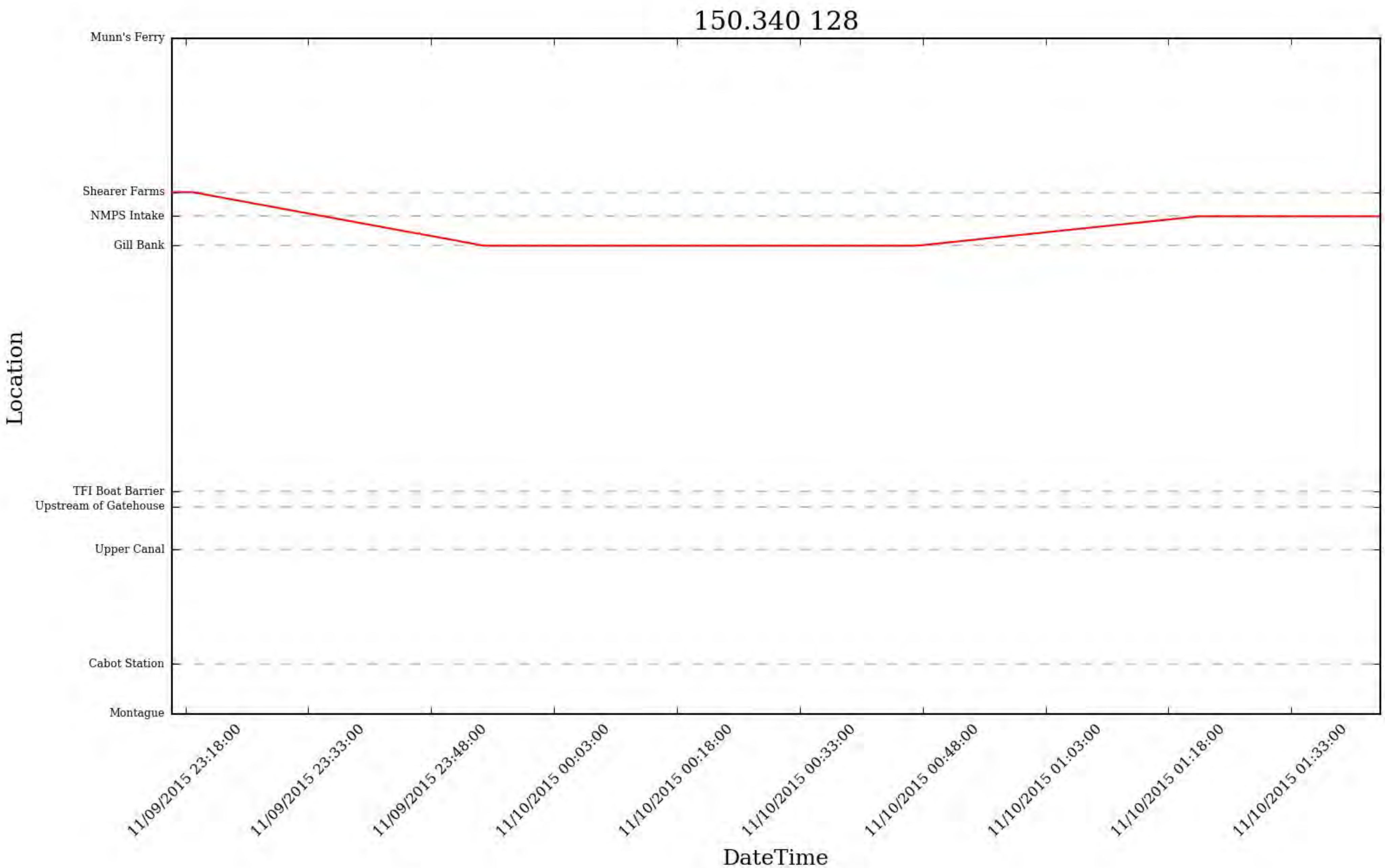

150.340 104
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/10/2015 00:15:00
11/10/2015 00:25:00
11/10/2015 00:35:00
11/10/2015 00:45:00
11/10/2015 00:55:00
11/10/2015 01:05:00
11/10/2015 01:15:00
DateTime


150.340 105
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/21/2015 03:29:00
11/21/2015 03:34:00
11/21/2015 03:39:00
11/21/2015 03:44:00
11/21/2015 03:49:00
DateTime

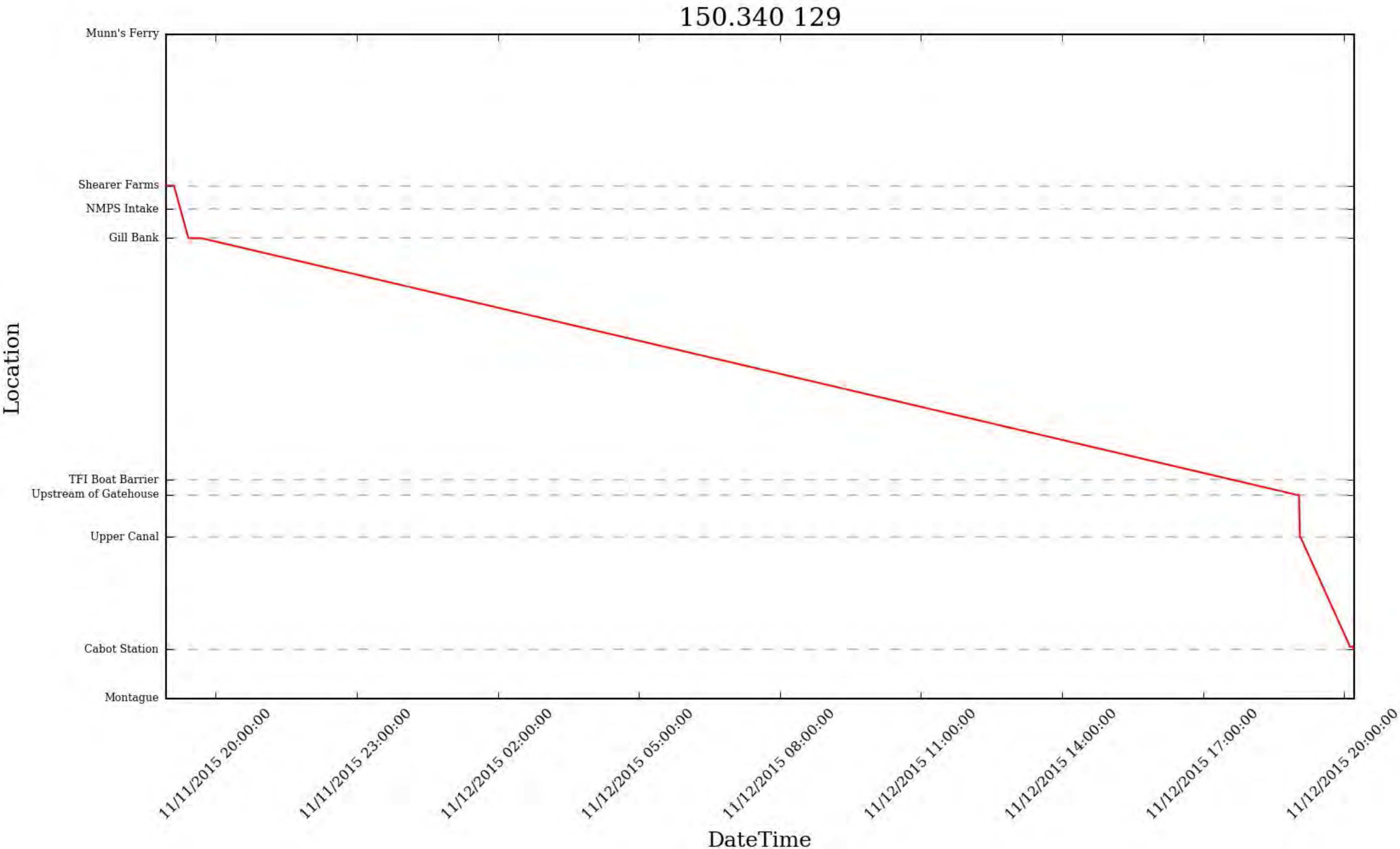


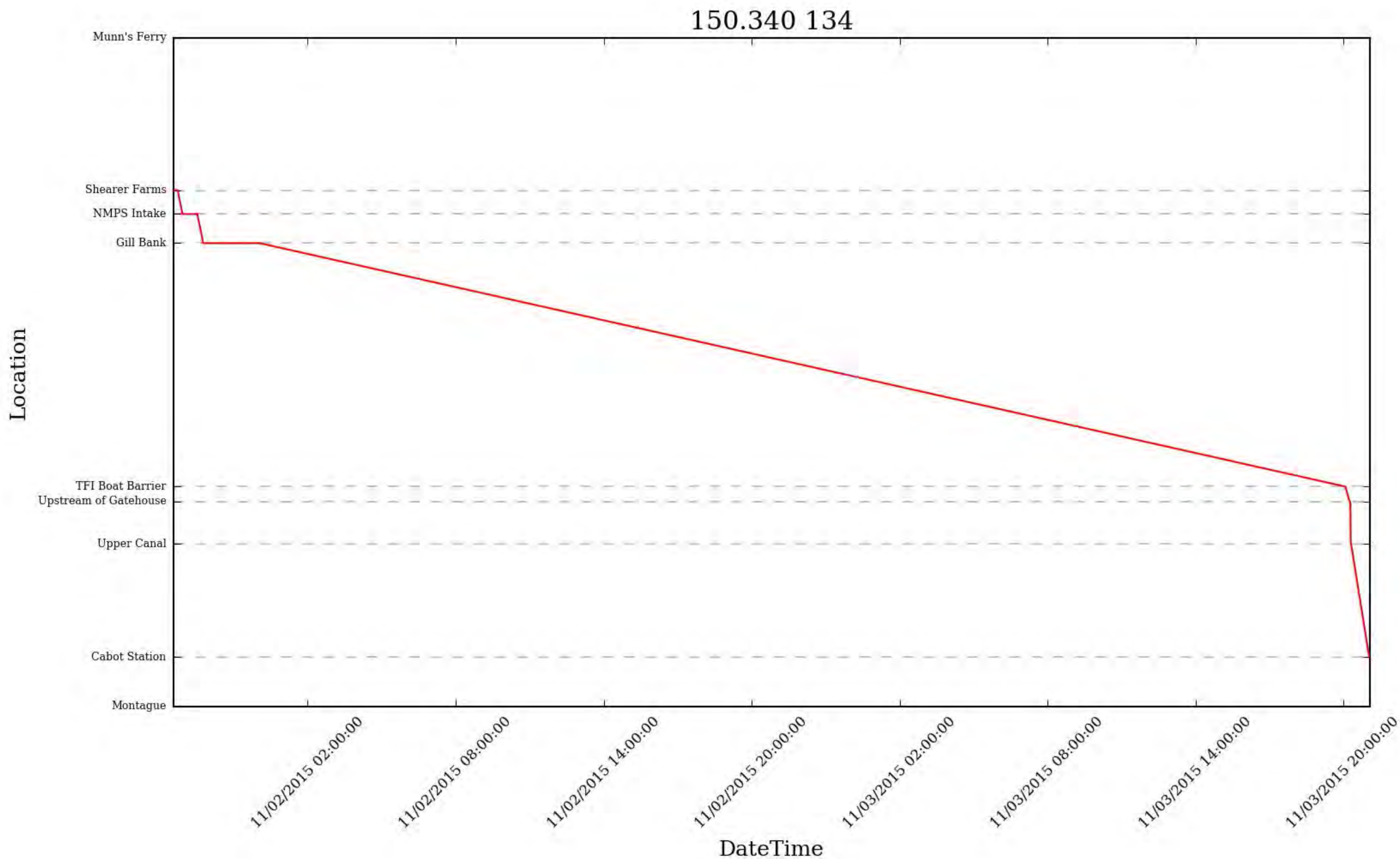
150.340 107
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
12/02/2015 04:14:00
12/02/2015 04:19:00
12/02/2015 04:24:00
12/02/2015 04:29:00
12/02/2015 04:34:00
12/02/2015 04:39:00
12/02/2015 04:44:00
12/02/2015 04:49:00
12/02/2015 04:54:00
DateTime

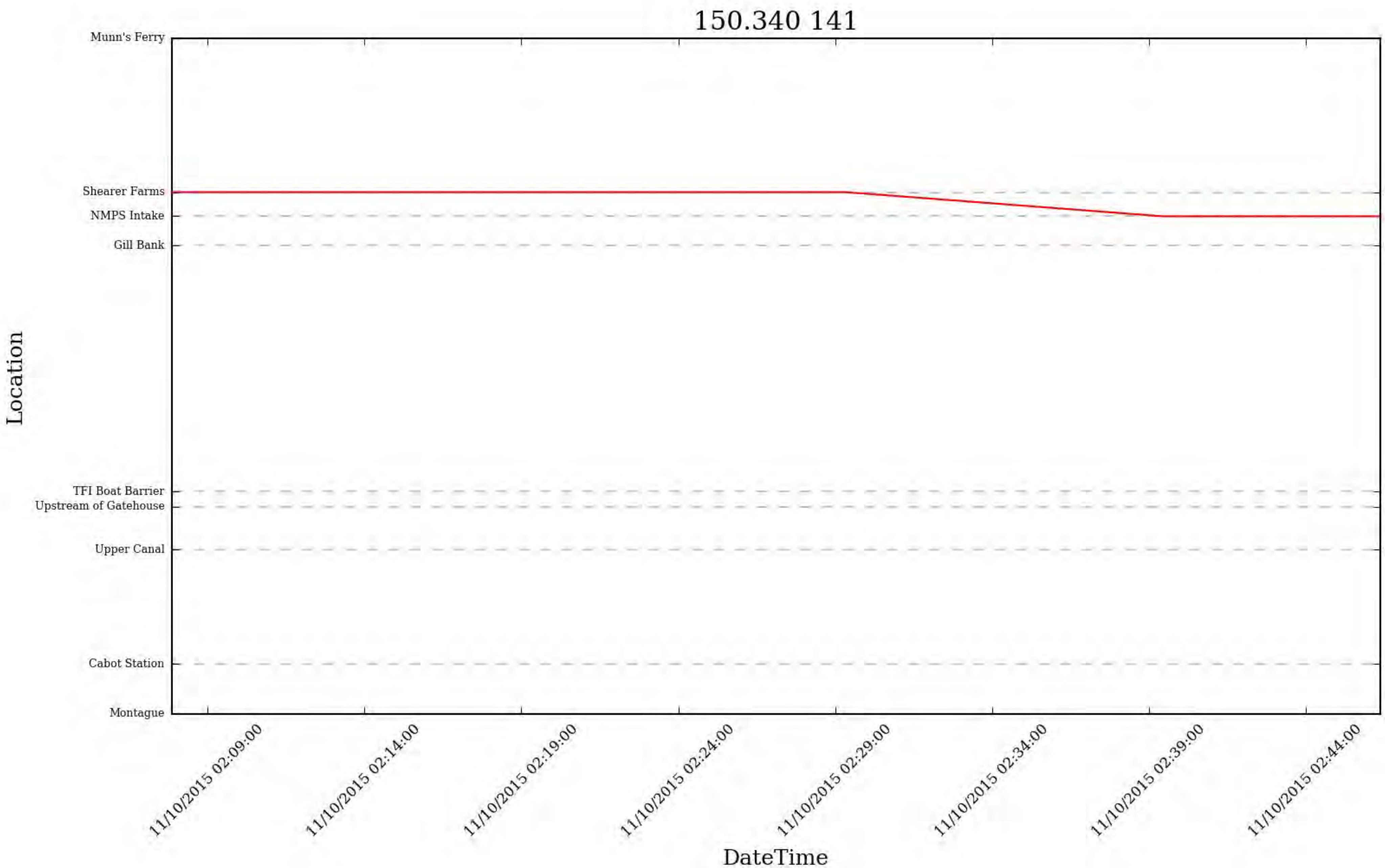

150.340 112
Location
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
11/07/2015 21:00:00
11/07/2015 23:00:00
11/08/2015 01:00:00
11/08/2015 03:00:00
11/08/2015 05:00:00
11/08/2015 07:00:00
11/08/2015 09:00:00
11/08/2015 11:00:00
11/08/2015 13:00:00
DateTime



150.340 128
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/09/2015 23:18:00
11/09/2015 23:33:00
11/09/2015 23:48:00
11/10/2015 00:03:00
11/10/2015 00:18:00
11/10/2015 00:33:00
11/10/2015 00:48:00
11/10/2015 01:03:00
11/10/2015 01:18:00
11/10/2015 01:33:00
DateTime


150.340 129
Location
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
11/11/2015 20:00:00
11/11/2015 23:00:00
11/12/2015 02:00:00
11/12/2015 05:00:00
11/12/2015 08:00:00
11/12/2015 11:00:00
11/12/2015 14:00:00
11/12/2015 17:00:00
11/12/2015 20:00:00
DateTime


150.340 134
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/02/2015 02:00:00
11/02/2015 08:00:00
11/02/2015 14:00:00
11/02/2015 20:00:00
11/03/2015 02:00:00
11/03/2015 08:00:00
11/03/2015 14:00:00
11/03/2015 20:00:00
DateTime


150.340 141
Location
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
11/10/2015 02:09:00
11/10/2015 02:14:00
11/10/2015 02:19:00
11/10/2015 02:24:00
11/10/2015 02:29:00
11/10/2015 02:34:00
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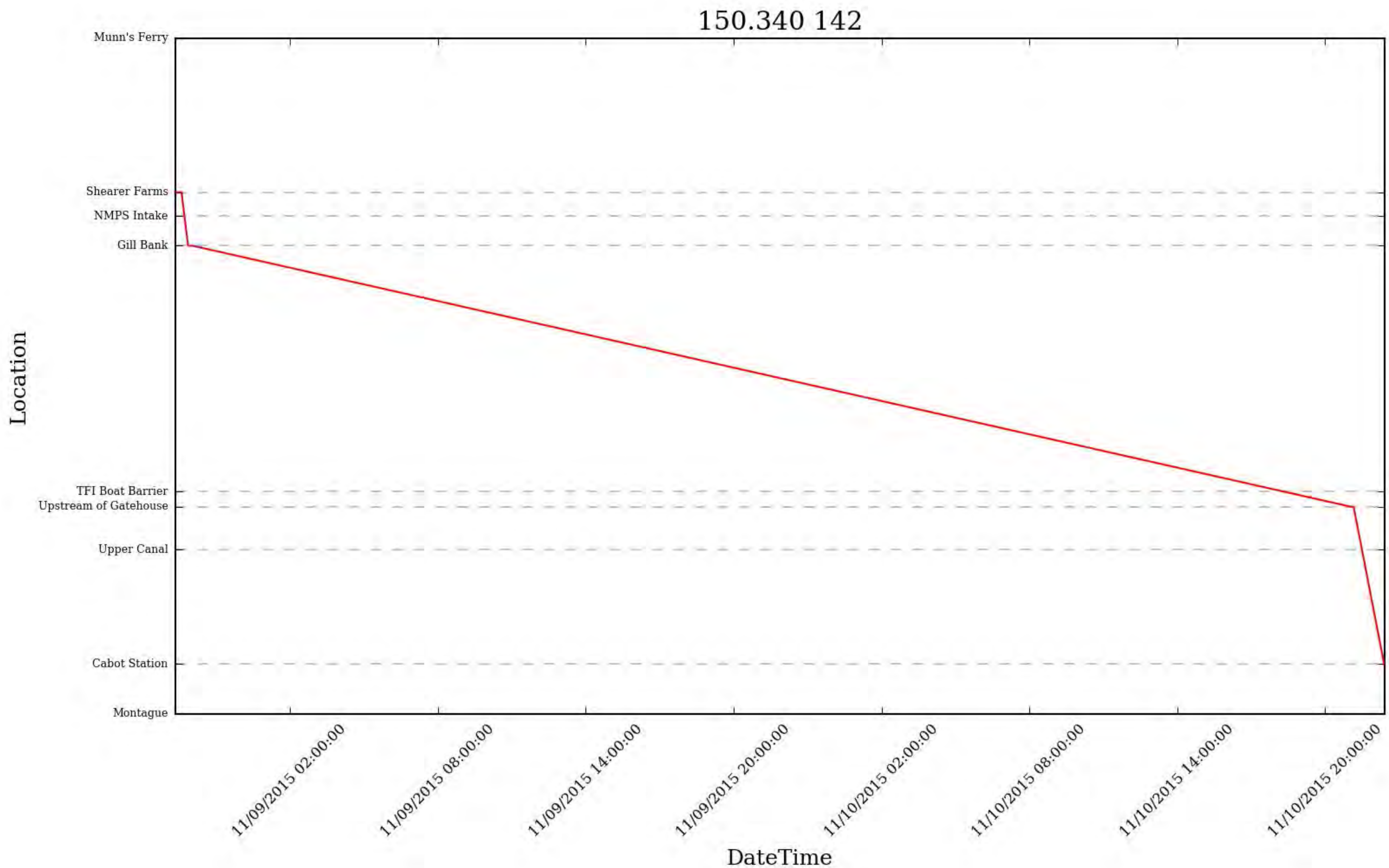
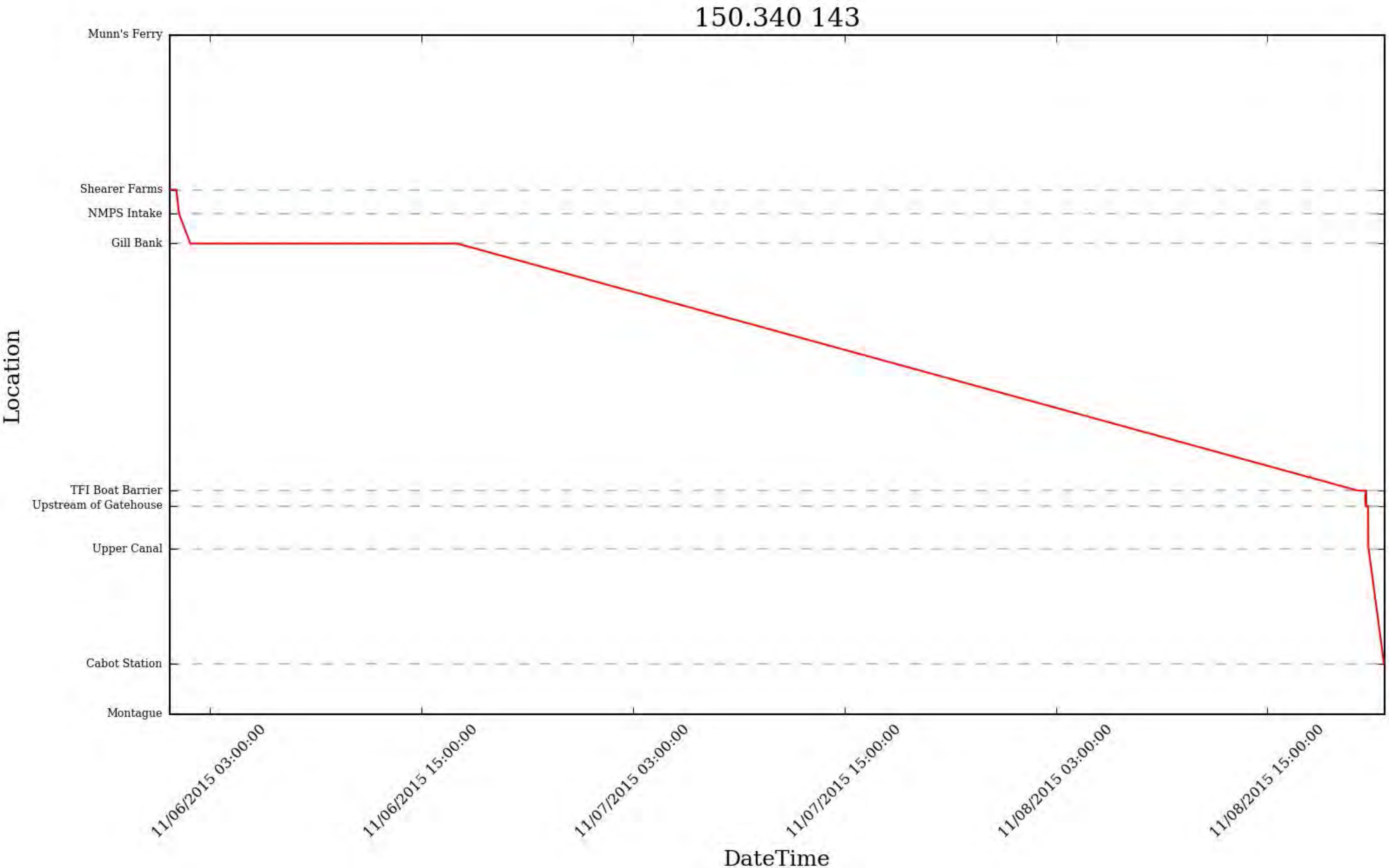
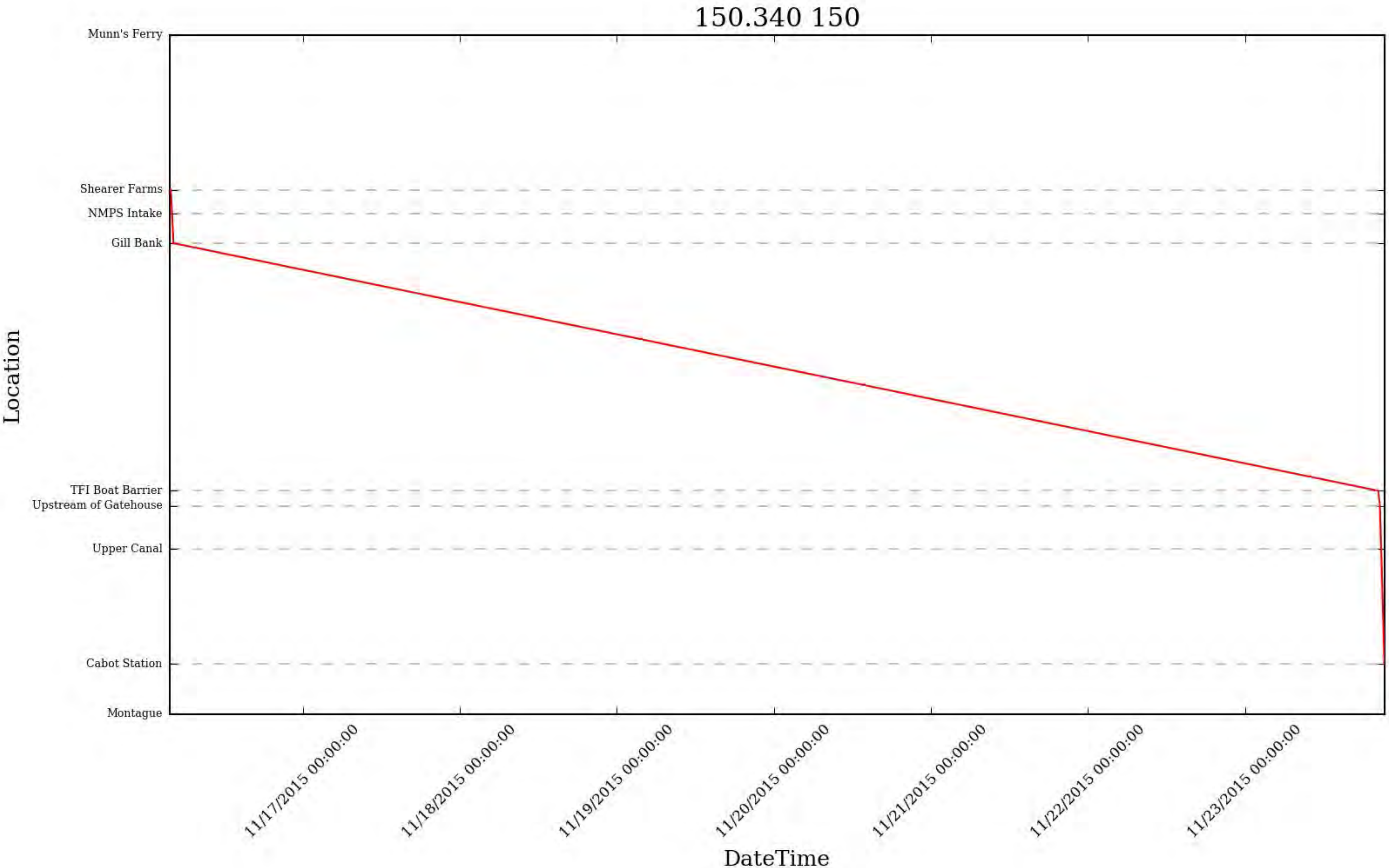
11/10/2015 02:44:00
DateTime


150.340 142
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/09/2015 02:00:00
11/09/2015 08:00:00
11/09/2015 14:00:00
11/09/2015 20:00:00
11/10/2015 02:00:00
11/10/2015 08:00:00
11/10/2015 14:00:00
11/10/2015 20:00:00
DateTime



150.340 143
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/06/2015 03:00:00
11/06/2015 15:00:00
11/07/2015 03:00:00
11/07/2015 15:00:00
11/08/2015 03:00:00
11/08/2015 15:00:00
DateTime



150.340 150
Location
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
11/17/2015 00:00:00
11/18/2015 00:00:00
11/19/2015 00:00:00
11/20/2015 00:00:00
11/21/2015 00:00:00
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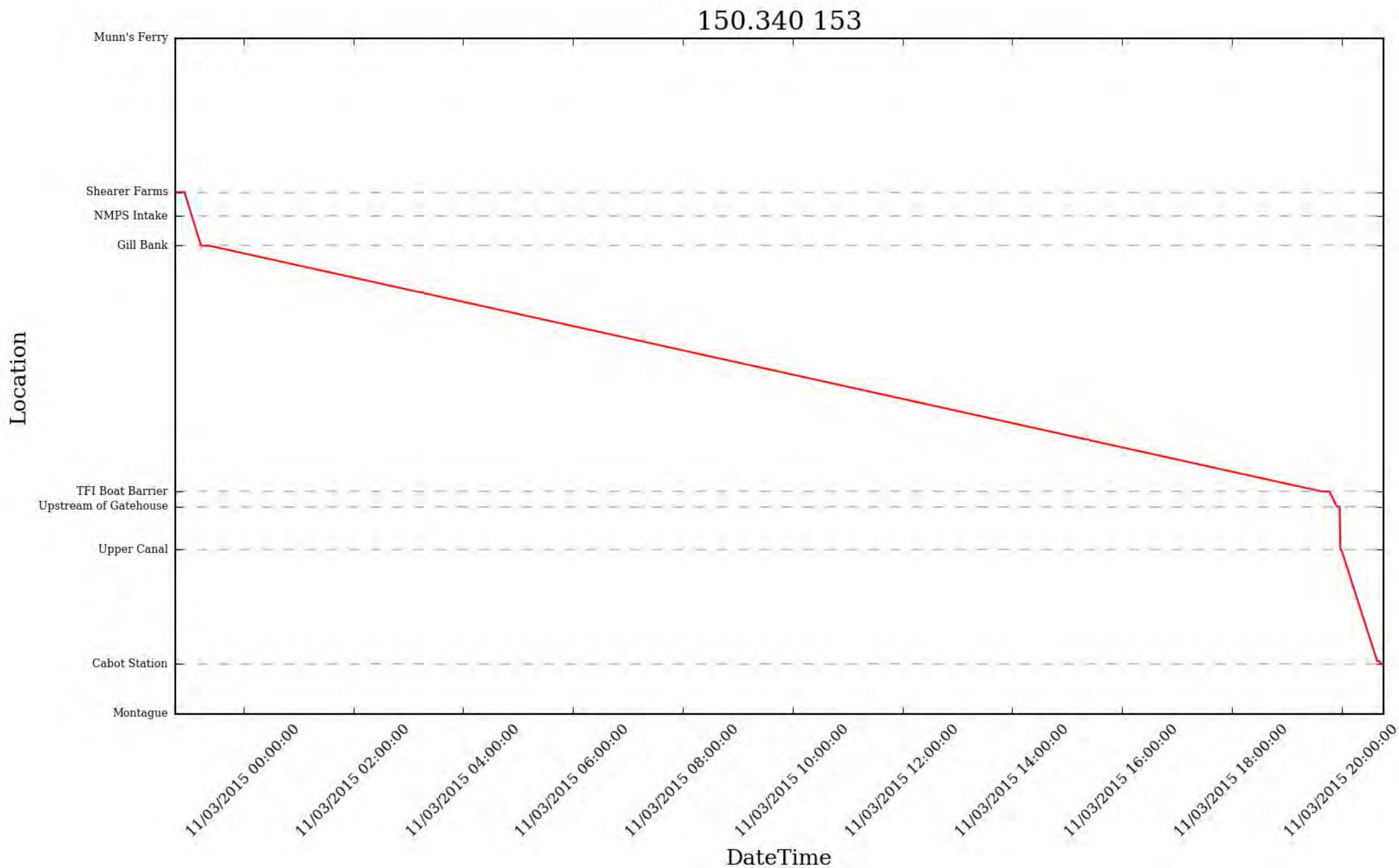
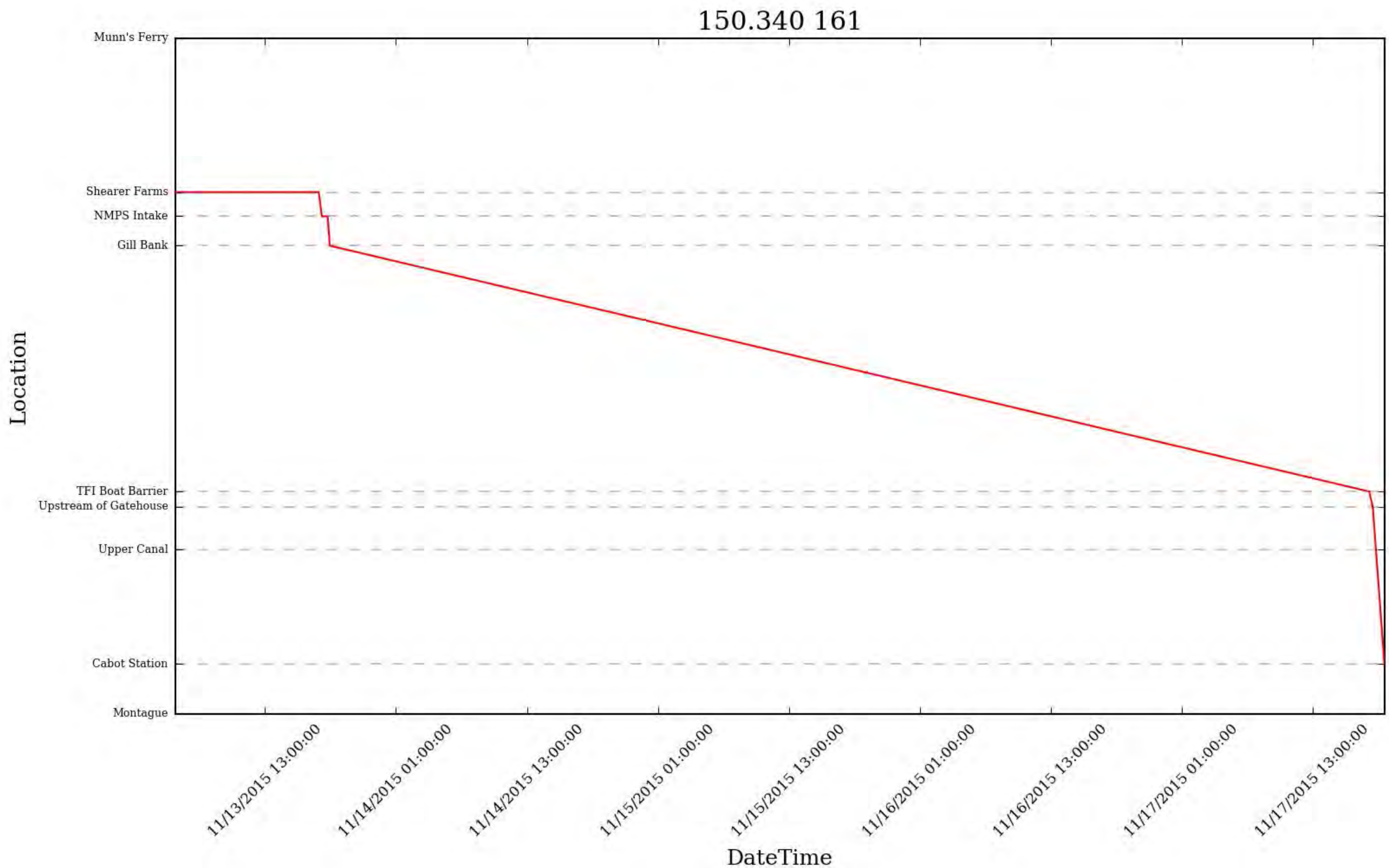
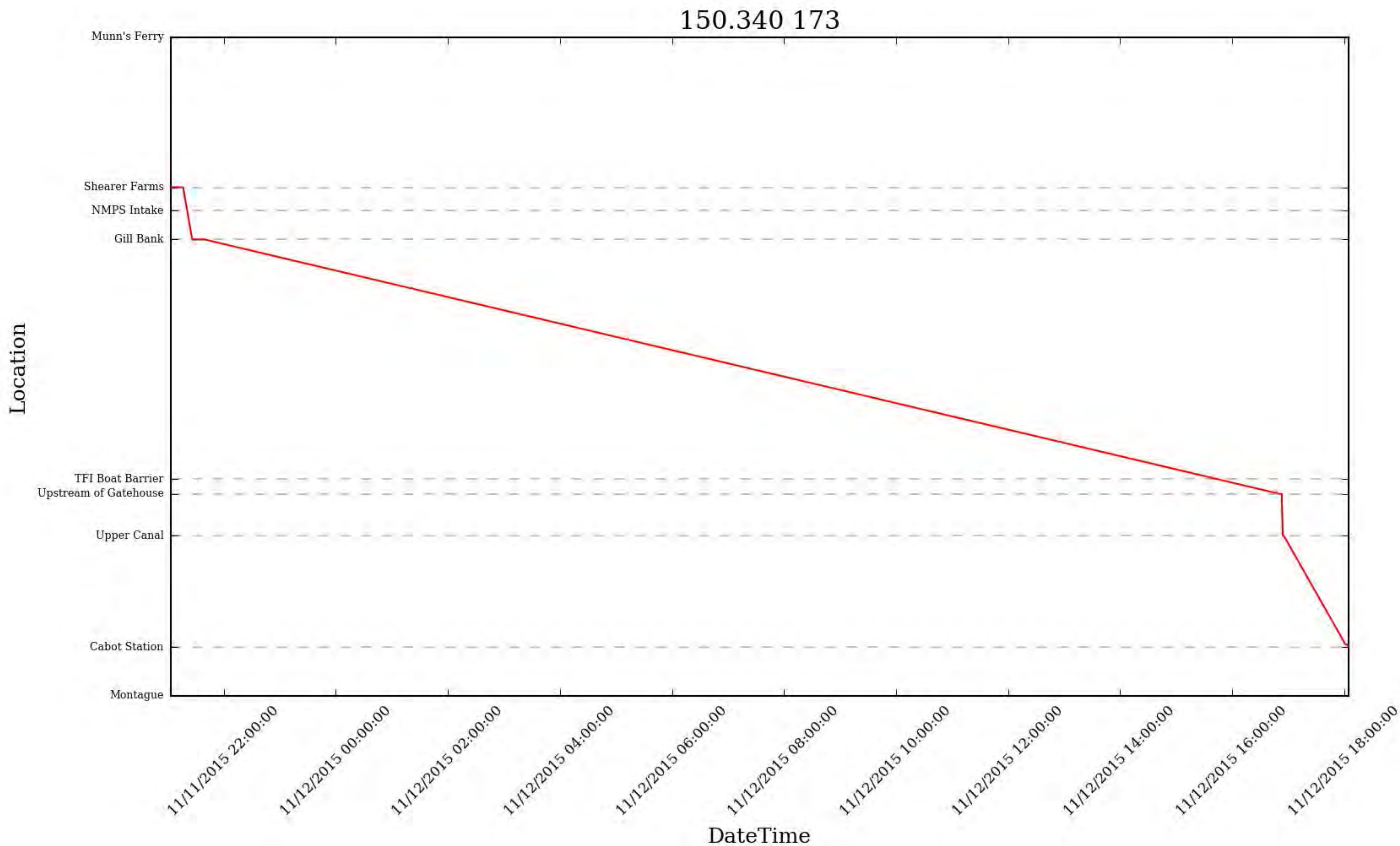
11/23/2015 00:00:00
DateTime

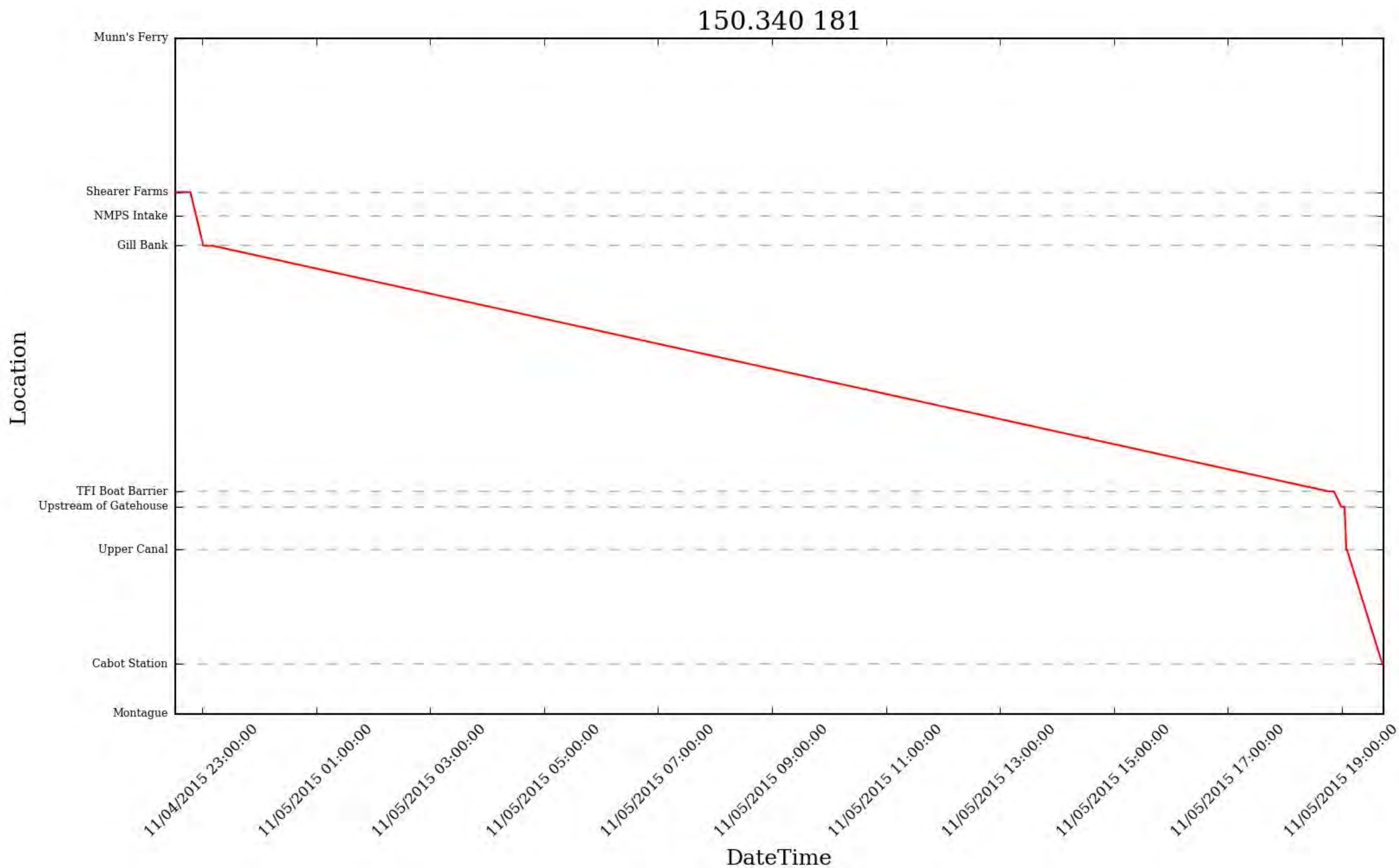


150.340 153
Location
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
11/03/2015 00:00:00
11/03/2015 02:00:00
11/03/2015 04:00:00
11/03/2015 06:00:00
11/03/2015 08:00:00
11/03/2015 10:00:00
11/03/2015 12:00:00
11/03/2015 14:00:00
11/03/2015 16:00:00
11/03/2015 18:00:00
11/03/2015 20:00:00
DateTime


150.340 161
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/13/2015 13:00:00
11/14/2015 01:00:00
11/14/2015 13:00:00
11/15/2015 01:00:00
11/15/2015 13:00:00
11/16/2015 01:00:00
11/16/2015 13:00:00
11/17/2015 01:00:00
11/17/2015 13:00:00
DateTime



150.340 173
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/11/2015 22:00:00
11/12/2015 00:00:00
11/12/2015 02:00:00
11/12/2015 04:00:00
11/12/2015 06:00:00
11/12/2015 08:00:00
11/12/2015 10:00:00
11/12/2015 12:00:00
11/12/2015 14:00:00
11/12/2015 16:00:00
11/12/2015 18:00:00
DateTime


150.340 181
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/04/2015 23:00:00
11/05/2015 01:00:00
11/05/2015 03:00:00
11/05/2015 05:00:00
11/05/2015 07:00:00
11/05/2015 09:00:00
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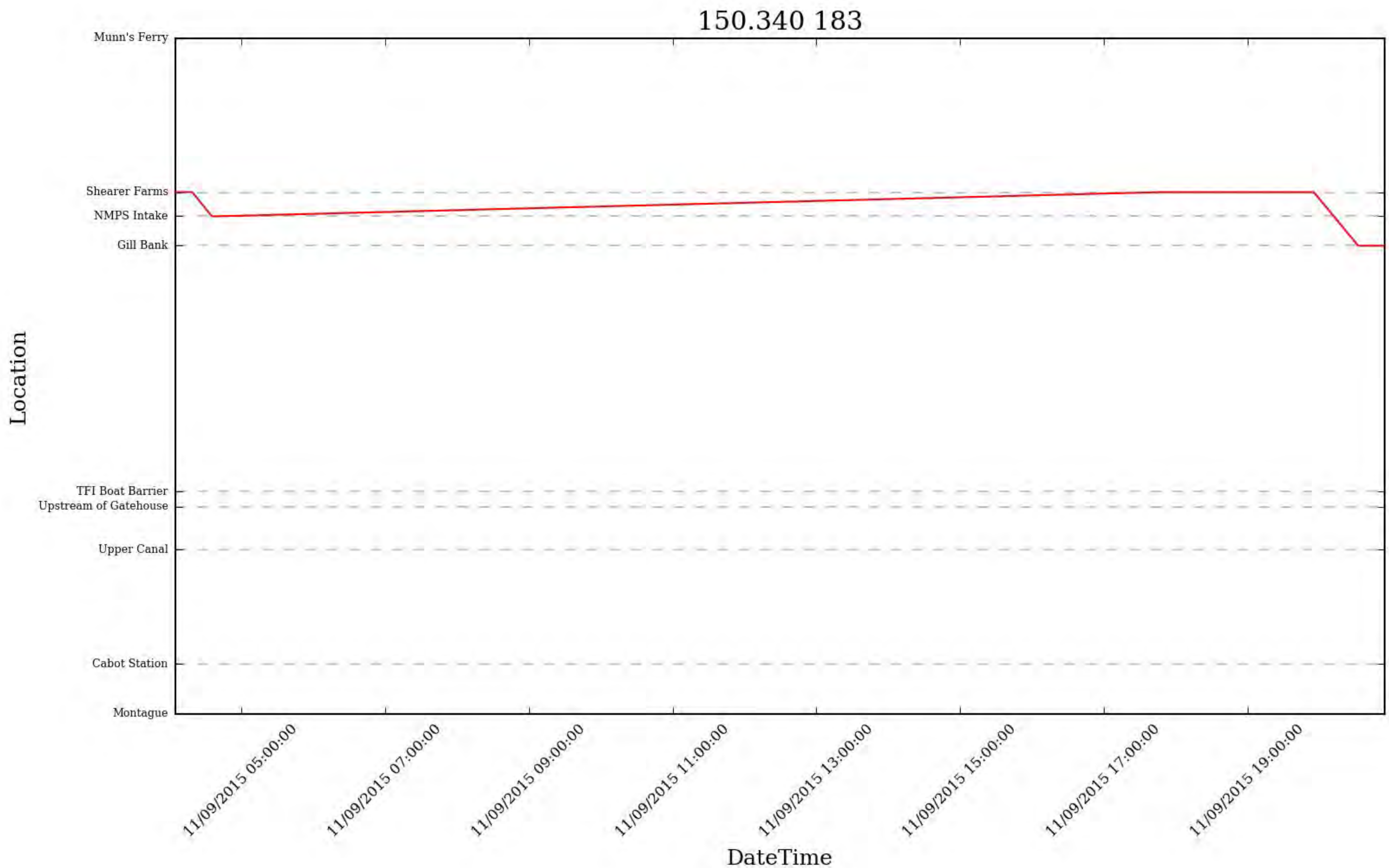
11/05/2015 17:00:00
11/05/2015 19:00:00
DateTime



150.340 183
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/09/2015 05:00:00
11/09/2015 07:00:00
11/09/2015 09:00:00
11/09/2015 11:00:00
11/09/2015 13:00:00
11/09/2015 15:00:00
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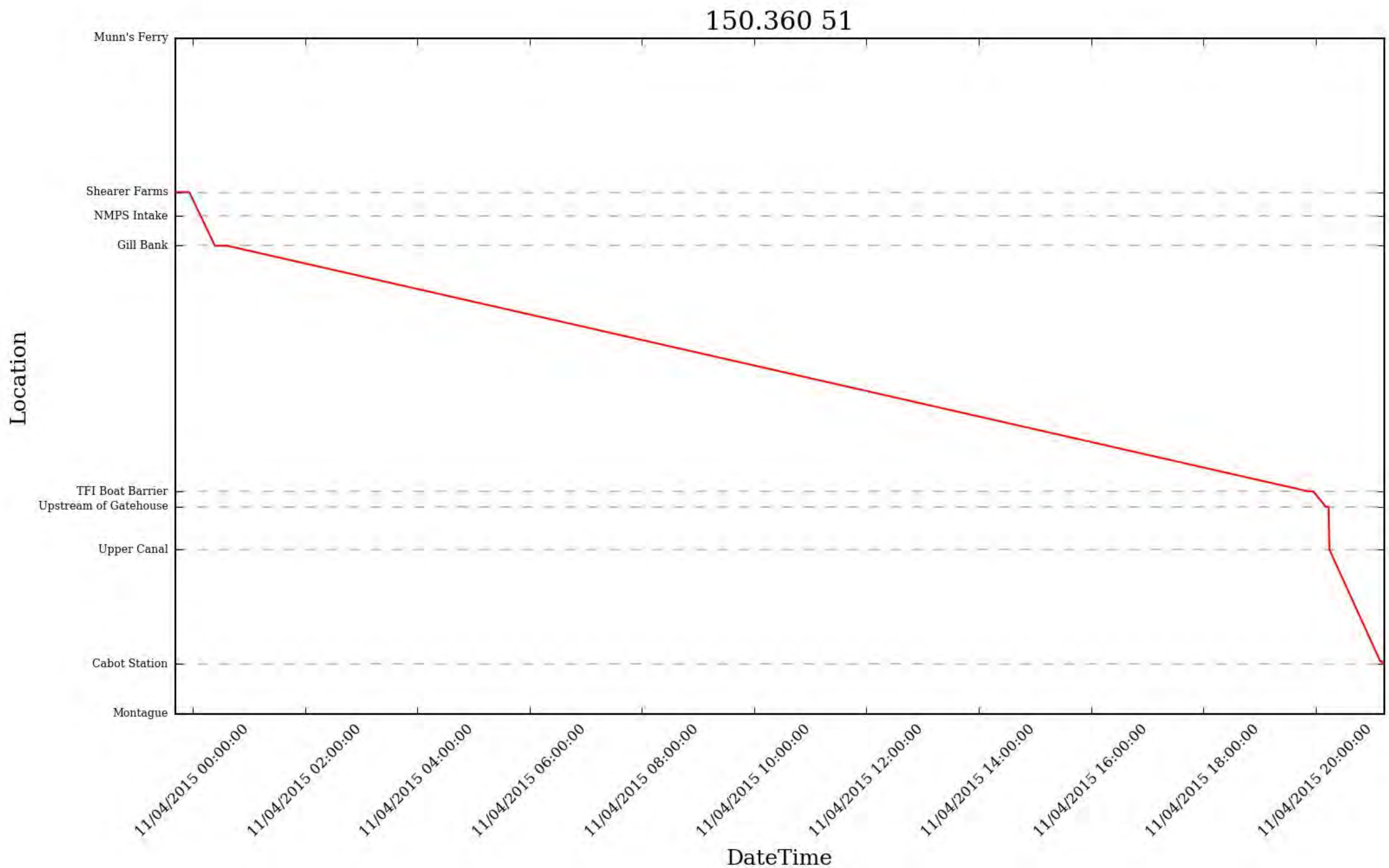
11/09/2015 19:00:00
DateTime


150.360 51
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/04/2015 00:00:00
11/04/2015 02:00:00
11/04/2015 04:00:00
11/04/2015 06:00:00
11/04/2015 08:00:00
11/04/2015 10:00:00
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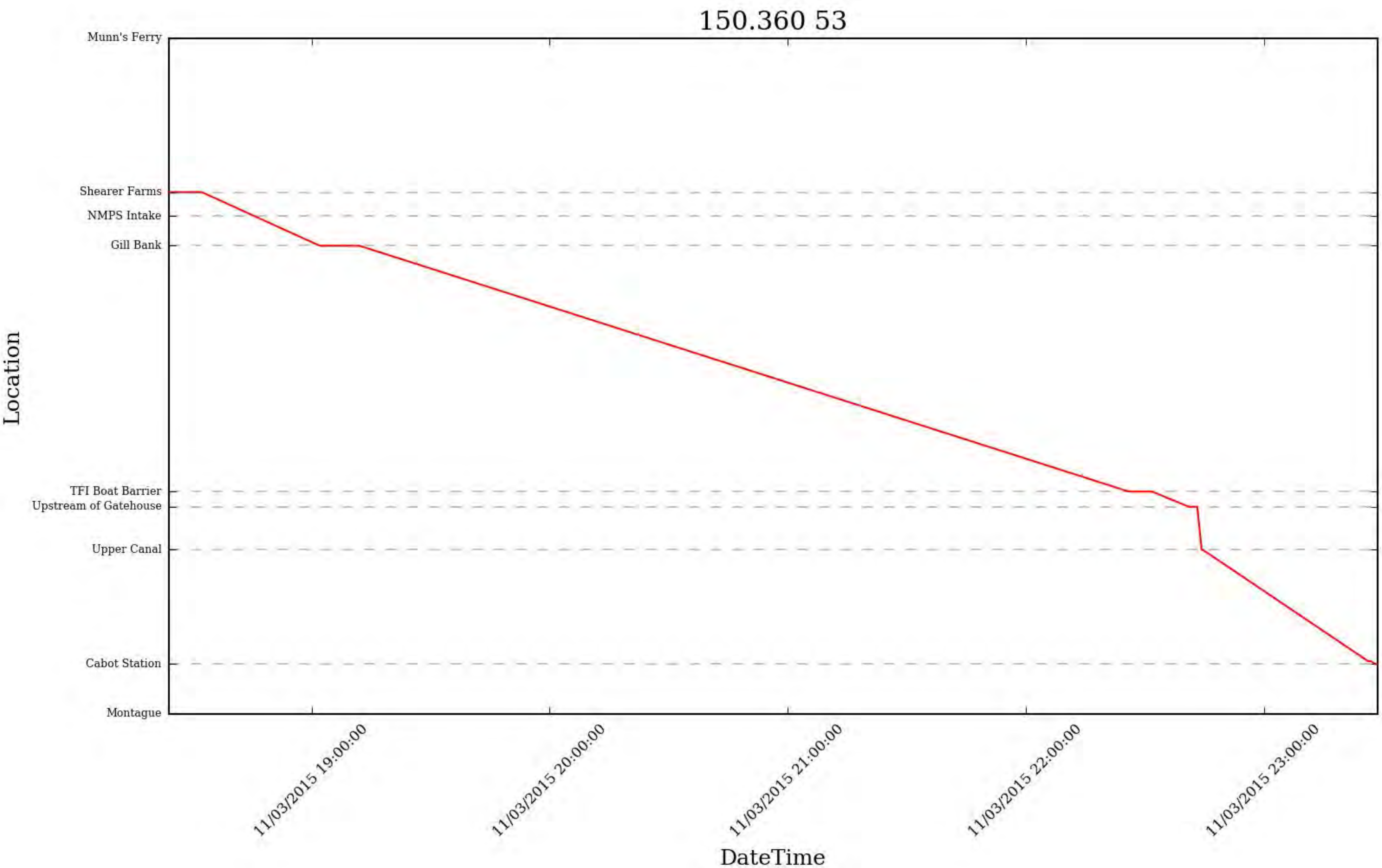
11/04/2015 20:00:00
DateTime



150.360 53
Location
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
11/03/2015 19:00:00
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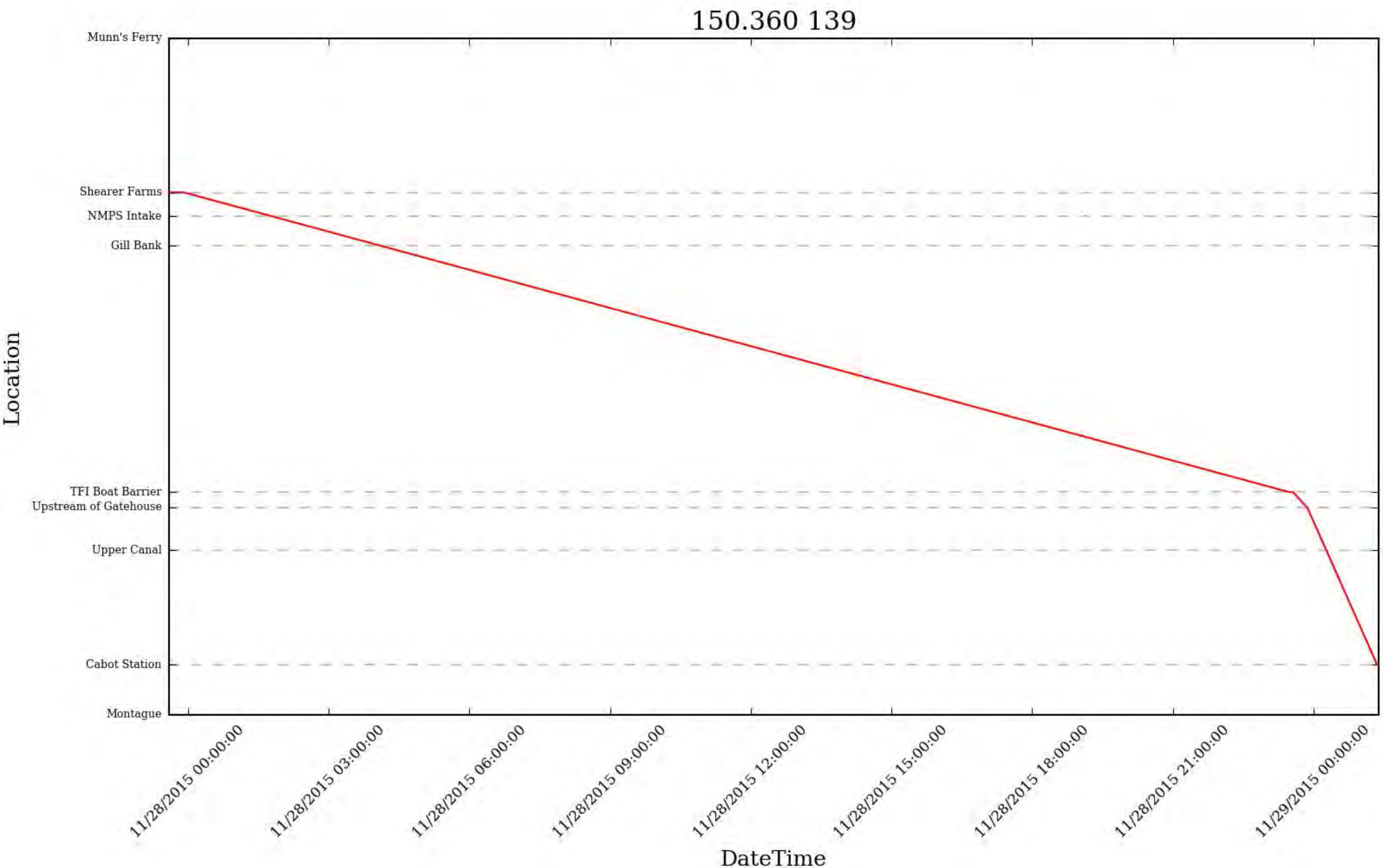
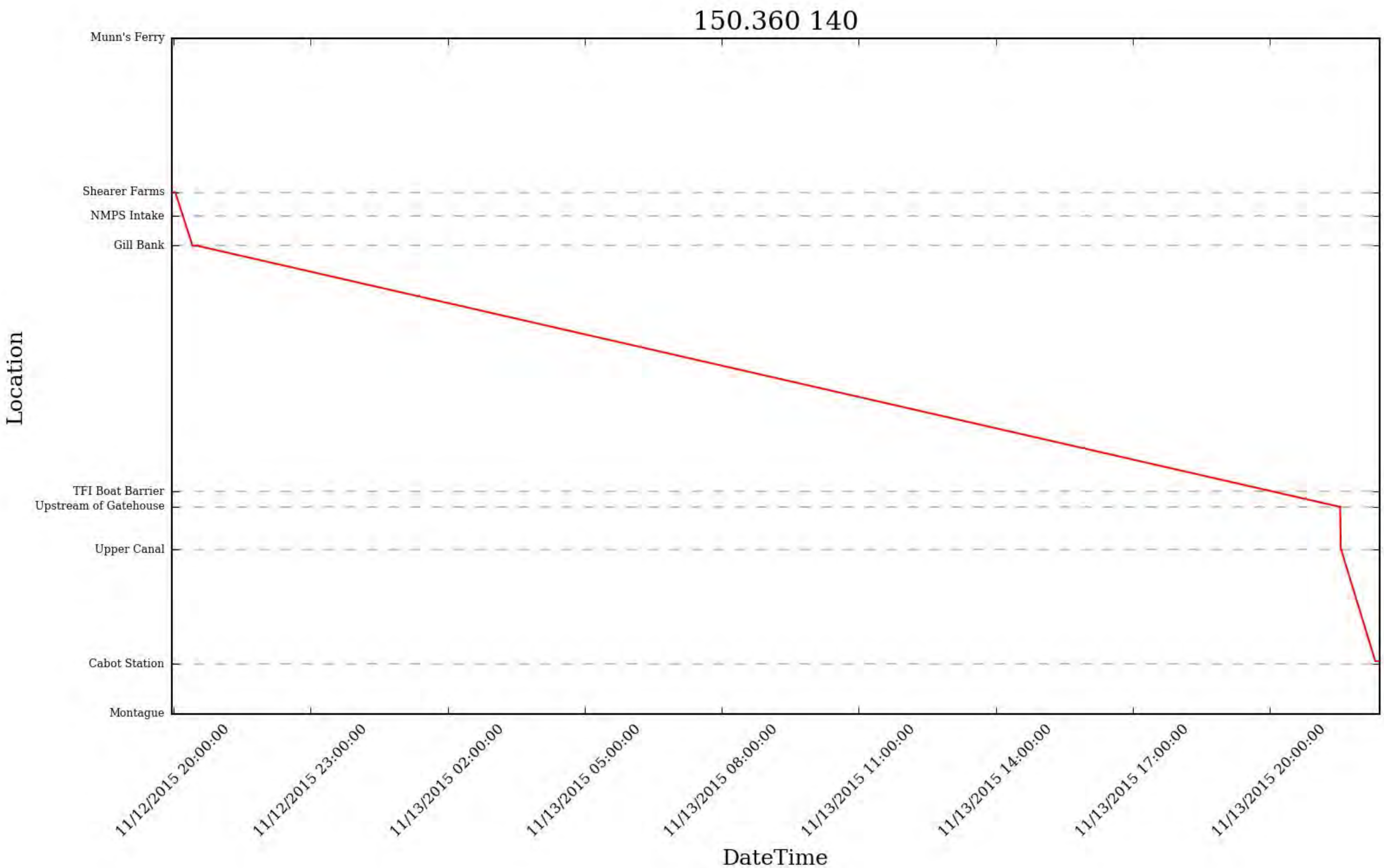
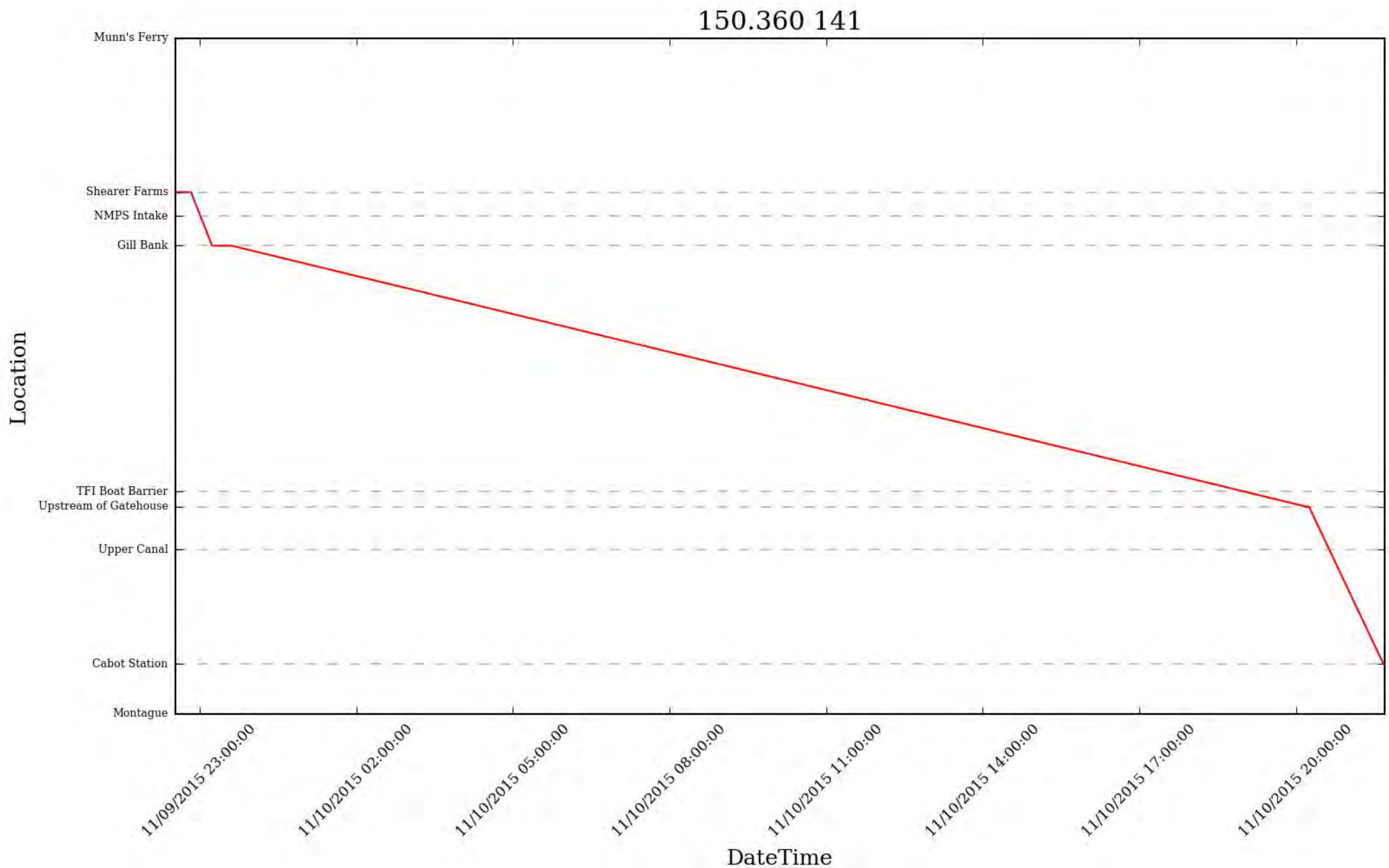
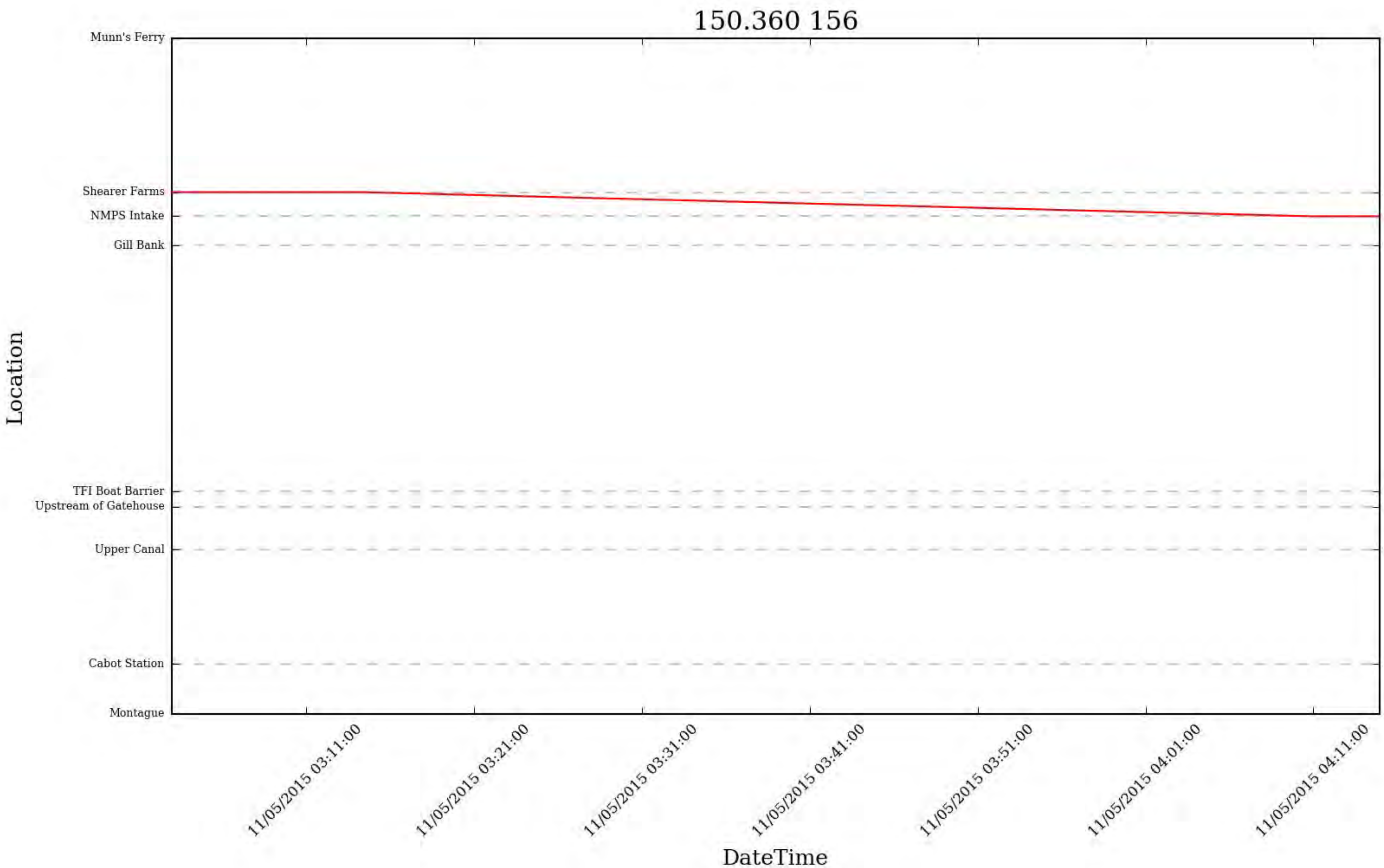
11/03/2015 23:00:00
DateTime


150.360 139
Location
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
11/28/2015 00:00:00
11/28/2015 03:00:00
11/28/2015 06:00:00
11/28/2015 09:00:00
11/28/2015 12:00:00
11/28/2015 15:00:00
11/28/2015 18:00:00
11/28/2015 21:00:00
11/29/2015 00:00:00
DateTime

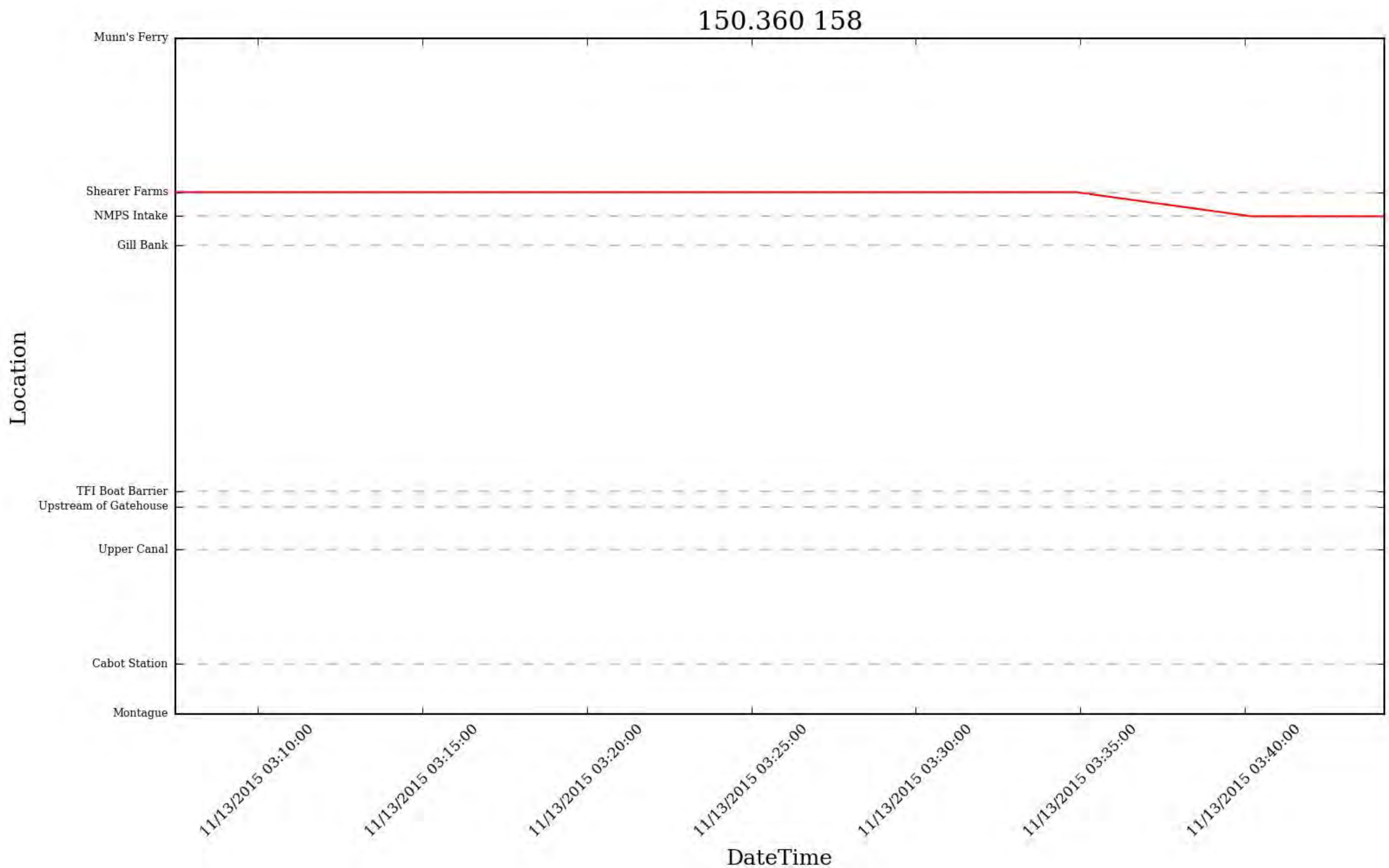


150.360 140
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/12/2015 20:00:00
11/12/2015 23:00:00
11/13/2015 02:00:00
11/13/2015 05:00:00
11/13/2015 08:00:00
11/13/2015 11:00:00
11/13/2015 14:00:00
11/13/2015 17:00:00
11/13/2015 20:00:00
DateTime

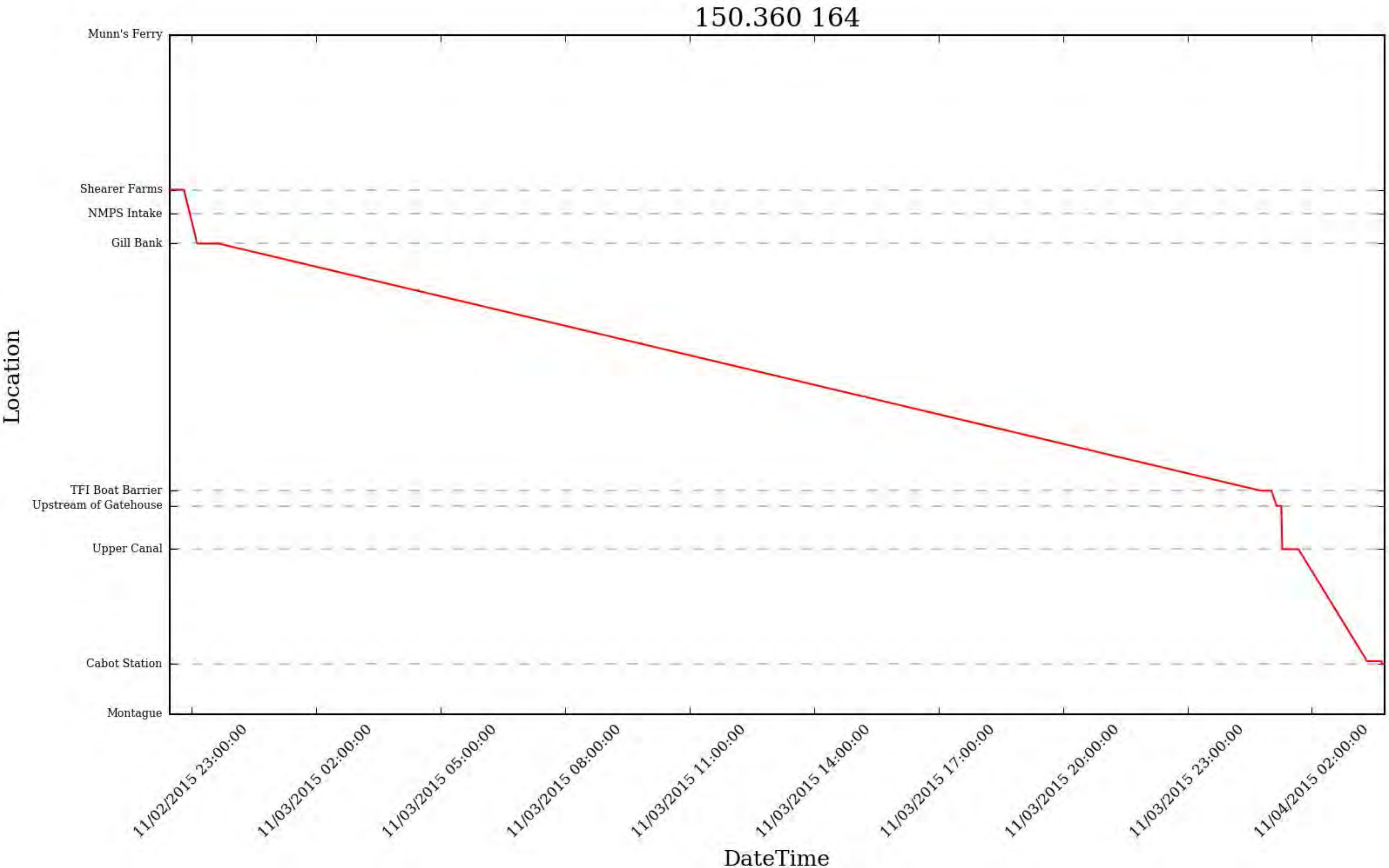

150.360 141
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/09/2015 23:00:00
11/10/2015 02:00:00
11/10/2015 05:00:00
11/10/2015 08:00:00
11/10/2015 11:00:00
11/10/2015 14:00:00
11/10/2015 17:00:00
11/10/2015 20:00:00
DateTime



150.360 156
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/05/2015 03:11:00
11/05/2015 03:21:00
11/05/2015 03:31:00
11/05/2015 03:41:00
11/05/2015 03:51:00
11/05/2015 04:01:00
11/05/2015 04:11:00
DateTime



150.360 158
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/13/2015 03:10:00
11/13/2015 03:15:00
11/13/2015 03:20:00
11/13/2015 03:25:00
11/13/2015 03:30:00
11/13/2015 03:35:00
11/13/2015 03:40:00
DateTime



150.360 164
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/02/2015 23:00:00
11/03/2015 02:00:00
11/03/2015 05:00:00
11/03/2015 08:00:00
11/03/2015 11:00:00
11/03/2015 14:00:00
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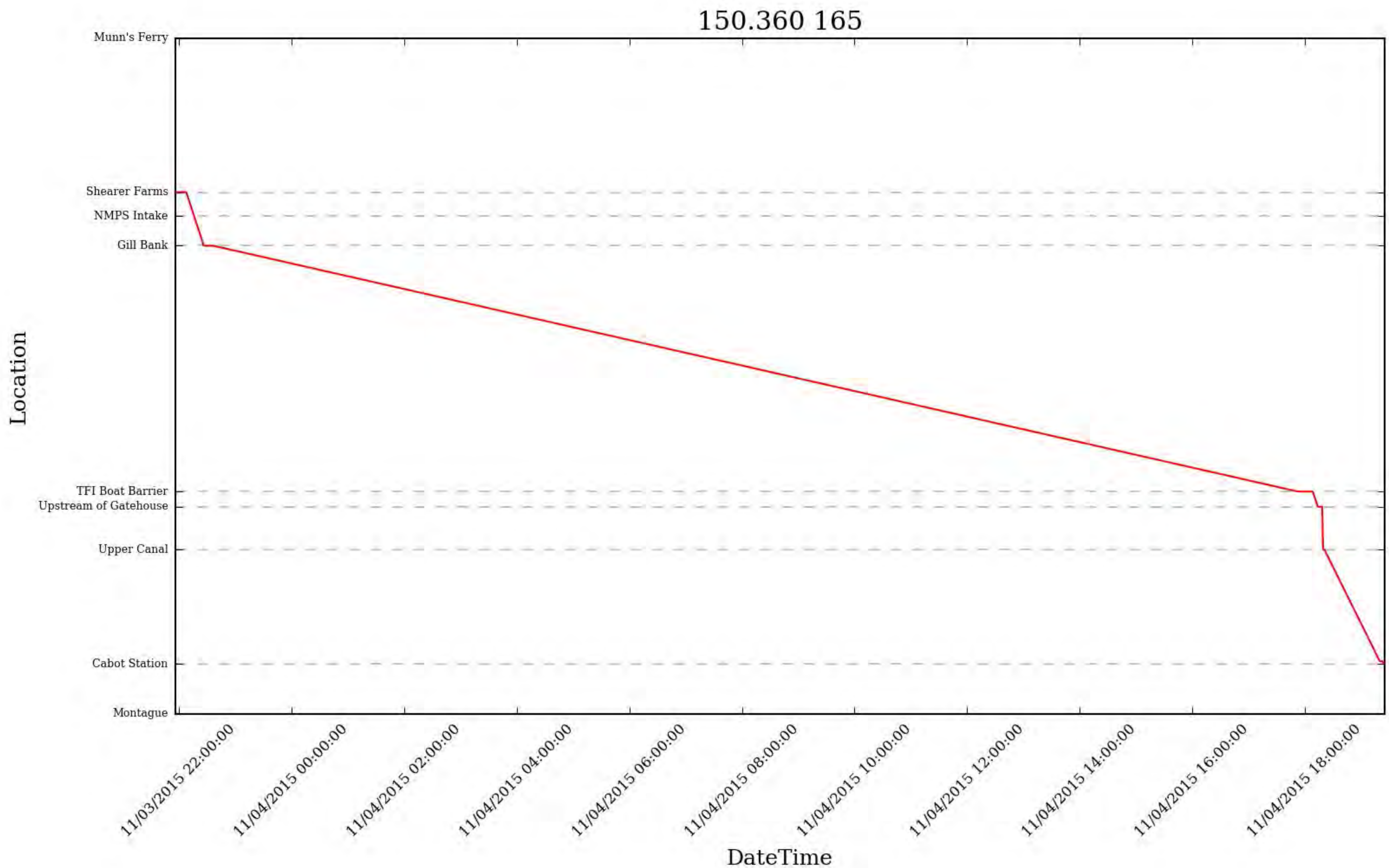
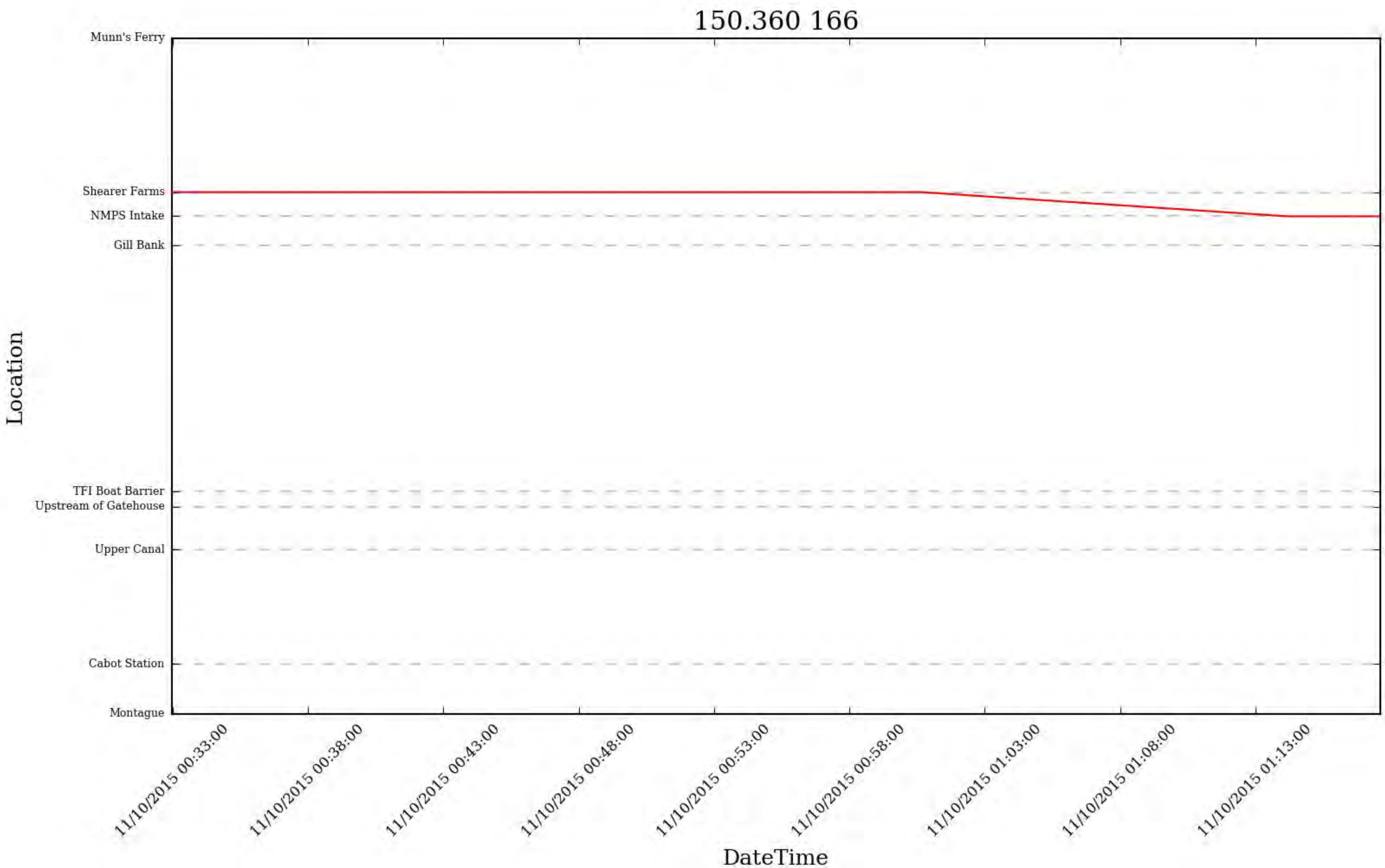
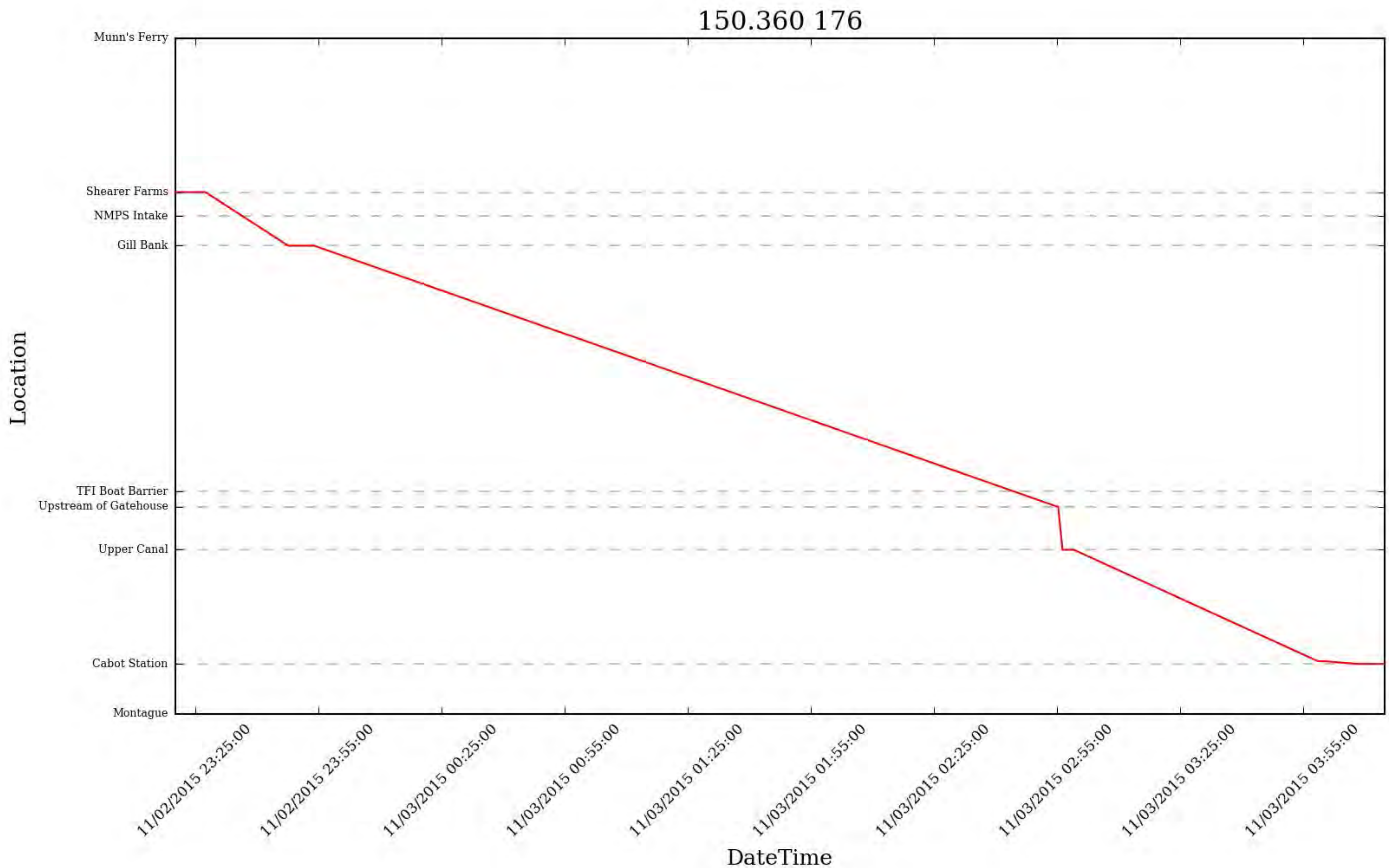
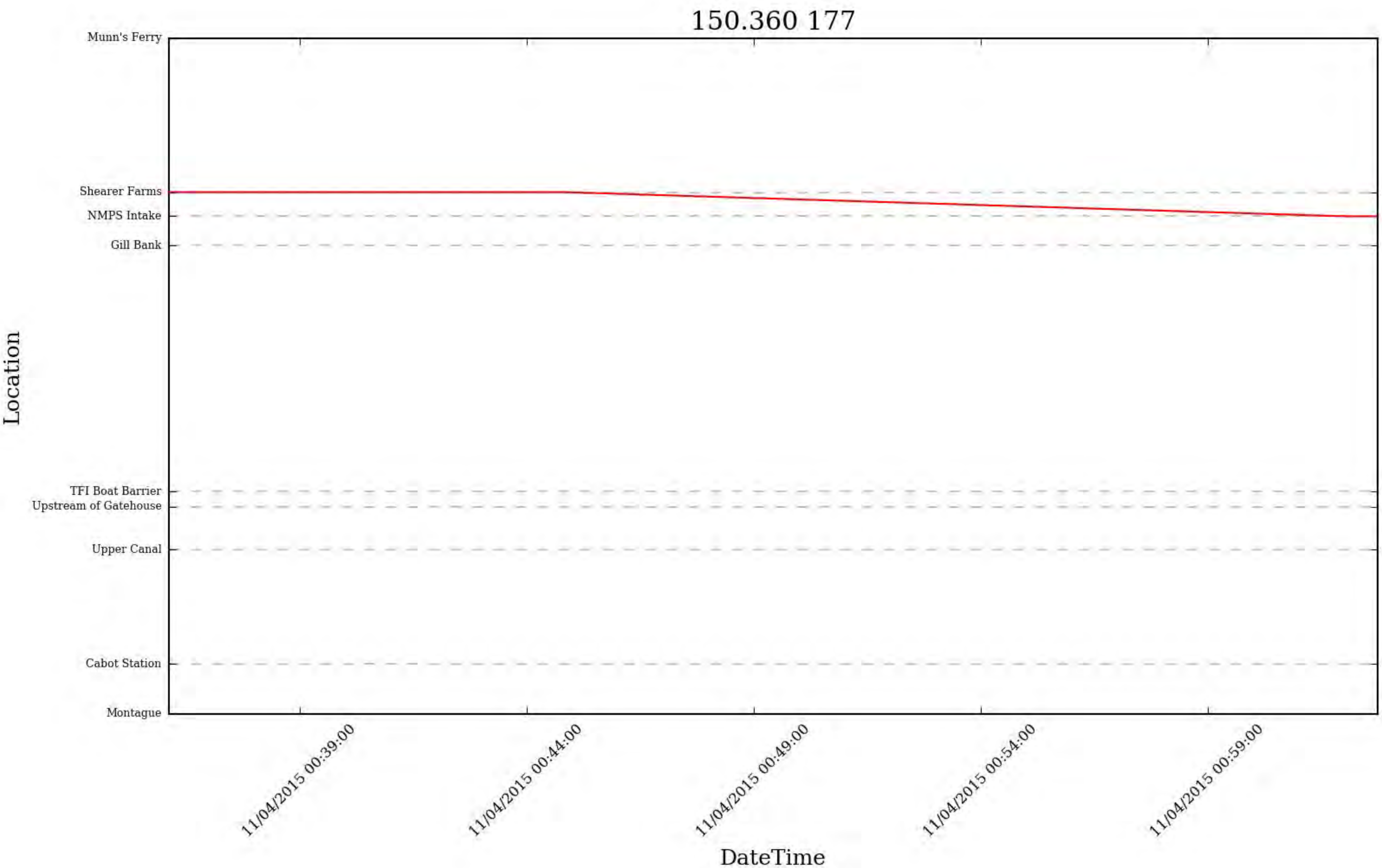
11/04/2015 02:00:00
DateTime

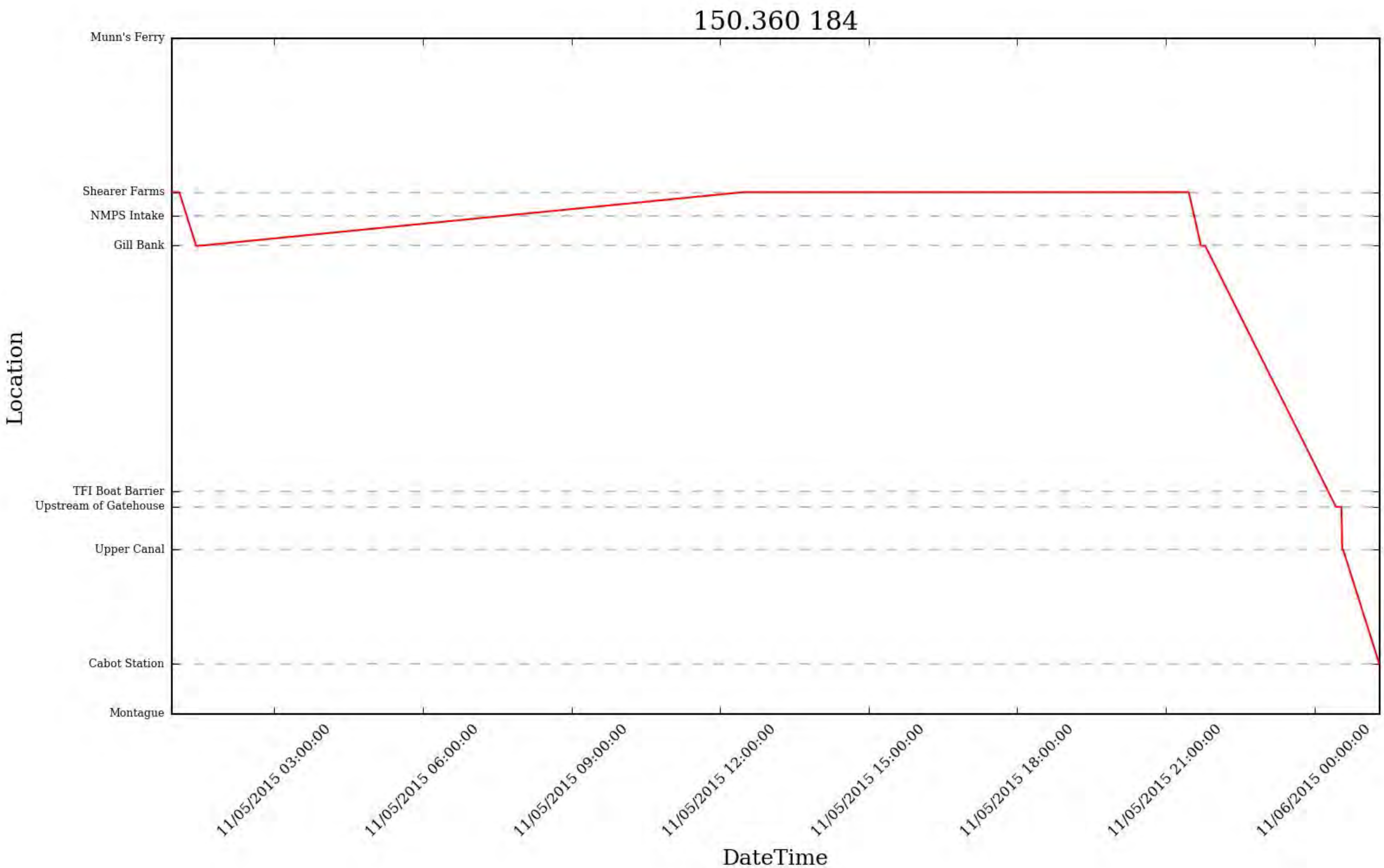

150.360 165
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/03/2015 22:00:00
11/04/2015 00:00:00
11/04/2015 02:00:00
11/04/2015 04:00:00
11/04/2015 06:00:00
11/04/2015 08:00:00
11/04/2015 10:00:00
11/04/2015 12:00:00
11/04/2015 14:00:00
11/04/2015 16:00:00
11/04/2015 18:00:00
DateTime

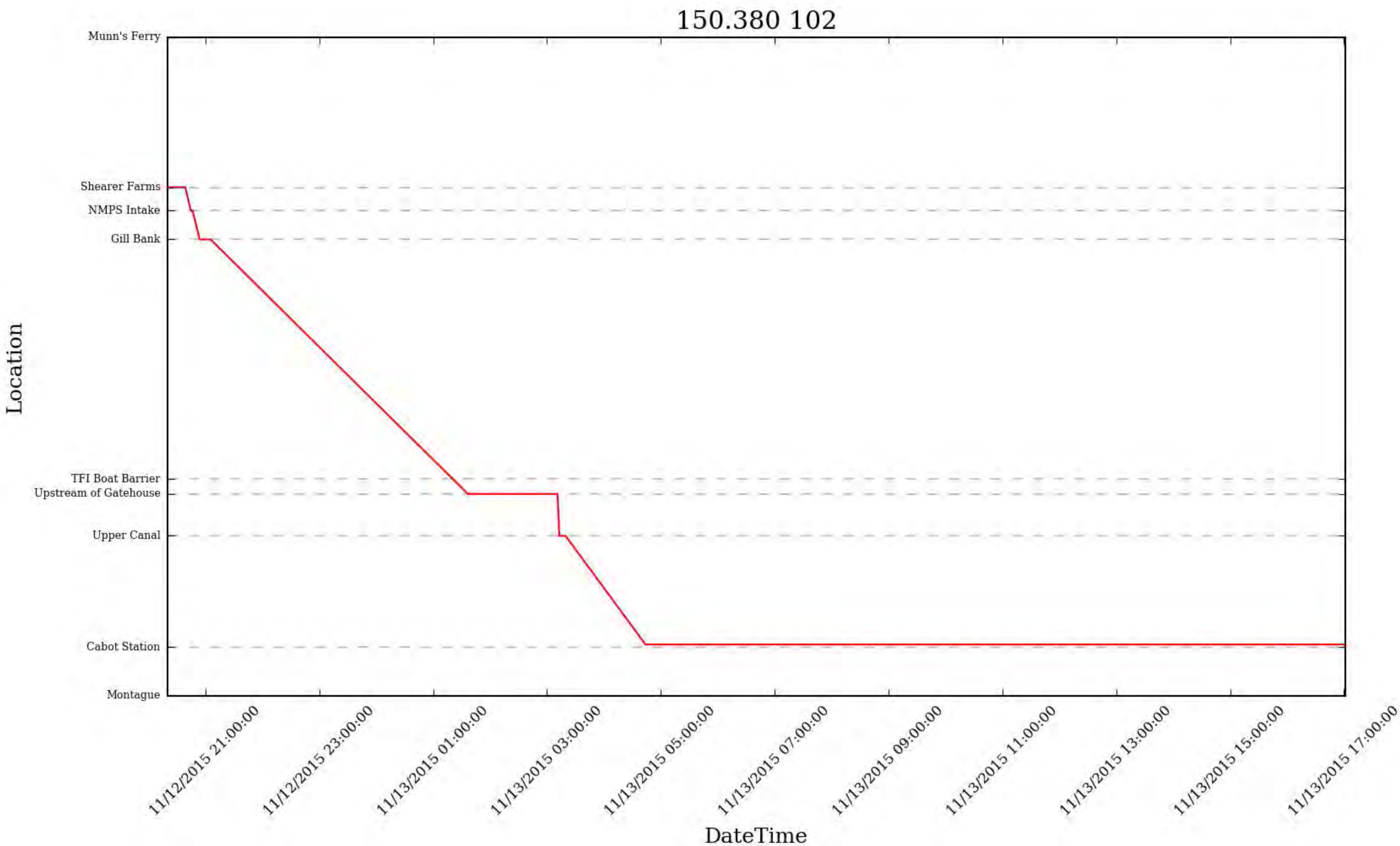

150.360 166
Location
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
11/10/2015 00:33:00
11/10/2015 00:38:00
11/10/2015 00:43:00
11/10/2015 00:48:00
11/10/2015 00:53:00
11/10/2015 00:58:00
11/10/2015 01:03:00
11/10/2015 01:08:00
11/10/2015 01:13:00
DateTime


150.360 176
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/02/2015 23:25:00
11/02/2015 23:55:00
11/03/2015 00:25:00
11/03/2015 00:55:00
11/03/2015 01:25:00
11/03/2015 01:55:00
11/03/2015 02:25:00
11/03/2015 02:55:00
11/03/2015 03:25:00
11/03/2015 03:55:00
DateTime

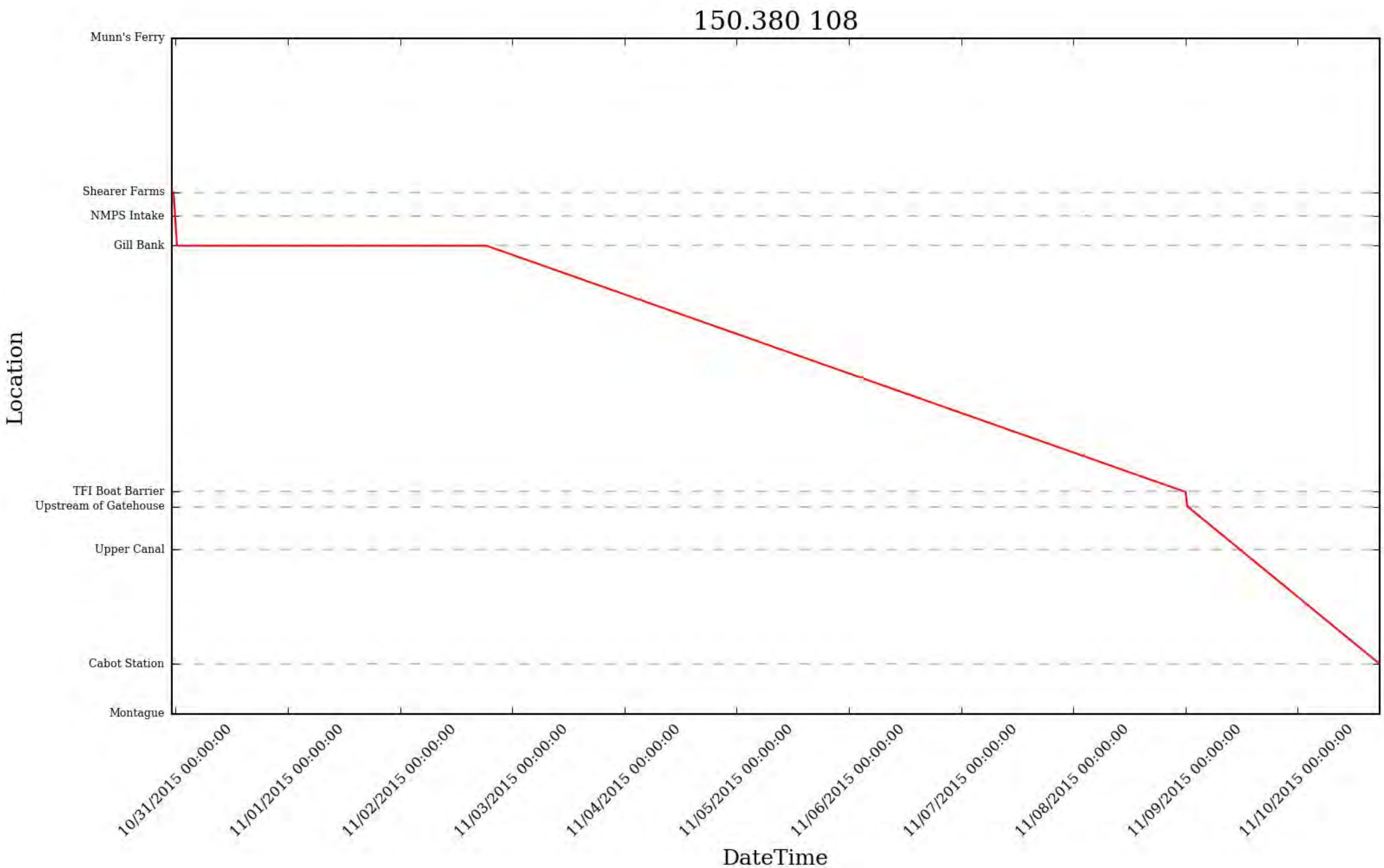


150.360 177
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/04/2015 00:39:00
11/04/2015 00:44:00
11/04/2015 00:49:00
11/04/2015 00:54:00
11/04/2015 00:59:00
DateTime

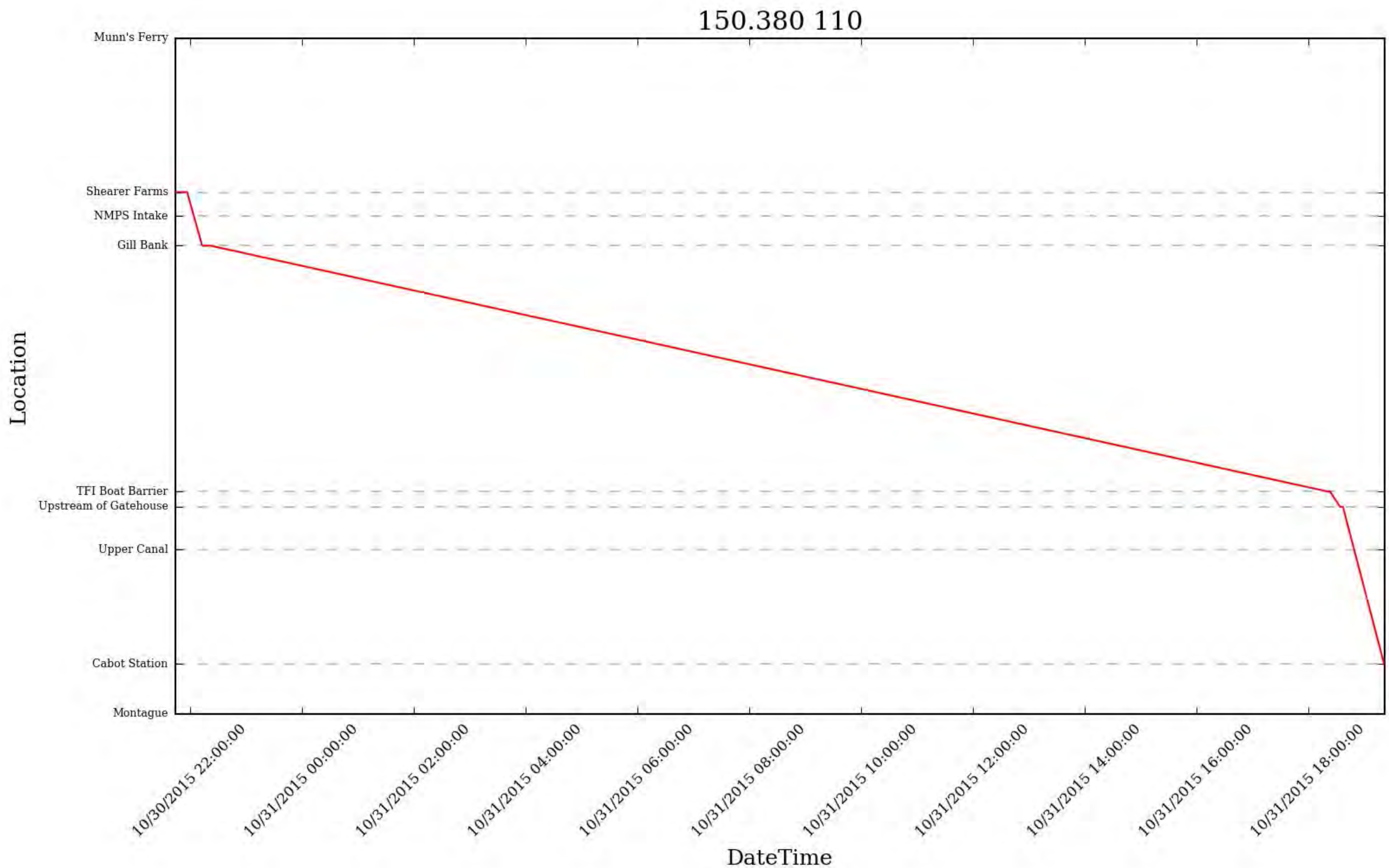

150.360 184
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/05/2015 03:00:00
11/05/2015 06:00:00
11/05/2015 09:00:00
11/05/2015 12:00:00
11/05/2015 15:00:00
11/05/2015 18:00:00
11/05/2015 21:00:00
11/06/2015 00:00:00
DateTime



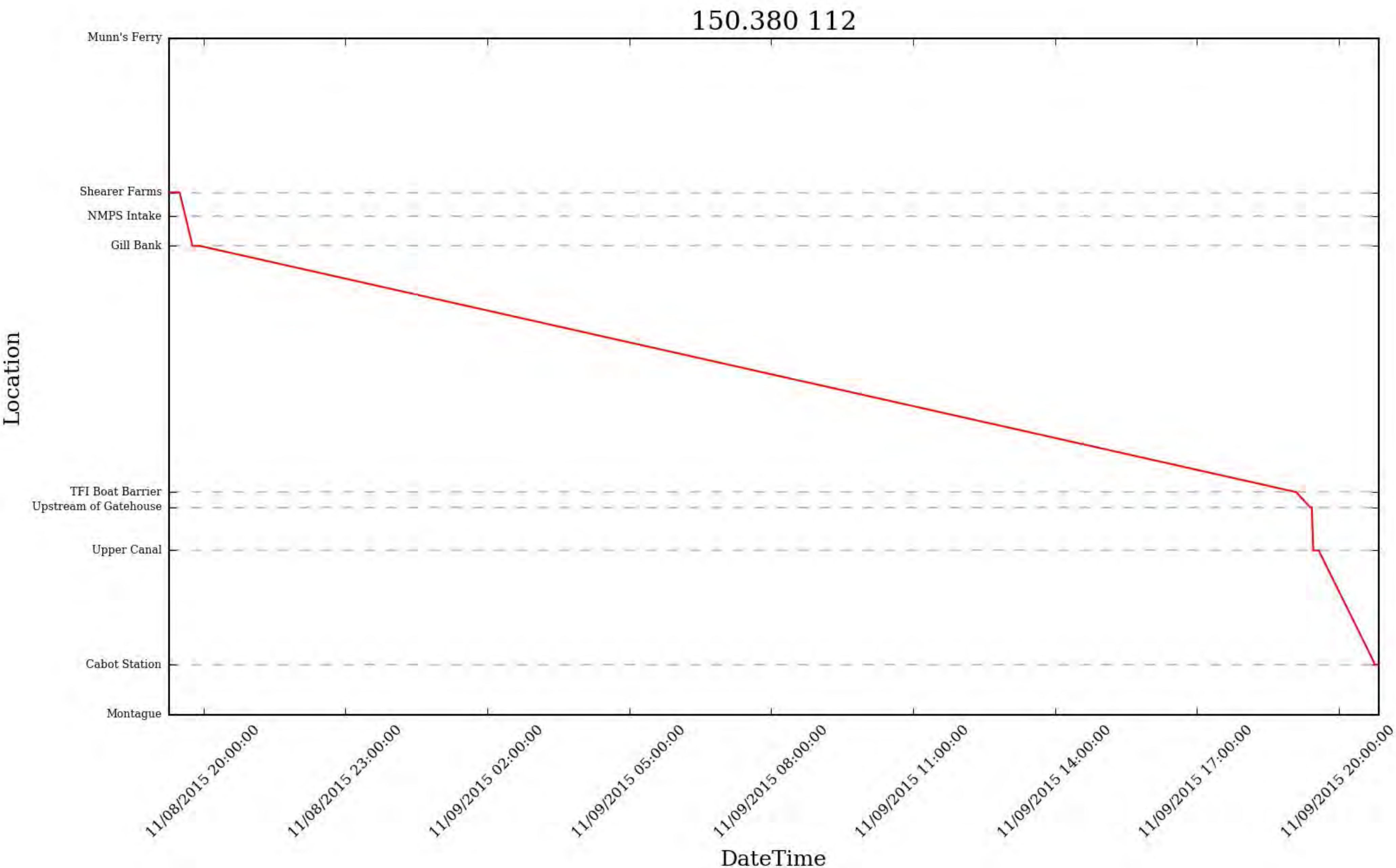
150.380 102
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/12/2015 21:00:00
11/12/2015 23:00:00
11/13/2015 01:00:00
11/13/2015 03:00:00
11/13/2015 05:00:00
11/13/2015 07:00:00
11/13/2015 09:00:00
11/13/2015 11:00:00
11/13/2015 13:00:00
11/13/2015 15:00:00
11/13/2015 17:00:00
DateTime



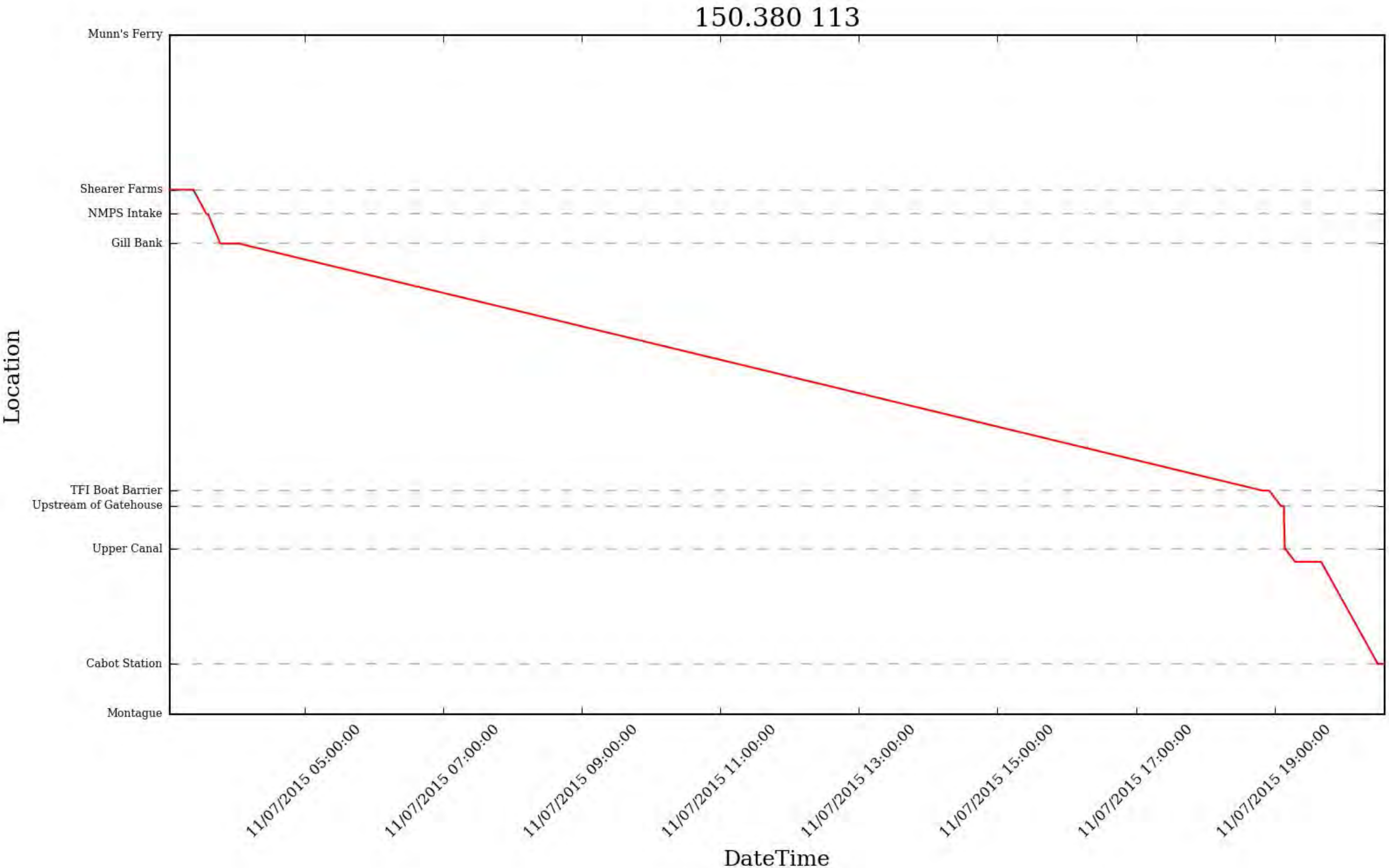
150.380 108
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
10/31/2015 00:00:00
11/01/2015 00:00:00
11/02/2015 00:00:00
11/03/2015 00:00:00
11/04/2015 00:00:00
11/05/2015 00:00:00
11/06/2015 00:00:00
11/07/2015 00:00:00
11/08/2015 00:00:00
11/09/2015 00:00:00
11/10/2015 00:00:00
DateTime

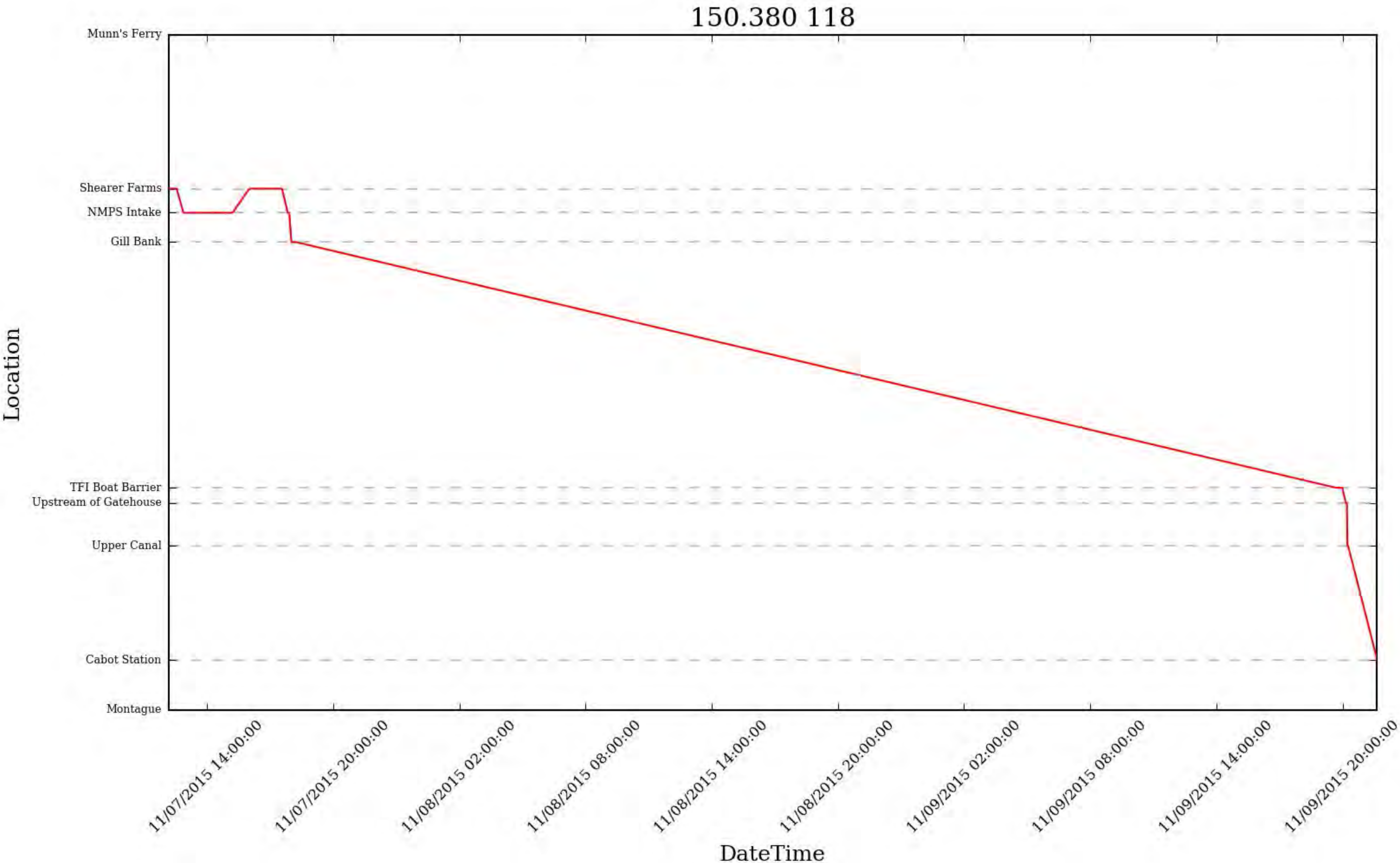


150.380 110
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
10/30/2015 22:00:00
10/31/2015 00:00:00
10/31/2015 02:00:00
10/31/2015 04:00:00
10/31/2015 06:00:00
10/31/2015 08:00:00
10/31/2015 10:00:00
10/31/2015 12:00:00
10/31/2015 14:00:00
10/31/2015 16:00:00
10/31/2015 18:00:00
DateTime

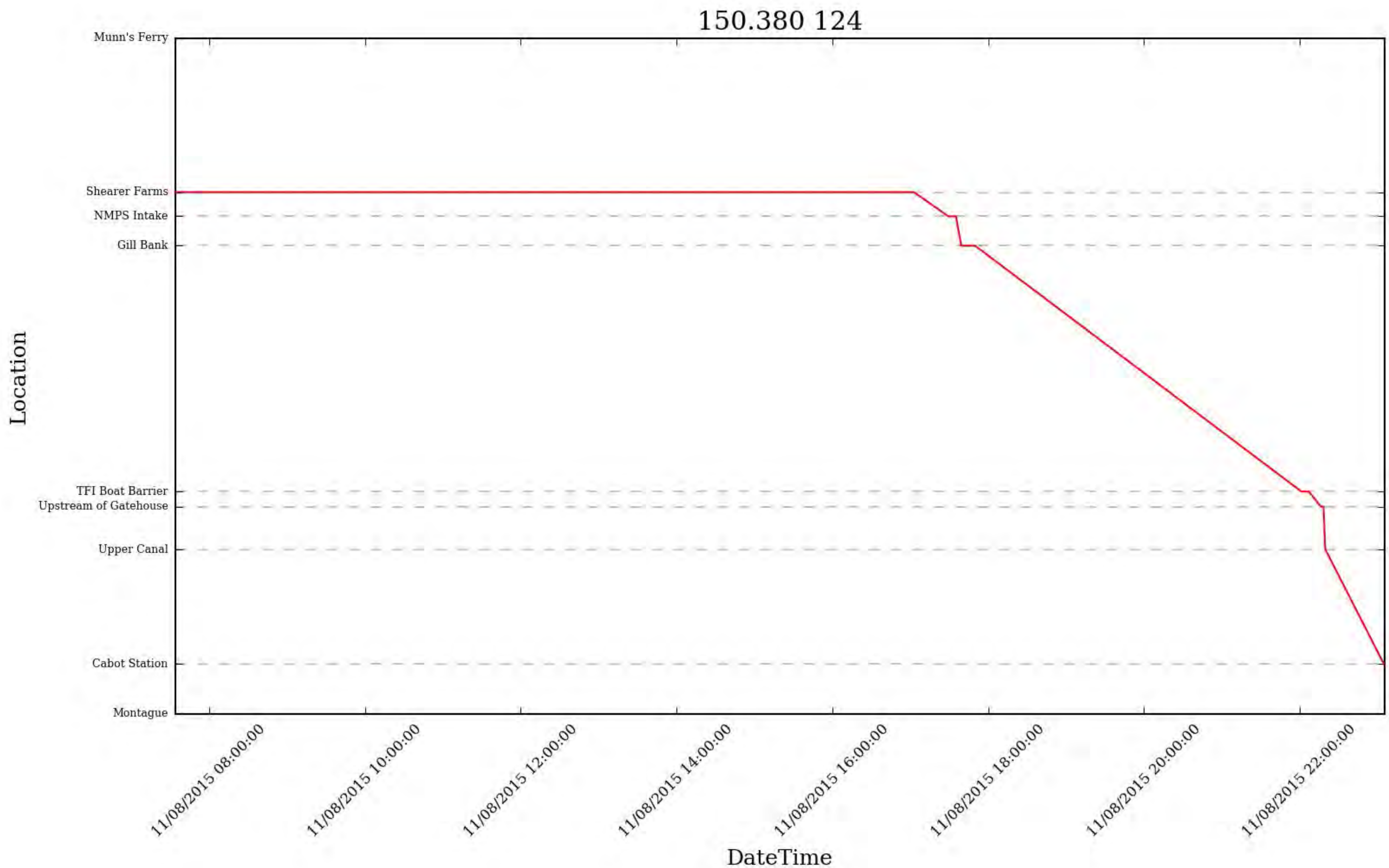


150.380 112
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/08/2015 20:00:00
11/08/2015 23:00:00
11/09/2015 02:00:00
11/09/2015 05:00:00
11/09/2015 08:00:00
11/09/2015 11:00:00
11/09/2015 14:00:00
11/09/2015 17:00:00
11/09/2015 20:00:00
DateTime

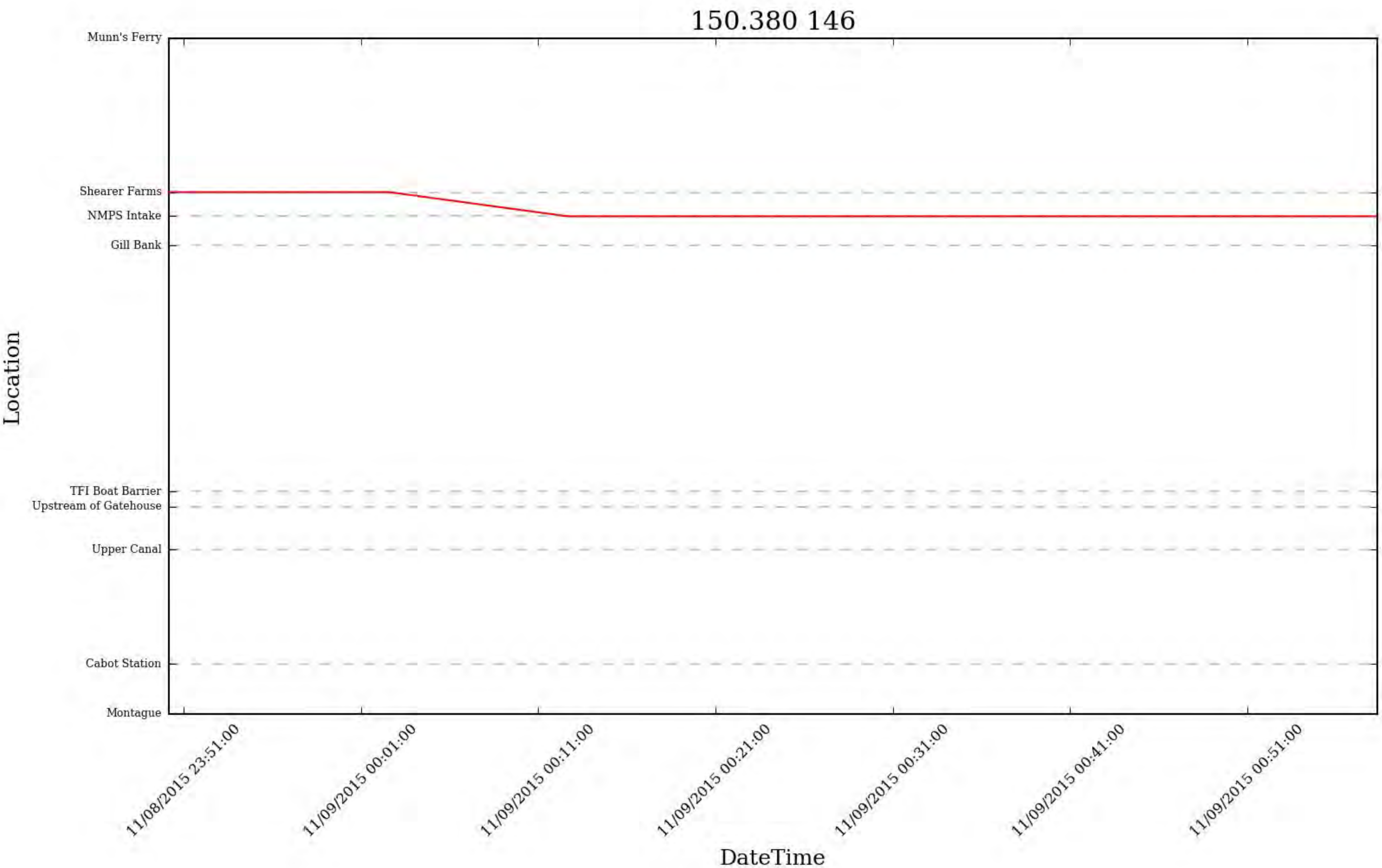

150.380 113
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/07/2015 05:00:00
11/07/2015 07:00:00
11/07/2015 09:00:00
11/07/2015 11:00:00
11/07/2015 13:00:00
11/07/2015 15:00:00
11/07/2015 17:00:00
11/07/2015 19:00:00
DateTime

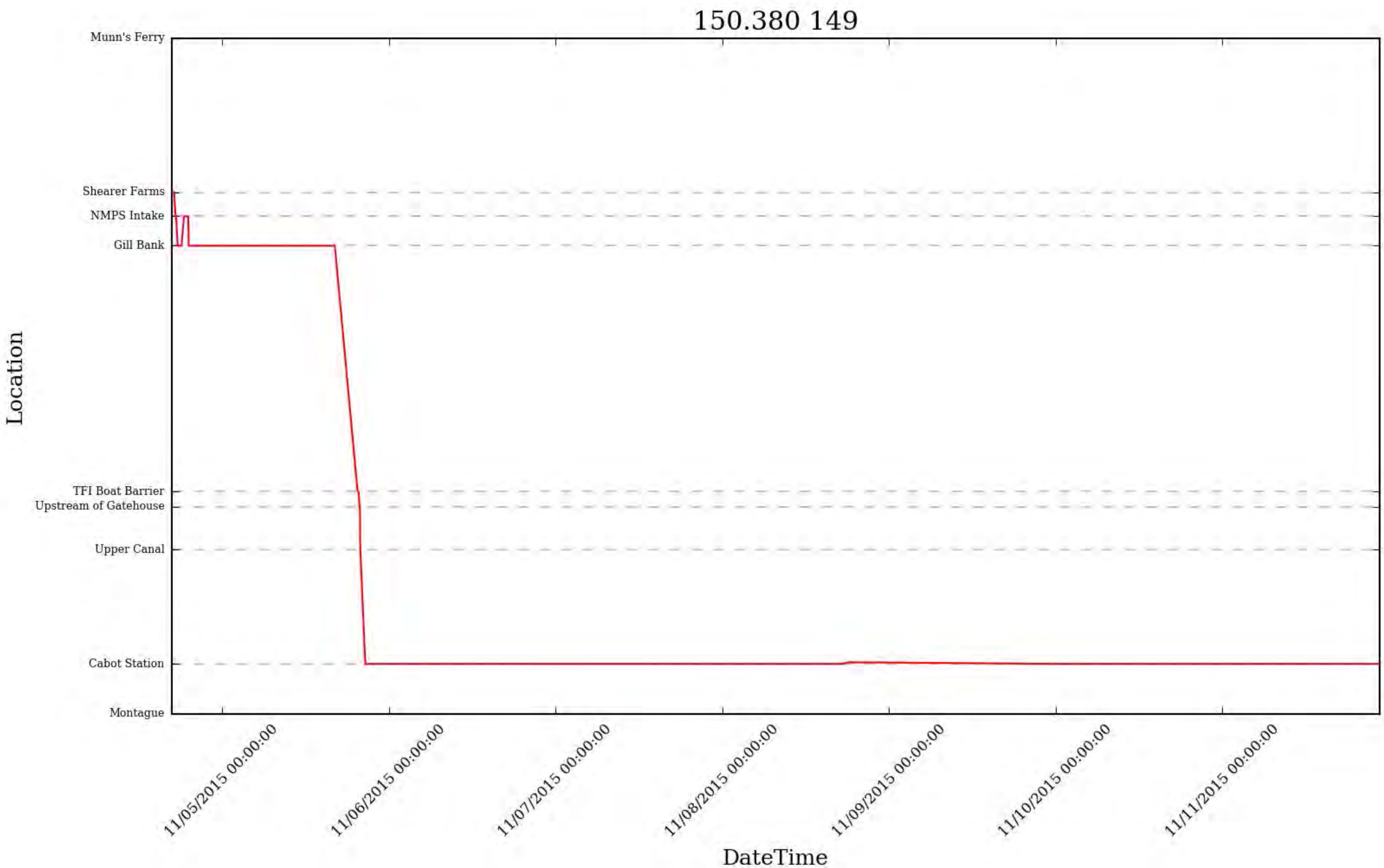


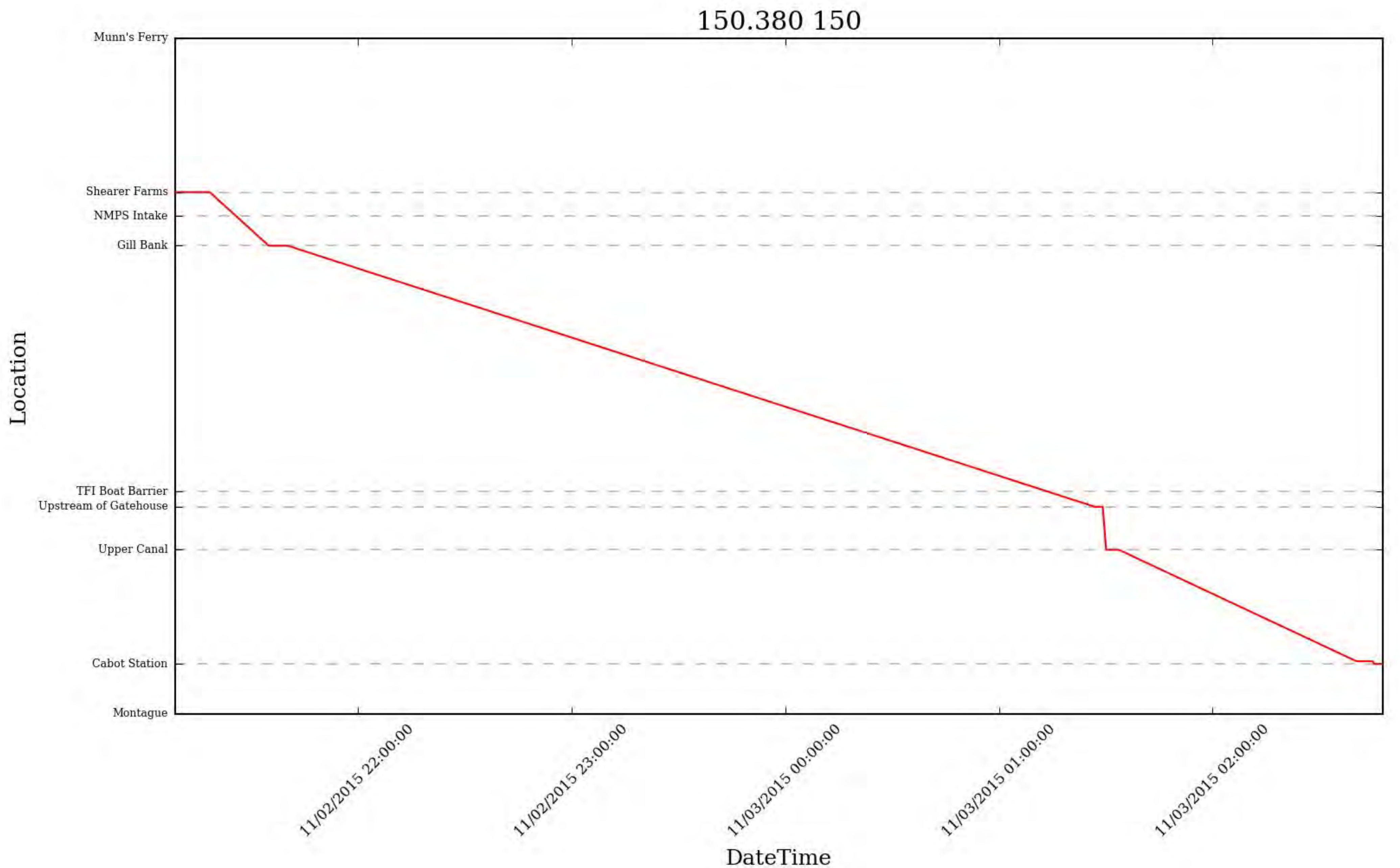
150.380 118
Location
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
11/07/2015 14:00:00
11/07/2015 20:00:00
11/08/2015 02:00:00
11/08/2015 08:00:00
11/08/2015 14:00:00
11/08/2015 20:00:00
11/09/2015 02:00:00
11/09/2015 08:00:00
11/09/2015 14:00:00
11/09/2015 20:00:00
DateTime

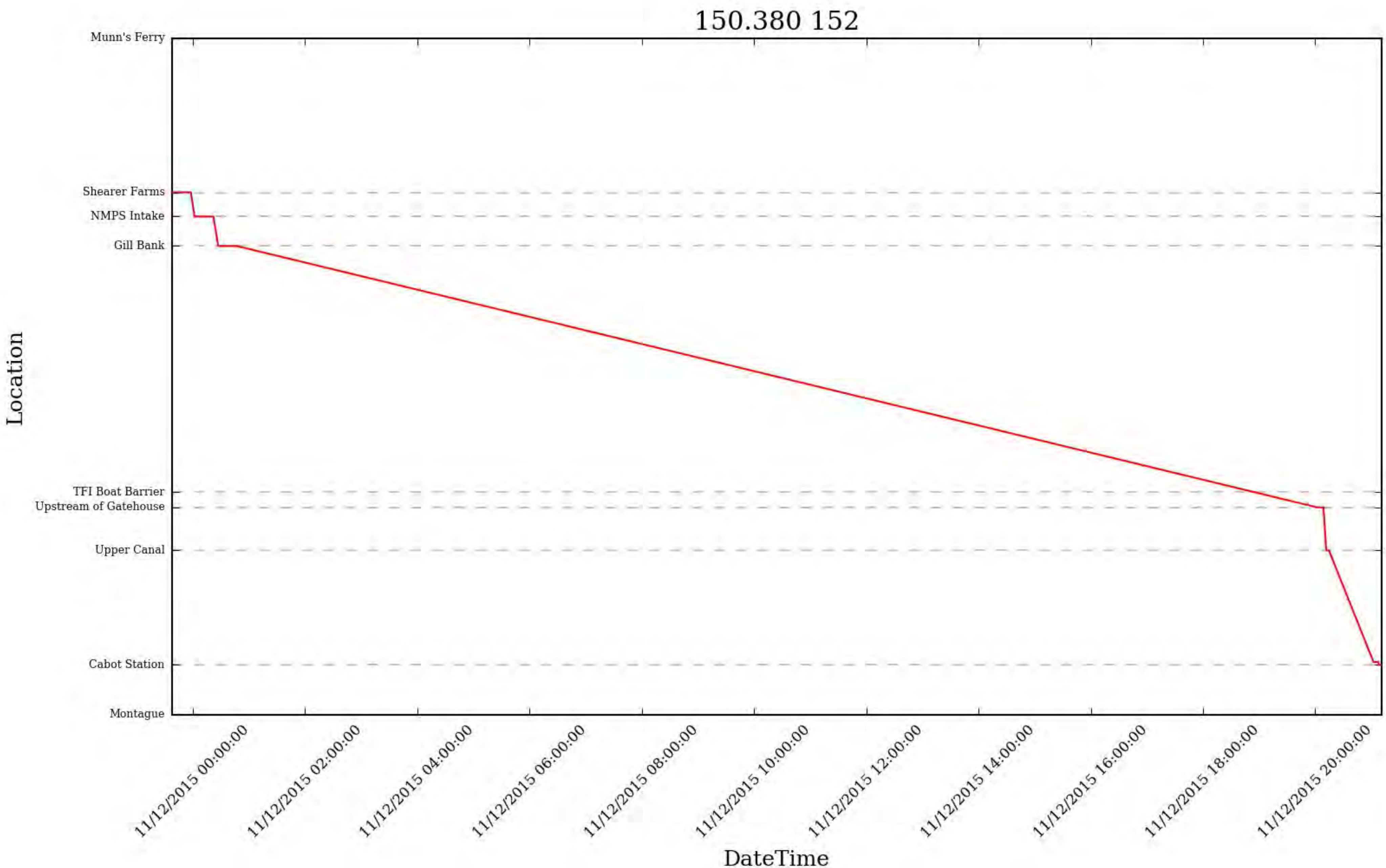


150.380 124
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/08/2015 08:00:00
11/08/2015 10:00:00
11/08/2015 12:00:00
11/08/2015 14:00:00
11/08/2015 16:00:00
11/08/2015 18:00:00
11/08/2015 20:00:00
11/08/2015 22:00:00
DateTime


150.380 146
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/08/2015 23:51:00
11/09/2015 00:01:00
11/09/2015 00:11:00
11/09/2015 00:21:00
11/09/2015 00:31:00
11/09/2015 00:41:00
11/09/2015 00:51:00
DateTime


150.380 149
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/05/2015 00:00:00
11/06/2015 00:00:00
11/07/2015 00:00:00
11/08/2015 00:00:00
11/09/2015 00:00:00
11/10/2015 00:00:00
11/11/2015 00:00:00
DateTime


150.380 150
Location
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
11/02/2015 22:00:00
11/02/2015 23:00:00
11/03/2015 00:00:00
11/03/2015 01:00:00
11/03/2015 02:00:00
DateTime



150.380 152
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/12/2015 00:00:00
11/12/2015 02:00:00
11/12/2015 04:00:00
11/12/2015 06:00:00
11/12/2015 08:00:00
11/12/2015 10:00:00
11/12/2015 12:00:00
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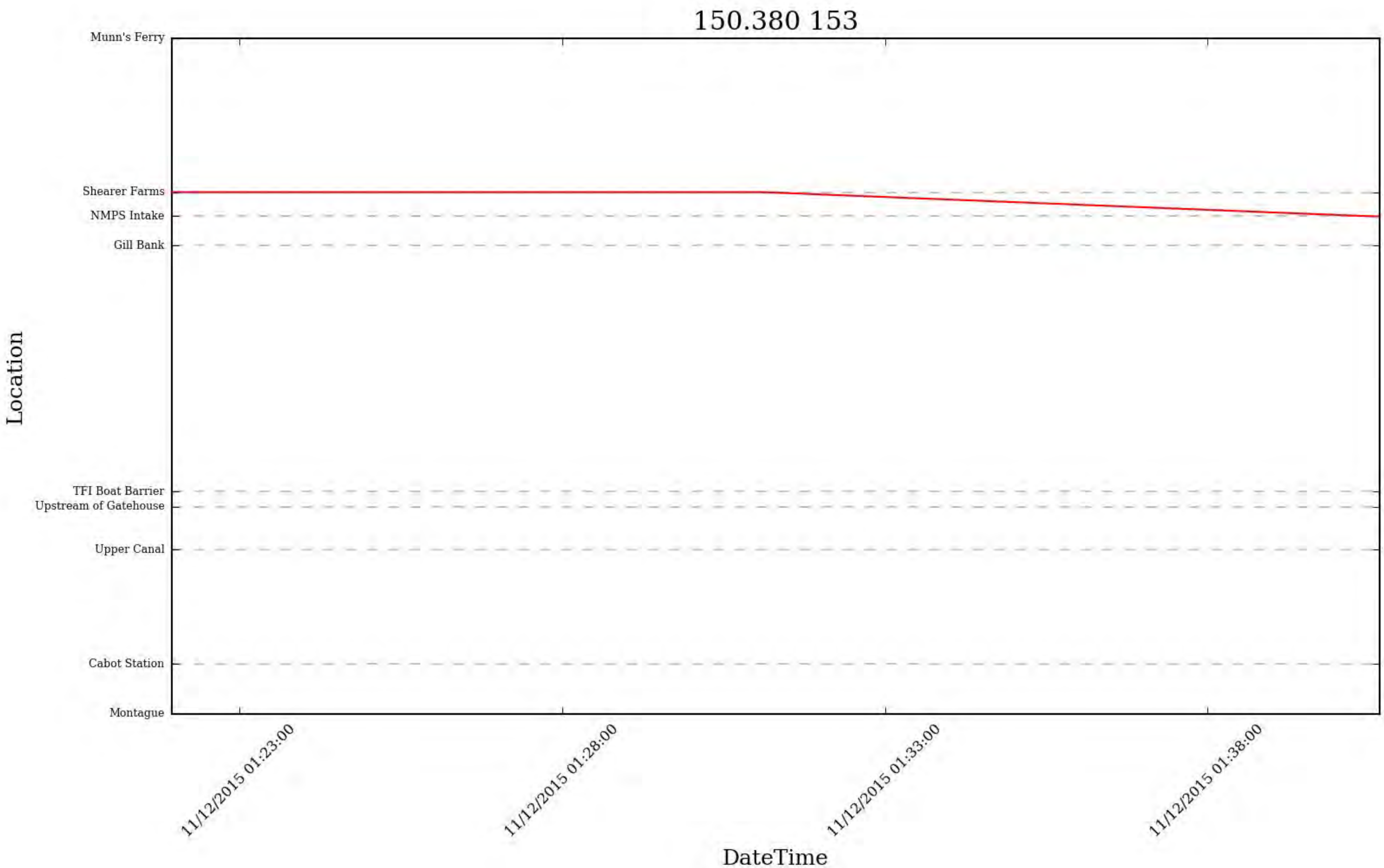
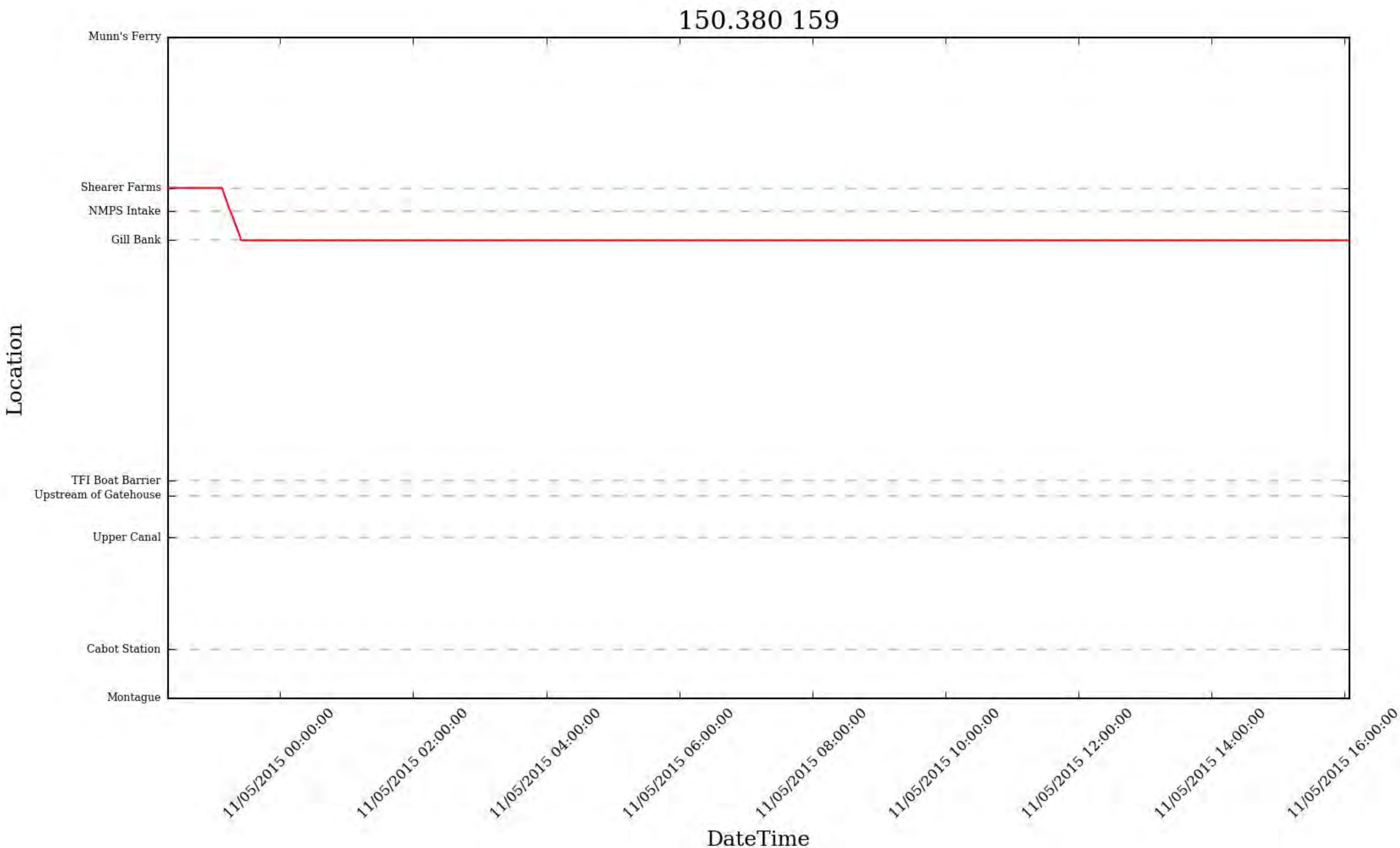
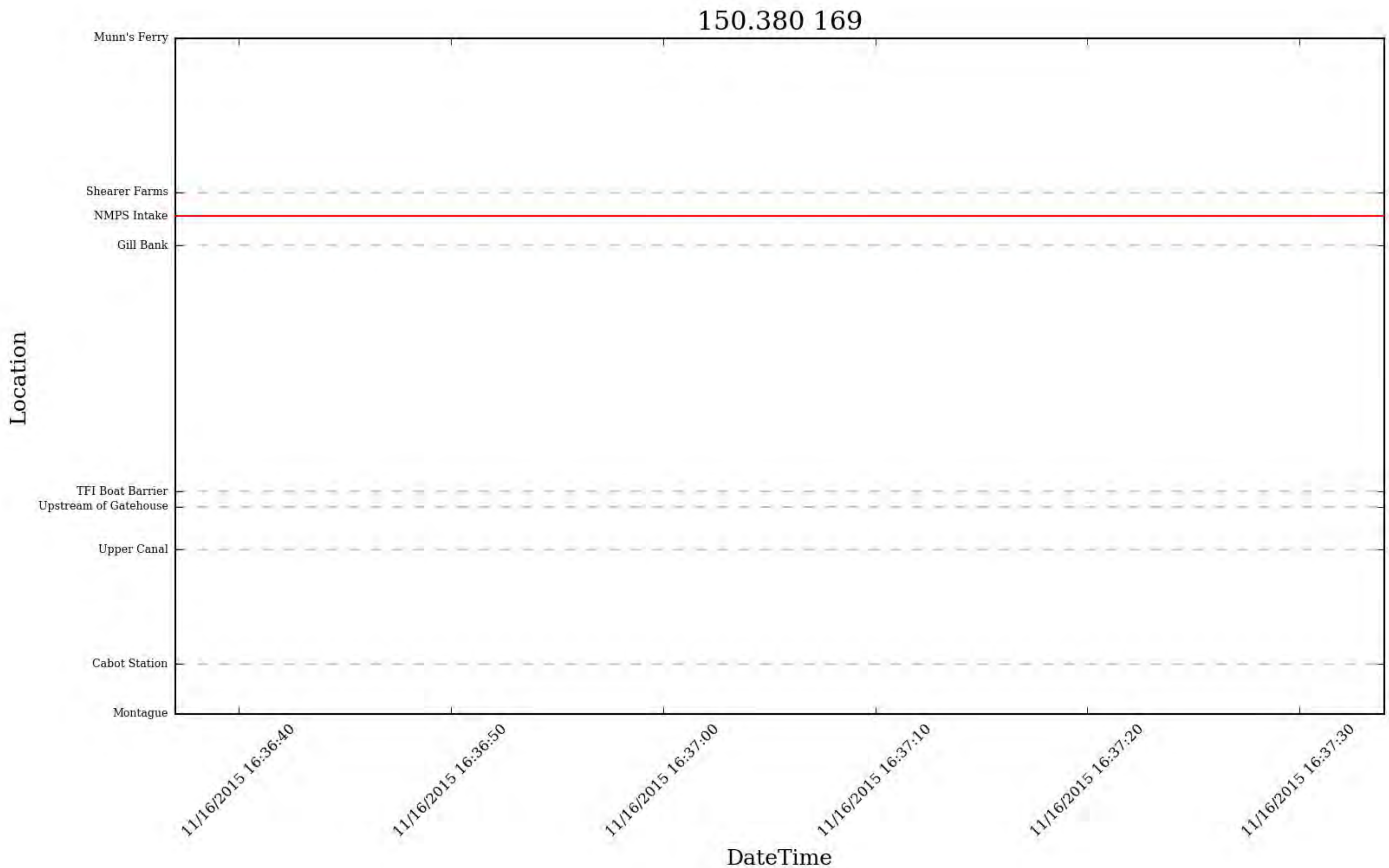
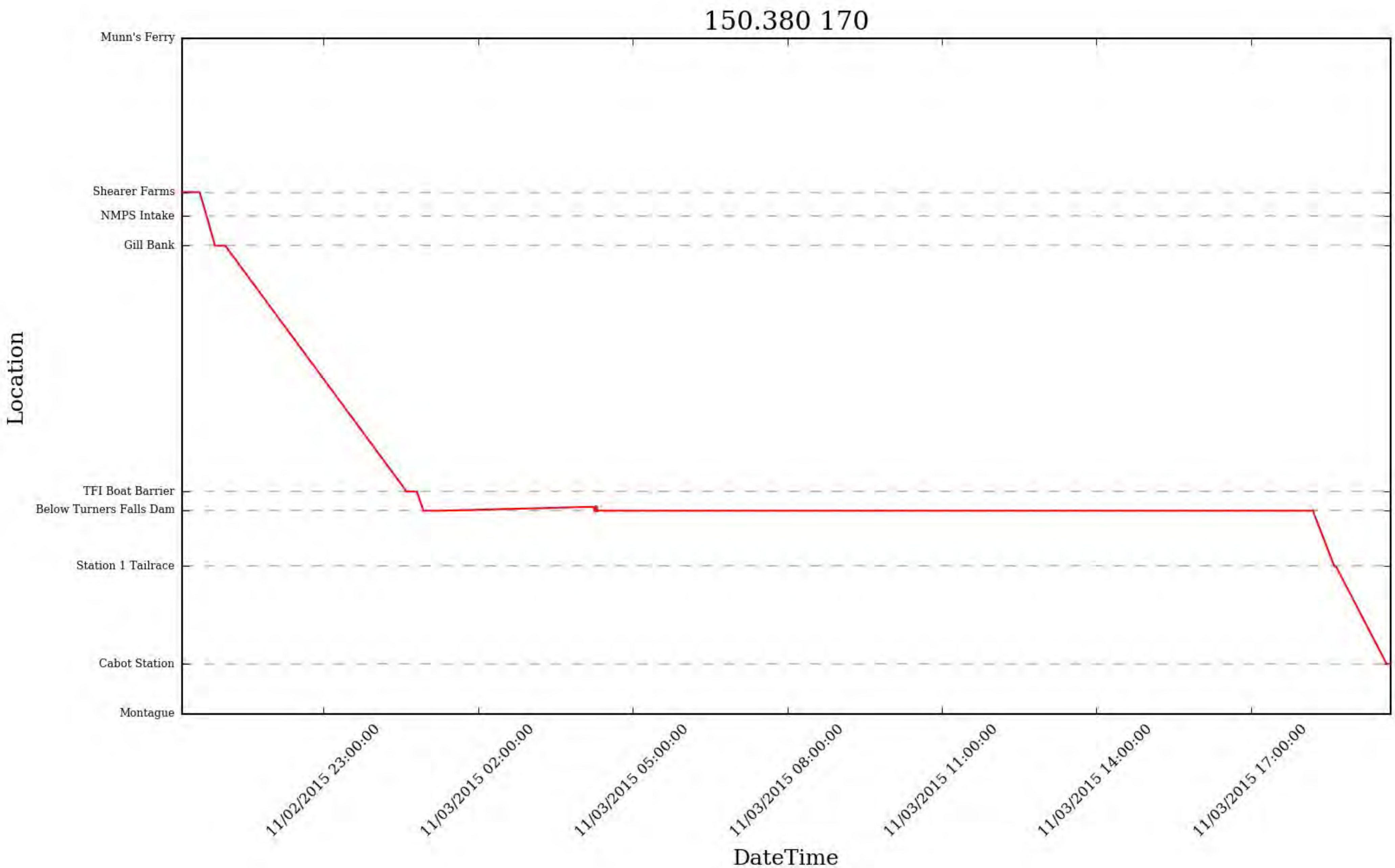
11/12/2015 16:00:00
11/12/2015 18:00:00
11/12/2015 20:00:00
DateTime



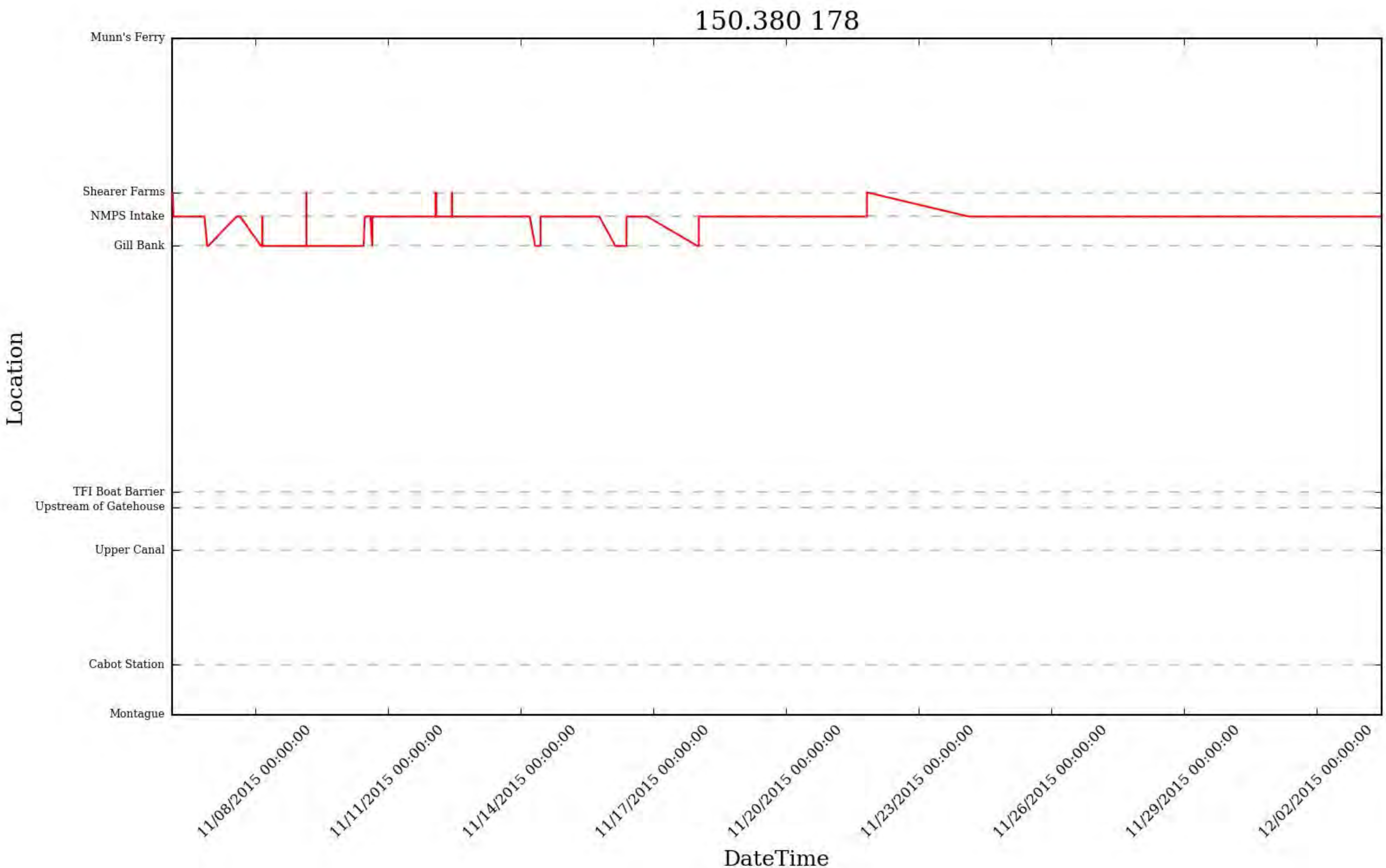
150.380 153
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/12/2015 01:23:00
11/12/2015 01:28:00
11/12/2015 01:33:00
11/12/2015 01:38:00
DateTime

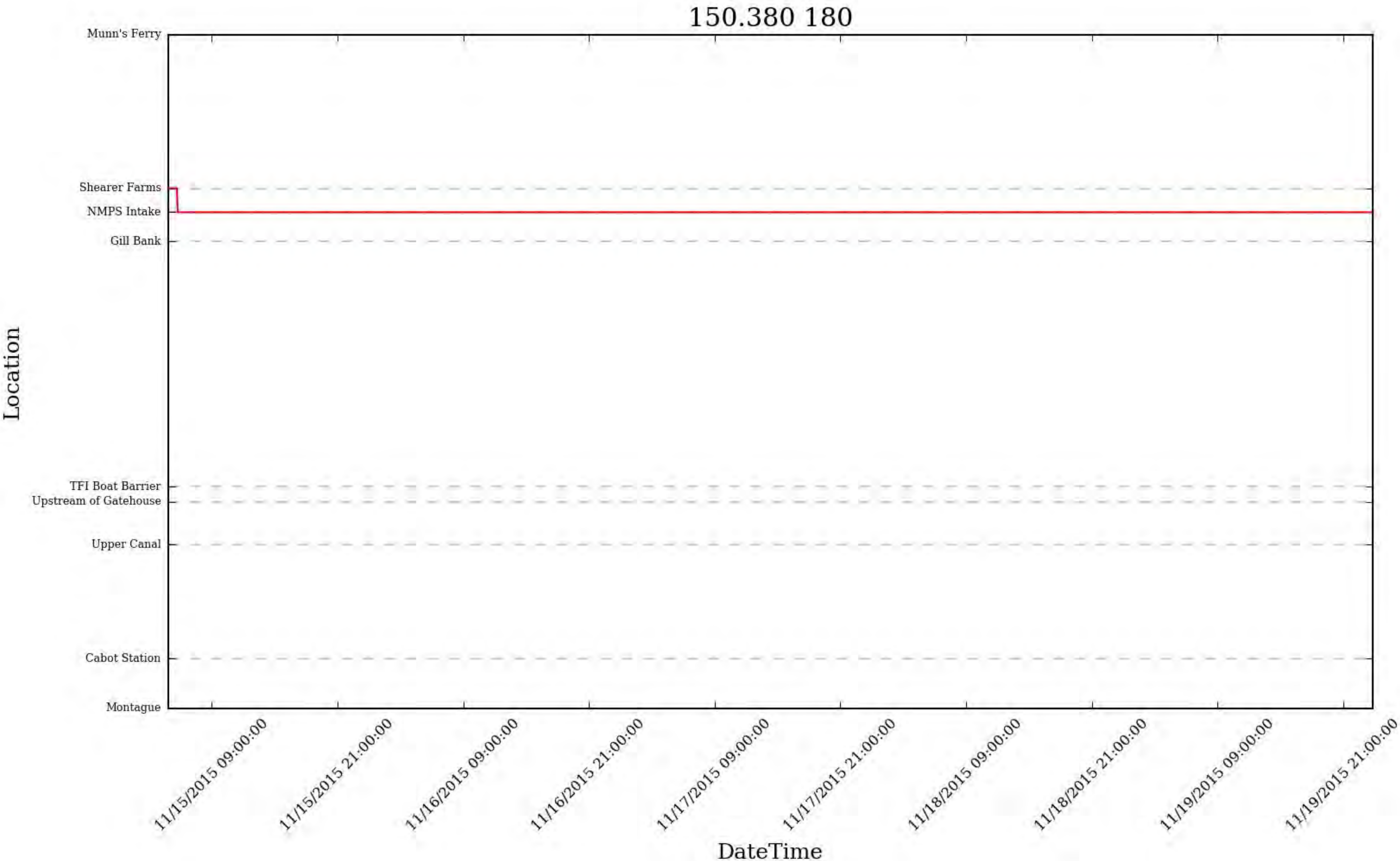

150.380 159
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/05/2015 00:00:00
11/05/2015 02:00:00
11/05/2015 04:00:00
11/05/2015 06:00:00
11/05/2015 08:00:00
11/05/2015 10:00:00
11/05/2015 12:00:00
11/05/2015 14:00:00
11/05/2015 16:00:00
DateTime


150.380 169
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/16/2015 16:36:40
11/16/2015 16:36:50
11/16/2015 16:37:00
11/16/2015 16:37:10
11/16/2015 16:37:20
11/16/2015 16:37:30
DateTime



150.380 170
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Below Turners Falls Dam
Station 1 Tailrace
Cabot Station
Montague
Location
11/02/2015 23:00:00
11/03/2015 02:00:00
11/03/2015 05:00:00
11/03/2015 08:00:00
11/03/2015 11:00:00
11/03/2015 14:00:00
11/03/2015 17:00:00
DateTime


150.380 178
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/08/2015 00:00:00
11/11/2015 00:00:00
11/14/2015 00:00:00
11/17/2015 00:00:00
11/20/2015 00:00:00
11/23/2015 00:00:00
11/26/2015 00:00:00
11/29/2015 00:00:00
12/02/2015 00:00:00
DateTime



150.380 180
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/15/2015 09:00:00
11/15/2015 21:00:00
11/16/2015 09:00:00
11/16/2015 21:00:00
11/17/2015 09:00:00
11/17/2015 21:00:00
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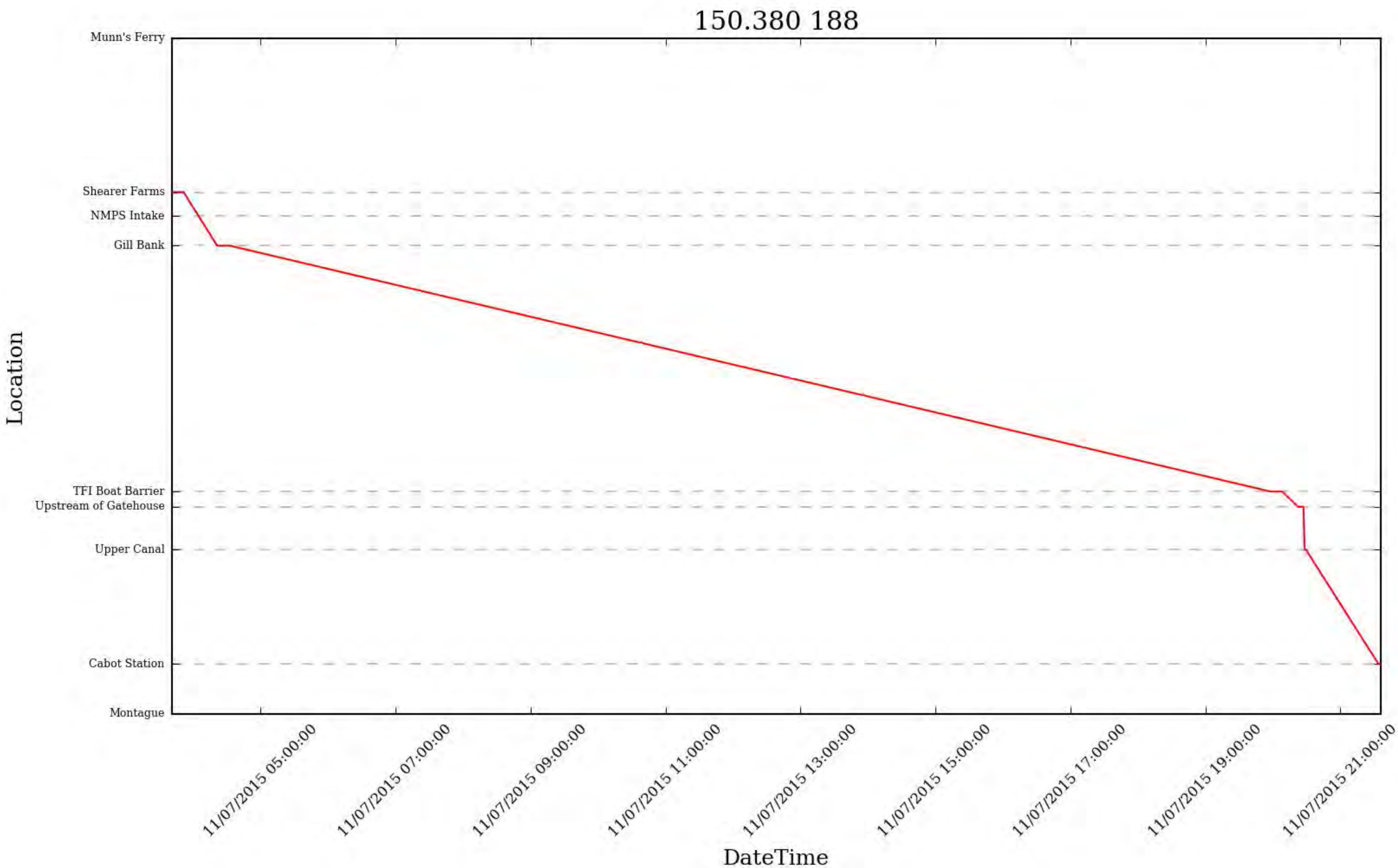
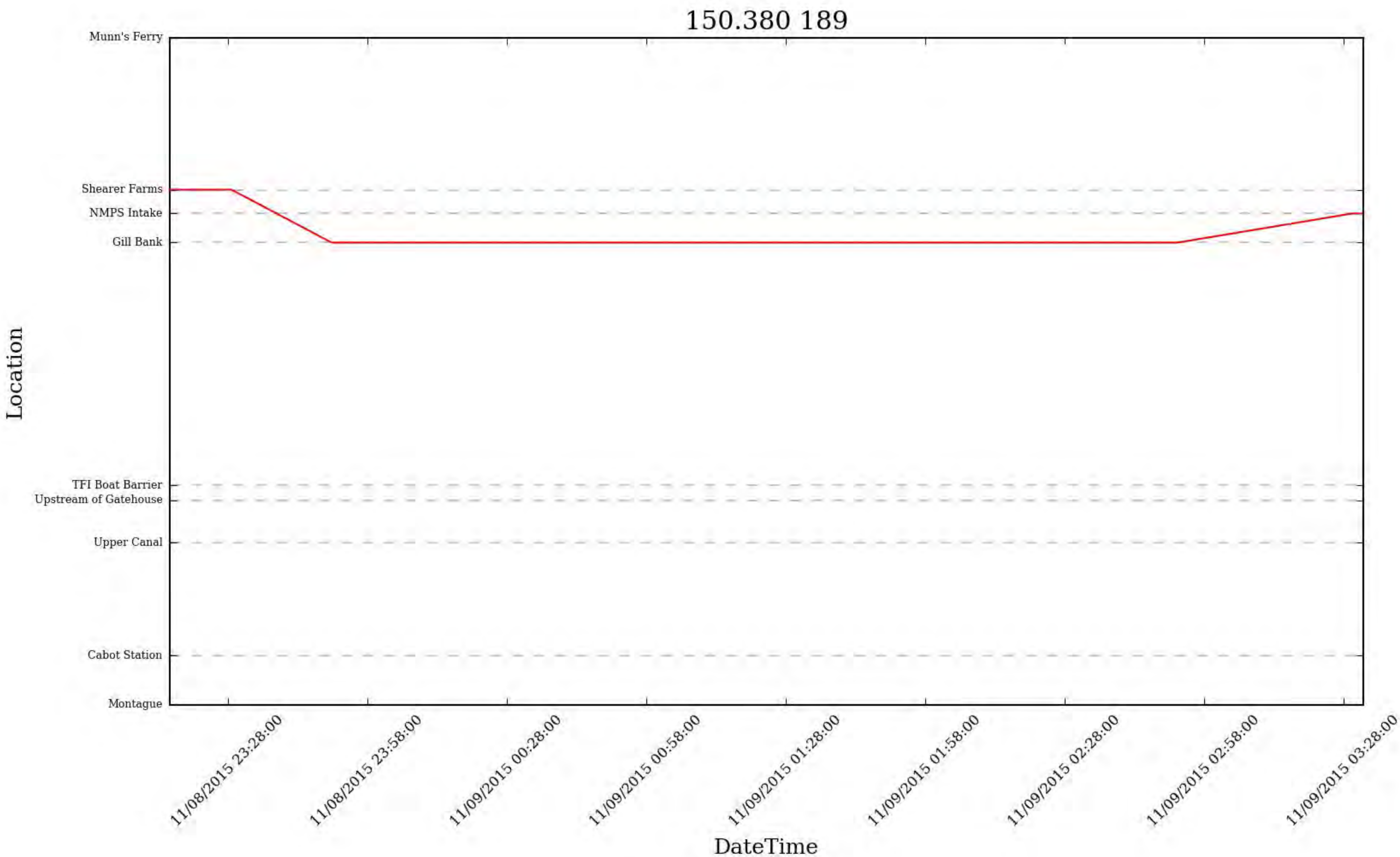
11/19/2015 21:00:00
DateTime

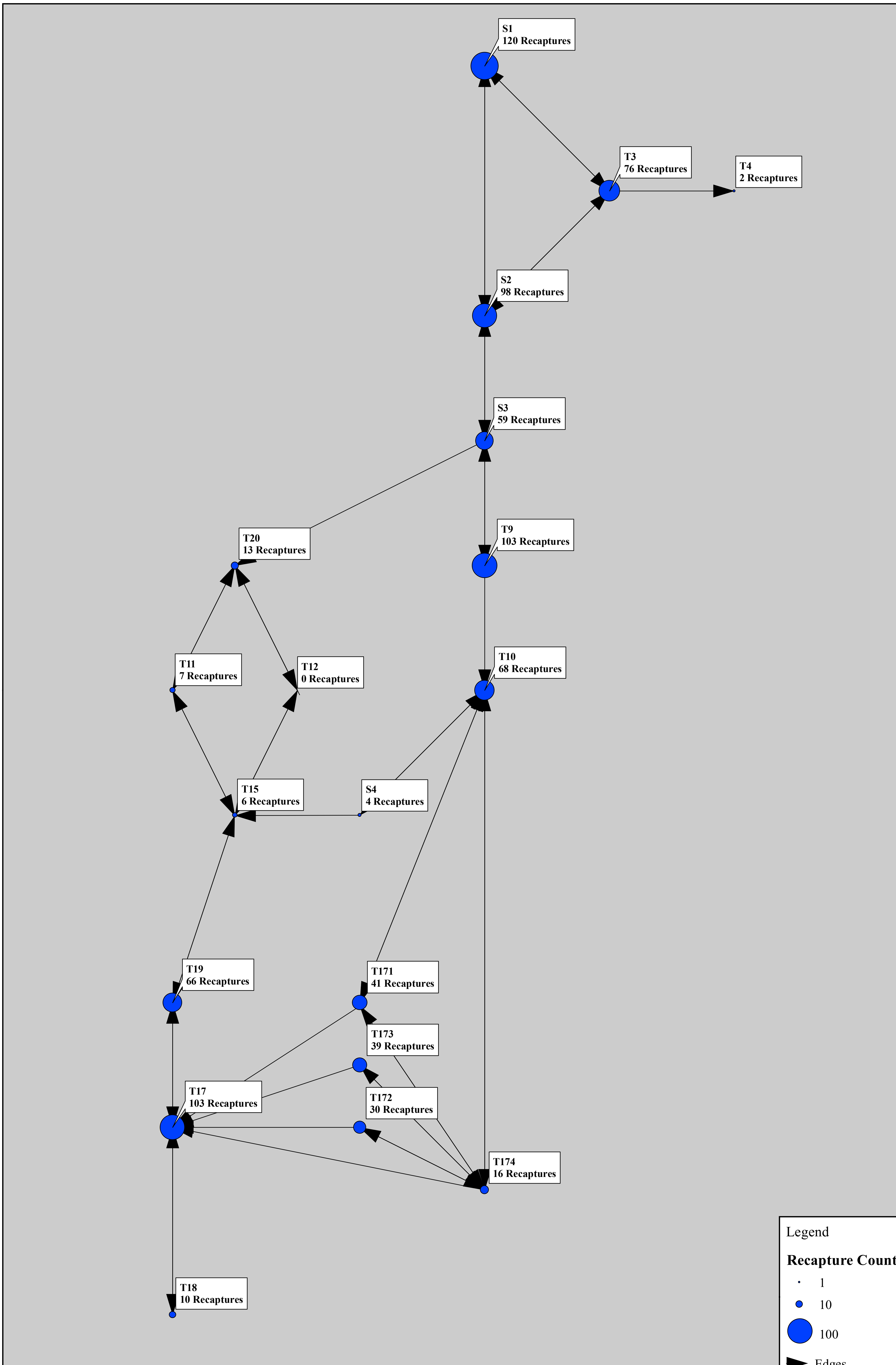


150.380 188
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/07/2015 05:00:00
11/07/2015 07:00:00
11/07/2015 09:00:00
11/07/2015 11:00:00
11/07/2015 13:00:00
11/07/2015 15:00:00
11/07/2015 17:00:00
11/07/2015 19:00:00
11/07/2015 21:00:00
DateTime



150.380 189
Munn's Ferry
Shearer Farms
NMPS Intake
Gill Bank
TFI Boat Barrier
Upstream of Gatehouse
Upper Canal
Cabot Station
Montague
Location
11/08/2015 23:28:00
11/08/2015 23:58:00
11/09/2015 00:28:00
11/09/2015 00:58:00
11/09/2015 01:28:00
11/09/2015 01:58:00
11/09/2015 02:28:00
11/09/2015 02:58:00
11/09/2015 03:28:00
DateTime

Attachment I to Study 3.3.5.
Figure 1: Number of eel recaptured at each station



FIRSTLIGHT HYDRO GENERATING COMPANY
Northfield Mountain Pumped Storage Project No. 2485
Turners Falls Hydroelectric Project No. 1889

Relicensing Study 3.3.5

FirstLight Power Resources

N

Figure 1: Number of eel recaptured at each station

Path: W:\gis\studies\3_3_5\maps\Study 3.3.5 Attachment I.mxd

Attachment J to Study 3.3.5.

The relationship between rainfall and discharge in river systems is complex, however discharge generally increases after rain events. TFI is a complex system, and there does not appear to be a clear relationship between spill over the bascule gates and cumulative daily rainfall (3.3.5 Attachment J - Figure 1). Other factors, such as the amount of water flowing through the Canal and the TFI water surface elevation, can have a strong influence on how much water spills over the bascule gates at any given time. 3.3.5 Attachment J - Figure 2 shows that initially there is not a strong relationship between total TFD discharge and bascule gate discharge, however as the Canal capacity is exceeded above 16,000 cfs, there is a clear inflection point, after which TFD discharge and bascule gate discharge appear to have a strong linear relationship. While this relationship does appear to exist at flows above 16,000 cfs, cumulative daily rainfall totals did not appear to be a strong driver of bascule gate flow during the 2015 study period (3.3.5 Attachment J - Figure 3).

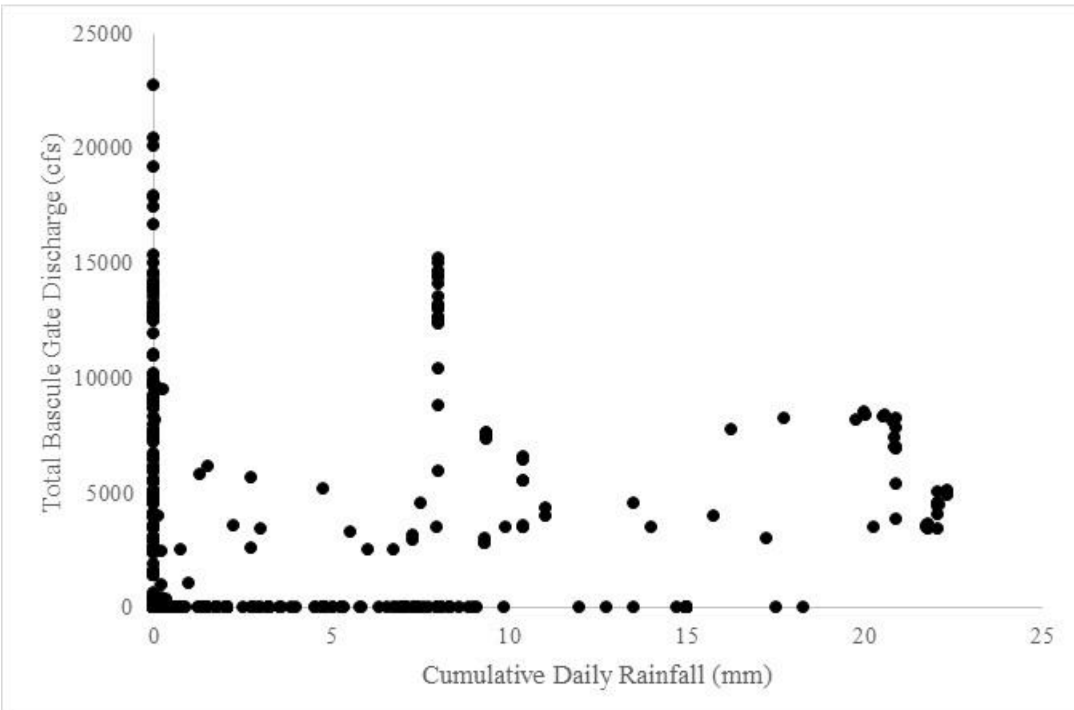


Figure 1: Cumulative daily rainfall vs. total bascule gate discharge between 10/25/15 and 12/31/15

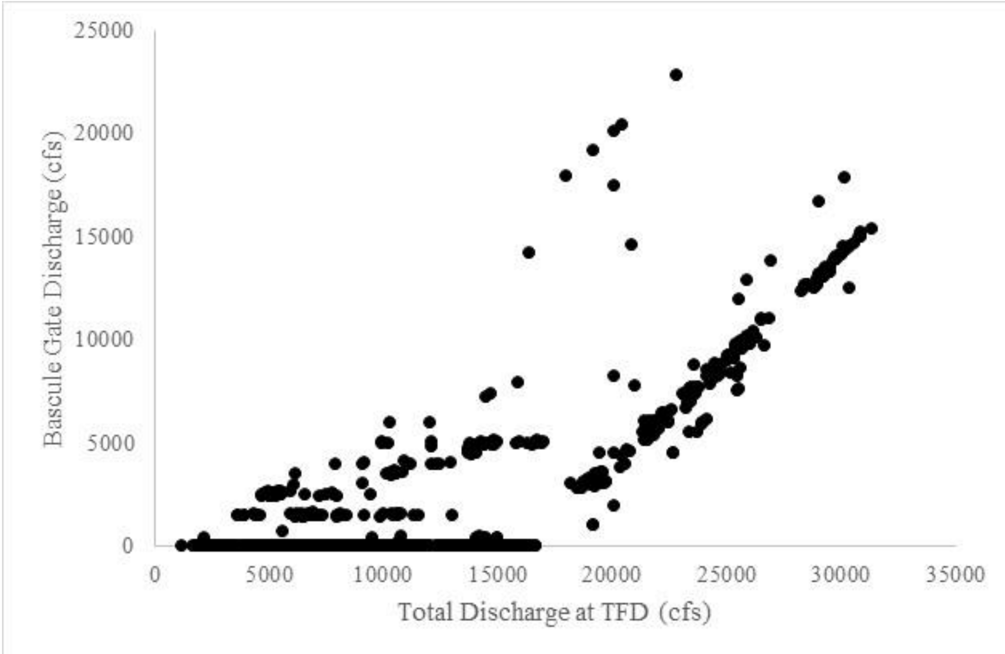


Figure 2: Total discharge at TFD vs. combined bascule gate discharge between 10/25/15 and 12/31/15

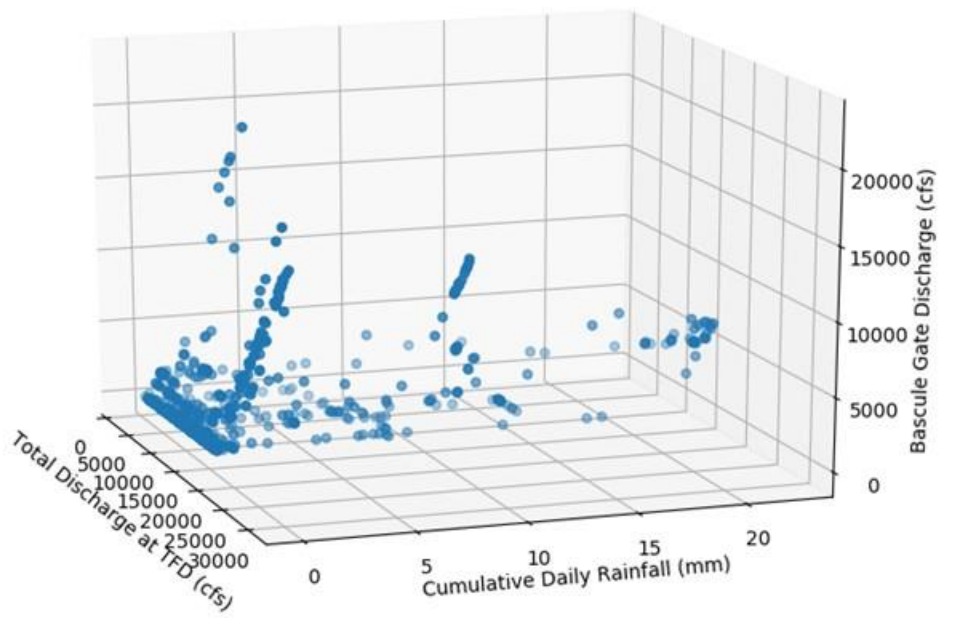


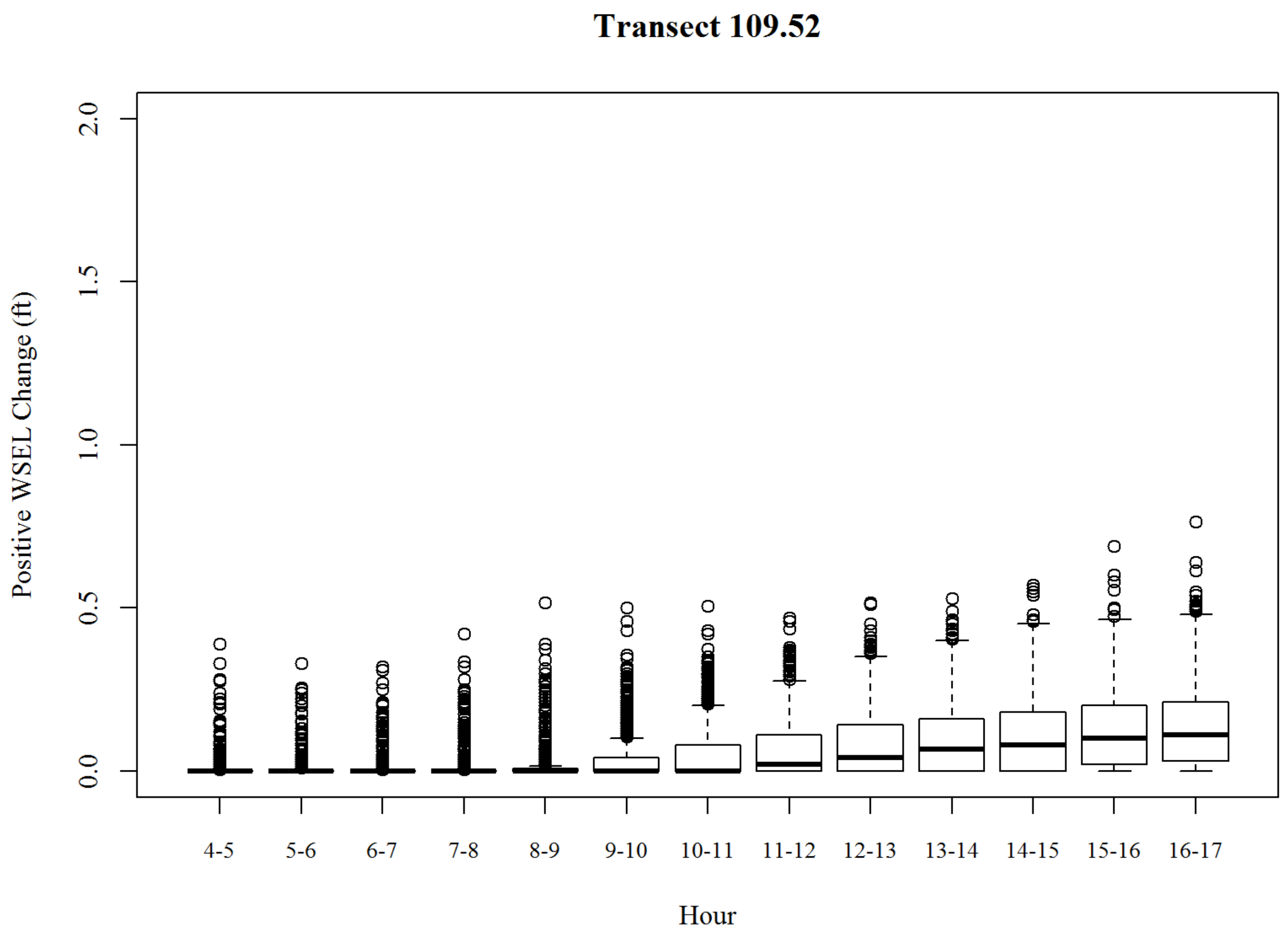
Figure 3: 3D plot of total discharge at TFD vs. cumulative daily rainfall vs. bascule gate discharge between 10/25/15 and 12/31/15.

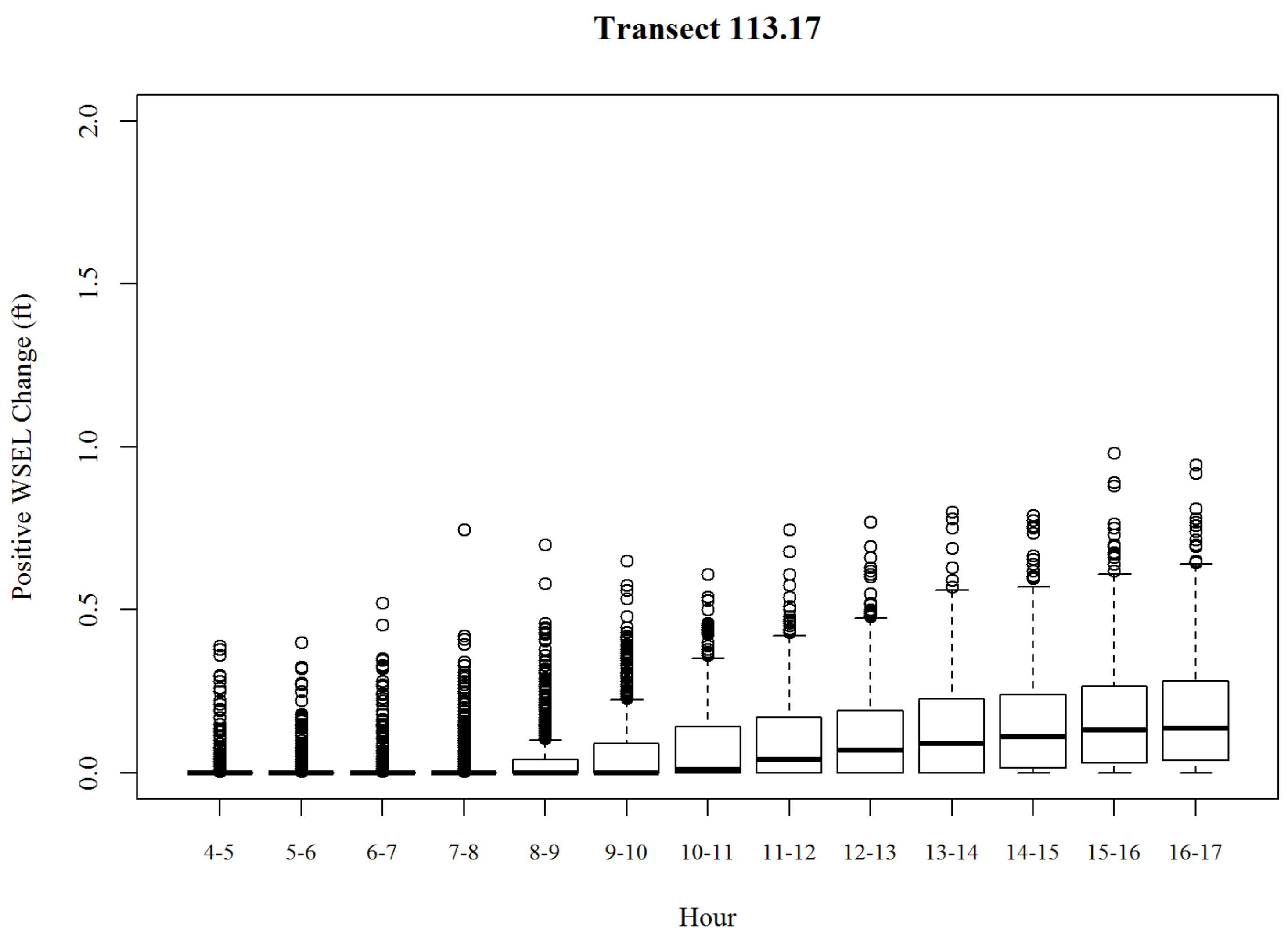
STUDY NO. 3.3.10 ATTACHMENTS

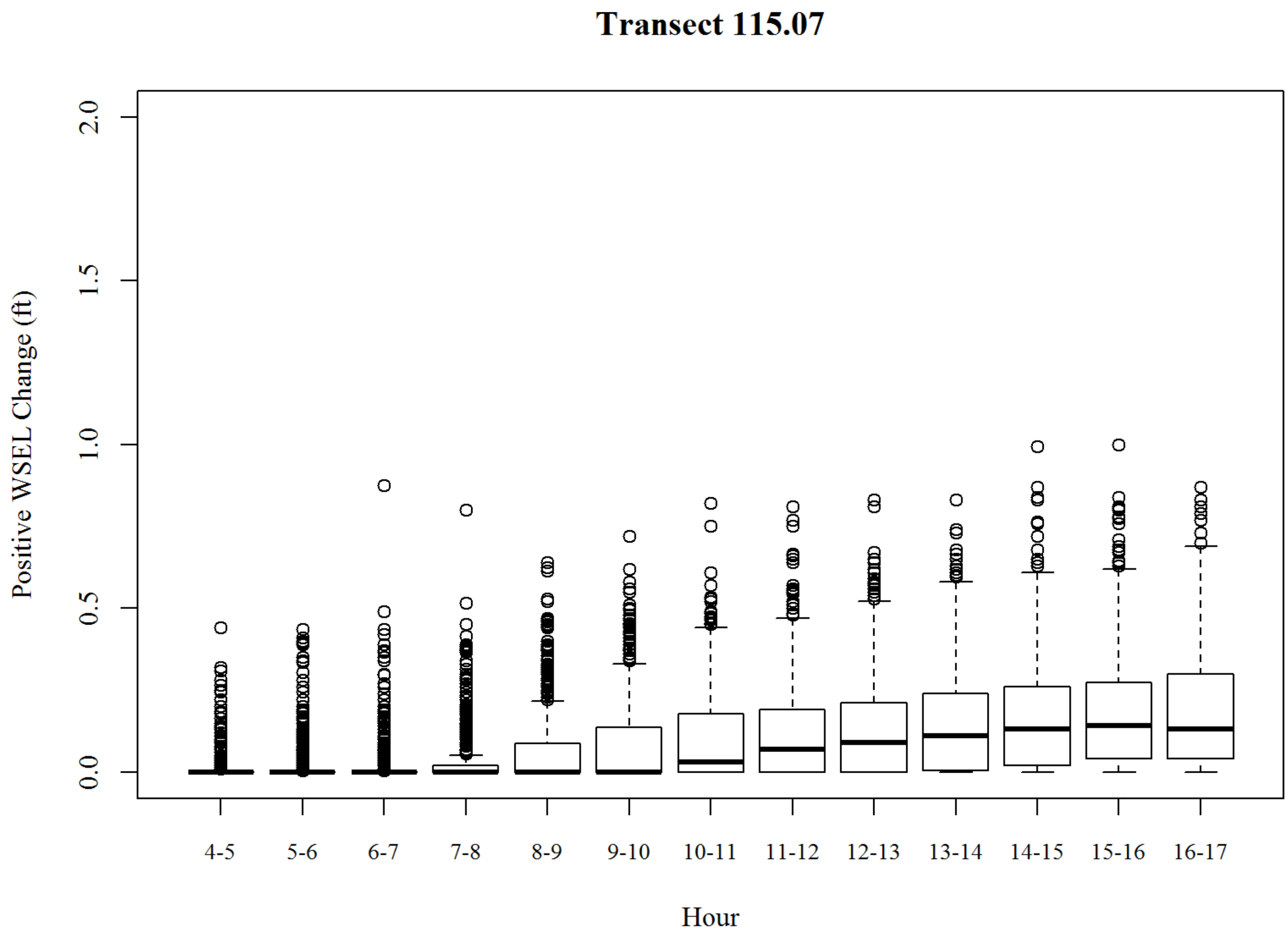
Attachment A to Study 3.3.10.
WSEL Boxplots for Odonate Study

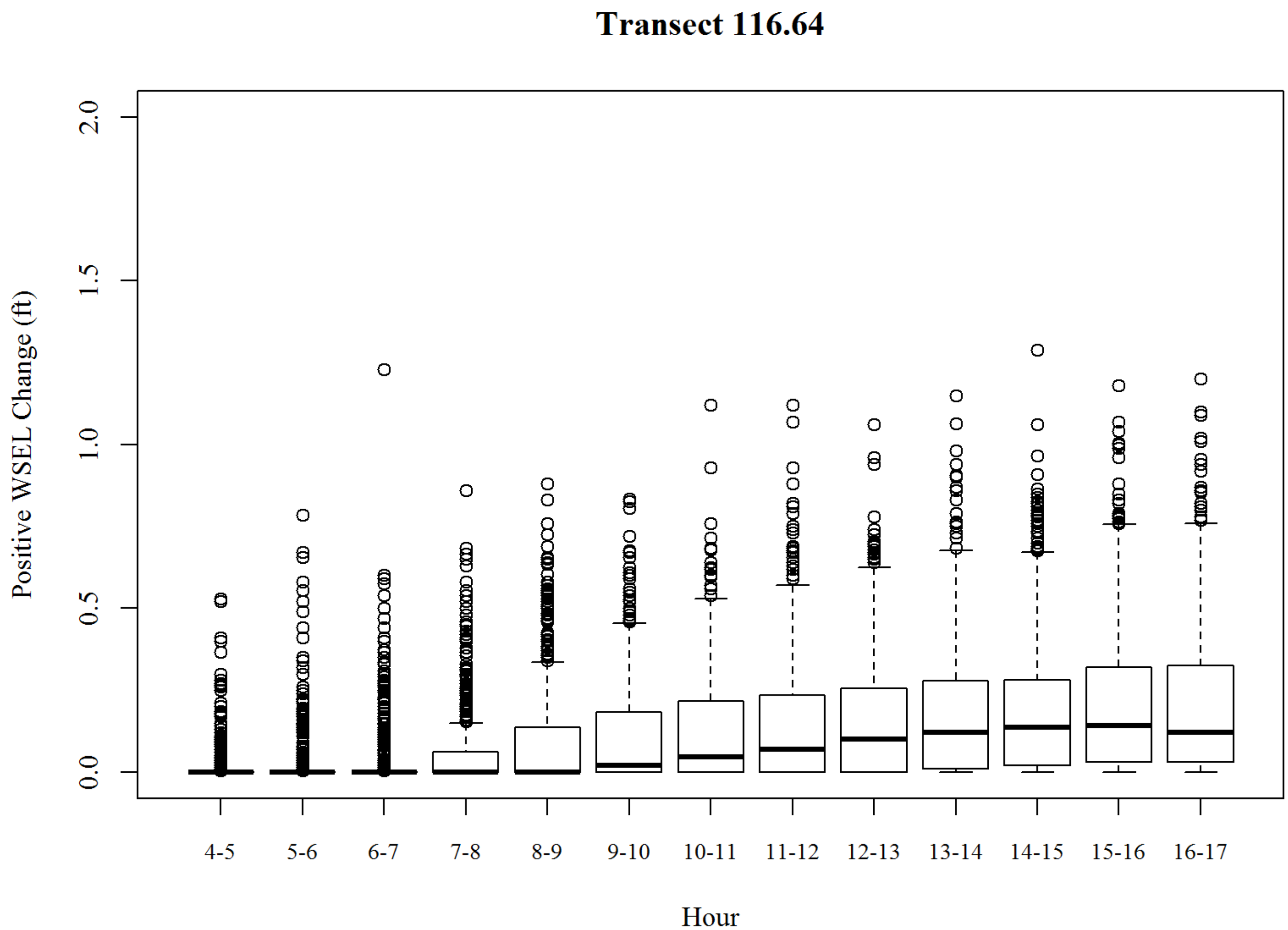
The boxplots below represent modeled positive hourly changes in water surface elevation at downstream (Transects 109.52 to 118.508) and upstream (Transects 2895 to 70507) locations. Values included in the dataset are from 4am to 5pm, May 15 to August 15. Downstream transect data were from years 2008-2015, and upstream transect data were from years 2000-2015, and the year 2010 was not included, consistent with the 2016 report.

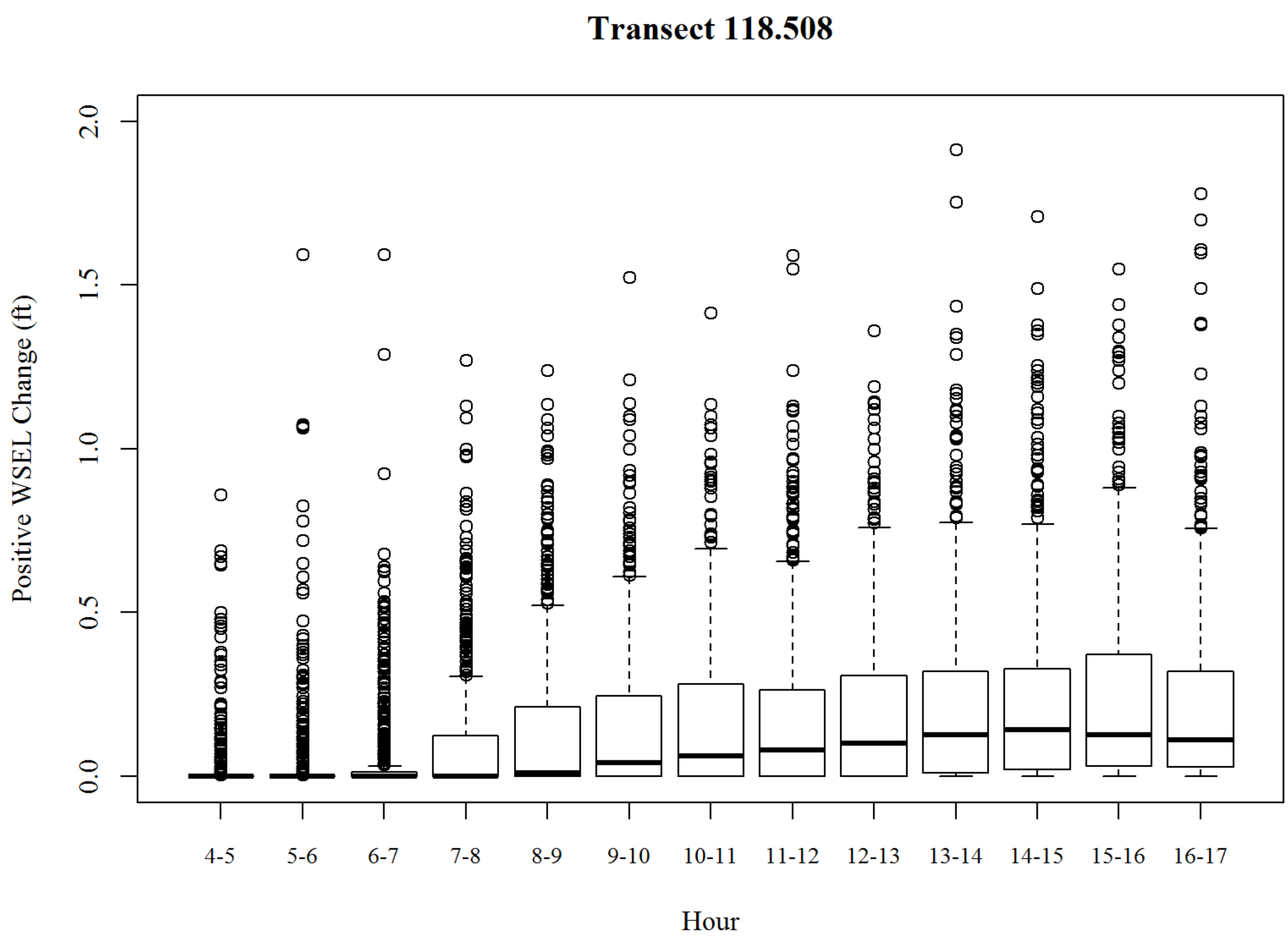
The boxplots show the median values (heavy center line in the box), along with the 25th and 75th percentile values (bottom and top edges of the box, respectively). The whiskers extend to the upper and lower adjacent values. The upper adjacent value is the value of the largest observation that is less than or equal to the upper quartile plus 1.5 times the length of the interquartile range. The lower adjacent value is the value of the smallest observation that is greater than or equal to the lower quartile less 1.5 times the length of the interquartile range. Outside values, sometimes referred to as outliers, are shown individually as points.


Transcect 109.52
Positive WSEL Change (ft)
0.0
0.5
1.0
1.5
2.0
4-5
5-6
6-7
7-8
8-9
9-10
10-11
11-12
12-13
13-14
14-15
15-16
16-17
Hour


Transect 113.17
Positive WSEL Change (ft)
0.0
0.5
1.0
1.5
2.0
4-5
5-6
6-7
7-8
8-9
9-10
10-11
11-12
12-13
13-14
14-15
15-16
16-17
Hour


Transcect 115.07
Positive WSEL Change (ft)
0.0
0.5
1.0
1.5
2.0
4-5
5-6
6-7
7-8
8-9
9-10
10-11
11-12
12-13
13-14
14-15
15-16
16-17
Hour


Transect 116.64
Positive WSEL Change (ft)
0.0
0.5
1.0
1.5
2.0
4-5
5-6
6-7
7-8
8-9
9-10
10-11
11-12
12-13
13-14
14-15
15-16
16-17
Hour


Transect 118.508
Positive WSEL Change (ft)
0.0
0.5
1.0
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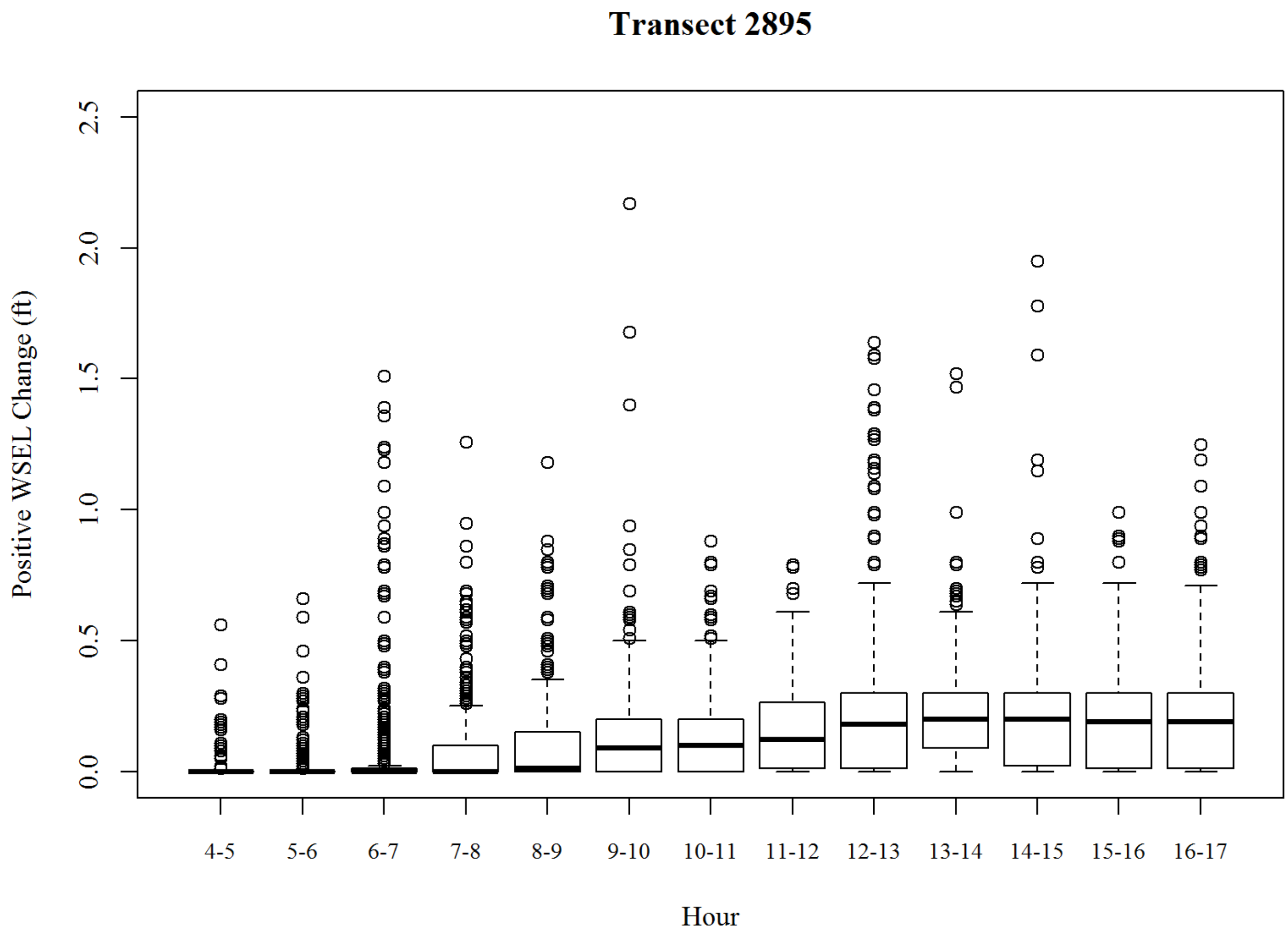
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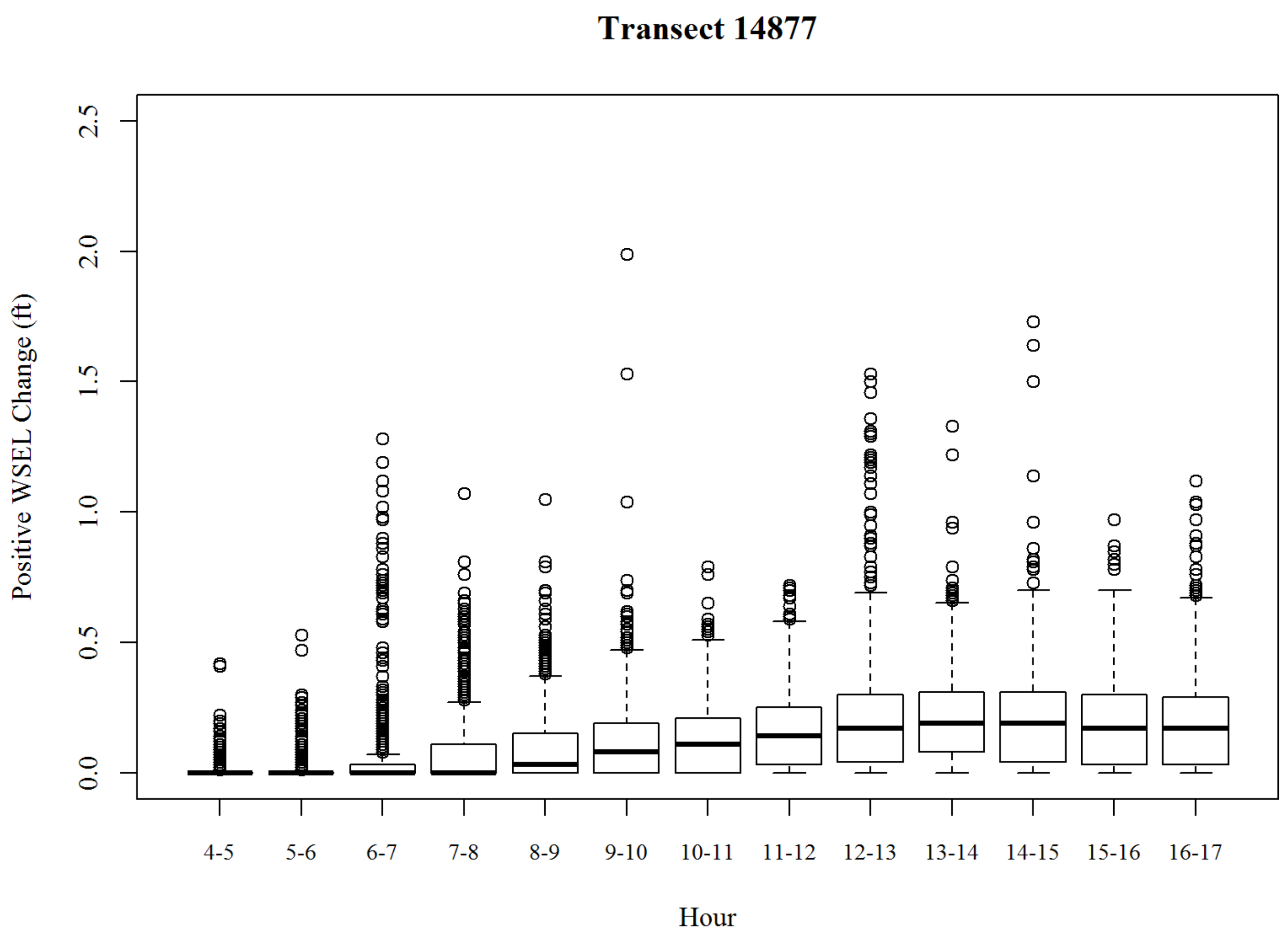
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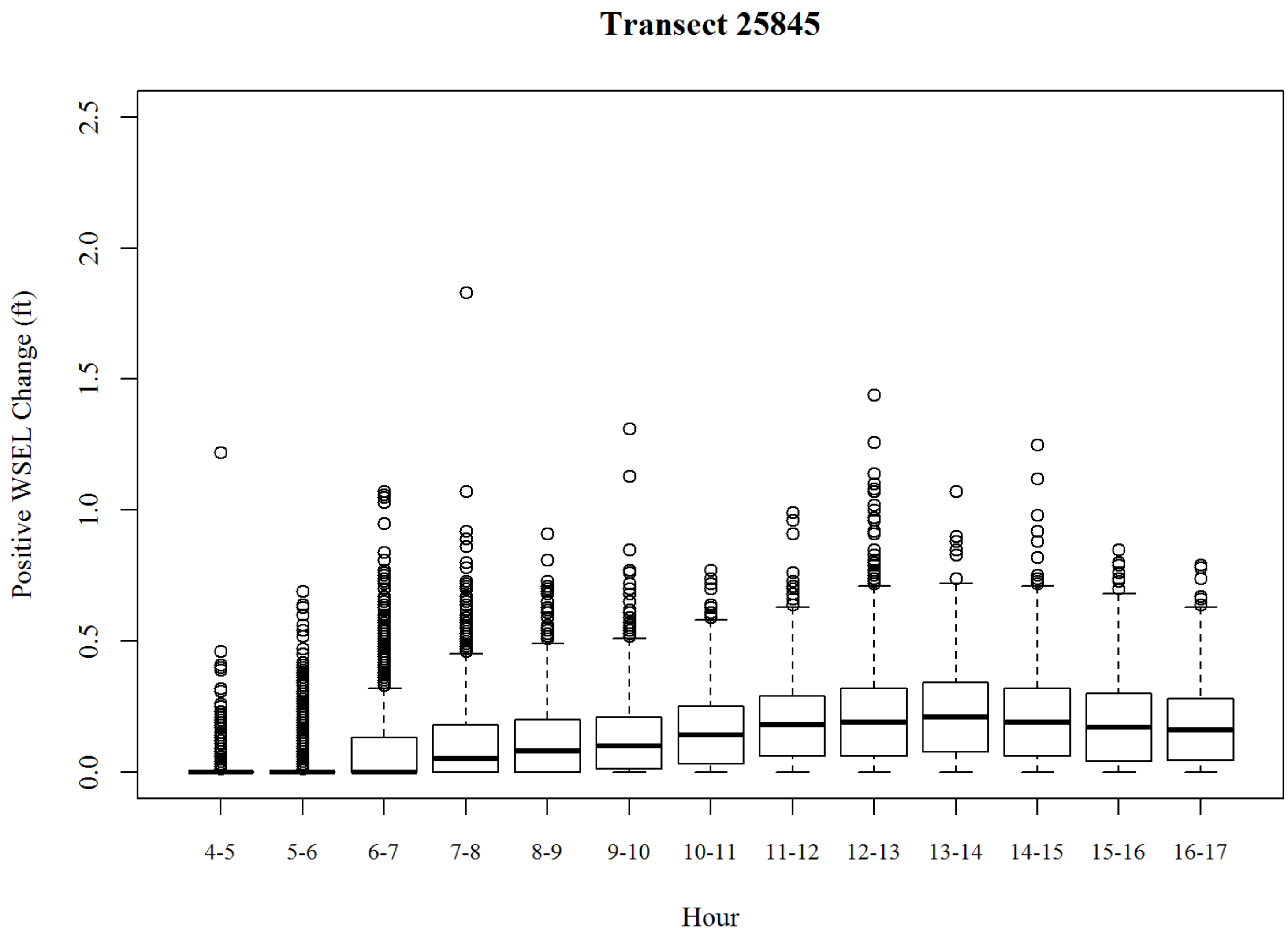
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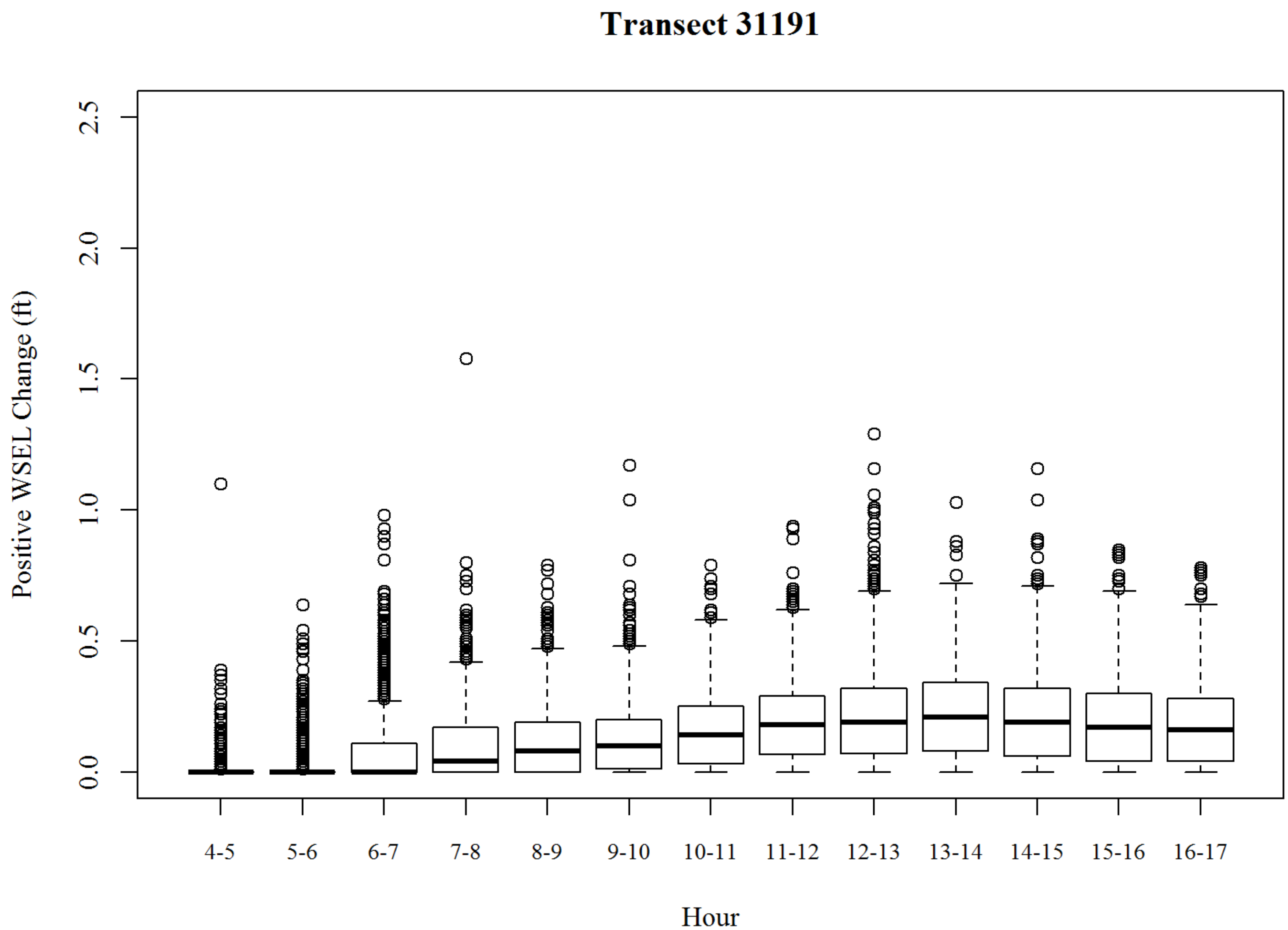
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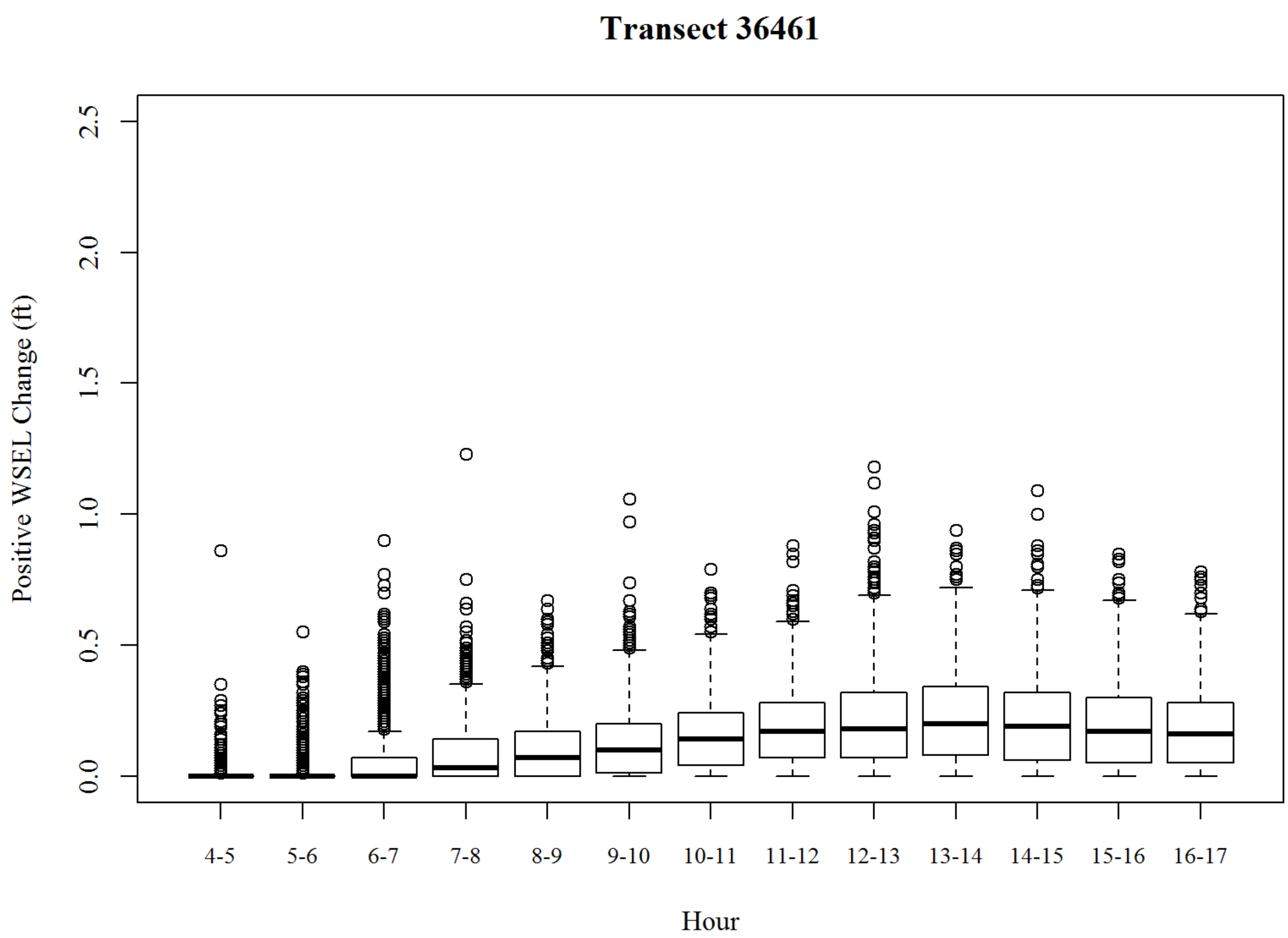
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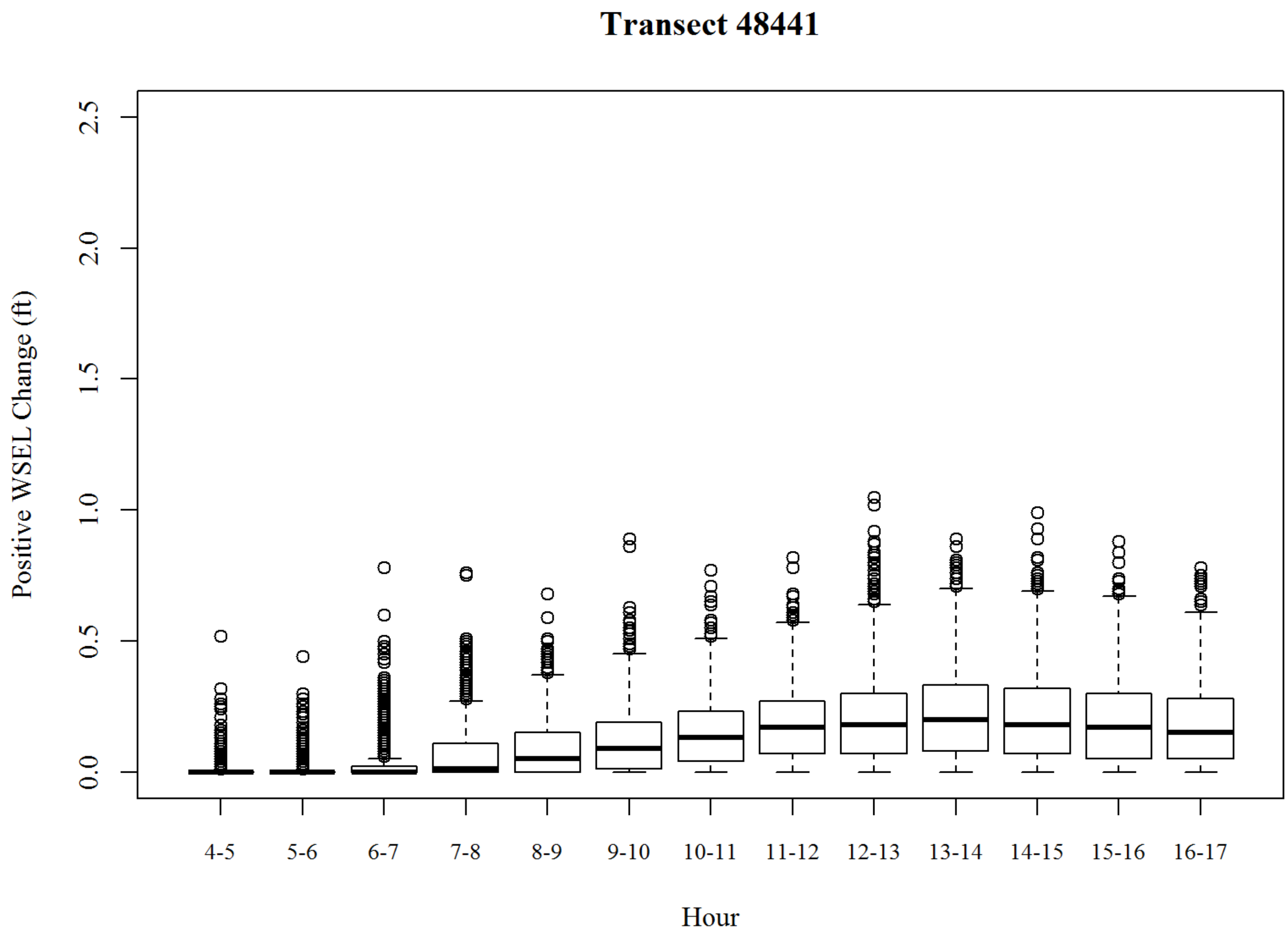
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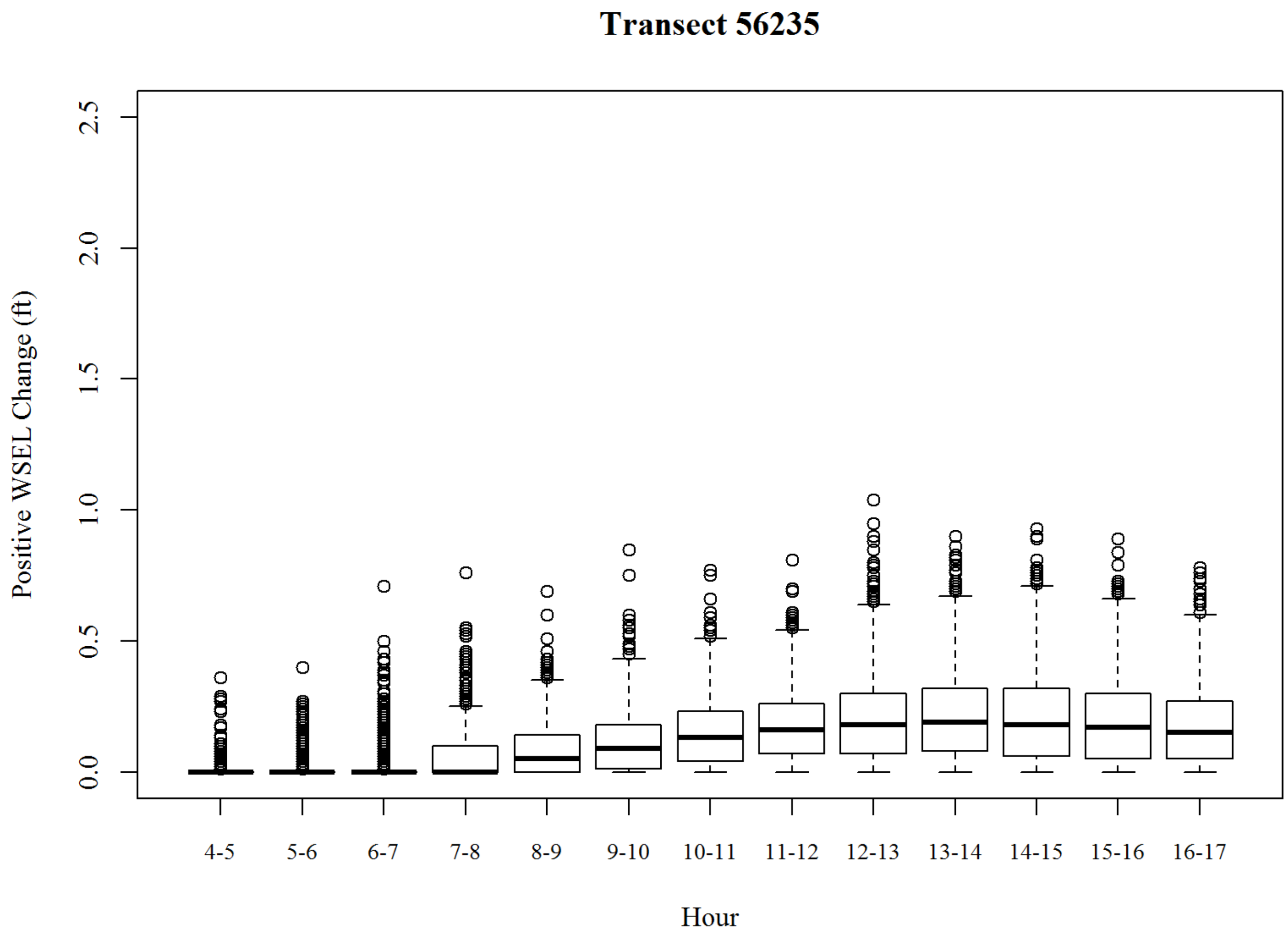
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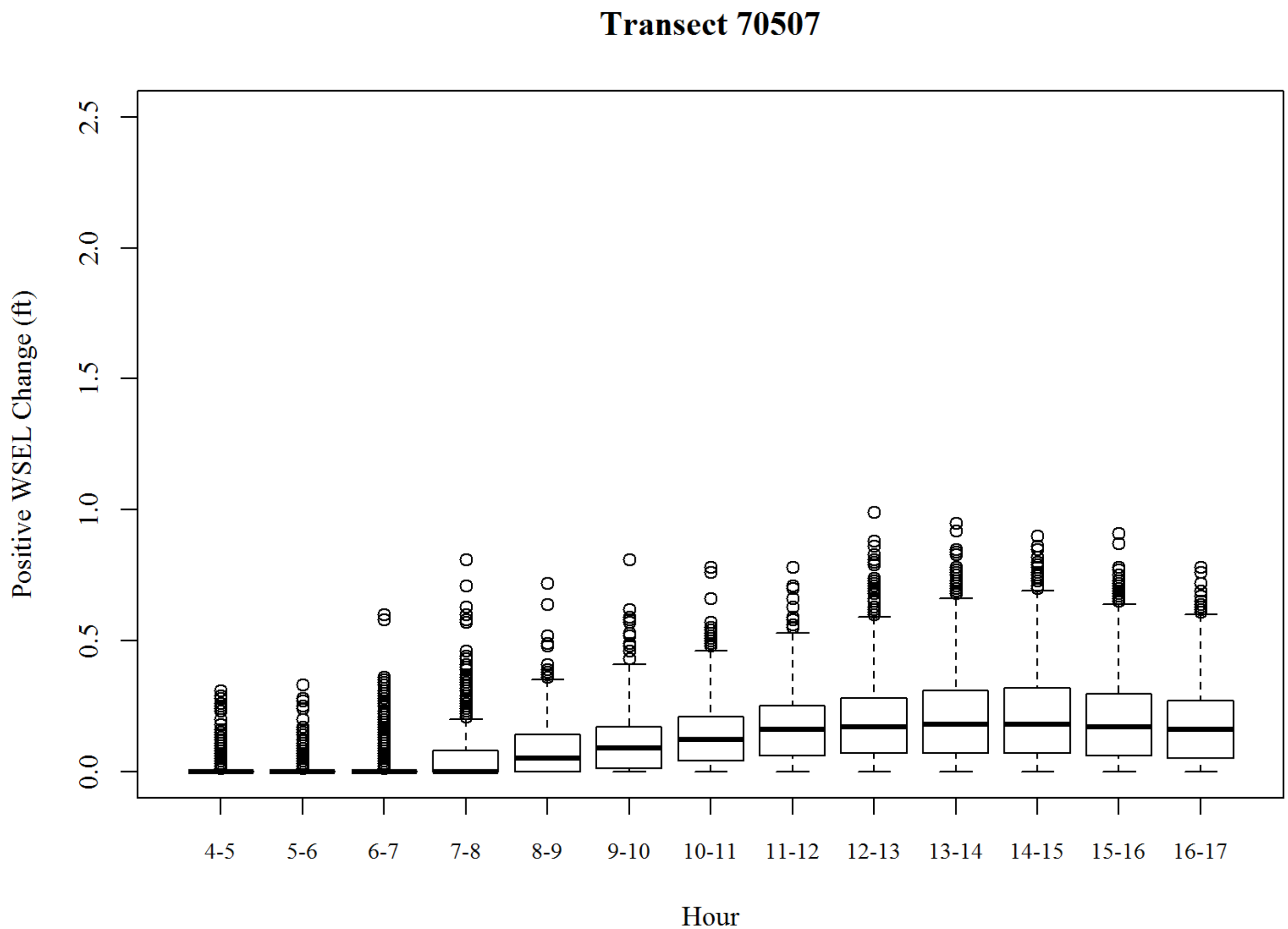
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Hour

Attachment B to Study 3.3.10.
Appendix 5 (2015) Excel file

Attachment C to Study 3.3.10.
Appendix E and F Excel file

STUDY NO. 3.3.19 ATTACHMENTS

Attachment A to Study 3.3.19.

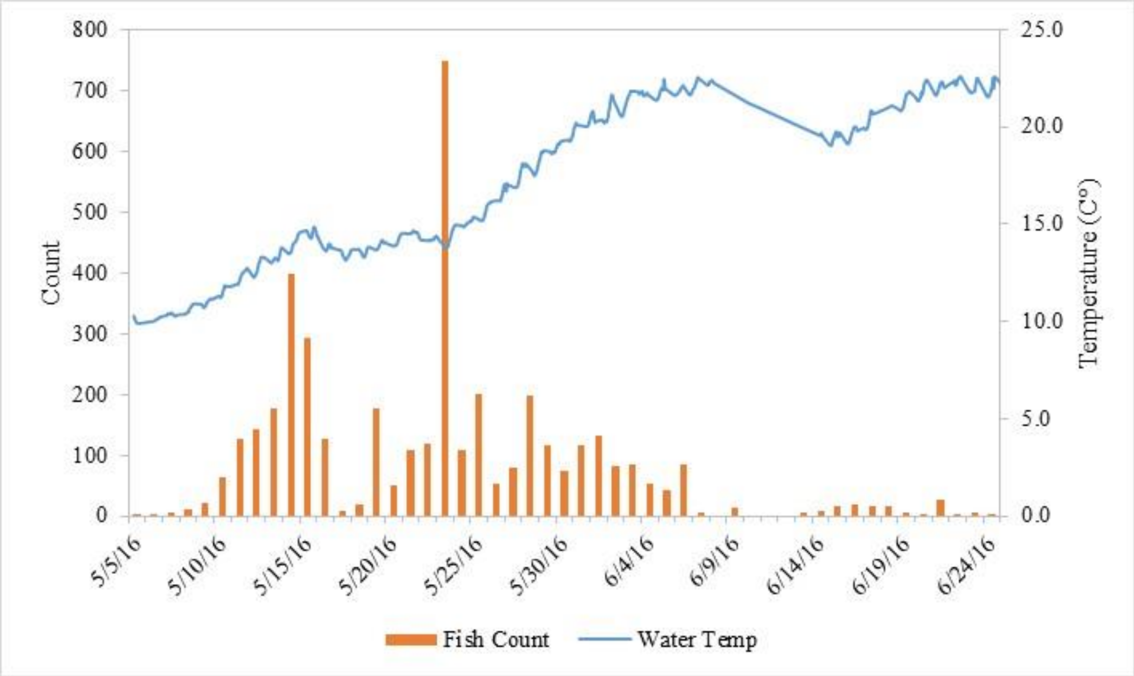

Figure CRC-1. DIDSON American shad counts at the Cabot fishway entrance and water temperatures in the Turners Falls Power Canal.

Attachment B to Study 3.3.19.

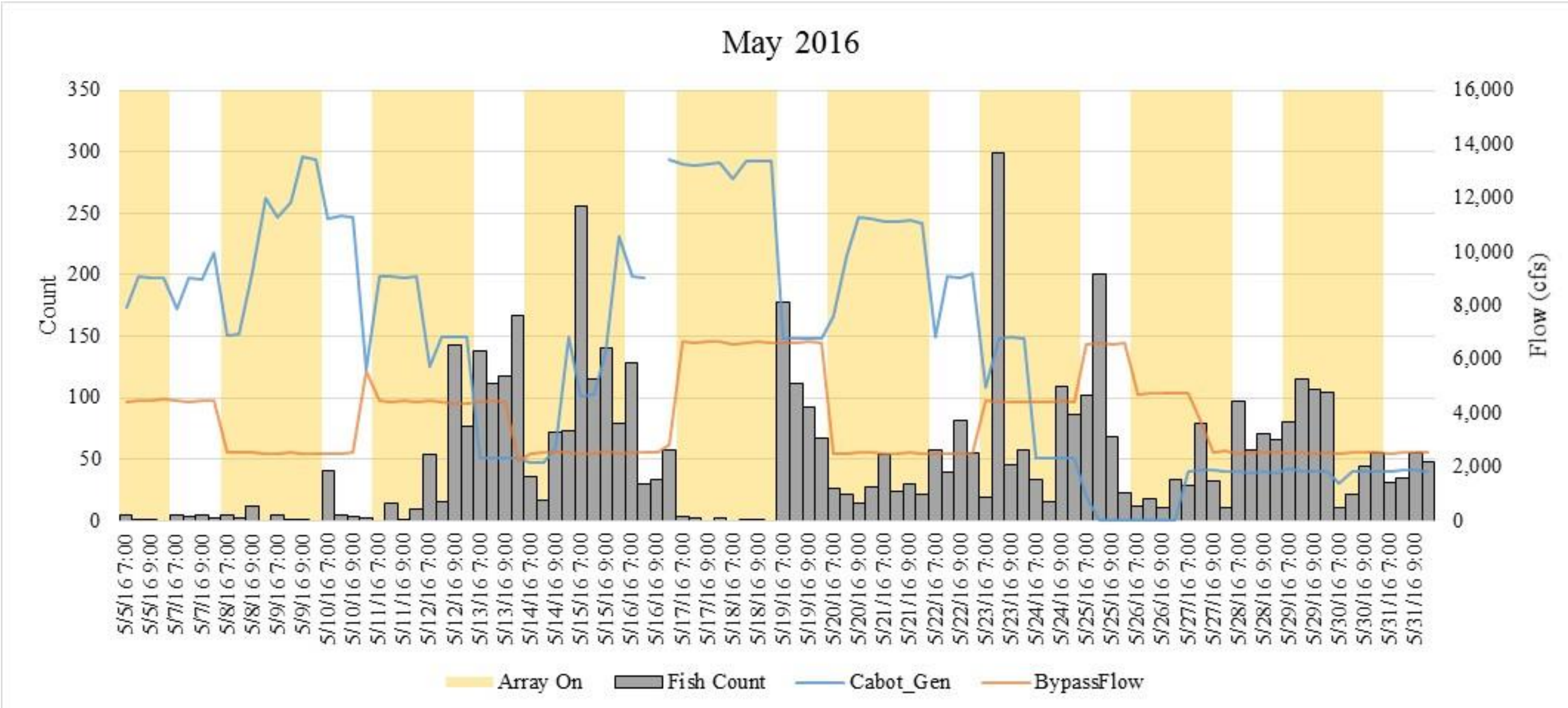

Figure 9: Flows (cfs) from the Bypass and Cabot Station and the number of shad observed during the hours between 7AM and 10AM each day in May.

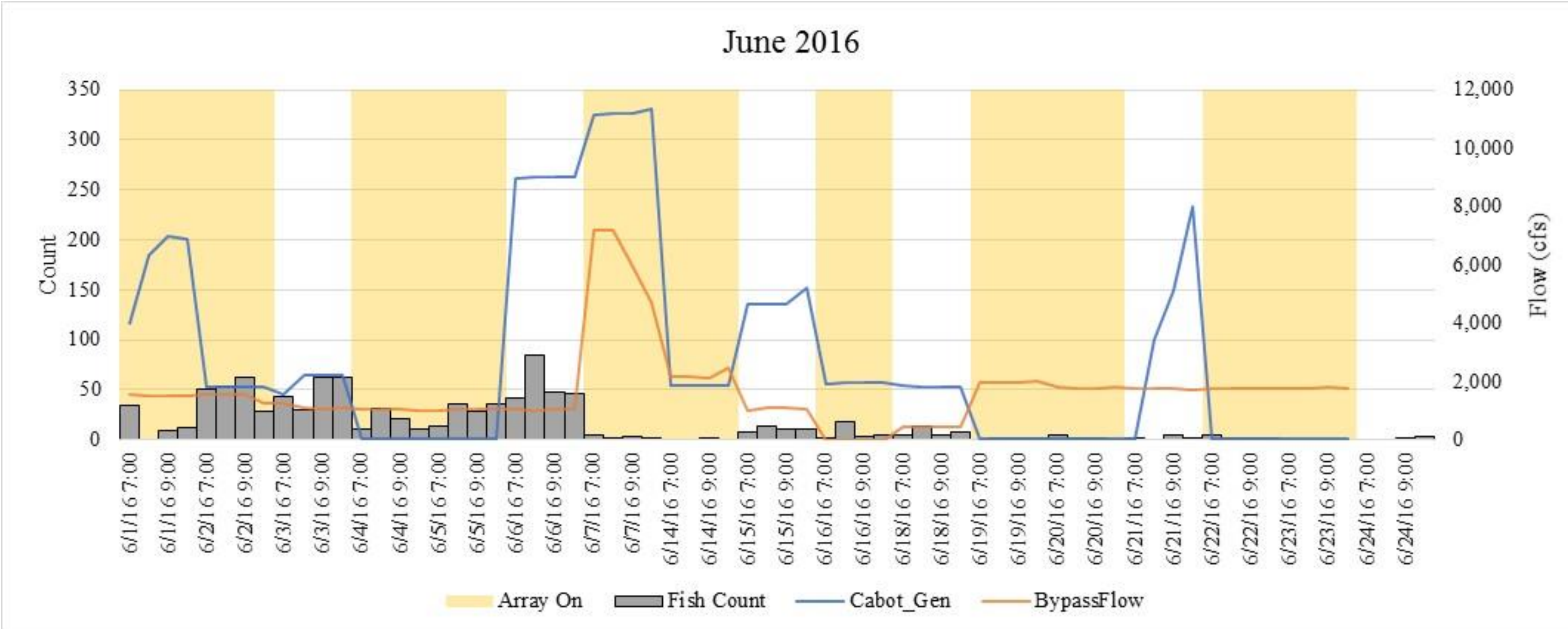

Figure 2: Flows (cfs) from the Bypass and Cabot Station and the number of shad observed during the hours between 7AM and 10AM each day in June.

Attachment C to Study 3.3.19.
Ultrasound Array (Shad moving from the Tailrace upstream)

Table 1 represents the conditions experienced by the 29 fish that moved upstream from the tailrace during the ultrasound study. The reason there are more than 29 movements upstream from the tailrace is because some fish make multiple attempts or transitions upstream from the tailrace. Table 2 represents the conditions experienced by the fish that moved upstream from the tailrace when the array was on. Again, some fish made multiple attempts or transitions upstream from the tailrace. In total, there were only 5 fish (149.740 119, 149.780 135, 149.780 97, 150.420 193 and 150.460 178) that made it all the way to Spillway Ladder entrance.

The summary of the Cox Proportional hazard regression models for upstream movement out of the tailrace are described in the report (Section 4.4.4.1). Additional covariates were modeled and summarized (Table 3) and included water temperature, Station No.1 operations, TFD Spill, the interaction between TFD Spill and Station No.1 and the interaction between water temperature and Bypass flow. The best model (Model 3) incorporated TFD Spill flow (kcfs) and the model was highly significant (LR=0.006). The effect of Spill on upstream movement into the bypass was also highly significant (p=0.002) and the hazard ratio (1.33) suggests that fish are 1.33 more times likely to move upstream from Cabot Station tailrace when spill increases at TFD.

Table 4 represents the summary of time it took 29 fish to move from the tailrace to the Bypass (T8) and from the tailrace to the Spillway Ladder (T10).

Table 1: Summary of conditions for all adult shad that moved upstream from the tailrace, n=36

Frequency and Code	Release Date and Time	Date and Time	Cabot Generation (cfs)	Montague Gage (cfs)	No1 Station Generation (cfs)	TFD Spill (cfs)
149.740 112	5/24/2016 12:00:00 PM	5/27/2016 21:00	4625.04	12300	0	2537.25
149.780 129	5/24/2016 12:00:00 PM	5/28/2016 7:00	1804.41	6190	0	2499.5
150.460 178	5/13/2016 12:55:00 PM	5/28/2016 7:00	1804.41	6190	0	2499.5
150.420 163	5/20/2016 1:00:00 PM	5/28/2016 11:00	1813.26	6290	0	2590.75
150.420 138	5/17/2016 2:40:00 PM	5/28/2016 16:00	6925.39	6010	0	2532.25
150.420 195	5/13/2016 12:55:00 PM	5/29/2016 6:00	763.83	4610	0	2482.25
149.740 119	5/24/2016 12:00:00 PM	5/29/2016 7:00	1937.25	4440	0	2472.75
150.420 152	5/18/2016 11:58:00 AM	5/29/2016 15:00	1830.97	6030	0	2563.5
149.780 134	5/24/2016 12:00:00 PM	5/29/2016 20:00	1811.05	5890	0	2550
149.780 135	5/24/2016 12:00:00 PM	5/30/2016 10:00	1804.41	6090	0	2536.25
149.740 120	5/24/2016 12:00:00 PM	5/30/2016 13:00	1797.76	6190	0	2552
149.780 136	5/24/2016 12:00:00 PM	5/30/2016 19:00	6894.39	10600	0	2502.25
150.420 177	5/24/2016 1:30:00 PM	6/4/2016 6:00	17.71	2070	0	1007.75
150.420 188	5/27/2016 1:10:00 PM	6/5/2016 8:00	17.71	2270	0	1039.25
150.420 177	5/24/2016 1:30:00 PM	6/7/2016 4:00	11070	22600	2186.54	8181
149.780 134	5/24/2016 12:00:00 PM	6/7/2016 5:00	11003.58	23600	2182.83	7819.25
149.740 120	5/24/2016 12:00:00 PM	6/7/2016 8:00	11187.34	22800	2193.95	5009.75
150.420 180	5/27/2016 1:10:00 PM	6/7/2016 11:00	11337.89	21200	2205.07	2542.5
150.420 146	5/18/2016 11:58:00 AM	6/19/2016 14:00	1753.48	3860	0	453
149.740 20	5/4/2016 1:00:00 PM	5/11/2016 11:00	9084.04	16200	0	4399.5
149.780 48	5/4/2016 1:00:00 PM	5/12/2016 16:00	6841.26	14400	0	4430
149.740 20	5/4/2016 1:00:00 PM	5/12/2016 23:00	6201.41	13600	0	4416.75
149.740 24	5/4/2016 1:00:00 PM	5/19/2016 15:00	6785.91	16100	2186.54	4430.75
149.740 25	5/4/2016 1:00:00 PM	5/10/2016 16:00	6830.19	13100	0	2476.5
149.780 35	5/4/2016 1:00:00 PM	5/14/2016 8:00	2163.07	7490	0	2541.25
149.780 40	5/4/2016 1:00:00 PM	5/14/2016 22:00	6836.83	11800	0	2528.75
149.780 40	5/4/2016 1:00:00 PM	5/15/2016 2:00	3923.2	12100	0	2493.75
149.780 97	5/17/2016 10:51:00 AM	5/24/2016 9:00	2335.77	8930	0	4445.5
150.420 115	5/11/2016 2:19:00 PM	5/25/2016 15:00		8690	2208.77	2551.25
150.420 193	5/13/2016 12:55:00 PM	5/26/2016 4:00	17.71	6500	2197.65	2506.5
149.740 90	5/17/2016 10:51:00 AM	5/27/2016 8:00	1866.4	8690	1197.03	2532.25

Frequency and Code	Release Date and Time	Date and Time	Cabot Generation (cfs)	Montague Gage (cfs)	No1 Station Generation (cfs)	TFD Spill (cfs)
149.740 61	5/10/2016 3:52:00 PM	5/27/2016 12:00	1833.19	6840	0	2554.25
150.420 152	5/18/2016 11:58:00 AM	5/27/2016 18:00	11333.46	14300	0	2494.25
149.780 40	5/4/2016 1:00:00 PM	5/7/2016 11:00	11089.92	16800	0	4402.25
149.780 44	5/4/2016 1:00:00 PM	5/8/2016 11:00	13461.12	15000	0	2546
149.780 46	5/4/2016 1:00:00 PM	5/7/2016 7:00	7897.33	14500	0	4445.75

Table 2: Summary of conditions for all adult shad that moved upstream from the tailrace when the ultrasound array was on, n=22

Frequency and Code	Release Date and Time	Date and Time	Cabot Generation (cfs)	Montague Gage (cfs)	No1 Station Generation (cfs)	TFD Spill (cfs)
149.740 112	5/24/2016 12:00:00 PM	5/27/2016 21:00	4625.04	12300	0	2537.25
149.740 119	5/24/2016 12:00:00 PM	5/29/2016 7:00	1937.25	4440	0	2472.75
150.420 152	5/18/2016 11:58:00 AM	5/29/2016 15:00	1830.97	6030	0	2563.5
149.780 134	5/24/2016 12:00:00 PM	5/29/2016 20:00	1811.05	5890	0	2550
149.780 135	5/24/2016 12:00:00 PM	5/30/2016 10:00	1804.41	6090	0	2536.25
149.740 120	5/24/2016 12:00:00 PM	5/30/2016 13:00	1797.76	6190	0	2552
149.780 136	5/24/2016 12:00:00 PM	5/30/2016 19:00	6894.39	10600	0	2502.25
150.420 188	5/27/2016 1:10:00 PM	6/5/2016 8:00	17.71	2270	0	1039.25
149.740 120	5/24/2016 12:00:00 PM	6/7/2016 8:00	11187.34	22800	2193.95	5009.75
150.420 180	5/27/2016 1:10:00 PM	6/7/2016 11:00	11337.89	21200	2205.07	2542.5
150.420 146	5/18/2016 11:58:00 AM	6/19/2016 14:00	1753.48	3860	0	453
149.740 20	5/4/2016 1:00:00 PM	5/11/2016 11:00	9084.04	16200	0	4399.5
149.780 48	5/4/2016 1:00:00 PM	5/12/2016 16:00	6841.26	14400	0	4430
149.740 20	5/4/2016 1:00:00 PM	5/12/2016 23:00	6201.41	13600	0	4416.75

Frequency and Code	Release Date and Time	Date and Time	Cabot Generation (cfs)	Montague Gage (cfs)	No1 Station Generation (cfs)	TFD Spill (cfs)
149.780 35	5/4/2016 1:00:00 PM	5/14/2016 8:00	2163.07	7490	0	2541.25
149.780 40	5/4/2016 1:00:00 PM	5/14/2016 22:00	6836.83	11800	0	2528.75
149.780 40	5/4/2016 1:00:00 PM	5/15/2016 2:00	3923.2	12100	0	2493.75
149.780 97	5/17/2016 10:51:00 AM	5/24/2016 9:00	2335.77	8930	0	4445.5
149.740 90	5/17/2016 10:51:00 AM	5/27/2016 8:00	1866.4	8690	1197.03	2532.25
149.740 61	5/10/2016 3:52:00 PM	5/27/2016 12:00	1833.19	6840	0	2554.25
150.420 152	5/18/2016 11:58:00 AM	5/27/2016 18:00	11333.46	14300	0	2494.25
149.780 44	5/4/2016 1:00:00 PM	5/8/2016 11:00	13461.12	15000	0	2546

Table 3: Cox Proportional Hazard Regression model outputs for shad that moved upstream from the tailrace

Model Number	Covariates	AIC	LR Test	Hazard Ratio	SE	P	(+/-)
1	Water Temperature	229.48	0.1	0.99	0.005	0.1	(0.98,1.00)
2	Station No.1 Ops (kcfs)	229.10	0.08	1.42	0.19	0.06	(0.98,2.05)
3	TFD Spill (kcfs)	224.52	0.006	1.33	0.09	0.002	(1.11,1.6)
4	TFD Spill (kcfs)	224.53	0.008	1.76	0.19	0.003	(1.21,2.55)
	Station No.1 Ops (kcfs)			2.35	0.44	0.05	(0.99,5.63)
	Spill:Station No.1 Ops			0.80	0.11	0.05	(0.65,0.99)
5	Bypass Flow (kcfs)	226.6	0.02	1.07	0.27	0.79	(0.63,1.83)
	Water Temp			0.99	0.01	0.27	(0.97,1.01)
	Bypass Flow:Water Temp			1.00	0.002	0.59	(0.99,1.01)

Table 4: Summary of migration time (hours) to T8 and to T10 from the Tailrace for 29 fish that moved upstream from the array

Movement	Min	25%	Median	75%	Max
Tailrace to Bypass (T8)	0 h, 0.75 min	0 h, 4.5 min	0 hour, 7.5 min	0 h, 21.3 min	15 h, 58 min
Bypass to Spillway Ladder (T10)	0 h, 10 min	0 h, 13.5 min	0 h, 20 min	1 h , 1.1 min	2 h, 58 min

STUDY NO. 3.3.20 ATTACHMENTS

Attachment A to Study 3.3.20.

Firstlight modeled river flows at three TFI HEC-RAS transects near NMPS Intake (one at the Shearer Farms telemetry station, one perpendicular to NMPS Intake, and one at the Gill Bank telemetry station) at one-hour time stamps between May 1st, 2016 and September 1, 2016. Flows at the three transects ranged from -7,633 to 23,875 cfs during this time and all three transects periodically experienced negative flows as a result of pumping and production cycles at NMPS (Table CRC-1-1). River flow was not strongly correlated with pumping magnitude at any of the three transects, however flow at Shearer Farms and NMPS Tailrace did appear to increase with increases in pumping magnitude, while flow at Gill Bank appeared to decrease with increases in pumping magnitude (Figure CRC-1-1). In general, as additional units turned on during pumping cycles, discharge increased at Shearer Farms and NMPS Tailrace while discharge decreased at Gill Bank. In contrast, as additional units turned on during production cycles, discharge decreased at Shearer Farms and NMPS Tailrace and increased at Gill Bank. The response of river flow to NMPS pumping/production cycles can be seen for a low-water period in Figure CRC-1-2 and a high-water period in Figure CRC-1-3. The ratio of water pumped by NMPS to river flow averaged approximately 0.3 for both Shearer Farms and NMPS Tailrace, indicating that NMPS generally pumped about a third of the available water from these transects during this time period (Table CRC-1-1 and Figure CRC-1-4). Gill Bank, which is located downstream of NMPS Intake had an average pumping ratio of approximately 1.04, indicating were instances where more water was being pumped through NMPS than was available to flow downstream (Table CRC-1-1). In Figure CRC-1-5, the extreme positive ratios indicate events where nearly no water flowed downstream at Gill Bank, while the negative ratios indicate events where the flow of water was actually reversed in an upstream direction towards NMPS Intake.

FirstLight assessed entrainment sample densities for 2015 and 2016 and compared them with river flow conditions to see if there was a relationship between density and river flow, and/or a relationship between density and the ratio of water pumped to water available and ratio of water pumped to water remaining in the river. In general, samples were collected over a range of pumping flows, with samples containing at least 1 organism (non-zero) occurring across all flows (Figure CRC-1-6). Over the two year sampling period, the majority of samples started during the midnight hour and between 2 and 3 o'clock in the morning, with non-zero samples occurring in every hour except 23:00 (Figure CRC-1-7). Figure CRC-1-8 counts non-zero samples for a range of pumping flows and water available at Shearer Farms. Note that most non-zero samples (count = 7) occur when pumping discharge is low (< 5000 cfs) and Shearer Farms is between 10 and 20,000 cfs. Conversely, the most non-zero samples (count = 5) occurred when pumping flow was low (< 5,000 cfs) and the water remaining at Gill Banks was between 5 and 10,000 cfs (Figure CRC-1-9). Over all samples, organisms were collected during all unit operating scenarios, with a majority of non-zero samples occurring when 3 units were pumping (Figure CRC-1-10). FirstLight found that 2016 had higher densities than 2015 (Figure CRC-1-11), with many more samples with densities between 0.1 and 0.2 organisms per cubic meter (org/m3) of water pumped. There does not appear to be a clear trend between with entrainment density over time or with the number of units pumping (Figure CRC-1-12). For example, the highest densities during the 2 o'clock hour occurred when three units were pumping, but the highest densities during the 1 o'clock hour occur when only 1 unit was pumping. These differences may be due to how the plant operates with units coming online and offline sequentially. Therefore during the 1 o'clock hour there may be more times when only 1 unit was running than the 2 o'clock hour when there is more than likely more than 1 unit was operating. FirstLight also attempted to see if there were relationships between organism density and the water available in the Turners Falls Impoundment (Shearer Farms modeled river flow), and if the ratio to pumping to water available (Shearer) and the ratio of pumping to water remaining (Gill Banks) influenced organism density. Figure CRC-1-12 shows organism density (org/m3) as a function of water available in the TFI (Shearer Farms) for non-zero samples. There does not appear to be a trend. FirstLight computed the ratio of pump flow to water available (Shearer Farms – Figure CRC-1-13) and ratio of pumped flow to water remaining (Gill Banks – Figure CRC-1-14). Neither figure demonstrated a functional relationship between the ratio of water pumped to water available (Figure CRC-1-13) nor ratio of water pumped to water remaining (Figure CRC-1-14). During worst case scenarios when

Northfield was pumping more water than was available at Shearer Farms and the flow in the river reversed (negative flow at Gill Bank), the density of organisms was low. However, the highest densities occurred when Northfield was pumping at rates that equaled flow in the river, meaning flow at Gill bank was near zero. Within this narrow flow range, pumping flow could have an effect on the densities of organisms within the source water body.

Table CRC-1-1: Descriptive statistics for pumping and production magnitudes at NMPS Intake as well as modeled discharge and the ratio of NMPS pumping to modeled discharge in the CT River at Gill Bank, NMPS Tailrace, and Shearer Farms between May 1st, 2016 and September 1st, 2016.

Flow	Min	25% Quartile	Median	75% Quartile	Max	Mean
Pumping Magnitude (cfs)	0	0	0	3345	14150.25	2093.12
Production Magnitude (cfs)	0	0	0	2645	18030.39	2123.58
CT River Flow at Gill Bank (cfs)	-5034	1673	4393	9398	21975	5542.04
CT River Flow at NMPS Tailrace (cfs)	-7633	2063	4947	8582	23875	5517.14
CT River Flow at Shearer Farms (cfs)	-7246.44	2120.67	4950.52	8417.7	23607.58	5517.61
Gill Pumping Ratio (cfs)	-217.52	0	0	0	3558	1.04
Ratio of Flow in CT River at NMPS Tailrace to NMPS Pumping	0	0	0	0.38	2.84	0.29
Ratio of Flow in CT River at Shearer to NMPS Pumping	0	0	0	0.38	2.85	0.30

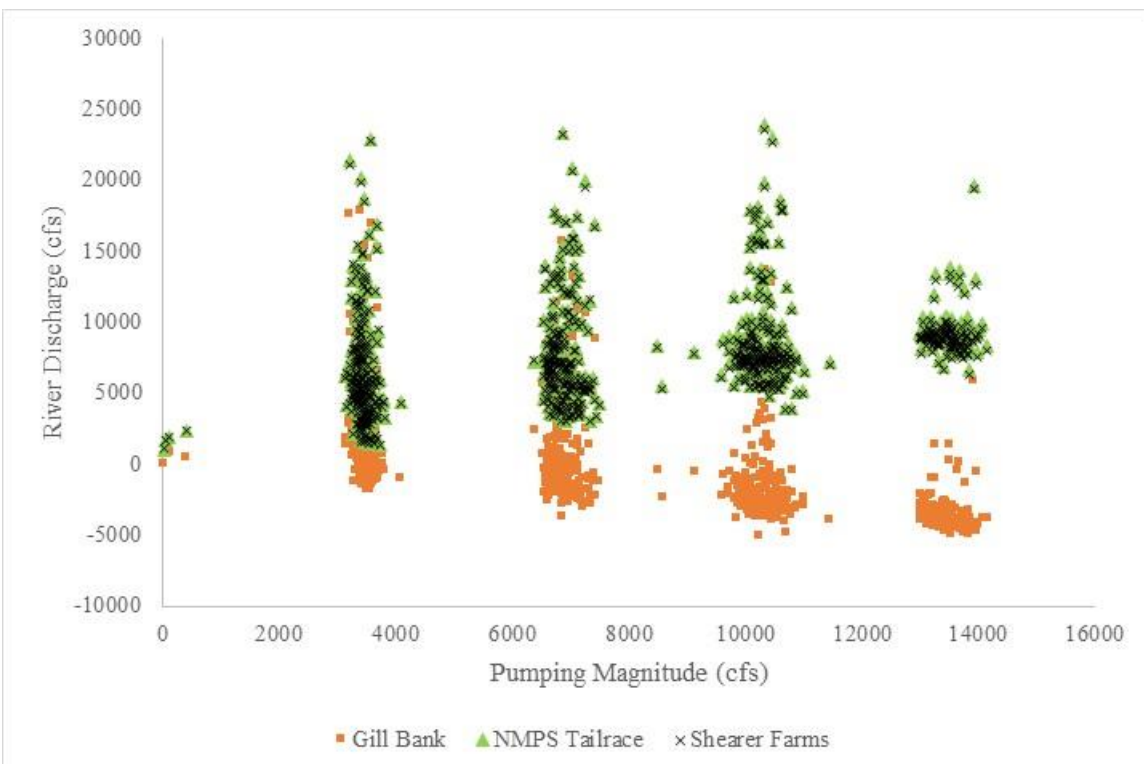

Figure CRC-1-1: Pumping magnitude at NMPS vs CT river flow at three transects near NMPS Intake.

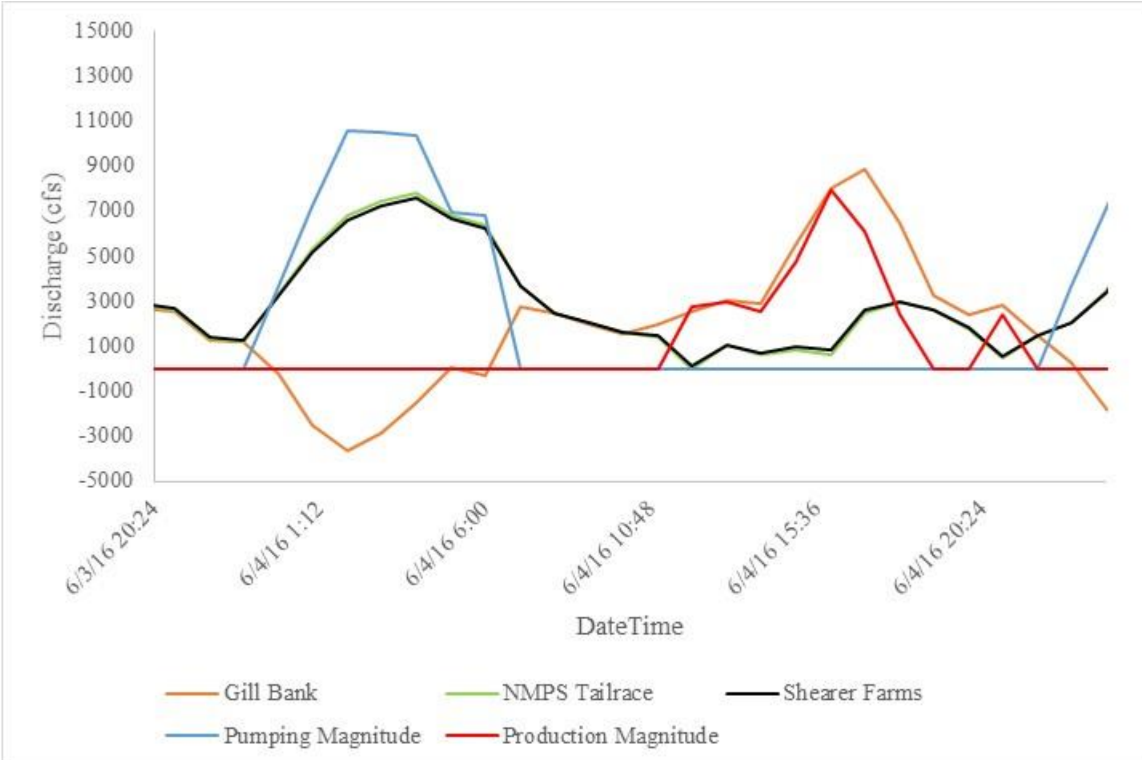

Figure CRC-1-2: Discharge in the CT River at Gill Bank, NMPS Tailrace, and Shearer Farms as well as pumping and production magnitude at NMPS Tailrace during a low-water period, June 3rd to 5th, 2016.

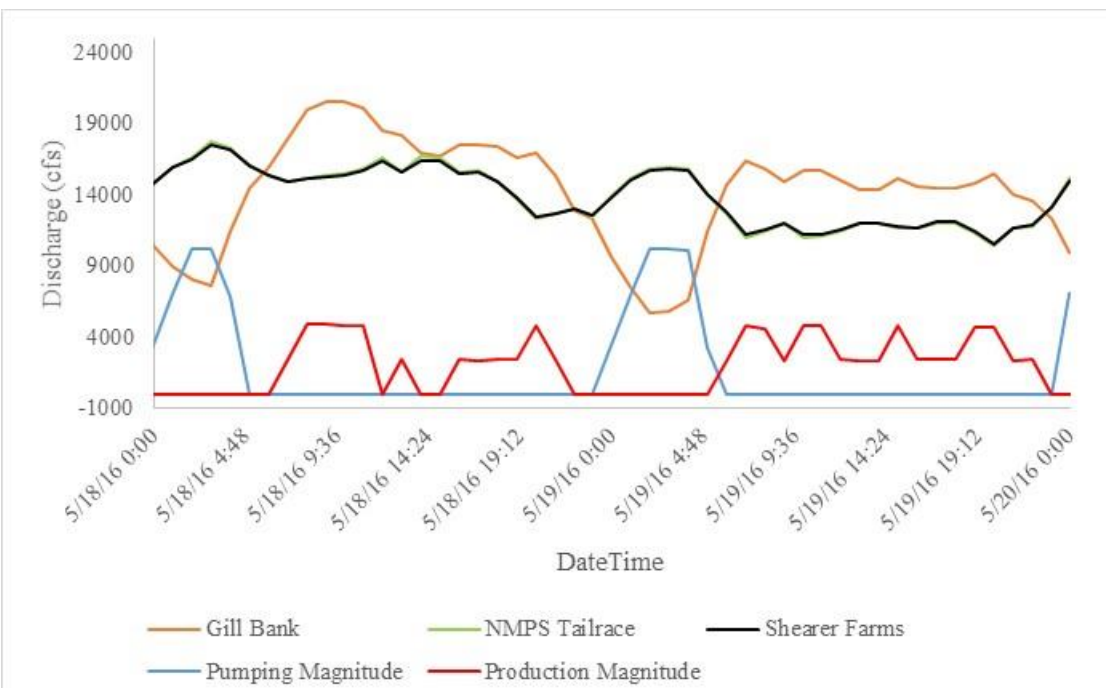

Figure CRC-1-3: Discharge in the CT River at Gill Bank, NMPS Tailrace, and Shearer Farms as well as pumping and production magnitude at NMPS Tailrace during a high-water period between May 18th to 20th, 2016.

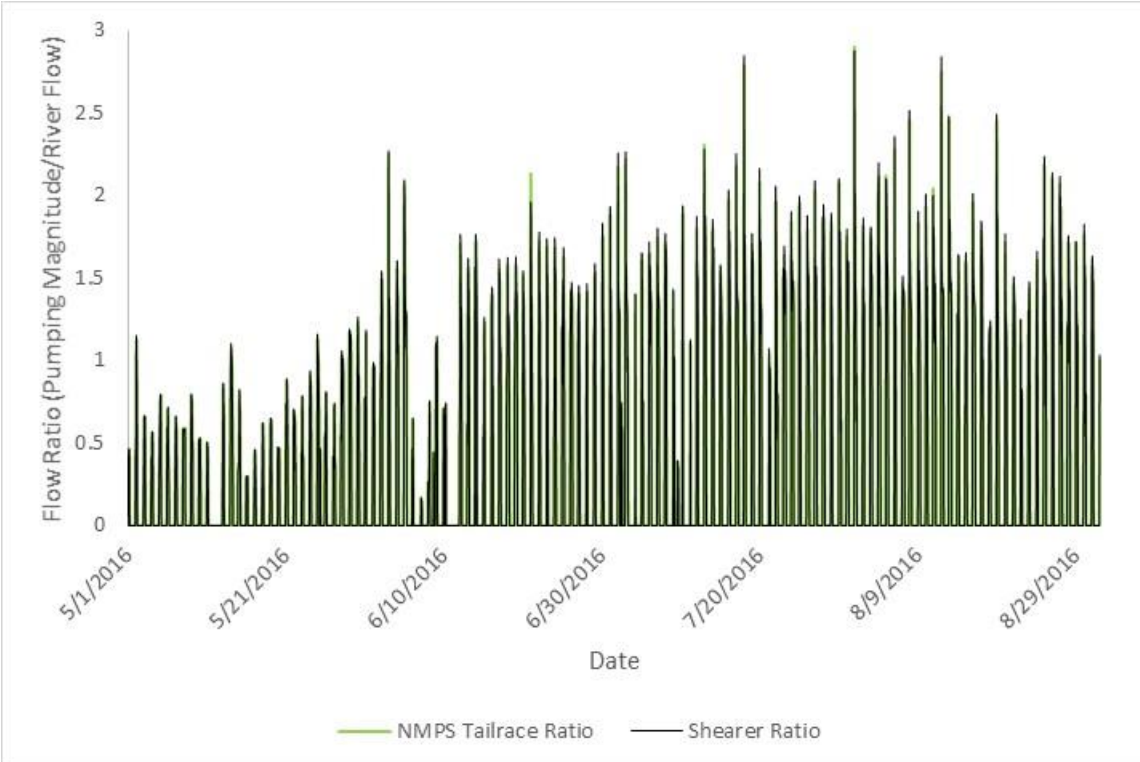

Figure CRC-1-4: Ratios of pumping magnitude at NMPS intake to river flow at Shearer Farms and NMPS Tailrace between May 1st, 2016 and September 1st, 2016.

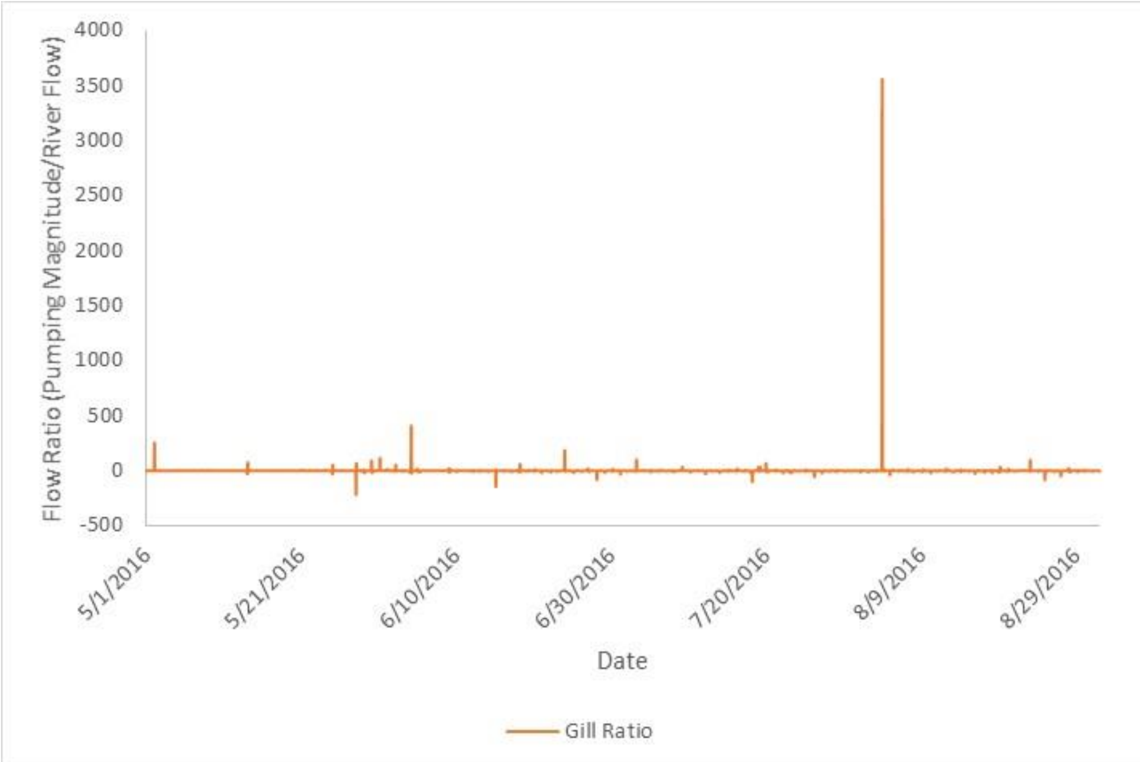

Figure CRC-1-5: Ratio of pumping magnitude at NMPS intake to CT river flow at Gill Bank between May 1st, 2016 and September 1st, 2016.

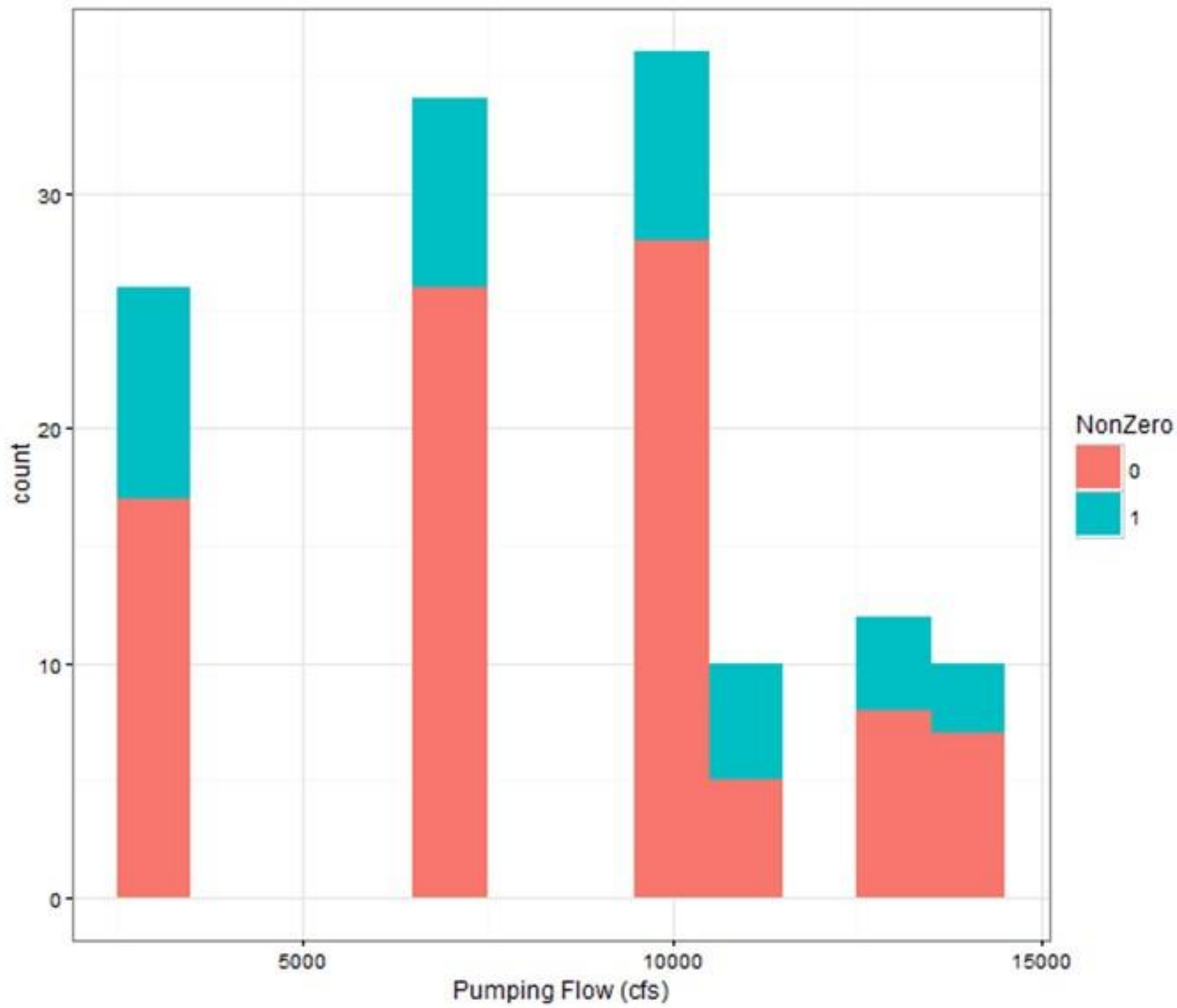

Figure CRC-1-6: Pumping flow at the start of entrainment sampling 2015 – 2016. Non-zero samples (binary value of "1") contain at least one organism (either egg or larvae).

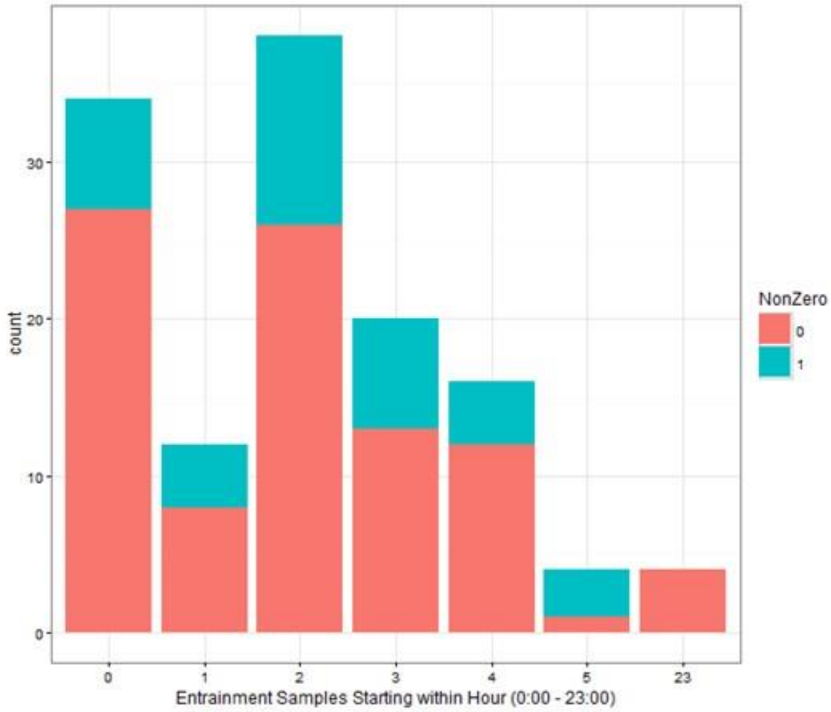

Figure CRC-1-7: Count of sample start hours between 2015 and 2016. Note that in 2015, FirstLight sampled 100 m3 of water, while in 2016 only 50 m3 were sampled per sample.

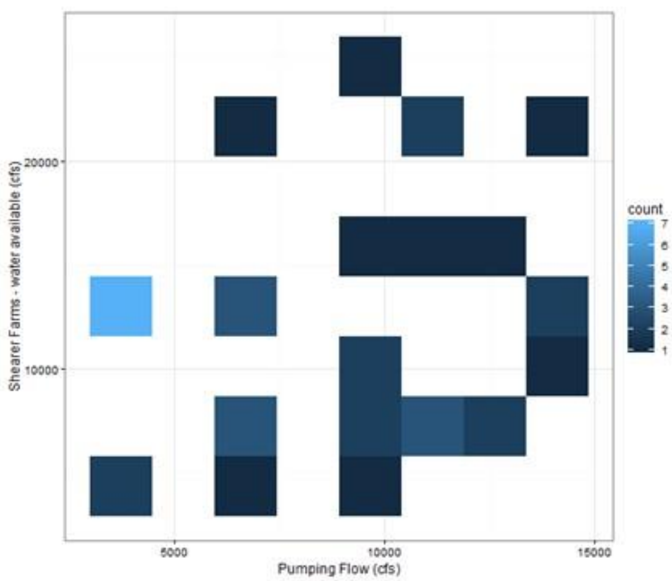

Figure CRC-1-8: Count of non-zero samples per Pumping Flow and water available at Shearer Farm

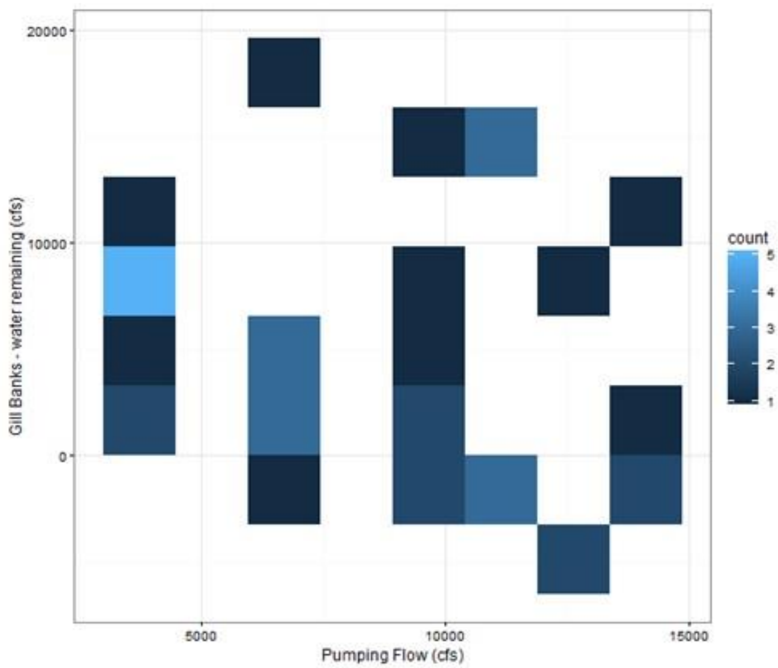

Figure CRC-1-9: Count of non-zero samples per Pumping Flow and water remaining at Gill Banks

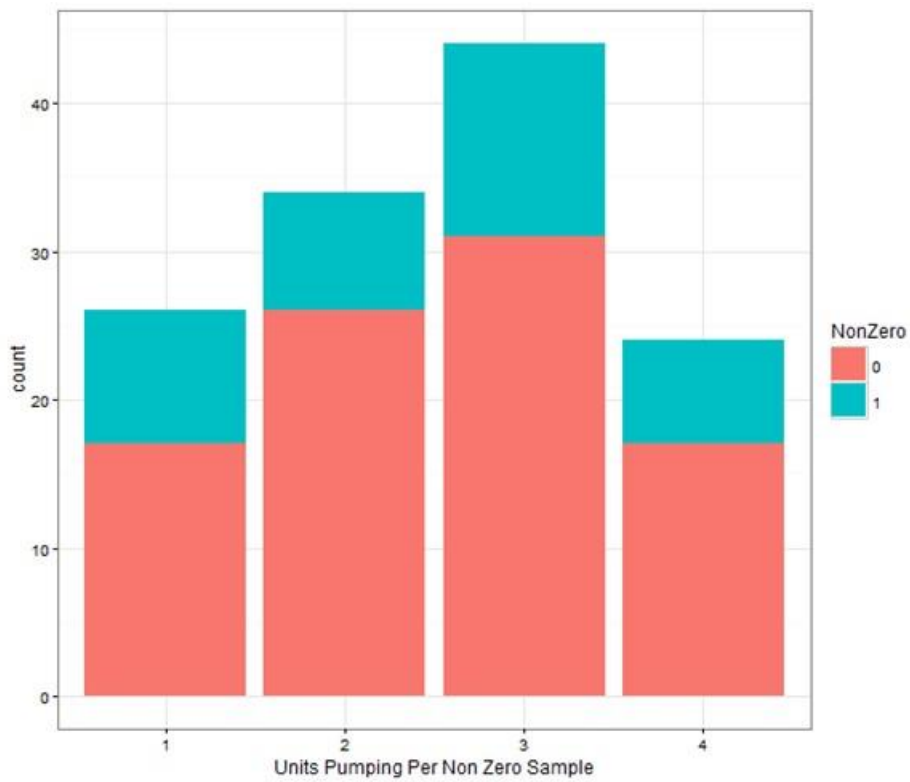

Figure CRC-1-10: Count of non-zero samples per unit operations

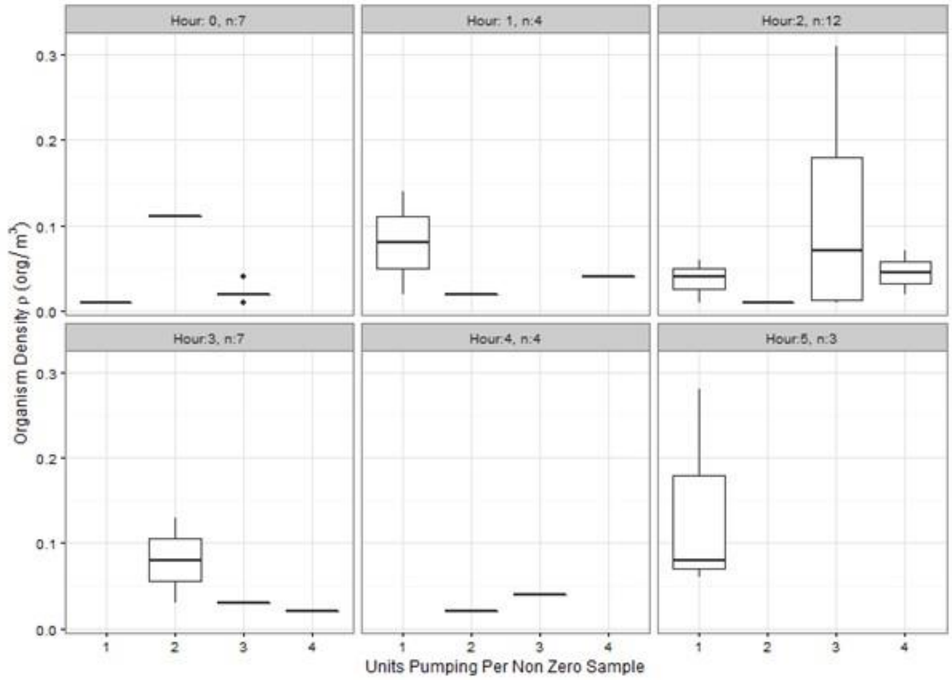

Figure CRC-1-11: Organism density per hour and number of units pumping.

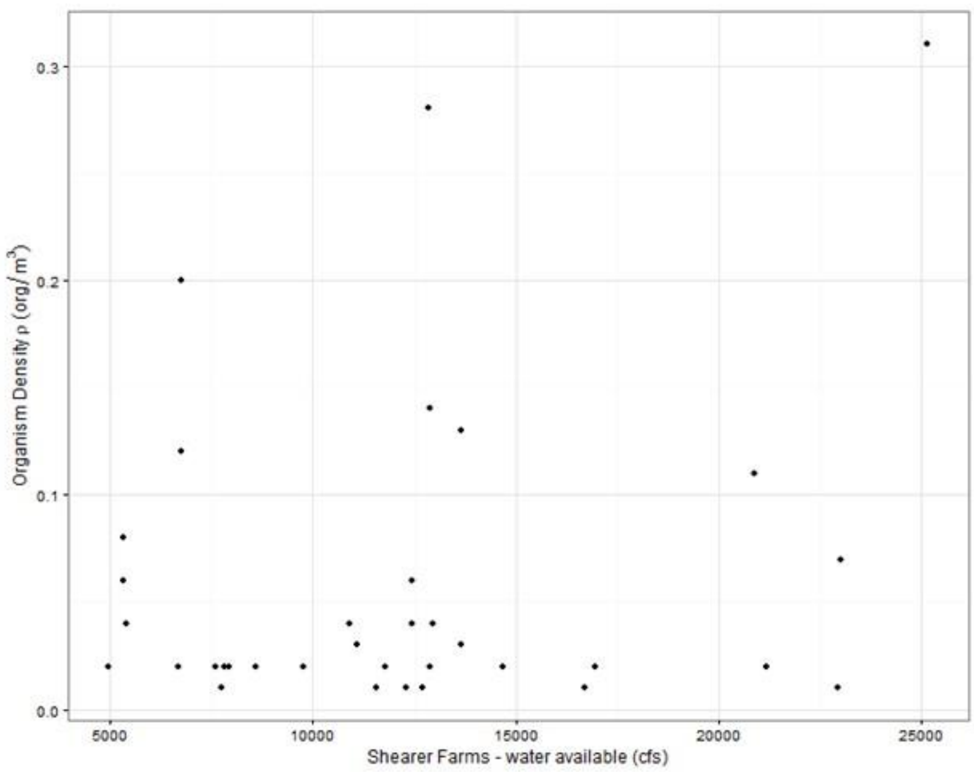

Figure CRC-1-12: Organism density as a function of water available at Shearer Farms.

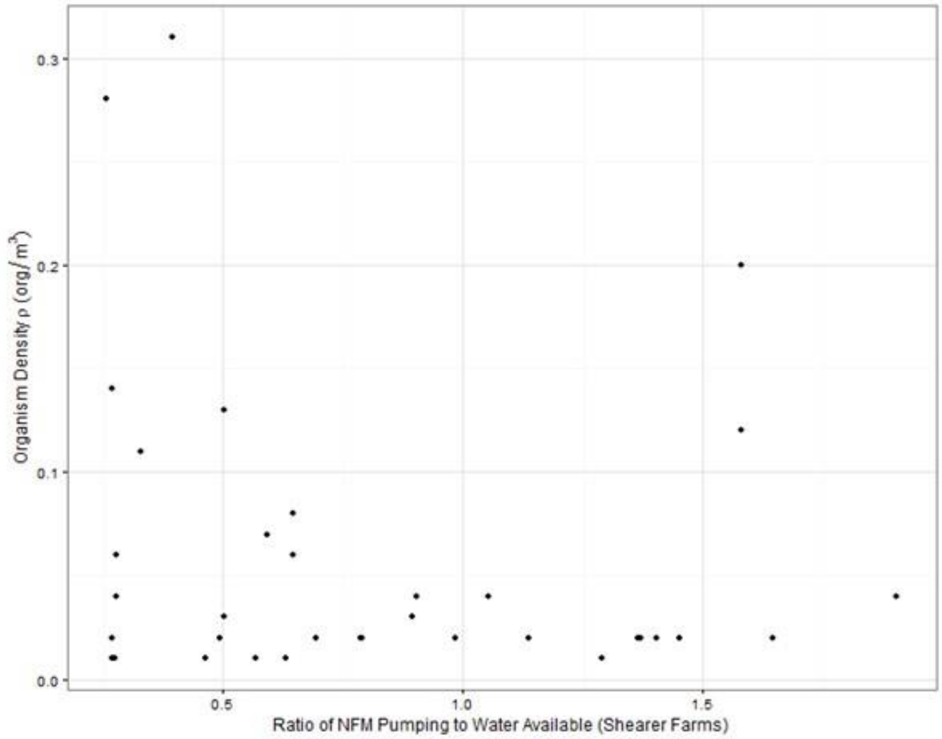

Figure CRC-1-13: Organism density as a function of the ratio of water pumped to water available at Shearer Farms.

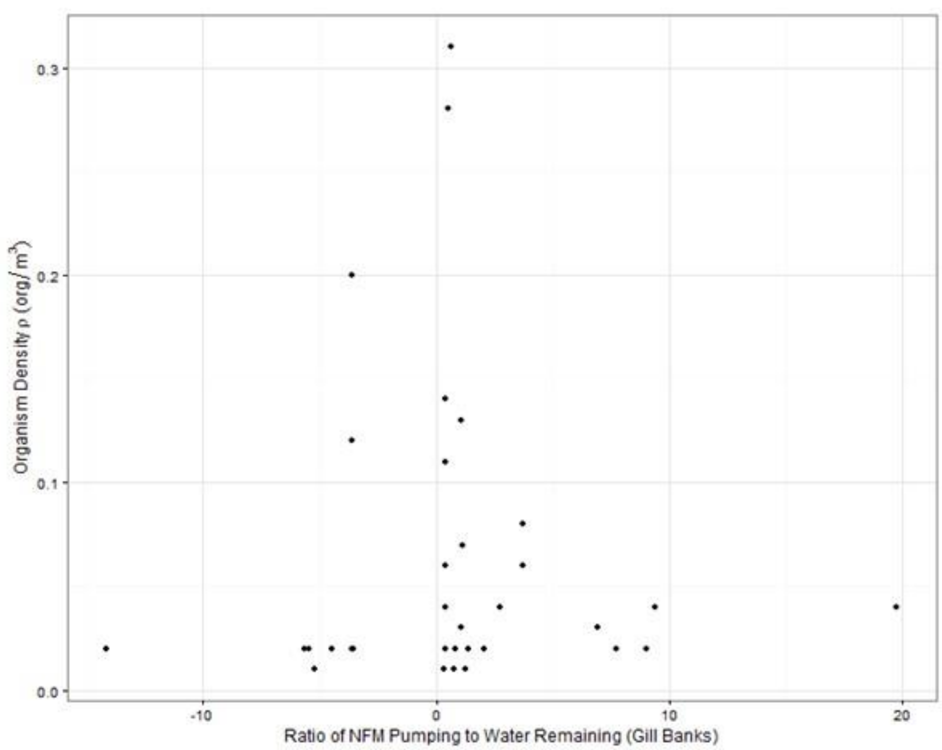

Figure CRC-1-14: Organism density as a function of the ratio of water pumped to water remaining at Gill Banks.

Attachment B to Study 3.3.20.

Table 3: American Shad ichthyoplankton counts from 2016 Offshore samples.

Sample Number	Date	Time	Life Stage	Count
5	5/18/2016	1:44	Egg	1
11	6/10/2016	3:19	Larvae	1
13	6/16/2016	0:59	Larvae	32
14	6/16/2016	1:14	Larvae	8

Table 4: American Shad ichthyoplankton counts from 2016 Entrainment samples.

Sample Number	Date	Time	Life Stage	Count
12	5/25/2016	4:42	Larvae	2
13	6/2/2016	2:45	Larvae	10
13	6/2/2016	2:45	Egg	6
14	6/2/2016	4:00	Larvae	4
14	6/2/2016	4:00	Egg	10
15	6/2/2016	5:10	Larvae	3
15	6/2/2016	5:10	Egg	4
16	6/8/2016	1:30	Larvae	1
16	6/8/2016	1:30	Egg	7
17	6/8/2016	2:43	Larvae	2
17	6/8/2016	2:43	Egg	3
18	6/8/2016	3:50	Larvae	2
18	6/8/2016	3:50	Egg	7
19	6/8/2016	5:03	Egg	14
20	6/17/2016	0:50	Egg	1
21	6/17/2016	3:19	Larvae	1
22	6/17/2016	4:28	Larvae	1
22	6/17/2016	4:28	Egg	1
23	6/23/2016	1:23	Egg	1
24	6/23/2016	2:35	Egg	1

Attachment C to Study 3.3.20.
Table 1: Flow rates (cfs) for NMPS units and modeled Connecticut River transects (Gill Bank, NMPS Tailrace, and Shearer Farms) at hourly time steps during the 2016 entrainment sampling period.

Time Stamp	NMPS Unit 1	NMPS Unit 2	NMPS Unit 3	NMPS Unit 4	Gill Bank	NMPS Tailrace	Shearer Farms
5/11/16 0:00	0	-3329	0	0	10179	13433	13339
5/11/16 1:00	0	-3359	-3423	0	7839	13619	13455
5/11/16 2:00	0	-3247	-3331	0	7503	13990	13774
5/11/16 3:00	0	-3274	-3306	0	8343	13974	13773
5/11/16 4:00	0	-3237	0	0	10517	12901	12845
5/11/16 5:00	0	0	0	0	13253	13225	13206
5/11/16 6:00	0	0	0	0	14492	14435	14376
5/11/16 7:00	0	0	0	2346	15587	13375	13464
5/11/16 8:00	0	0	0	2184	15006	13310	13330
5/11/16 9:00	0	0	0	0	13924	13878	13820
5/11/16 10:00	0	0	0	0	13678	13670	13659
5/11/16 11:00	0	0	0	0	13767	13747	13725
5/11/16 12:00	0	0	0	1680	14503	13220	13254
5/11/16 13:00	0	0	0	2297	15325	12452	12543
5/11/16 14:00	0	0	0	2308	15243	12820	12838
5/11/16 15:00	0	0	0	2370	15061	12469	12531
5/11/16 16:00	2419	0	0	2314	15858	11652	11788
5/11/16 17:00	4467	0	0	2306	16646	11252	11403
5/11/16 18:00	2340	0	0	2324	16324	11749	11844
5/11/16 19:00	2975	0	0	2315	16939	11044	11214
5/11/16 20:00	2332	0	2464	3732	18317	8994	9293
5/11/16 21:00	2364	0	0	2337	16720	11996	11982
5/11/16 22:00	0	0	0	2338	15589	13423	13399
5/11/16 23:00	0	0	0	0	14560	14497	14422
5/12/16 0:00	0	0	0	0	13497	13484	13464
5/12/16 1:00	0	0	0	0	12561	12531	12493
5/12/16 2:00	0	0	0	0	12312	12218	12112
5/12/16 3:00	0	0	0	0	10921	10860	10787
5/12/16 4:00	0	0	0	0	9821	9756	9679
5/12/16 5:00	0	0	0	0	9818	9707	9583
5/12/16 6:00	0	0	0	0	9676	9575	9460
5/12/16 7:00	0	0	0	0	9121	9059	8987
5/12/16 8:00	0	0	0	0	9621	9507	9380
5/12/16 9:00	2458	0	0	0	10710	8826	8773
5/12/16 10:00	3130	0	0	0	11475	8232	8200
5/12/16 11:00	2386	0	2445	0	12377	7339	7357
5/12/16 12:00	3241	0	2450	0	13107	6973	6998
5/12/16 13:00	5175	0	2857	0	13608	6508	6593
5/12/16 14:00	4219	0	2492	0	13948	7884	7929
5/12/16 15:00	2425	0	0	0	12994	9731	9738
5/12/16 16:00	2434	0	0	0	12627	10250	10310
5/12/16 17:00	2431	0	0	0	12707	10342	10421
5/12/16 18:00	2443	0	0	0	12637	10276	10361
5/12/16 19:00	2441	0	0	0	14384	9227	9391

Time Stamp	NMPS Unit 1	NMPS Unit 2	NMPS Unit 3	NMPS Unit 4	Gill Bank	NMPS Tailrace	Shearer Farms
5/12/16 20:00		2497	2464	0	16027	6216	6563
5/12/16 21:00	2471	2424	0	0	13965	8399	8486
5/12/16 22:00	0	0	0	0	11476	10280	10303
5/12/16 23:00	0	0	0	0	10320	11263	11277
5/13/16 0:00	0	-3648	0	0	8476	12138	12119
5/13/16 1:00	0	-3654	0	-3696	5918	11518	11576
5/13/16 2:00	-3513	-3601	0	-3613	3649	12529	12418
5/13/16 3:00	0	-3642	0	-3617	2492	11283	11172
5/13/16 4:00	0	-3637	0	-3574	3843	9995	9857
5/13/16 5:00	0	0	0	0	6989	8022	7964
5/13/16 6:00	0	0	2507	0	8350	5873	5904
5/13/16 7:00	0	0	2446	0	8453	5059	5083
5/13/16 8:00	0		2451	0	9114	4254	4320
5/13/16 9:00	0		2451	0	8817	3706	3790
5/13/16 10:00	0	2781	3207	0	8997	3696	3769
5/13/16 11:00	0	0	2483	2381	9180	3691	3766
5/13/16 12:00	0	0	2651	0	8820	6158	6083
5/13/16 13:00	0	0	2663	0	8719	6716	6689
5/13/16 14:00	0	0	0	0	8600	8514	8418
5/13/16 15:00	0	0	0	0	9991	9937	9880
5/13/16 16:00	0	0	0	0	9863	9912	9964
5/13/16 17:00	0	0	0	0	11160	11149	11141
5/13/16 18:00	0	0	0	0	11694	11731	11773
5/13/16 19:00	0	0	0	0	11485	11584	11693
5/13/16 20:00	0	0	0	0	11234	11355	11491
5/13/16 21:00	0	0	0	0	11051	11177	11317
5/13/16 22:00	0	0	0	0	10191	10329	10481
5/13/16 23:00	0	0	0	-3706	6531	9367	9434
5/14/16 0:00	0	0	-3687	-3627	1363	9496	9387
5/14/16 1:00	0	-3523	-3690	-3594	-398	11035	10756
5/14/16 2:00	-3397	-3506	-3532	-3530	-533	13054	12650
5/14/16 3:00	-3336	-3371	-3506	-3456	181	13586	13196
5/14/16 4:00	-3313	-3343	-3438	-3418	1352	13799	13391
5/14/16 5:00	0	-3358	-3480	-3407	3241	12417	12135
5/14/16 6:00	0	0	-3489	-3466	4003	10785	10644
5/14/16 7:00	0	0	0	-3431	6089	10278	10213
5/14/16 8:00	0	0	0	0	8523	8655	8811
5/14/16 9:00	0	0	0	0	8268	8407	8563
5/14/16 10:00	0	0	0	0	9015	9098	9194
5/14/16 11:00	0	0	0	0	9853	9901	9958
5/14/16 12:00	0	0	0	0	9649	9701	9758
5/14/16 13:00	0	0	0	0	8760	8776	8791
5/14/16 14:00	0	0	0	0	7881	7852	7817
5/14/16 15:00	0	0	0	0	7719	7640	7550
5/14/16 16:00	0	0	2412	0	8673	7410	7347
5/14/16 17:00	0	0	2404	0	9893	7504	7527
5/14/16 18:00	0	0	2412	2379	11587	8049	8132

Time Stamp	NMPS Unit 1	NMPS Unit 2	NMPS Unit 3	NMPS Unit 4	Gill Bank	NMPS Tailrace	Shearer Farms
5/14/16 19:00	0	0	2454	2383	11926	8313	8439
5/14/16 20:00	0	0	2947	2398	12627	7515	7724
5/14/16 21:00	0	0	2370	0	11206	8081	8212
5/14/16 22:00	0	0	0	0	8825	9723	9741
5/14/16 23:00	0	0	0	-3478	7236	10690	10665
5/15/16 0:00	0	0	0	-3470	6452	9886	9854
5/15/16 1:00	0	0	0	-3423	5852	9199	9101
5/15/16 2:00	0	0	0	-3487	5165	8523	8386
5/15/16 3:00	0	0	-3449	-3449	1894	8586	8438
5/15/16 4:00	0	0	-3379	-3410	2732	9354	9176
5/15/16 5:00	0	0	-3361	-3347	3803	10450	10278
5/15/16 6:00	0	0	0	-3367	6678	10832	10759
5/15/16 7:00	0	0	0	0	9763	9896	10056
5/15/16 8:00	0	0	0	0	10321	10442	10580
5/15/16 9:00	0	0	0	0	10512	10653	10812
5/15/16 10:00	0	0	2402	0	13177	10894	11038
5/15/16 11:00	0	0	2406	0	14290	11932	11985
5/15/16 12:00	0	0	2403	0	14711	12373	12429
5/15/16 13:00	0	0	2831	0	14853	12333	12412
5/15/16 14:00	0	0	3092	2377	15786	11494	11643
5/15/16 15:00	0	0	3940	2340	16445	10771	10948
5/15/16 16:00	0	0	2353	2300	15983	11084	11204
5/15/16 17:00	0	0	2370	0	14545	12216	12250
5/15/16 18:00	0	0	2361	0	14373	12068	12152
5/15/16 19:00	0	0	2425	0	14360	12003	12075
5/15/16 20:00	0	0	2423	2404	15447	10746	10899
5/15/16 21:00	0	0	2431	0	14508	10922	10971
5/15/16 22:00	0	0	2432	0	13393	11557	11539
5/15/16 23:00	0	0	0	0	12006	11948	11877
5/16/16 0:00	0	-3415	0	0	8528	11845	11710
5/16/16 1:00	0	-3390	0	0	8063	11319	11183
5/16/16 2:00	0	-3328	0	0	8472	11699	11529
5/16/16 3:00	0	-3334	0	0	7932	11235	11138
5/16/16 4:00	0	-3405	0	0	8162	11454	11348
5/16/16 5:00	0	0	0	0	10524	12130	12049
5/16/16 6:00	2398	0	0	0	13239	11784	11864
5/16/16 7:00	2421	0	0	0	14339	12056	12197
5/16/16 8:00	2423	0	2441	0	15218	12343	12521
5/16/16 9:00	2420	0	2375	0	15602	12170	12393
5/16/16 10:00	2365	0	2383	0	17021	12419	12614
5/16/16 11:00	2363	0	2380	0	18861	14161	14218
5/16/16 12:00	2373	0	0	0	18764	15762	15741
5/16/16 13:00	2368	0	2475	0	19730	14992	15100
5/16/16 14:00	2345	0	0	0	19266	15695	15710
5/16/16 15:00	2372	0	0	0	18601	16212	16208
5/16/16 16:00	2411	0	2477	0	19154	15566	15636
5/16/16 17:00	2373	0	2477	0	19247	15614	15654

Time Stamp	NMPS Unit 1	NMPS Unit 2	NMPS Unit 3	NMPS Unit 4	Gill Bank	NMPS Tailrace	Shearer Farms
5/16/16 18:00	2483	0	2479	0	19880	15012	15102
5/16/16 19:00	2493	2486	3224	0	20742	14217	14345
5/16/16 20:00	2508	2479	2497	0	20770	13767	13900
5/16/16 21:00	2508	0	0	0	18436	15895	15838
5/16/16 22:00	0	0	0	0	17265	17193	17108
5/16/16 23:00	0	0	0	0	16585	17401	17340
5/17/16 0:00	-3477	0	0	0	15330	18661	18495
5/17/16 1:00	-3429	0	-3614	0	13209	20898	20595
5/17/16 2:00	-3384	-3502	-3576	0	12815	22978	22651
5/17/16 3:00	-3380	-3422	-3535	0	13706	23875	23608
5/17/16 4:00	-3298	0	-3570	0	15728	23351	23221
5/17/16 5:00		0	-3585	0	16953	22840	22752
5/17/16 6:00	0	0	0	0	20369	20478	20621
5/17/16 7:00	0	2427	0	0	21903	19543	19629
5/17/16 8:00	0	2357	0	0	21975	19588	19593
5/17/16 9:00	0	2347	0	0	21931	19576	19572
5/17/16 10:00	0	2372	0	0	21583	19960	19905
5/17/16 11:00	0	0	0	0	20586	20496	20390
5/17/16 12:00	0	0	0	0	20552	20474	20387
5/17/16 13:00	0	0	0	0	20696	20054	20009
5/17/16 14:00	0	2404	0	0	21516	19129	19165
5/17/16 15:00	0	2416	0	0	21095	18694	18715
5/17/16 16:00	0	2418	0	0	19790	17444	17523
5/17/16 17:00	0	2426	0	0	18921	16558	16621
5/17/16 18:00	0	2420	0	0	17830	15494	15590
5/17/16 19:00	0	2431	0	0	16457	14173	14333
5/17/16 20:00	0	0	0	0	14625	13549	13699
5/17/16 21:00	0	0	0	0	13439	13551	13673
5/17/16 22:00	0	0	0	0	12990	13128	13280
5/17/16 23:00	0	0	0	0	13005	13124	13258
5/18/16 0:00	0	-3447	0	0	10432	14804	14792
5/18/16 1:00	0	-3482	-3559	0	8960	15960	15911
5/18/16 2:00	-3386	-3354	-3516	0	8098	16613	16535
5/18/16 3:00	-3301	-3414	-3478	0	7660	17703	17524
5/18/16 4:00	0	-3291	-3489	0	11388	17298	17185
5/18/16 5:00	0	0	0	0	14434	16087	16067
5/18/16 6:00	0	0	0	0	15975	15405	15406
5/18/16 7:00	0	2403	0	0	17912	14914	14939
5/18/16 8:00	0	2452	2435	0	20027	15145	15139
5/18/16 9:00	0	2435	2439	0	20537	15323	15315
5/18/16 10:00	0	2382	2447	0	20560	15437	15425
5/18/16 11:00	0	2361	2452	0	20066	15810	15750
5/18/16 12:00	0	0	0	0	18501	16556	16377
5/18/16 13:00	0	0	2452	0	18206	15654	15548
5/18/16 14:00	0	0	0	0	16927	16690	16419
5/18/16 15:00	0	0	0	0	16755	16560	16340
5/18/16 16:00	0	2426	0	0	17480	15602	15539

Time Stamp	NMPS Unit 1	NMPS Unit 2	NMPS Unit 3	NMPS Unit 4	Gill Bank	NMPS Tailrace	Shearer Farms
5/18/16 17:00	0	2383	0	0	17556	15711	15643
5/18/16 18:00	0	0	2479	0	17344	14908	14953
5/18/16 19:00	0	0	2484	0	16655	13726	13853
5/18/16 20:00	0	2397	2422	0	16922	12294	12492
5/18/16 21:00	0	0	2429	0	15335	12637	12723
5/18/16 22:00	0	0	0	0	12916	12979	13039
5/18/16 23:00	0	0	0	0	12343	12446	12559
5/19/16 0:00	-3413	0	0	0	9674	13900	13826
5/19/16 1:00	-3339	0	-3653	0	7492	15174	15020
5/19/16 2:00	-3304	-3345	-3563	0	5678	15829	15670
5/19/16 3:00	-3307	-3419	-3460	0	5880	15914	15783
5/19/16 4:00	-3289	-3342	-3471	0	6650	15842	15726
5/19/16 5:00	-3273	0	0	0	11470	14002	14082
5/19/16 6:00	0	0	0	2372	14733	12666	12784
5/19/16 7:00	0	2423	0	2403	16398	11039	11236
5/19/16 8:00	0	2773	0	1771	15802	11491	11569
5/19/16 9:00	0	2340	0	0	14958	11983	12031
5/19/16 10:00	0	2376	0	2409	15706	11049	11198
5/19/16 11:00	0	2365	0	2403	15731	11059	11168
5/19/16 12:00	0	0	0	2418	15061	11437	11512
5/19/16 13:00	0	0	0	2360	14323	11975	12018
5/19/16 14:00	0	0	0	2368	14309	12000	12060
5/19/16 15:00	0	2455	0	2374	15144	11634	11724
5/19/16 16:00	0	2446	0	0	14592	11623	11699
5/19/16 17:00	0	2437	0	0	14430	12025	12068
5/19/16 18:00	0	2455	0	0	14436	12053	12107
5/19/16 19:00	0	2403	0	2300	14861	11372	11475
5/19/16 20:00	0	2412	0	2241	15432	10385	10536
5/19/16 21:00	0	2391	0	0	13995	11627	11645
5/19/16 22:00	0	2398	0	0	13570	11813	11860
5/19/16 23:00	0	0	0	0	12331	13159	13108
5/20/16 0:00	-3447	0	-3637	0	9976	15120	14943
5/20/16 1:00	-3433	0	-3622	0	9149	16055	15858
5/20/16 2:00	-3359	0	-3629	0	9009	15788	15570
5/20/16 3:00	-3367	0	-3499	0	8631	15347	15117
5/20/16 4:00	-3306	0	-3498	0	7956	14633	14440
5/20/16 5:00	-3291	0	0	0	10098	13908	13752
5/20/16 6:00	0	0	0	0	11630	11674	11728
5/20/16 7:00	0	0	0	0	11207	11246	11290
5/20/16 8:00	0	0	0	0	12162	11581	11612
5/20/16 9:00	0	2420	0	0	14046	11666	11718
5/20/16 10:00	0	2426	0	0	14368	11973	12006
5/20/16 11:00	0	2422	0	2328	15438	11870	11924
5/20/16 12:00	0	2454	0	2409	16039	11039	11161
5/20/16 13:00	0	2934	0	2884	16345	10644	10765
5/20/16 14:00	0	3118	0	2805	16343	10663	10777
5/20/16 15:00	0	3643	0	3583	16813	10236	10395

Time Stamp	NMPS Unit 1	NMPS Unit 2	NMPS Unit 3	NMPS Unit 4	Gill Bank	NMPS Tailrace	Shearer Farms
5/20/16 16:00	0	3554	0	3478	17113	10104	10261
5/20/16 17:00	0	2429	0	2451	16138	10338	10471
5/20/16 18:00	0	0	0	2397	14839	11342	11404
5/20/16 19:00	0	0	0	2242	13774	12080	12119
5/20/16 20:00	0	0	0	0	12911	12911	12909
5/20/16 21:00	0	0	0	0	11745	11768	11789
5/20/16 22:00	0	0	0	0	9257	9331	9408
5/20/16 23:00	0	0	0	0	8624	8636	8649
5/21/16 0:00	-3512	0	0	0	5918	8544	8546
5/21/16 1:00	-3471	0	-3669	0	1758	9747	9672
5/21/16 2:00		-3514	-3605	0	1260	11684	11505
5/21/16 3:00	-3368	-3469	-3560	0	1560	11869	11735
5/21/16 4:00	-3405	-3424	-3489	0	3032	13172	12931
5/21/16 5:00	-3349	0	-3509	0	6694	12581	12430
5/21/16 6:00	-3324	0	0	0	9223	11621	11525
5/21/16 7:00	0	0	0	0	11616	11499	11376
5/21/16 8:00	0	0	0	0	12150	11996	11824
5/21/16 9:00	0	0	0	0	11972	11848	11706
5/21/16 10:00	0	5030	0	0	13428	10912	10867
5/21/16 11:00	0	3633	0	0	14248	11021	11000
5/21/16 12:00	0	2365	0	0	14209	11810	11773
5/21/16 13:00	0	3594	0	0	14498	11230	11255
5/21/16 14:00	2466	4368	0	0	15380	9222	9351
5/21/16 15:00	0	3267	0	0	13611	10602	10504
5/21/16 16:00	0	0	0	0	11213	11133	11032
5/21/16 17:00	0	0	0	0	10997	10943	10881
5/21/16 18:00	0	0	0	0	10740	10699	10651
5/21/16 19:00	0	2474	0	0	10803	9606	9647
5/21/16 20:00	0	2463	0	0	10812	8437	8525
5/21/16 21:00	0	0	0	0	9436	9403	9362
5/21/16 22:00	0	0	0	0	9117	9136	9156
5/21/16 23:00	0	0	0	0	8354	8419	8490
5/22/16 0:00	0	-3464	-3632	0	4077	10168	10060
5/22/16 1:00	0	-3422	-3561	0	3122	10154	10125
5/22/16 2:00	0	-3514	-3547	0	3543	10458	10409
5/22/16 3:00	0	-3433	-3537	0	3756	10705	10646
5/22/16 4:00	0	-3395	-3482	0	3966	10783	10728
5/22/16 5:00	0	0	-3473	0	5196	10384	10375
5/22/16 6:00	0	0	-3417	0	6314	8984	9066
5/22/16 7:00	0	0	0	0	8373	8448	8540
5/22/16 8:00	0	0	0	0	10766	10702	10639
5/22/16 9:00	0	0	0	0	11799	11782	11766
5/22/16 10:00	0	0	0	0	12041	12056	12073
5/22/16 11:00	2429	0	0	0	12915	10604	10731
5/22/16 12:00	2429	0	0	0	12098	10327	10372
5/22/16 13:00	0	0	0	0	10980	10947	10905
5/22/16 14:00	0	0	0	0	10749	10745	10739

Time Stamp	NMPS Unit 1	NMPS Unit 2	NMPS Unit 3	NMPS Unit 4	Gill Bank	NMPS Tailrace	Shearer Farms
5/22/16 15:00	0	0	0	0	10845	10822	10797
5/22/16 16:00	0	0	0	0	11373	10604	10602
5/22/16 17:00	2332	0	0	0	12672	9973	10016
5/22/16 18:00	2910	0	0	0	12770	10000	10018
5/22/16 19:00	4103	0	0	0	12813	9717	9758
5/22/16 20:00	5118	0	2459	0	14803	7196	7437
5/22/16 21:00	2371	0	2394	0	13572	8178	8238
5/22/16 22:00	2350	0	0	0	10626	8889	8928
5/22/16 23:00	0	0	0	0	7812	8748	8790
5/23/16 0:00	0	-3497	0	0	4660	8158	8195
5/23/16 1:00	0	-3433	0	0	3176	7485	7512
5/23/16 2:00	0	-3412	-3490	0	2058	8906	8795
5/23/16 3:00	0	-3410	-3451	0	3489	9435	9343
5/23/16 4:00	0	-3381	0	0	5281	8623	8625
5/23/16 5:00	0	-3407	0	0	5630	8187	8194
5/23/16 6:00	0	0	0	0	7651	7101	7175
5/23/16 7:00	0	0	3628	0	10573	7072	7157
5/23/16 8:00	2433	0	2690	0	13407	8158	8252
5/23/16 9:00	0	0	2384	0	13901	10120	10162
5/23/16 10:00	2449	0	2433	0	14109	9932	10087
5/23/16 11:00	0	0	0	0	12056	12043	12019
5/23/16 12:00	0	0	2465	0	13998	11056	11194
5/23/16 13:00	0	0	2650	0	14062	12201	12210
5/23/16 14:00	0	0	2469	0	14324	12802	12803
5/23/16 15:00	0	0	5153	0	15694	11323	11472
5/23/16 16:00	0	0	2412	0	15348	11955	11999
5/23/16 17:00	2440	0	0	0	15368	11768	11850
5/23/16 18:00	0	0	2487	0	14325	11254	11288
5/23/16 19:00	2040	0	4547	0	14950	9257	9347
5/23/16 20:00	3556	0	2440	0	14710	8558	8607
5/23/16 21:00	0	0	0	0	12101	10624	10499
5/23/16 22:00	0	0	0	0	10282	10251	10212
5/23/16 23:00	0	0	0	0	8380	9119	9105
5/24/16 0:00	0	0	-3699	0	4218	8655	8577
5/24/16 1:00	-3379	0	-3587	0	2124	9838	9629
5/24/16 2:00	-3415	0	-3515	-3513	1379	11509	11193
5/24/16 3:00	-3351	0	-3535	-3497	2044	12077	11750
5/24/16 4:00	-3313	0	-3460	-3439	2818	11906	11598
5/24/16 5:00	-3303	0	-3417	0	4905	10652	10441
5/24/16 6:00	0	0	0	0	7657	7652	7652
5/24/16 7:00	3322	0	0	0	8494	6105	6110
5/24/16 8:00	2332	0	0	0	8100	5750	5732
5/24/16 9:00	2367	0	0	0	7954	5225	5247
5/24/16 10:00	0	0	0	0	7175	5977	5944
5/24/16 11:00	0	0	0	0	6724	6680	6628
5/24/16 12:00	2422	0	0	0	8154	5789	5842
5/24/16 13:00	2423	0	0	0	8540	6137	6173

Time Stamp	NMPS Unit 1	NMPS Unit 2	NMPS Unit 3	NMPS Unit 4	Gill Bank	NMPS Tailrace	Shearer Farms
5/24/16 14:00	3140	0	0	0	9225	6172	6259
5/24/16 15:00	3255	0	0	0	9248	6092	6209
5/24/16 16:00	3272	0	2468	0	10562	4807	5027
5/24/16 17:00	5181	0	2489	0	10739	4003	4237
5/24/16 18:00		0	2481	0	9725	4972	5110
5/24/16 19:00	2396	0	2489	0	9586	4859	5034
5/24/16 20:00	3508	0	2427	0	10231	4292	4496
5/24/16 21:00	0	0	0	0	7301	6566	6596
5/24/16 22:00	0	0	0	0	6369	7303	7349
5/24/16 23:00	0	-3569	0	0	4056	9251	9150
5/25/16 0:00	-3301	-3461	-3522	-3490	-1257	12285	11934
5/25/16 1:00	-3313	-3339	-3518	-3474	-462	12906	12553
5/25/16 2:00	-3296	-3368	-3451	-3391	255	13352	12948
5/25/16 3:00	-3243	-3330	-3360	-3332	1347	13419	12989
5/25/16 4:00	-3263	-3332	0	-3442	2463	12087	11774
5/25/16 5:00	0	-3265	0	-3426	4192	10594	10371
5/25/16 6:00	0	0	0	0	7060	7116	7185
5/25/16 7:00	0	0	0	0	7218	7128	7029
5/25/16 8:00	0	0	0	-3399	5851	7422	7292
5/25/16 9:00	0	0	0	-3372	5300	7699	7555
5/25/16 10:00	0	0	0	0	6639	6640	6644
5/25/16 11:00	0	0	0	0	6973	6947	6920
5/25/16 12:00	0	0	2382	0	8145	6979	7017
5/25/16 13:00	0	0	2404	0	8944	6641	6753
5/25/16 14:00	0	0	2415	0	8983	6439	6572
5/25/16 15:00	0	2412	3782	0	9806	4672	4977
5/25/16 16:00	0	2409	3935	0	9709	4093	4399
5/25/16 17:00	0	0	2351	0	7945	5750	5920
5/25/16 18:00	0	0	2335	0	7531	5972	6196
5/25/16 19:00	0	0	0	0	6578	6729	6897
5/25/16 20:00	0	0	2399	0	7798	5831	6094
5/25/16 21:00	0	0	4933	0	8505	5240	5508
5/25/16 22:00	0	0	0	0	5554	5930	6084
5/25/16 23:00	0	-3328	0	0	2951	6370	6411
5/26/16 0:00	0	-3352	0	0	2568	5922	5939
5/26/16 1:00	0	-3326	-16	0	2242	6381	6320
5/26/16 2:00	0	-3340	-3396	0	1960	8497	8287
5/26/16 3:00	0	-3335	-3455	0	1913	8512	8372
5/26/16 4:00	0	-3329	0	0	3965	8261	8136
5/26/16 5:00	0	0	0	0	6168	6187	6212
5/26/16 6:00	0	0	0	0	5652	5644	5635
5/26/16 7:00	0	0	0	0	5384	5382	5380
5/26/16 8:00	0	0	0	0	5509	5514	5521
5/26/16 9:00	0	0	0	0	5780	5826	5879
5/26/16 10:00	0	0	0	0	6408	6462	6526
5/26/16 11:00	0	0	0	0	6951	6156	6282
5/26/16 12:00	4003	0	0	0	8350	4854	5078

Time Stamp	NMPS Unit 1	NMPS Unit 2	NMPS Unit 3	NMPS Unit 4	Gill Bank	NMPS Tailrace	Shearer Farms
5/26/16 13:00	2331	0	0	0	8258	4663	4871
5/26/16 14:00	5068	0	0	2365	8789	4134	4364
5/26/16 15:00	5039	2423	2443	2289	13026	1099	1506
5/26/16 16:00	3876	0	2354	2375	15107	4641	4776
5/26/16 17:00	5186	0	0	2308	15210	6767	6882
5/26/16 18:00	2343	0	0	0	13257	10119	10061
5/26/16 19:00	0	0	0	0	11589	11531	11458
5/26/16 20:00	2370	0	0	0	11471	9779	9811
5/26/16 21:00	2462	0	0	0	11442	8774	8709
5/26/16 22:00	0	0	0	0	9320	9169	8994
5/26/16 23:00	0	0	0	0	7689	7638	7576
5/27/16 0:00	-3256	0	0	0	6400	7945	7818
5/27/16 1:00	-3335	0	0	0	5932	9057	8866
5/27/16 2:00	-3327	0	0	0	6541	9675	9472
5/27/16 3:00	-3286	0	-3434	0	3748	9501	9327
5/27/16 4:00	-3277	0	-3494	0	3534	9300	9130
5/27/16 5:00	-3285	0	0	0	5001	8187	8095
5/27/16 6:00	-3312	0	0	0	5949	8298	8156
5/27/16 7:00	0	0	0	0	6706	6701	6696
5/27/16 8:00	0	0	0	0	6511	6477	6438
5/27/16 9:00	0	0	0	0	5595	5614	5633
5/27/16 10:00	0	0	0	0	5258	5271	5285
5/27/16 11:00	0	5074	0	2313	8044	4021	4159
5/27/16 12:00	0	5026	0	3240	9913	2356	2632
5/27/16 13:00	0	4319	0	2333	10054	2748	2990
5/27/16 14:00	0	5122	0	5033	11188	1266	1612
5/27/16 15:00	2483	5156	0	5118	13226	750	1047
5/27/16 16:00	2420	5218	0	5170	15366	2676	2828
5/27/16 17:00	0	5263	0	4661	14806	5360	5394
5/27/16 18:00	0	2429	0	2249	12781	8519	8415
5/27/16 19:00	0	0	0	0	10184	8936	8877
5/27/16 20:00	0	0	0	0	8344	8319	8287
5/27/16 21:00	0	0	0	0	6735	6747	6758
5/27/16 22:00	0	0	0	0	6255	6233	6210
5/27/16 23:00	-3508	0	0	0	3024	6478	6415
5/28/16 0:00	-3325	0	-29	0	2369	6647	6565
5/28/16 1:00	-3481	0	-3620	0	432	8194	8000
5/28/16 2:00	-3392	0	-3569	-3480	-48	10183	9891
5/28/16 3:00	-3363	0	-3458	-3489	168	10318	10075
5/28/16 4:00	-3342	0	-3518	-3455	1509	10686	10405
5/28/16 5:00	-3323	0	-3504	0	1840	9370	9203
5/28/16 6:00	-3241	0	-3481	-3395	1259	10285	9979
5/28/16 7:00	0	0	-3396	-3397	3050	8890	8748
5/28/16 8:00	0	0	0	0	6066	6106	6156
5/28/16 9:00	0	0	0	0	5683	5671	5657
5/28/16 10:00	0	0	0	0	5642	5067	5087
5/28/16 11:00	0	0	0	3729	6531	3383	3513

Time Stamp	NMPS Unit 1	NMPS Unit 2	NMPS Unit 3	NMPS Unit 4	Gill Bank	NMPS Tailrace	Shearer Farms
5/28/16 12:00	0	5051	0	2342	7898	1737	1932
5/28/16 13:00	0	5054	0	2628	8528	1335	1551
5/28/16 14:00	2463	5054	0	3951	10511	235	576
5/28/16 15:00	3473	3471	3477	3387	11985	-1668	-1207
5/28/16 16:00	2424	2430	2449	2250	12290	2354	2583
5/28/16 17:00	3587	3583	3603	3480	15699	2262	2631
5/28/16 18:00	0	5319	0	3803	15595	5270	5405
5/28/16 19:00	0	2716	0	2273	13572	7930	7933
5/28/16 20:00	0	3577	0	1130	13165	8123	8141
5/28/16 21:00	0	2450	0	0	10112	8201	8108
5/28/16 22:00	0	0	0	0	7670	7582	7479
5/28/16 23:00	0	0	0	0	6574	6525	6469
5/29/16 0:00	0	0	0	0	5230	5232	5233
5/29/16 1:00	-3475	0	-3699	0	804	6115	6031
5/29/16 2:00	-3599	0	-3717	-1816	-498	7892	7725
5/29/16 3:00	-3454	0	-3605	-3583	-1222	9307	9091
5/29/16 4:00	-3452	0	-3628	-3550	-655	9770	9549
5/29/16 5:00	-3437	0	-3582	-3546	-1015	9314	9118
5/29/16 6:00	-3388	0	-3531	-3492	-650	9509	9264
5/29/16 7:00	-3319	0	0	0	3392	8373	8226
5/29/16 8:00	0	0	0	0	5760	6571	6547
5/29/16 9:00	0	0	0	0	5913	5898	5881
5/29/16 10:00	0	0	0	0	5373	5381	5389
5/29/16 11:00	0	0	0	0	4968	4988	5011
5/29/16 12:00	0	0	0	0	5064	5072	5081
5/29/16 13:00	0	0	0	0	4951	4987	5027
5/29/16 14:00	0	2437	0	0	7147	5178	5298
5/29/16 15:00	0	2445	0	0	7936	5627	5767
5/29/16 16:00	0	2355	0	0	6814	5209	5392
5/29/16 17:00	0	0	0	0	6042	6130	6229
5/29/16 18:00	0	0	0	0	6156	6259	6375
5/29/16 19:00	0	0	0	0	6002	6115	6241
5/29/16 20:00	0	0	0	0	5634	5736	5850
5/29/16 21:00	0	0	0	0	4544	4607	4676
5/29/16 22:00	0	0	0	0	3811	3824	3839
5/29/16 23:00	0	0	0	0	4318	4281	4241
5/30/16 0:00	0	0	0	0	4217	4208	4196
5/30/16 1:00	-3343	0	0	0	1723	5004	4940
5/30/16 2:00	-3371	0	-3602	0	77	6841	6680
5/30/16 3:00	-3376	0	-3438	-3416	-1724	8298	8087
5/30/16 4:00	-3337	0	-3473	-1692	-462	8384	8202
5/30/16 5:00	-3277	0	-3450	0	1213	7772	7627
5/30/16 6:00	-3233	0	-3437	0	907	7456	7301
5/30/16 7:00	-3230	0	0	0	3144	6317	6254
5/30/16 8:00	0	0	0	0	5832	5850	5876
5/30/16 9:00	0	0	0	0	6648	6675	6708
5/30/16 10:00	0	0	0	0	6360	6459	6570

Time Stamp	NMPS Unit 1	NMPS Unit 2	NMPS Unit 3	NMPS Unit 4	Gill Bank	NMPS Tailrace	Shearer Farms
5/30/16 11:00	0	0	0	0	6369	6466	6574
5/30/16 12:00	0	2357	0	0	7027	5417	5602
5/30/16 13:00	0	0	0	0	6185	5138	5286
5/30/16 14:00	0	0	0	0	4895	4982	5077
5/30/16 15:00	0	0	0	0	6163	6132	6100
5/30/16 16:00	0	2361	0	0	7137	5964	5975
5/30/16 17:00	0	4564	0	0	9744	6706	6718
5/30/16 18:00	0	2336	0	0	9525	7447	7435
5/30/16 19:00	0	2400	0	0	8789	6359	6359
5/30/16 20:00	0	5024	0	2365	11191	3916	3974
5/30/16 21:00	0	2321	0	0	9504	5319	5207
5/30/16 22:00	0	0	0	0	6719	6048	5939
5/30/16 23:00	0	0	0	0	3820	3872	3925
5/31/16 0:00	0	0	-3491	0	1153	4587	4528
5/31/16 1:00	0	0	-3481	0	1568	4987	4927
5/31/16 2:00	0	0	-3476	0	1778	5215	5152
5/31/16 3:00	0	0	-3410	0	1941	5323	5251
5/31/16 4:00	0	0	-3408	-3402	59	5928	5807
5/31/16 5:00	0	0	0	0	3339	5828	5737
5/31/16 6:00	0	0	0	0	3696	3745	3799
5/31/16 7:00	0	0	0	0	4623	4588	4553
5/31/16 8:00	0	0	0	0	6058	6043	6030
5/31/16 9:00	0	0	0	0	6568	6618	6675
5/31/16 10:00	0	0	0	0	5967	6074	6193
5/31/16 11:00	0	0	0	0	5595	5109	5215
5/31/16 12:00	0	0	0	4578	6476	3195	3345
5/31/16 13:00	2891	0	0	4920	7866	1840	2001
5/31/16 14:00	2803	0	0	4932	8830	668	866
5/31/16 15:00	4659	0	0	4975	10333	634	836
5/31/16 16:00	2340	0	0	5002	11599	3142	3286
5/31/16 17:00	2377	0	0	4005	11359	5320	5442
5/31/16 18:00	0	0	0	1710	9313	7090	7153
5/31/16 19:00	0	0	0	0	8417	8424	8430
5/31/16 20:00	0	0	0	0	8572	8582	8592
5/31/16 21:00	0	0	0	0	8001	8010	8019
5/31/16 22:00	0	0	0	0	7995	7965	7932
5/31/16 23:00	0	0	0	0	7370	8174	8094
6/1/16 0:00	0	-3477	0	0	4378	8285	8101
6/1/16 1:00	0	-3441	-3471	0	1737	8463	8212
6/1/16 2:00	0	-3495	-3518	0	482	7286	7115
6/1/16 3:00	0	-3388	-3465	0	661	7377	7180
6/1/16 4:00	0	-3373	-3436	0	523	7209	7049
6/1/16 5:00	0	-3361	-3431	0	2186	7157	7005
6/1/16 6:00	0	0	0	0	3364	3456	3559
6/1/16 7:00	5032	0	0	0	7687	1418	1534
6/1/16 8:00	2373	0	2390	0	8284	2505	2572
6/1/16 9:00	3953	0	0	0	10087	5558	5557

Time Stamp	NMPS Unit 1	NMPS Unit 2	NMPS Unit 3	NMPS Unit 4	Gill Bank	NMPS Tailrace	Shearer Farms
6/1/16 10:00	2382	0	0	0	9435	6387	6457
6/1/16 11:00	2341	0	0	0	8163	5994	6025
6/1/16 12:00	0	0	0	0	7094	5768	5717
6/1/16 13:00	5181	0	5207	0	10564	1845	2004
6/1/16 14:00	5236	2467	5223	0	12854	129	279
6/1/16 15:00	5302	2479	5306	0	14215	1301	1453
6/1/16 16:00		0	2734	0	14679	6249	6285
6/1/16 17:00	4092	2480	2448	0	15773	7265	7431
6/1/16 18:00	2448	2514	2471	0	14336	8286	8405
6/1/16 19:00	2426	0	0	0	12456	10013	9980
6/1/16 20:00	2415	0	0	0	10764	8310	8278
6/1/16 21:00	0	0	0	0	8664	7631	7485
6/1/16 22:00	0	0	0	0	6679	6581	6468
6/1/16 23:00	0	-3660	0	0	2490	6055	5955
6/2/16 0:00	0	-3670	0	0	665	4279	4243
6/2/16 1:00	0	-3636	0	0	-577	3903	3817
6/2/16 2:00	0	-3623	-3689	0	-1135	5932	5714
6/2/16 3:00	0	-3527	-3636	-3531	-3320	7187	6948
6/2/16 4:00	0	-3448	-3613	-3505	-2081	7472	7243
6/2/16 5:00	0	-3468	-3610	0	137	6184	6045
6/2/16 6:00	0	0	0	0	3157	3170	3186
6/2/16 7:00	0	0	0	0	3960	2591	2558
6/2/16 8:00	5397	0	0	0	5433	290	391
6/2/16 9:00	5185	2447	0	0	5961	-849	-737
6/2/16 10:00	2377	0	0	0	3471	1654	1612
6/2/16 11:00	2433	0	0	0	3618	1238	1294
6/2/16 12:00	2469	0	0	0	3373	1384	1408
6/2/16 13:00	3295	0	0	0	4091	941	990
6/2/16 14:00	2467	0	0	0	3589	1159	1182
6/2/16 15:00	2808	0	0	0	3714	1240	1296
6/2/16 16:00	3508	0	0	0	4975	2075	2139
6/2/16 17:00	2444	0	0	0	5024	2145	2262
6/2/16 18:00	2391	0	0	0	4421	2126	2251
6/2/16 19:00	0	0	0	0	3041	2514	2595
6/2/16 20:00	0	0	0	0	2785	2211	2270
6/2/16 21:00	2485	0	0	0	3884	1504	1630
6/2/16 22:00	0	0	0	0	3978	2803	2878
6/2/16 23:00	0	0	0	0	1489	2509	2626
6/3/16 0:00	0	-3666	-3775	0	-2162	3356	3329
6/3/16 1:00	0	-3593	-3643	0	-2627	5393	5218
6/3/16 2:00	0	-3596	-3616	-3440	-2424	8008	7707
6/3/16 3:00	0	-3515	-3529	-3507	-1439	8097	7859
6/3/16 4:00	0	-3463	0	0	643	5862	5770
6/3/16 5:00	0	0	0	0	2564	4239	4175
6/3/16 6:00	0	0	0	0	2983	2998	3015
6/3/16 7:00	4078	0	0	0	6070	1982	2095
6/3/16 8:00	2642	0	0	0	4984	2584	2668

Time Stamp	NMPS Unit 1	NMPS Unit 2	NMPS Unit 3	NMPS Unit 4	Gill Bank	NMPS Tailrace	Shearer Farms
6/3/16 9:00	0	0	0	0	3893	3325	3372
6/3/16 10:00	2366	0	0	0	3589	1073	1211
6/3/16 11:00	3272	2452	0	0	6426	-218	-118
6/3/16 12:00	3082	2467	0	0	6235	842	856
6/3/16 13:00	5192	0	0	0	4867	724	786
6/3/16 14:00	2671	0	0	0	3632	1128	1164
6/3/16 15:00	2413	0	0	0	4021	1515	1537
6/3/16 16:00	2409	0	0	0	4166	1791	1831
6/3/16 17:00	0	0	0	0	3442	2880	2924
6/3/16 18:00	0	0	0	0	3003	3084	3173
6/3/16 19:00	0	0	0	0	2526	2632	2751
6/3/16 20:00	0	0	0	0	2703	2783	2873
6/3/16 21:00	0	0	0	0	2516	2594	2681
6/3/16 22:00	0	0	0	0	1269	1339	1415
6/3/16 23:00	0	0	0	0	1202	1213	1227
6/4/16 0:00	0	0	-3681	0	-265	3344	3249
6/4/16 1:00	-3515	0	-3679	0	-2541	5316	5162
6/4/16 2:00	-3395	0	-3606	-3525	-3641	6759	6556
6/4/16 3:00	-3365	0	-3584	-3513	-2867	7442	7219
6/4/16 4:00	-3324	0	-3544	-3480	-1528	7782	7549
6/4/16 5:00	-3381	0	-3535	0	17	6789	6639
6/4/16 6:00	-3304	0	-3455	0	-316	6346	6194
6/4/16 7:00	0	0	0	0	2775	3654	3671
6/4/16 8:00	0	0	0	0	2474	2481	2489
6/4/16 9:00	0	0	0	0	1992	2004	2018
6/4/16 10:00	0	0	0	0	1548	1582	1621
6/4/16 11:00	0	0	0	0	1973	1409	1452
6/4/16 12:00	2723	0	0	0	2532	-44	80
6/4/16 13:00	2937	0	0	0	3037	1014	1044
6/4/16 14:00	2504	0	0	0	2891	581	700
6/4/16 15:00	2370	0	0	2367	5527	831	991
6/4/16 16:00	5154	0	0	2749	8007	615	832
6/4/16 17:00	3762	0	0	2286	8838	2491	2579
6/4/16 18:00	2381	0	0	0	6428	2941	2958
6/4/16 19:00	0	0	0	0	3221	2619	2607
6/4/16 20:00	0	0	0	0	2376	1778	1793
6/4/16 21:00	2420	0	0	0	2836	470	546
6/4/16 22:00	0	0	0	0	1497	1495	1492
6/4/16 23:00	0	0	-3668	0	223	2050	2057
6/5/16 0:00	-3454	0	-3695	0	-1830	3467	3414
6/5/16 1:00	-3337	0	-3506	-3517	-2740	5801	5635
6/5/16 2:00	-3307	0	-3523	-3511	-2743	7449	7227
6/5/16 3:00	-3235	0	-3463	-3423	-1813	8203	7983
6/5/16 4:00	-3280	0	-3479	-3411	-995	8930	8735
6/5/16 5:00	-3276	0	-3408	-3427	-1079	9550	9370
6/5/16 6:00	-3199	-3301	-3384	-3307	-1000	10384	10163
6/5/16 7:00	-3141	-3240	0	0	2413	7198	7267

Time Stamp	NMPS Unit 1	NMPS Unit 2	NMPS Unit 3	NMPS Unit 4	Gill Bank	NMPS Tailrace	Shearer Farms
6/5/16 8:00	0	0	0	0	4148	5042	5145
6/5/16 9:00	0	0	0	0	3831	3927	4035
6/5/16 10:00	0	0	0	0	3385	3487	3603
6/5/16 11:00	0	0	0	0	2537	2650	2777
6/5/16 12:00	0	0	0	0	922	1028	1146
6/5/16 13:00	0	0	0	0	953	980	1014
6/5/16 14:00	0	0	0	0	2542	2525	2508
6/5/16 15:00	0	0	0	0	3160	3207	3259
6/5/16 16:00	0	0	0	0	3612	3671	3737
6/5/16 17:00	0	0	0	0	4277	3746	3818
6/5/16 18:00	0	2395	0	0	5666	3375	3466
6/5/16 19:00	0	0	0	0	5035	5013	4988
6/5/16 20:00	0	0	0	0	4845	4885	4930
6/5/16 21:00	0	0	0	0	5209	5232	5259
6/5/16 22:00	0	0	0	0	5373	5400	5430
6/5/16 23:00	0	0	0	0	5531	5561	5594
6/6/16 0:00	0	0	-3395	0	4935	7448	7404
6/6/16 1:00	0	0	-3379	0	6071	9404	9312
6/6/16 2:00	-3181	0	-3354	0	5724	10107	10030
6/6/16 3:00	0	0	-3336	0	7005	10285	10214
6/6/16 4:00	0	0	0	0	8479	9325	9331
6/6/16 5:00	0	0	0	0	8605	8637	8673
6/6/16 6:00	0	0	0	0	9488	9473	9459
6/6/16 7:00	0	0	0	0	9553	9554	9554
6/6/16 8:00	0	0	0	0	9251	9241	9229
6/6/16 9:00	0	0	0	0	9473	9459	9444
6/6/16 10:00	0	0	0	0	10002	9993	9985
6/6/16 11:00	0	0	0	0	10158	10172	10188
6/6/16 12:00	0	0	0	0	10273	10287	10304
6/6/16 13:00	0	0	0	0	11313	10708	10693
6/6/16 14:00	0	4912	0	0	13071	9504	9589
6/6/16 15:00	0	4961	0	0	14420	9036	9165
6/6/16 16:00	0	4508	0	2316	15452	9145	9334
6/6/16 17:00	0	4954	0	2318	15461	10259	10418
6/6/16 18:00	0	0	0	0	13522	12388	12433
6/6/16 19:00	0	2395	0	0	13268	11623	11793
6/6/16 20:00	0	0	0	0	12515	12576	12641
6/6/16 21:00	0	0	0	0	12573	12657	12751
6/6/16 22:00	0	0	0	0	13045	13130	13227
6/6/16 23:00	0	0	0	0	14087	14137	14195
6/7/16 0:00	0	0	0	0	14620	14672	14730
6/7/16 1:00	0	0	0	0	15361	15376	15395
6/7/16 2:00	0	0	0	0	17101	18623	18403
6/7/16 3:00	0	0	0	-3398	17805	20131	19881
6/7/16 4:00	0	0	0	0	18575	20110	19905
6/7/16 5:00	-3209	0	0	0	17597	21432	21088
6/7/16 6:00	0	0	0	0	18933	18882	18833

Time Stamp	NMPS Unit 1	NMPS Unit 2	NMPS Unit 3	NMPS Unit 4	Gill Bank	NMPS Tailrace	Shearer Farms
6/7/16 7:00	0	0	0	0	18278	18181	18071
6/7/16 8:00	0	0	0	0	17871	17767	17649
6/7/16 9:00	0	0	0	0	17639	17539	17426
6/7/16 10:00	0	2388	0	0	17488	16302	16306
6/7/16 11:00	0	3842	0	0	18171	14872	14941
6/7/16 12:00	0	4937	0	0	18887	13200	13317
6/7/16 13:00	0	4966	0	2340	18808	11237	11387
6/7/16 14:00	0	4992	0	2332	18132	11166	11211
6/7/16 15:00	0	5053	0	3602	18146	10224	10326
6/7/16 16:00	0	5050	0	2817	17738	10061	10138
6/7/16 17:00	0	5084	0	3100	17344	10103	10172
6/7/16 18:00	0	3300	0	2304	17487	9937	10020
6/7/16 19:00	0	2520	0	2317	16782	10483	10519
6/7/16 20:00	0	2400	0	2308	15270	11719	11680
6/7/16 21:00	0	0	0	0	13946	13802	13634
6/7/16 22:00	0	0	0	0	13784	13713	13632
6/7/16 23:00	0	0	0	0	13427	13375	13315
6/8/16 0:00	0	-3493	0	0	11668	13319	13212
6/8/16 1:00	0	-3498	0	0	9705	13084	12968
6/8/16 2:00	0	-3431	0	0	9508	12888	12770
6/8/16 3:00	0	-3465	0	0	9236	12588	12460
6/8/16 4:00	-3412	-3431	0	0	6493	13933	13650
6/8/16 5:00	-3363	-3344	0	-3387	5647	13883	13641
6/8/16 6:00	0	0	0	0	9896	9973	10072
6/8/16 7:00	0	0	0	0	10356	10258	10150
6/8/16 8:00	0	0	0	0	10420	10320	10207
6/8/16 9:00	0	0	0	0	9714	9669	9614
6/8/16 10:00	0	0	0	0	9121	9078	9027
6/8/16 11:00	0	0	0	0	8429	8378	8318
6/8/16 12:00	0	0	0	0	7388	7370	7347
6/8/16 13:00	0	5032	0	0	9043	6000	6096
6/8/16 14:00	0	974	0	0	8530	7090	7105
6/8/16 15:00	0	0	0	0	6906	6992	7083
6/8/16 16:00	0	0	0	0	5804	6795	6907
6/8/16 17:00	0	0	-3540	0	5283	7942	7955
6/8/16 18:00	0	0	0	0	6520	6657	6813
6/8/16 19:00	0	0	0	0	6400	6509	6632
6/8/16 20:00	0	0	0	0	6360	6467	6587
6/8/16 21:00	0	0	0	0	6499	6595	6702
6/8/16 22:00	0	0	0	0	6229	6326	6434
6/8/16 23:00	0	-3376	29	0	3315	7567	7553
6/9/16 0:00	0	-3391	-3528	-3478	1160	9611	9453
6/9/16 1:00	0	-3336	-3458	0	2270	8986	8917
6/9/16 2:00	0	-3344	-3433	-3411	496	9908	9718
6/9/16 3:00	-3213	-3253	-3447	-3332	-948	11931	11583
6/9/16 4:00	0	-3210	-3265	-3339	663	11866	11584
6/9/16 5:00	0	0	0	0	6473	8929	8921

Time Stamp	NMPS Unit 1	NMPS Unit 2	NMPS Unit 3	NMPS Unit 4	Gill Bank	NMPS Tailrace	Shearer Farms
6/9/16 6:00	0	0	0	0	7741	7715	7687
6/9/16 7:00	2347	0	2327	0	8456	6162	6199
6/9/16 8:00	2312	0	2325	0	9157	4588	4672
6/9/16 9:00	2297	0	4996	0	10233	3078	3215
6/9/16 10:00	2320	0	5026	0	9393	3377	3446
6/9/16 11:00	0	0	0	0	6528	5869	5776
6/9/16 12:00	0	0	0	0	6125	6098	6067
6/9/16 13:00	0	0	0	0	6337	6297	6252
6/9/16 14:00	0	0	0	0	6407	6365	6318
6/9/16 15:00	0	0	0	0	6864	6241	6219
6/9/16 16:00	0	0	2421	0	8204	5837	5893
6/9/16 17:00	0	0	2416	0	8734	6382	6435
6/9/16 18:00	0	0	0	0	7653	7654	7651
6/9/16 19:00	0	0	0	0	7677	7705	7735
6/9/16 20:00	0	0	0	0	6826	6867	6911
6/9/16 21:00	0	0	0	0	5538	5590	5646
6/9/16 22:00	0	0	0	0	4818	4840	4863
6/9/16 23:00	0	-3301	0	0	3038	4667	4624
6/10/16 0:00	0	0	0	0	2590	2635	2686
6/10/16 1:00	0	0	0	0	2180	2953	2908
6/10/16 2:00	0		0	-3395	-459	6017	5771
6/10/16 3:00	0	-3282	0	0	924	4987	4921
6/10/16 4:00	0	-3252	0	0	1651	5612	5452
6/10/16 5:00	0	0	0	0	3522	4555	4501
6/10/16 6:00	0	-3210	0	0	2841	4382	4311
6/10/16 7:00	0	0	0	0	3082	3107	3135
6/10/16 8:00	0	0	0	0	2955	2409	2445
6/10/16 9:00	4913	0	2416	0	4621	-76	108
6/10/16 10:00	4962	0	2406	0	4815	-1148	-969
6/10/16 11:00	2386	0	0	0	3214	877	926
6/10/16 12:00	3287	0	0	0	3703	1010	1154
6/10/16 13:00	3258	0	0	0	4888	2006	2175
6/10/16 14:00	2332	0	0	0	5346	3177	3358
6/10/16 15:00	3647	0	0	0	5799	2811	3068
6/10/16 16:00	5001	0	2357	0	7139	855	1220
6/10/16 17:00	4350	0	2371	0	6678	1305	1586
6/10/16 18:00	2388	0	0	0	5701	3468	3634
6/10/16 19:00	2352	0	0	0	6046	3857	4055
6/10/16 20:00	4059	0	0	0	7000	3945	4140
6/10/16 21:00	2368	0	0	0	8155	5692	5700
6/10/16 22:00	2348	0	0	0	5898	4152	4169
6/10/16 23:00	0	0	0	0	5233	5101	4954
6/11/16 0:00	0	0	0	0	4801	4718	4624
6/11/16 1:00	0	0	0	0	2914	2924	2932
6/11/16 2:00	0	0	0	0	3587	3521	3451
6/11/16 3:00	0	0	0	0	3292	3265	3234
6/11/16 4:00	0	0	0	0	3381	3343	3301

Time Stamp	NMPS Unit 1	NMPS Unit 2	NMPS Unit 3	NMPS Unit 4	Gill Bank	NMPS Tailrace	Shearer Farms
6/11/16 5:00	0	0	0	0	3282	3251	3216
6/11/16 6:00	0	0	0	0	4664	4559	4444
6/11/16 7:00	0	0	0	0	6066	5916	5750
6/11/16 8:00	0	2417	0	0	7356	4891	4821
6/11/16 9:00		0	0	0	9573	5051	4933
6/11/16 10:00	0	0	0	0	9030	6672	6452
6/11/16 11:00	4503	2439	0	0	10668	3775	3794
6/11/16 12:00	3477	2358	0	0	10799	4228	4171
6/11/16 13:00	3538	2359	0	0	11482	5627	5580
6/11/16 14:00	2597	2388	0	0	11392	6557	6538
6/11/16 15:00	3512	0	0	0	9782	6760	6783
6/11/16 16:00	3524		0	0	10822	5576	5718
6/11/16 17:00	4417	2594	0	0	11216	4736	4911
6/11/16 18:00	2406	2426	0	0	10089	4963	5151
6/11/16 19:00	2451	4269	0	0	11177	5242	5506
6/11/16 20:00	3919	4288	0	0	12123	5032	5367
6/11/16 21:00	2458	0	0	0	11800	8744	8761
6/11/16 22:00	2471	0	0	0	10217	7720	7681
6/11/16 23:00	2673	0	0	0	8781	5898	5794
6/12/16 0:00	0	-3666	0	0	3070	5686	5520
6/12/16 1:00	0	0	0	-3702	-731	4733	4641
6/12/16 2:00	-3557	-3583	0	-3576	-3015	6344	6135
6/12/16 3:00	-3410	-3520	-3522	-3522	-4668	9136	8784
6/12/16 4:00	-3383	0	-3577	-3524	-2722	8492	8266
6/12/16 5:00	-3380	0	-3559	-3509	-1190	8139	7903
6/12/16 6:00	-3270	0	0	-3561	1085	6956	6787
6/12/16 7:00	0	0	0	0	2771	4511	4474
6/12/16 8:00	0	0	2474	0	3782	1974	2022
6/12/16 9:00	0	0	0	0	3290	2624	2568
6/12/16 10:00	0	0	2136	0	3568	2407	2397
6/12/16 11:00	0	0	3041	0	3828	1183	1244
6/12/16 12:00	0	0	2387	0	4582	2213	2239
6/12/16 13:00	0	0	2394	0	6375	4021	4074
6/12/16 14:00	0	0	2395	0	6767	4231	4392
6/12/16 15:00	0	0	2410	0	6398	4162	4355
6/12/16 16:00	0	0	2422	0	6238	3908	4117
6/12/16 17:00	0	0	2425	0	6166	3727	3938
6/12/16 18:00	0	0	2442	0	6060	3804	4003
6/12/16 19:00	0	0	2442	0	6109	3847	4045
6/12/16 20:00	0	0	2430	0	6080	3816	4017
6/12/16 21:00	0	0	0	0	6767	5621	5709
6/12/16 22:00	0	0	2455	0	7429	5019	5147
6/12/16 23:00	0	-3615	0	0	4705	5901	5863
6/13/16 0:00	0	-3641	0	0	3189	7503	7287
6/13/16 1:00	-3420	-3561	-3652	0	-1079	7606	7390
6/13/16 2:00	-3257	-3464	-3583	-3517	-3860	8835	8532
6/13/16 3:00	-3291	-3402	-3488	-3374	-3500	9789	9453

Time Stamp	NMPS Unit 1	NMPS Unit 2	NMPS Unit 3	NMPS Unit 4	Gill Bank	NMPS Tailrace	Shearer Farms
6/13/16 4:00	-3220	-3360	-3475	-3357	-2579	9783	9469
6/13/16 5:00	0	0	-3556	-3506	1440	8157	7963
6/13/16 6:00	0	0	0	0	3514	3575	3644
6/13/16 7:00	0	2404	0	0	4181	2386	2396
6/13/16 8:00	0	0	0	0	4599	3408	3425
6/13/16 9:00	0	0	0	0	4482	4527	4577
6/13/16 10:00	0	0	0	0	4302	4403	4517
6/13/16 11:00	0	0	0	0	5289	5287	5286
6/13/16 12:00	0	0	0	0	4367	4367	4364
6/13/16 13:00	0	0	0	0	3693	3652	3606
6/13/16 14:00	0	0	0	0	3949	3867	3775
6/13/16 15:00	0	0	0	0	4076	3177	3142
6/13/16 16:00	0	2873	0	0	4077	1387	1442
6/13/16 17:00	0	3429	0	0	4697	1317	1359
6/13/16 18:00	0	2339	0	0	5293	2746	2799
6/13/16 19:00	0	2338	0	0	5400	3174	3304
6/13/16 20:00	0	0	0	0	3986	4074	4169
6/13/16 21:00	0	0	0	0	3271	3378	3496
6/13/16 22:00	0	0	0	0	1399	1502	1615
6/13/16 23:00	-3284	0	0	0	-1152	2123	2097
6/14/16 0:00	0	0	0	0	1965	1969	1973
6/14/16 1:00	-3313	0	-3494	0	-1850	3982	3869
6/14/16 2:00	-3209	-3287	-3509	0	-3027	6073	5879
6/14/16 3:00	-3312	-3282	-3394	0	-2482	7236	7010
6/14/16 4:00	-3251	-3349	-3360	0	-1277	7596	7366
6/14/16 5:00	0	0	0	0	2513	4947	4914
6/14/16 6:00	0	0	0	0	3185	3176	3167
6/14/16 7:00	0	0	0	0	3248	3220	3189
6/14/16 8:00	0	0	0	0	4754	4738	4724
6/14/16 9:00	0	0	0	0	5361	5425	5498
6/14/16 10:00	0	0	0	0	5131	5260	5404
6/14/16 11:00	0	0	0	0	5254	4779	4926
6/14/16 12:00	0	0	2763	0	4315	1706	1913
6/14/16 13:00	0	0	3618	0	3804	280	378
6/14/16 14:00	2417	0	5042	0	7391	2125	2087
6/14/16 15:00	2388	0	5048	0	8655	1340	1479
6/14/16 16:00	2426	0	5046	0	9356	2010	2141
6/14/16 17:00	2427	0	4088	0	9844	3564	3695
6/14/16 18:00	0	0	4085	0	9427	5827	5897
6/14/16 19:00	0	0	0	0	8682	6946	7008
6/14/16 20:00	0	0	3554	0	9656	6542	6657
6/14/16 21:00	0	0	2367	0	8092	5757	5797
6/14/16 22:00	0	0	0	0	6216	4761	4751
6/14/16 23:00	0	0	0	0	5133	5909	5782
6/15/16 0:00	0	0	-3614	0	3409	6813	6667
6/15/16 1:00	0	0	-3478	0	2440	6683	6574
6/15/16 2:00	-3246	0	-3582	0	1714	8278	8048

Time Stamp	NMPS Unit 1	NMPS Unit 2	NMPS Unit 3	NMPS Unit 4	Gill Bank	NMPS Tailrace	Shearer Farms
6/15/16 3:00	-3289	0	-3445	-3420	-70	8223	8044
6/15/16 4:00	-3208	0	-3454	0	787	7353	7231
6/15/16 5:00	0	0	0	0	3618	5328	5312
6/15/16 6:00	0	0	0	0	4078	4080	4081
6/15/16 7:00	0	0	0	0	5246	5173	5094
6/15/16 8:00	0	0	0	0	6130	6113	6095
6/15/16 9:00	0	0	0	0	6839	6863	6891
6/15/16 10:00	0	0	0	2319	7726	6648	6743
6/15/16 11:00	0	3493	0	2325	9808	5844	5977
6/15/16 12:00	0	3514	0	3326	10984	4587	4751
6/15/16 13:00	0	4458	0	4290	12224	4356	4474
6/15/16 14:00	0	5087	0	4984	13430	3838	4008
6/15/16 15:00	0	5110	0	5007	14916	4928	5080
6/15/16 16:00	2473	5170	0	5064	16748	4260	4531
6/15/16 17:00	0	5180	0	5115	17022	5604	5775
6/15/16 18:00	0	5223	0	3629	16712	7903	7925
6/15/16 19:00	0	5055	0	2789	15196	7982	7936
6/15/16 20:00	0	4043	0	2371	14333	7251	7169
6/15/16 21:00	0	0	0	0	10929	8625	8411
6/15/16 22:00	0	2522	0	0	7703	5228	5260
6/15/16 23:00	0	0	0	0	2521	3453	3439
6/16/16 0:00	0	0		0	-615	3903	3805
6/16/16 1:00	-3469	0	-3719	0	-2165	5759	5570
6/16/16 2:00	-3467	0	-3650	-3586	-2777	7665	7405
6/16/16 3:00	-3405	0	-3623	-3518	-1901	7635	7425
6/16/16 4:00	0	0	-3686	0	690	5892	5793
6/16/16 5:00	0	0	-3558	0	1727	4356	4298
6/16/16 6:00	0	0	0	0	3321	3288	3253
6/16/16 7:00	0	2445	0	0	4968	2121	2147
6/16/16 8:00	0	4379	0	0	5538	1717	1806
6/16/16 9:00	0	0	0	0	4435	3716	3715
6/16/16 10:00	0	0	0	0	4006	4045	4089
6/16/16 11:00	0	0	0	0	4225	4272	4325
6/16/16 12:00	0	0	0	0	5549	4930	4997
6/16/16 13:00	0	4625	0	0	7866	3513	3737
6/16/16 14:00	0	5197	0	0	8389	3101	3320
6/16/16 15:00	0	5231	0	2756	10016	2651	2890
6/16/16 16:00	0	4405	0	2367	11637	4404	4527
6/16/16 17:00	0	5041	0	3340	13317	5449	5557
6/16/16 18:00	0	5030	0	2277	12934	6533	6595
6/16/16 19:00	0	2430	0	0	12449	9338	9238
6/16/16 20:00	0	0	0	0	11563	10834	10705
6/16/16 21:00	0	0	0	0	9614	9618	9616
6/16/16 22:00	0	0	0	0	7648	7697	7747
6/16/16 23:00	0	0	0	0	3204	4184	4259
6/17/16 0:00	-3386	-3516	0	-2695	-2270	6254	6021
6/17/16 1:00	-3539	-3506	0	-3670	-2378	8111	7817

Time Stamp	NMPS Unit 1	NMPS Unit 2	NMPS Unit 3	NMPS Unit 4	Gill Bank	NMPS Tailrace	Shearer Farms
6/17/16 2:00	-3348	-3540	-3554	-3568	-4244	9490	9154
6/17/16 3:00	-3290		-3615	-3496	-3633	9910	9576
6/17/16 4:00	-3359	-3465	0	-3489	-1019	9892	9558
6/17/16 5:00	-3353	-3431	0	0	2374	7324	7193
6/17/16 6:00	0	0	0	0	4259	4255	4251
6/17/16 7:00	0	5110	0	0	5457	1519	1598
6/17/16 8:00	0	5075	0	0	5757	786	891
6/17/16 9:00	0	5175	0	4093	7103	-469	-248
6/17/16 10:00	0	2390	0	2314	5059	823	961
6/17/16 11:00	0	2722	0	0	5720	2666	2747
6/17/16 12:00	0	5202	0	1395	7917	2022	2248
6/17/16 13:00	0	5205	0	2840	10340	2668	2874
6/17/16 14:00	0	5264	0	3728	10949	2635	2874
6/17/16 15:00	0	5050	0	4224	11396	2647	2881
6/17/16 16:00	0	3574	0	2417	10938	4204	4339
6/17/16 17:00	0	2416	0	0	9547	6309	6350
6/17/16 18:00	0	0	0	0	8136	8118	8095
6/17/16 19:00	0	0	0	0	8618	8607	8595
6/17/16 20:00	0	0	0	0	8792	8776	8758
6/17/16 21:00	0	0	0	0	8604	8571	8534
6/17/16 22:00	0	0	0	0	6042	6040	6033
6/17/16 23:00	0	-3788	0	0	769	4413	4336
6/18/16 0:00	0	-3740	0	-28	-407	4132	4018
6/18/16 1:00	0	-3591	0	-3658	-979	6139	5910
6/18/16 2:00	0	-3558	-3590	-3659	-2021	6859	6649
6/18/16 3:00	0	-3573	-3600	-3568	-1907	8585	8265
6/18/16 4:00	0	-3509	-3552	-3519	-1858	8549	8280
6/18/16 5:00	0	-3444	-3577	-3482	-824	8587	8302
6/18/16 6:00	0	-3426	0	-3495	117	6933	6777
6/18/16 7:00	0	-3426	0	0	2866	5364	5262
6/18/16 8:00	0	0	0	0	3210	3212	3213
6/18/16 9:00	0	0	0	0	2957	2918	2874
6/18/16 10:00	0	0	0	0	2670	2648	2622
6/18/16 11:00	0	0	0	0	2330	2325	2319
6/18/16 12:00	0	0	0	0	2582	2566	2548
6/18/16 13:00	0	0	0	0	2993	2973	2951
6/18/16 14:00	0	0	2446	0	3673	2173	2242
6/18/16 15:00	0	0	5140	0	5690	1032	1199
6/18/16 16:00	0	2475	5174	0	7202	709	907
6/18/16 17:00	0	2397	5247	2410	7690	-1283	-951
6/18/16 18:00	0	0	2426	2271	5868	-389	-140
6/18/16 19:00	0	0	2411	0	4389	2105	2257
6/18/16 20:00	0	0	3084	0	3822	1438	1675
6/18/16 21:00	0	674	2261	0	3569	-173	15
6/18/16 22:00	0	0	0	0	820	-15	50
6/18/16 23:00	0	0	-3666	0	1043	4552	4363
6/19/16 0:00	0	0	-3679	0	-1029	3510	3509

Time Stamp	NMPS Unit 1	NMPS Unit 2	NMPS Unit 3	NMPS Unit 4	Gill Bank	NMPS Tailrace	Shearer Farms
6/19/16 1:00	0	0	-3542	-3579	-2466	5389	5215
6/19/16 2:00	0	-3463	-3536	-3513	-2477	7808	7514
6/19/16 3:00	-3316	-3413	-3474	-3408	-3143	8651	8357
6/19/16 4:00	-3263	-3401	-3436	-3360	-3398	9779	9406
6/19/16 5:00	-3223	-3359	-3481	-3312	-3137	9889	9531
6/19/16 6:00	-3190	-3243	-3416	-3307	-2264	9795	9437
6/19/16 7:00	0	0	-3380	-3318	955	8263	8056
6/19/16 8:00	0	0	0	0	4060	4167	4288
6/19/16 9:00	0	0	0	0	3635	3641	3648
6/19/16 10:00	0	0	0	0	2887	2921	2957
6/19/16 11:00	0	0	0	0	2088	2145	2209
6/19/16 12:00	0	0	0	0	2765	2791	2823
6/19/16 13:00	0	0	0	0	3685	3712	3743
6/19/16 14:00	0	2363	0	0	4324	3252	3374
6/19/16 15:00	0	2369	0	0	4595	2384	2562
6/19/16 16:00	0	2372	0	0	4616	2378	2528
6/19/16 17:00	0	2368	0	0	4167	1953	2132
6/19/16 18:00	0	2375	0	0	4431	2188	2337
6/19/16 19:00	0	2364	0	0	4357	2126	2286
6/19/16 20:00	0	2384	0	0	4008	1754	1897
6/19/16 21:00	0	2371	0	0	2193	524	650
6/19/16 22:00	0	0	0	0	491	531	577
6/19/16 23:00	0	0	0	0	494	1324	1323
6/20/16 0:00	0	-3370	0	0	512	3752	3633
6/20/16 1:00	0	-3322	-3349	0	-1368	4439	4337
6/20/16 2:00	0	-3272	-3438	0	-1852	5484	5317
6/20/16 3:00	-3193	-3248	-3397	0	-2312	7240	6964
6/20/16 4:00	0	-3228	-3373	0	512	6889	6692
6/20/16 5:00	0	-3260	0	0	2332	4711	4660
6/20/16 6:00	0	0	0	0	2700	2707	2716
6/20/16 7:00	0	0	0	0	2660	2618	2572
6/20/16 8:00	0	0	0	0	2250	2238	2224
6/20/16 9:00	0	0	0	0	1968	1967	1966
6/20/16 10:00	0	0	0	0	1822	1822	1823
6/20/16 11:00	0	0	0	0	2210	1624	1634
6/20/16 12:00	0	0	4223	0	3221	18	124
6/20/16 13:00	0	1485	5007	0	4768	-940	-795
6/20/16 14:00	0	2865	5071	0	6154	-1321	-1113
6/20/16 15:00	0	4050	5116	0	7008	-1563	-1299
6/20/16 16:00	0	5033	5141	0	6188	-3079	-2719
6/20/16 17:00	0	2344	5130	0	5564	-1926	-1669
6/20/16 18:00	0	0	2360	0	3595	426	586
6/20/16 19:00	0	0	0	0	1941	2026	2121
6/20/16 20:00	0	0	0	0	681	788	906
6/20/16 21:00	0	0	0	0	1557	1580	1609
6/20/16 22:00	0	0	0	0	4044	4047	4054
6/20/16 23:00	0	0	0	0	3721	3825	3939

Time Stamp	NMPS Unit 1	NMPS Unit 2	NMPS Unit 3	NMPS Unit 4	Gill Bank	NMPS Tailrace	Shearer Farms
6/21/16 0:00	0	0	0	-3418	-197	1630	1752
6/21/16 1:00	-3339	0	0	-3520	-2046	3808	3678
6/21/16 2:00	-3254	0	0	-3400	-1322	6024	5812
6/21/16 3:00	-3234	0	-3379	-3349	-2353	7440	7199
6/21/16 4:00	-3192	0	0	-3380	-816	7269	7073
6/21/16 5:00	-3316	0	0	0	1954	5945	5825
6/21/16 6:00	0	0	0	0	2856	2886	2919
6/21/16 7:00	0	0	0	0	2454	2429	2402
6/21/16 8:00	0	0	0	0	2984	2933	2877
6/21/16 9:00	0	0	0	0	4268	4169	4060
6/21/16 10:00	0	0	0	0	5740	5588	5417
6/21/16 11:00	0	0	0	0	7701	6897	6668
6/21/16 12:00	5068	0	0	4087	11450	3819	3845
6/21/16 13:00	5035	0	0	4913	12064	2145	2167
6/21/16 14:00	5131	2397	0	5014	12634	1383	1405
6/21/16 15:00	5180	2446	0	5030	11714	-808	-666
6/21/16 16:00	5231	2443	0	5074	10671	-1342	-1214
6/21/16 17:00	4121	0	0	4588	9426	269	311
6/21/16 18:00	2382	0	0	2310	4645	-733	-590
6/21/16 19:00	0	0	0	0	1317	1312	1307
6/21/16 20:00	0	0	0	0	1187	1236	1291
6/21/16 21:00	0	0	0	0	692	779	877
6/21/16 22:00	0	0	0	0	1781	1818	1862
6/21/16 23:00	0	0	0	0	2321	2345	2372
6/22/16 0:00	0	0	0	0	976	1892	1924
6/22/16 1:00	0	-3518	0	-3559	-1537	4484	4334
6/22/16 2:00	0	-3439	-3520	-3530	-2383	6082	5893
6/22/16 3:00	0	-3413	-3457	-3466	-2563	7543	7286
6/22/16 4:00	0	-3438	-3447	-3379	-769	7592	7366
6/22/16 5:00	0	0	0	-3427	2258	4821	4792
6/22/16 6:00	0	0	0	0	3060	3052	3043
6/22/16 7:00	0	0	0	0	3360	2113	2114
6/22/16 8:00	0	2325	0	0	2919	385	474
6/22/16 9:00	0	0	0	0	1768	1742	1714
6/22/16 10:00	0	2423	0	0	2222	1074	1137
6/22/16 11:00	0	2886	0	0	3543	156	272
6/22/16 12:00	0	4903	0	2347	6005	-123	1
6/22/16 13:00	0	5112	0	3385	6439	-1243	-1070
6/22/16 14:00	0	5098	0	3388	6884	-1867	-1703
6/22/16 15:00	0	5141	0	5047	7204	-2804	-2604
6/22/16 16:00	0	5208	0	5086	8595	-1578	-1447
6/22/16 17:00	0	5238	0	2293	7432	-1366	-1193
6/22/16 18:00	0	3870	0	2283	3993	-1745	-1550
6/22/16 19:00	0	0	0	0	1794	1787	1781
6/22/16 20:00	0	0	0	0	1534	1607	1688
6/22/16 21:00	0	0	0	0	1834	1870	1911
6/22/16 22:00	0	0	0	0	2448	2454	2462

Time Stamp	NMPS Unit 1	NMPS Unit 2	NMPS Unit 3	NMPS Unit 4	Gill Bank	NMPS Tailrace	Shearer Farms
6/22/16 23:00	0	0	0	0	1972	2003	2037
6/23/16 0:00	0	0	0	0	1892	1910	1928
6/23/16 1:00	0	-3621	0	-3581	-918	4366	4243
6/23/16 2:00	0	-3532	0	-3600	-1450	5608	5471
6/23/16 3:00	0	-3487	-3635	-3507	-3190	7237	7017
6/23/16 4:00	0	-3558	0	-3601	-1220	7416	7218
6/23/16 5:00	0	0	0	0	2870	4584	4567
6/23/16 6:00	0	0	0	0	2940	2936	2930
6/23/16 7:00	0	0	0	0	2752	2724	2693
6/23/16 8:00	0	0	0	0	2382	2375	2368
6/23/16 9:00	0	0	0	0	1402	1433	1468
6/23/16 10:00	0	0	0	0	2138	2118	2096
6/23/16 11:00	-7	2426	0	-53	3155	1996	2004
6/23/16 12:00	-9	5082	0	-53	3828	19	130
6/23/16 13:00	-8	5130	0	-53	4627	-345	-225
6/23/16 14:00	-8	5169	0	3012	6716	-166	5
6/23/16 15:00	-8	2653	0	0	6075	2700	2746
6/23/16 16:00	-7	5170	0	0	6359	2663	2746
6/23/16 17:00	-9	3560	0	0	4849	1840	1888
6/23/16 18:00	-9	5211	0	0	4725	183	303
6/23/16 19:00	-8	5216	0	0	6396	1308	1447
6/23/16 20:00	-8	5001	0	2329	8220	1609	1824
6/23/16 21:00	-8	2467	0	2350	8632	3427	3495
6/23/16 22:00	-7	2466	0	1141	8025	4623	4573
6/23/16 23:00	-8	0	0	-3730	4173	5932	5786
6/24/16 0:00	-8	36	0	-3734	20	4607	4560
6/24/16 1:00	-9	-3644	-3733	-3628	-2360	6590	6372
6/24/16 2:00	-6	-3568	-3662	-3536	-3551	7847	7595
6/24/16 3:00	-3383	-3499	-3587	-3476	-4390	9291	8965
6/24/16 4:00	0	-3421	-3539	-3527	-2537	9312	9019
6/24/16 5:00	0	-3349	0	0	2014	7906	7709
6/24/16 6:00	0	0	0	0	3332	3387	3446
6/24/16 7:00	0	0	0	0	2503	2471	2435
6/24/16 8:00	0	0	0	0	2213	2187	2157
6/24/16 9:00	0	0	0	0	1906	1902	1897
6/24/16 10:00	0	0	0	0	1456	1468	1482
6/24/16 11:00	0	0	0	0	1495	1501	1508
6/24/16 12:00	0	0	0	0	2596	1879	1869
6/24/16 13:00	0	5052	0	0	4607	-865	-715
6/24/16 14:00	2498	5113	0	3869	6773	-3199	-2990
6/24/16 15:00	2972	5245	0	5154	8204	-5252	-4961
6/24/16 16:00	5343	5335	0	5270	8949	-6317	-6004
6/24/16 17:00	4081	4032	0	3984	7367	-1863	-1810
6/24/16 18:00	0	3012	0	2812	5938	402	460
6/24/16 19:00	0	5049	0	0	5944	1263	1367
6/24/16 20:00	0	0	0	0	5233	5170	5101
6/24/16 21:00	0	0	0	0	5325	5327	5327

Time Stamp	NMPS Unit 1	NMPS Unit 2	NMPS Unit 3	NMPS Unit 4	Gill Bank	NMPS Tailrace	Shearer Farms
6/24/16 22:00	0	0	0	0	3520	3539	3557
6/24/16 23:00	0	0	-3811	0	-464	3289	3223
6/25/16 0:00	0	0	-3785	0	0	4561	4421
6/25/16 1:00	0	-3671	-3724	0	-1190	6032	5844
6/25/16 2:00	0	-3598	-3651	-3615	-3087	7571	7319
6/25/16 3:00	0	-3546	-3640	-3539	-2462	7989	7742
6/25/16 4:00	-3368	-3457	-3514	-3482	-3502	8486	8200
6/25/16 5:00	0	-3456	-3480	-3493	-673	8625	8335
6/25/16 6:00	0	0	-3560	0	1814	5333	5296
6/25/16 7:00	0	0	0	0	3676	3670	3665
6/25/16 8:00	0	0	0	0	4311	4300	4290
6/25/16 9:00	0	0	0	0	4333	4402	4480
6/25/16 10:00	0	0	0	0	3276	3395	3528
6/25/16 11:00	0	2442	0	0	2427	755	930
6/25/16 12:00	0	2453	0	0	1965	-388	-292
6/25/16 13:00	0	0	0	0	1171	1155	1138
6/25/16 14:00	0	2434	0	0	3727	100	194
6/25/16 15:00	0	2433	2483	0	4644	-737	-572
6/25/16 16:00	0	2670	2493	0	6305	1318	1439
6/25/16 17:00	0	5163	2495	0	6870	419	639
6/25/16 18:00	0	2409	0	0	4096	525	617
6/25/16 19:00	0	0	0	0	2817	2074	2038
6/25/16 20:00	0	0	0	0	2165	2160	2154
6/25/16 21:00	0	0	0	0	1326	1359	1394
6/25/16 22:00	0	0	0	0	2295	2264	2231
6/25/16 23:00	0	0	0	0	1673	2564	2540
6/26/16 0:00	0	0	-3683	0	-1124	3363	3294
6/26/16 1:00	0	-3485	-3583	0	-2119	5727	5529
6/26/16 2:00	0	-3474	-3538	-3498	-2676	7621	7354
6/26/16 3:00	0	-3397	-3512	-3449	-2999	7997	7748
6/26/16 4:00	-3241	-3390	-3422	-3384	-3673	9491	9117
6/26/16 5:00	-3274	-3361	-3447	-3324	-2718	9540	9203
6/26/16 6:00	0	-3317	-3439	-3342	-1361	8515	8258
6/26/16 7:00	0	0	-3512	0	2277	7133	6949
6/26/16 8:00	0	0	0	0	3726	3757	3791
6/26/16 9:00	0	2370	2041	0	4500	1657	1705
6/26/16 10:00	0	2359	2419	0	3812	-276	-167
6/26/16 11:00	0	0	0	0	1972	1353	1320
6/26/16 12:00	0	0	0	0	1323	1353	1385
6/26/16 13:00	0	2385	0	0	2831	1011	1095
6/26/16 14:00	0	3678	0	0	4809	1386	1509
6/26/16 15:00	0	3009	0	0	5495	2026	2158
6/26/16 16:00	0	4991	2402	0	5312	-638	-378
6/26/16 17:00	0	5023	2422	0	3638	-2898	-2660
6/26/16 18:00	0	3738	2436	0	3655	-1631	-1540
6/26/16 19:00	0	2341	0	0	2907	-1341	-1216
6/26/16 20:00	0	0	0	0	1078	516	546

Time Stamp	NMPS Unit 1	NMPS Unit 2	NMPS Unit 3	NMPS Unit 4	Gill Bank	NMPS Tailrace	Shearer Farms
6/26/16 21:00	0	0	0	0	1407	1426	1449
6/26/16 22:00	0	0	0	0	1320	1352	1387
6/26/16 23:00	0	0	0	0	1592	1598	1606
6/27/16 0:00	0	0	-3486	0	173	2722	2669
6/27/16 1:00	0	-3474	-3510	0	-2020	5509	5303
6/27/16 2:00	0	-3321	-3410	-3401	-2756	7223	6966
6/27/16 3:00	0	-3351	-3440	-3431	-2159	7711	7456
6/27/16 4:00	0	-3373	-3506	0	-826	7386	7160
6/27/16 5:00	0	-3258	0	0	1846	5878	5754
6/27/16 6:00	0	0	0	0	2807	2848	2893
6/27/16 7:00	0	0	0	0	2652	2612	2568
6/27/16 8:00	0	0	0	0	2544	2524	2502
6/27/16 9:00	0	0	0	0	2484	2508	2536
6/27/16 10:00	0	0	0	0	2621	2667	2720
6/27/16 11:00	0	2258	0	0	3027	1948	2027
6/27/16 12:00	0	4099	0	0	3597	-160	-14
6/27/16 13:00	0	5107	5086	0	5820	-2464	-2265
6/27/16 14:00	0	5097	5093	0	6392	-3576	-3358
6/27/16 15:00	2451	5150	5117	0	6496	-4707	-4433
6/27/16 16:00	2450		5198	0	6236	-5658	-5353
6/27/16 17:00	0	5171	2378	0	5470	-3314	-3111
6/27/16 18:00	0	2395	2402	0	5497	80	272
6/27/16 19:00	0	0	0	0	2350	2468	2594
6/27/16 20:00	0	0	0	0	519	662	820
6/27/16 21:00	0	0	0	0	976	988	1004
6/27/16 22:00	0	0	0	0	2582	2527	2466
6/27/16 23:00	0	0	0	0	2233	2237	2240
6/28/16 0:00	0	0	0	0	813	1723	1737
6/28/16 1:00	0	0	-3535	0	-462	3850	3733
6/28/16 2:00	0	-3470	-3529	0	-1999	5685	5508
6/28/16 3:00	0	-3389	-3486	-3408	-2785	7312	7068
6/28/16 4:00	0	-3364	-3425	0	-83	7444	7226
6/28/16 5:00	0	0	0	0	2873	4590	4560
6/28/16 6:00	0	0	0	0	2833	2821	2806
6/28/16 7:00	0	0	0	0	2340	2333	2325
6/28/16 8:00	0	0	0	0	2954	2969	2987
6/28/16 9:00	0	0	0	0	3242	3268	3298
6/28/16 10:00	0	2383	0	0	2695	1582	1673
6/28/16 11:00	0	2394	0	0	2604	278	358
6/28/16 12:00	0	3414	0	0	3604	715	741
6/28/16 13:00	0	3675	0	0	3690	216	294
6/28/16 14:00	0	3680	0	0	3497	-153	-65
6/28/16 15:00	0	5028	0	0	3847	-525	-423
6/28/16 16:00	0	5055	0	0	3680	-873	-759
6/28/16 17:00	0	3449	0	0	2563	38	101
6/28/16 18:00	0	0	0	0	1939	1925	1910
6/28/16 19:00	0	0	0	0	1746	1772	1801

Time Stamp	NMPS Unit 1	NMPS Unit 2	NMPS Unit 3	NMPS Unit 4	Gill Bank	NMPS Tailrace	Shearer Farms
6/28/16 20:00	0	0	0	0	2006	2040	2078
6/28/16 21:00	0	0	0	0	3316	3335	3358
6/28/16 22:00	0	0	0	0	3228	3284	3346
6/28/16 23:00	0	0	0	0	1045	1964	2023
6/29/16 0:00	0	-3438	0	-32	-1181	3067	2989
6/29/16 1:00	0	-3458	0	-3465	-1533	6052	5823
6/29/16 2:00	0	-3343	-3478	-3433	-2685	7396	7159
6/29/16 3:00	-3232	-3304	-3411	-3343	-3267	8668	8364
6/29/16 4:00	0	-3263	-3390	-3358	-601	7629	7430
6/29/16 5:00	0	-3339	0	0	2519	4956	4900
6/29/16 6:00	0	0	0	0	2888	2879	2868
6/29/16 7:00	0	0	0	0	3069	3020	2967
6/29/16 8:00	0	0	0	0	3006	3025	3046
6/29/16 9:00	0	0	0	0	3058	3113	3176
6/29/16 10:00	0	0	0	0	3062	3131	3210
6/29/16 11:00	0	0	3347	0	5219	2098	2244
6/29/16 12:00	2338	0	4776	0	7880	1322	1484
6/29/16 13:00	2346	0	3294	0	8025	2644	2727
6/29/16 14:00	3449	0	3473	0	9433	3530	3662
6/29/16 15:00	2541	0	4450	0	12330	5722	5776
6/29/16 16:00	3461	0	3487	0	12917	6159	6257
6/29/16 17:00	5210	0	5170	0	14174	4756	4965
6/29/16 18:00	3372	0	5172	0	13768	6735	6774
6/29/16 19:00	0	0	2423	0	12617	7997	8012
6/29/16 20:00	0	0	2637	0	12083	9281	9244
6/29/16 21:00	0	0	2429	0	12187	9735	9698
6/29/16 22:00	0	0	0	0	11209	10529	10441
6/29/16 23:00	0	0	0	0	9512	9488	9455
6/30/16 0:00	0	0	0	0	5341	6259	6266
6/30/16 1:00	0	0	-3591	0	-1394	3101	3104
6/30/16 2:00	-3335	-3399	-3502	0	-2577	5890	5630
6/30/16 3:00	-3229	-3405	-3498	-3408	-4340	8939	8568
6/30/16 4:00	-3364	-3357	-3472	0	-2083	8496	8251
6/30/16 5:00	0	-3392	-3522	0	435	6360	6246
6/30/16 6:00	0	0	0	0	3455	3456	3458
6/30/16 7:00	0	0	0	0	2633	2628	2621
6/30/16 8:00	0	0	0	0	3084	3092	3102
6/30/16 9:00	0	0	0	0	3124	3181	3246
6/30/16 10:00	0	0	0	0	3025	3119	3226
6/30/16 11:00	0	0	0	0	5162	5176	5198
6/30/16 12:00	0	3492	0	0	8018	6309	6351
6/30/16 13:00	0	3976	0	2350	10259	5493	5646
6/30/16 14:00	0	3953	0	2361	11679	4903	5069
6/30/16 15:00	0	5077	0	5000	14154	4832	5005
6/30/16 16:00	0	5117	0	5054	15079	5065	5242
6/30/16 17:00	0	5192	2509	3237	16545	4857	5061
6/30/16 18:00	0	3065	0	2320	14579	6634	6712

Time Stamp	NMPS Unit 1	NMPS Unit 2	NMPS Unit 3	NMPS Unit 4	Gill Bank	NMPS Tailrace	Shearer Farms
6/30/16 19:00	0	2380	0	0	11750	8761	8741
6/30/16 20:00	0	2401	0	0	9430	6855	6949
6/30/16 21:00	0	0	0	0	3620	3119	3218
6/30/16 22:00	0	0	0	0	1284	1294	1307
6/30/16 23:00	0	0	0	0	1559	1535	1512
7/1/16 0:00	0	0	0	0	1138	1982	1971
7/1/16 1:00	-3377	0	0	-3471	-1400	3702	3606
7/1/16 2:00	-3419	0	0	-3544	-1886	5809	5623
7/1/16 3:00	-3441	0	-3523	-3527	-2644	7596	7340
7/1/16 4:00	-3399	0	-3606	0	-216	7430	7223
7/1/16 5:00	-3345	0	0	0	2206	4669	4631
7/1/16 6:00	0	0	0	0	2752	2743	2733
7/1/16 7:00	0	0	0	0	2730	2685	2634
7/1/16 8:00	0	0	2319	0	3526	2337	2351
7/1/16 9:00	0	0	2405	0	5465	2044	2135
7/1/16 10:00	2459	0	4413	0	7543	1972	2094
7/1/16 11:00	3691	0	5225	0	10119	2128	2246
7/1/16 12:00	3669	0	5256	0	10987	1789	1930
7/1/16 13:00	5271	0	5314	0	11504	1080	1252
7/1/16 14:00	5354	0	5377	0	11613	1405	1543
7/1/16 15:00	3928	0	5146	0	10769	1995	2116
7/1/16 16:00	2451	0	5168	0	9892	2237	2360
7/1/16 17:00	0	0	0	0	6241	5549	5478
7/1/16 18:00	0	0	0	0	6673	6623	6566
7/1/16 19:00	0	0	0	0	6323	6306	6284
7/1/16 20:00	0	0	0	0	5494	5505	5516
7/1/16 21:00	0	0	0	0	4684	4713	4744
7/1/16 22:00	0	0	0	0	4174	4216	4261
7/1/16 23:00	0	0	0	0	3570	3603	3639
7/2/16 0:00	0	0	0	-123	847	1857	1911
7/2/16 1:00	-3595	0	-3757	-3642	-2916	5156	4958
7/2/16 2:00	-3513	0	-3720	-3640	-2972	7636	7375
7/2/16 3:00	-3399	0	-3585	-3605	-2604	7832	7617
7/2/16 4:00	-3419	0	-3576	-3543	-2091	8250	7994
7/2/16 5:00	-3391	0	-3628	-3418	-1996	8204	7954
7/2/16 6:00	-3330	29	-3558	-3451	-1772	8351	8110
7/2/16 7:00	0	0	0	0	4372	6918	6837
7/2/16 8:00	0	0	0	0	4760	4810	4864
7/2/16 9:00	0	0	0	0	3706	3764	3828
7/2/16 10:00	0	0	0	0	2436	3355	3428
7/2/16 11:00	0	-3394	0	0	1999	4561	4552
7/2/16 12:00	0	0	0	0	3801	3911	4038
7/2/16 13:00	0	-3394	0	0	3843	5609	5688
7/2/16 14:00	0	0	0	0	5461	6433	6565
7/2/16 15:00	0	0	750	0	5129	5120	5387
7/2/16 16:00	0	0	2463	0	9181	6228	6375
7/2/16 17:00	2448	0	2471	0	13067	8180	8225

Time Stamp	NMPS Unit 1	NMPS Unit 2	NMPS Unit 3	NMPS Unit 4	Gill Bank	NMPS Tailrace	Shearer Farms
7/2/16 18:00	0	0	2467	0	13025	9353	9374
7/2/16 19:00	0	0	0	0	11976	10737	10692
7/2/16 20:00	0	0	0	0	11487	11437	11378
7/2/16 21:00	0	0	0	0	11291	11273	11252
7/2/16 22:00	0	0	0	0	9301	9336	9369
7/2/16 23:00	-3345	0	0	0	2019	3836	4000
7/3/16 0:00	-3401	0	0	-3449	-2794	3101	3047
7/3/16 1:00	-3360	0	-3468	-3403	-2540	6608	6322
7/3/16 2:00	-3290	0	-3463	-3444	-2420	6782	6602
7/3/16 3:00	-3225	0	-3406	-3390	-2443	7450	7221
7/3/16 4:00	-3249	0	-3454	-3407	-2122	7749	7510
7/3/16 5:00	-3192	0	-3405	-3318	-1520	8113	7847
7/3/16 6:00	0	0	-3357	-3365	67	7352	7153
7/3/16 7:00	0	0	-3270	-3404	1109	6761	6569
7/3/16 8:00	0	0	0	0	2708	4331	4300
7/3/16 9:00	0	0	0	0	2855	2845	2834
7/3/16 10:00	0	0	0	0	2644	2613	2580
7/3/16 11:00	0	0	0	0	2496	2493	2490
7/3/16 12:00	0	0	0	0	2146	2207	2275
7/3/16 13:00	0	0	0	0	2421	2495	2579
7/3/16 14:00	0	0	0	0	2830	2904	2989
7/3/16 15:00	0	0	0	0	3198	3266	3343
7/3/16 16:00	0	0	0	0	3608	3668	3735
7/3/16 17:00	0	0	0	0	4114	4200	4298
7/3/16 18:00	0	0	0	0	4609	4721	4850
7/3/16 19:00	0	0	0	0	4525	4677	4847
7/3/16 20:00	0	2769	0	0	5294	3350	3582
7/3/16 21:00	0	2297	0	0	3440	1337	1555
7/3/16 22:00	0	0	0	0	-29	83	207
7/3/16 23:00	0	0	0	0	1272	1262	1255
7/4/16 0:00	0	0	0	0	2081	2076	2070
7/4/16 1:00	0	0	0	0	2279	2291	2305
7/4/16 2:00	0	0	0	0	1963	1994	2029
7/4/16 3:00	0	0	0	0	2214	2222	2231
7/4/16 4:00	0	0	0	0	2220	2233	2247
7/4/16 5:00	0	0	0	0	1985	2009	2035
7/4/16 6:00	0	0	-3388	0	724	2419	2416
7/4/16 7:00	0	0	0	0	2830	2816	2802
7/4/16 8:00	0	0	0	0	2209	2232	2256
7/4/16 9:00	0	0	0	0	2161	2169	2179
7/4/16 10:00	0	0	0	0	2782	2791	2802
7/4/16 11:00	0	0	0	0	3535	3579	3630
7/4/16 12:00	2977	0	0	0	6088	4629	4667
7/4/16 13:00	4930	0	0	0	9975	6002	5978
7/4/16 14:00	4963	0	0	0	11209	6266	6261
7/4/16 15:00	4944	0	0	2317	11628	5540	5575
7/4/16 16:00	4983	0	0	3313	12445	4700	4766

Time Stamp	NMPS Unit 1	NMPS Unit 2	NMPS Unit 3	NMPS Unit 4	Gill Bank	NMPS Tailrace	Shearer Farms
7/4/16 17:00	3672	0	0	2248	11883	4793	4831
7/4/16 18:00	3975	0	0	0	10782	5953	5924
7/4/16 19:00	0	0	0	0	8965	7190	7112
7/4/16 20:00	0	0	0	0	7406	7330	7242
7/4/16 21:00	0	0	0	0	6124	6062	5990
7/4/16 22:00	0	0	0	0	3287	3311	3333
7/4/16 23:00	0	0	0	0	2046	2054	2064
7/5/16 0:00	0	0	0	0	1625	2431	2407
7/5/16 1:00	0	-3329	0	-3415	-1625	4197	4081
7/5/16 2:00	0	-3221	-3415	-3356	-2714	6289	6078
7/5/16 3:00	0	-3294	0	-3322	-618	5910	5777
7/5/16 4:00	0	-3287	0	0	1139	5940	5779
7/5/16 5:00	0	-3312	0	0	2102	4518	4452
7/5/16 6:00	0	0	0	0	2580	2590	2600
7/5/16 7:00	0	0	0	0	2032	2020	2008
7/5/16 8:00	0	0	0	0	1697	1696	1695
7/5/16 9:00	0	0	0	0	1637	1639	1642
7/5/16 10:00	0	0	0	0	1696	1698	1700
7/5/16 11:00	2713	0	0	2310	3842	1383	1447
7/5/16 12:00	3579	0	0	3056	6532	371	558
7/5/16 13:00	5005	0	0	3689	7764	-976	-696
7/5/16 14:00	5023	0	0	4907	7331	-2320	-1988
7/5/16 15:00	5065	0	0	4973	7959	-1827	-1548
7/5/16 16:00		0	2452	5051	10953	-1449	-1176
7/5/16 17:00	5228	2495	2486	5141	14172	-42	166
7/5/16 18:00	2613	4698	2491	2238	15577	1040	1217
7/5/16 19:00	3229	2405	0	2250	13732	4657	4601
7/5/16 20:00	2401	2395	0	0	11373	5146	5057
7/5/16 21:00	0	0	0	0	7489	6697	6478
7/5/16 22:00	0	0	0	0	4572	4527	4472
7/5/16 23:00	0	-3590	0	0	-770	3588	3523
7/6/16 0:00	0	-3531	-3623	-3519	-3071	6492	6239
7/6/16 1:00	0	-3499	-3498	-3507	-2699	7656	7412
7/6/16 2:00	-3279	-3416	-3533	-3407	-4436	8976	8660
7/6/16 3:00	-3248	-3384	-3493	-3344	-3853	9395	9075
7/6/16 4:00		-3327	-3415	-3360	-3484	9596	9261
7/6/16 5:00	-3181	-3312	-3312	-3409	-3224	9699	9349
7/6/16 6:00	0	-3224	0	-3393	649	8663	8397
7/6/16 7:00	0	0	0	0	3829	4654	4673
7/6/16 8:00	0	0	0	0	3015	2998	2977
7/6/16 9:00	0	0	0	0	2143	2133	2121
7/6/16 10:00	0	0	0	0	1716	1716	1716
7/6/16 11:00	2375	0	0	0	2494	1326	1349
7/6/16 12:00	2375	0	0	2314	3191	-235	-124
7/6/16 13:00	3291	0	2437	2321	5110	-2577	-2367
7/6/16 14:00	5063	0	2462	4947	7597	-3709	-3384
7/6/16 15:00	5141	2477	3930	5058	10893	-3653	-3225

Time Stamp	NMPS Unit 1	NMPS Unit 2	NMPS Unit 3	NMPS Unit 4	Gill Bank	NMPS Tailrace	Shearer Farms
7/6/16 16:00	5219	2501	3461	5148	11945	-4780	-4216
7/6/16 17:00	5221	0	2533	5136	11672	-1345	-990
7/6/16 18:00	3351	0	0	3706	11570	2358	2580
7/6/16 19:00	0	0	0	0	7836	6068	6047
7/6/16 20:00	0	0	0	0	4194	4224	4249
7/6/16 21:00	0	0	0	0	3921	3842	3756
7/6/16 22:00	0	0	0	0	2544	2527	2507
7/6/16 23:00	0	0	0	0	1485	2347	2317
7/7/16 0:00	0	-3467	0	-3480	-1697	5995	5756
7/7/16 1:00	-3333	-3408	-3505	-3474	-4007	7898	7634
7/7/16 2:00	-3334	-3394	-3572	-3414	-3879	9496	9153
7/7/16 3:00	-3292	-3437	-3424	-3366	-3323	9903	9561
7/7/16 4:00	-3242	-3300	-3445	-3364	-2997	9983	9631
7/7/16 5:00	-3139	-3265	-3368	-3312	-2233	9825	9474
7/7/16 6:00	0	-3209	0	0	3152	7165	7031
7/7/16 7:00	0	0	0	0	3753	3771	3790
7/7/16 8:00	0	0	0	0	2951	2910	2862
7/7/16 9:00	0	0	0	0	2537	2507	2473
7/7/16 10:00	0	0	0	0	3019	2958	2890
7/7/16 11:00	0	0	0	0	2102	2112	2122
7/7/16 12:00	2372	0	0	0	2437	1277	1311
7/7/16 13:00	4975	0	3892	0	5248	-780	-612
7/7/16 14:00	4316	0	0	0	5499	175	348
7/7/16 15:00	5060	0	2441	0	7307	1469	1689
7/7/16 16:00	5012	0	2387	0	7435	325	688
7/7/16 17:00	3734	0	0	0	5529	281	612
7/7/16 18:00	3545	0	0	0	4257	1810	2046
7/7/16 19:00	0	0	0	0	3405	3553	3719
7/7/16 20:00	0	0	0	0	3401	3581	3782
7/7/16 21:00	0	0	0	0	2701	2846	3008
7/7/16 22:00	0	0	0	-28	8	975	1083
7/7/16 23:00	0	-3418	0	0	-823	4171	3999
7/8/16 0:00	0	-3399	0	-3446	-667	4334	4239
7/8/16 1:00	0	-3337	-3487	-3353	-2350	5937	5744
7/8/16 2:00	0	-3282	-3378	-3394	-2396	6675	6473
7/8/16 3:00	-3088	-3245	-3361	-3320	-3939	8086	7798
7/8/16 4:00	0	-3240	-3321	-3264	-1150	7743	7515
7/8/16 5:00	0	0	0	0	2282	5493	5406
7/8/16 6:00	0	0	0	0	2736	2750	2765
7/8/16 7:00	0	0	0	0	2720	2669	2613
7/8/16 8:00	0	0	0	0	1996	1995	1992
7/8/16 9:00	0	0	0	0	1071	1102	1137
7/8/16 10:00	0	0	0	0	1181	1192	1206
7/8/16 11:00	2366	0	0	0	2418	1254	1274
7/8/16 12:00	4375	0	0	0	3453	162	248
7/8/16 13:00	4875	0	0	0	3855	-695	-592
7/8/16 14:00		0	0	0	3398	-1052	-945

Time Stamp	NMPS Unit 1	NMPS Unit 2	NMPS Unit 3	NMPS Unit 4	Gill Bank	NMPS Tailrace	Shearer Farms
7/8/16 15:00	4977	0	2427	0	5655	-1561	-1348
7/8/16 16:00	3379	0	0	0	6341	1121	1304
7/8/16 17:00	0	0	0	0	4800	3261	3442
7/8/16 18:00	0	0	0	0	3176	3380	3606
7/8/16 19:00	0	0	0	0	4804	4906	5025
7/8/16 20:00	0	0	0	0	7609	7583	7558
7/8/16 21:00	0	0	0	0	7177	7189	7200
7/8/16 22:00	0	0	0	0	4869	4876	4880
7/8/16 23:00	0	0	0	0	1075	1145	1218
7/9/16 0:00	0	0	0	0	1571	1542	1514
7/9/16 1:00	0	0	-3413	0	723	2413	2380
7/9/16 2:00	0	0	0	0	887	2595	2574
7/9/16 3:00	0	0	0	0	1725	1742	1762
7/9/16 4:00	0	0	-3458	0	107	3474	3377
7/9/16 5:00	0	0	0	0	2160	3815	3744
7/9/16 6:00	0	0	0	0	1993	2024	2057
7/9/16 7:00	0	0	0	0	1788	1780	1773
7/9/16 8:00	0	0	0	0	1556	1564	1573
7/9/16 9:00	0	0	0	0	1648	1652	1656
7/9/16 10:00	0	0	0	0	1548	1562	1578
7/9/16 11:00	0	0	0	0	3058	3065	3074
7/9/16 12:00	0	0	0	0	5711	5712	5716
7/9/16 13:00	0	0	0	0	6866	6906	6951
7/9/16 14:00	0	0	0	-3410	6284	8809	8756
7/9/16 15:00	0	0	0	-3419	6345	9659	9592
7/9/16 16:00	0	0	0	-3373	6494	9819	9760
7/9/16 17:00	0	0	0	0	8434	8466	8505
7/9/16 18:00	0	0	0	0	8348	8348	8349
7/9/16 19:00	0	0	0	0	7773	7794	7815
7/9/16 20:00	0	0	0	0	7092	7081	7068
7/9/16 21:00	0	0	0	0	6325	6274	6217
7/9/16 22:00	0	0	0	0	5253	5180	5096
7/9/16 23:00	0	0	0	0	2966	2964	2959
7/10/16 0:00	0	0	0	0	1792	1796	1801
7/10/16 1:00	0	0	0	0	1754	1752	1752
7/10/16 2:00	0	0	0	0	1745	1755	1767
7/10/16 3:00	0	0	0	0	1491	1516	1542
7/10/16 4:00	0	0	0	0	1760	1767	1775
7/10/16 5:00	0	0	-3420	0	-378	2180	2169
7/10/16 6:00	0	0	-3312	-3346	-507	3585	3497
7/10/16 7:00	0	0	0	0	1616	3259	3220
7/10/16 8:00	0	0	0	0	2186	2192	2197
7/10/16 9:00	0	0	0	0	2186	2168	2147
7/10/16 10:00	0	0	0	0	1990	1986	1982
7/10/16 11:00	0	0	0	0	1781	1834	1892
7/10/16 12:00	0	0	0	0	3702	3737	3779
7/10/16 13:00	0	0	0	0	3898	4006	4126

Time Stamp	NMPS Unit 1	NMPS Unit 2	NMPS Unit 3	NMPS Unit 4	Gill Bank	NMPS Tailrace	Shearer Farms
7/10/16 14:00	0	0	0	0	4834	4894	4963
7/10/16 15:00	0	0	0	0	6907	6871	6833
7/10/16 16:00	0	0	0	0	8012	7402	7383
7/10/16 17:00	0	2364	0	0	8364	6062	6135
7/10/16 18:00	0	0	0	0	7767	6581	6577
7/10/16 19:00	0	0	0	0	7228	7207	7183
7/10/16 20:00	0	0	0	0	7571	7543	7511
7/10/16 21:00	0	0	0	0	6825	6800	6769
7/10/16 22:00	0	0	0	0	5729	5658	5576
7/10/16 23:00	0	0	0	0	3760	3724	3680
7/11/16 0:00	0	0	0	0	1774	1786	1798
7/11/16 1:00	0	0	0	0	2091	2061	2029
7/11/16 2:00	0	0	0	0	1789	1795	1801
7/11/16 3:00	0	0	0	0	1139	1173	1210
7/11/16 4:00	0	0	0	0	721	1566	1569
7/11/16 5:00	0	0	0	-3413	629	3099	3029
7/11/16 6:00	0	0	0	0	2188	2203	2221
7/11/16 7:00	0	0	0	0	2820	2777	2729
7/11/16 8:00	0	0	0	0	3061	3021	2975
7/11/16 9:00	0	0	0	0	3189	3146	3097
7/11/16 10:00	0	0	0	0	4105	4016	3917
7/11/16 11:00	0	0	3056	0	5096	3533	3485
7/11/16 12:00	0	0	4317	0	6219	2533	2526
7/11/16 13:00	2371	0	4977	0	8606	1581	1596
7/11/16 14:00	3472	0	5027	0	9561	1652	1697
7/11/16 15:00	5073	0	5072	0	11764	2568	2706
7/11/16 16:00	3913	0	5085	2363	13316	2784	3013
7/11/16 17:00	2358	0	4181	1300	12410	3318	3534
7/11/16 18:00	2354	0	3564	0	11941	6327	6365
7/11/16 19:00	0	0	0	0	9449	7712	7733
7/11/16 20:00	0	0	0	0	9139	9107	9070
7/11/16 21:00	0	0	0	0	7573	7627	7683
7/11/16 22:00	0	0	0	0	5899	5869	5834
7/11/16 23:00	0	5	0	0	3267	4073	4008
7/12/16 0:00	0	-3403	-3525	-3445	-1699	5835	5612
7/12/16 1:00	-3203	-3329	-3443	-3355	-4434	8667	8324
7/12/16 2:00	-3227	-3246	-3372	-3353	-4061	8935	8656
7/12/16 3:00	-3213	-3220	-3308	-3279	-2727	9219	8909
7/12/16 4:00	0	-3316	0	-3324	-250	7856	7652
7/12/16 5:00	0	0	0	0	2968	4604	4581
7/12/16 6:00	0	0	0	0	2488	2494	2499
7/12/16 7:00	0	0	0	0	2156	2132	2105
7/12/16 8:00	0	0	0	0	1292	1316	1341
7/12/16 9:00	0	0	0	0	1311	1322	1335
7/12/16 10:00	0	0	0	0	1575	1578	1582
7/12/16 11:00	0	0	0	0	1788	1788	1789
7/12/16 12:00	2838	0	4112	0	4354	965	1068

Time Stamp	NMPS Unit 1	NMPS Unit 2	NMPS Unit 3	NMPS Unit 4	Gill Bank	NMPS Tailrace	Shearer Farms
7/12/16 13:00	4965	0	5005	0	7639	-603	-345
7/12/16 14:00	5001	0	5045	2324	11840	817	1012
7/12/16 15:00	5045	0	5092	3202	12596	-20	279
7/12/16 16:00	5097	0	5111	2275	12476	-190	91
7/12/16 17:00	5119	0	5162	0	12832	1594	1769
7/12/16 18:00	5133	0	5180	0	13018	4145	4214
7/12/16 19:00	0	0	0	0	10155	8039	7916
7/12/16 20:00	0	0	0	0	9179	9091	8989
7/12/16 21:00	0	0	0	0	6764	6797	6826
7/12/16 22:00	0	0	0	0	3261	3321	3383
7/12/16 23:00	0	-3398	0	-82	-1086	1543	1551
7/13/16 0:00	0	-3228	-3524	-3418	-2791	5614	5363
7/13/16 1:00	0	-3437	-3473	-3467	-3253	6870	6663
7/13/16 2:00	-3227	-3324	-3410	-3361	-4290	7321	7106
7/13/16 3:00	-3230	-3284	-3375	-3366	-4030	8901	8567
7/13/16 4:00	-3241	-3313	0	-3332	-2386	8880	8590
7/13/16 5:00	0	-3411	0	0	1830	7415	7232
7/13/16 6:00	0	0	0	0	3301	3351	3405
7/13/16 7:00	0	0	0	0	2410	2388	2364
7/13/16 8:00	0	0	0	0	1838	1834	1829
7/13/16 9:00	0	0	0	0	1533	1543	1556
7/13/16 10:00	0	0	0	0	1616	1621	1627
7/13/16 11:00	0	0	0	0	1773	1774	1776
7/13/16 12:00	0	0	2416	0	2958	767	836
7/13/16 13:00	2317	0	3470	0	5917	-9	128
7/13/16 14:00	3388	0	4102	0	8867	2301	2404
7/13/16 15:00	5099	0	5126	0	11502	2028	2297
7/13/16 16:00	5058	0	5115	2816	12421	470	848
7/13/16 17:00	2372	0	2855	0	10332	4423	4513
7/13/16 18:00	2362	0	0	0	8199	5023	5143
7/13/16 19:00	0	0	0	0	5210	5196	5173
7/13/16 20:00	0	0	0	0	3891	3860	3825
7/13/16 21:00	0	0	0	0	2575	2561	2543
7/13/16 22:00	0	0	0	0	1208	2078	2067
7/13/16 23:00	0	-3423	0	0	-200	3137	3066
7/14/16 0:00	0	-3405	0	-3386	-1485	4119	4023
7/14/16 1:00	0	-3333	-3504	-3420	-2656	5713	5536
7/14/16 2:00	0	-3317	-3428	-3383	-2783	7131	6895
7/14/16 3:00	-3207	-3290	-3381	-3334	-3917	8209	7926
7/14/16 4:00	0	-3347	0	-3376	-1079	7756	7532
7/14/16 5:00	0	0	0	0	2283	5476	5402
7/14/16 6:00	0	0	0	0	2706	2735	2767
7/14/16 7:00	0	0	0	0	2052	2042	2029
7/14/16 8:00	0	0	0	0	1700	1699	1698
7/14/16 9:00	0	0	0	0	1640	1642	1645
7/14/16 10:00	0	0	0	0	1496	1510	1525
7/14/16 11:00	0	0	0	0	1235	1259	1286

Time Stamp	NMPS Unit 1	NMPS Unit 2	NMPS Unit 3	NMPS Unit 4	Gill Bank	NMPS Tailrace	Shearer Farms
7/14/16 12:00	0	0	2722	0	2339	1008	1045
7/14/16 13:00	0	0	4969	0	4608	239	361
7/14/16 14:00	2918	0	4978	0	7307	-657	-412
7/14/16 15:00		0	5031	0	9775	542	759
7/14/16 16:00	2364	0	5096	2320	10107	-221	90
7/14/16 17:00	2320	0	2391	2265	8472	946	1164
7/14/16 18:00	2328	0	0	0	5657	3187	3299
7/14/16 19:00	0	0	0	0	4029	4091	4158
7/14/16 20:00	5195	0	0	0	4532	2031	2128
7/14/16 21:00	0	0	0	0	2053	886	926
7/14/16 22:00	0	0	0	0	1634	1613	1592
7/14/16 23:00	0	-3402	0	0	-672	2720	2675
7/15/16 0:00	0	-3419	0	-3467	-2237	4487	4367
7/15/16 1:00	0	-3345	-3494	-3463	-3730	6923	6683
7/15/16 2:00	0	-3293	-3372	-3326	-2671	7212	7010
7/15/16 3:00	0	-3271	-3368	-3317	-2048	7693	7450
7/15/16 4:00	0	-3192	0	-3341	710	6310	6173
7/15/16 5:00	0	0	0	0	2052	3688	3678
7/15/16 6:00	0	0	0	0	2298	2294	2289
7/15/16 7:00	0	0	0	0	3144	3081	3011
7/15/16 8:00	0	0	0	0	3979	3969	3959
7/15/16 9:00	0	0	0	2290	6874	5694	5660
7/15/16 10:00	0	0	0	2308	9457	5619	5670
7/15/16 11:00	4983	0	4787	2316	13047	2267	2548
7/15/16 12:00	5016	0	4794	2338	13736	1768	1971
7/15/16 13:00	5025	0	5090	2349	14518	2320	2479
7/15/16 14:00	5052	0	5198	3868	15589	2104	2293
7/15/16 15:00	5165	0	5224	5113	16388	1152	1389
7/15/16 16:00	3357	0	4428	2407	16377	3502	3579
7/15/16 17:00	4123	0	4024	2398	15823	5397	5419
7/15/16 18:00	4144	0	4049	2246	14696	5652	5699
7/15/16 19:00	0	0	0	2221	9220	6925	6889
7/15/16 20:00	0	0	0	2246	6017	4468	4618
7/15/16 21:00	0	0	0	0	5170	5198	5231
7/15/16 22:00	0	0	0	0	5455	5492	5533
7/15/16 23:00	0	0	0	0	4505	5413	5436
7/16/16 0:00	-3506	0	0	0	796	5108	5039
7/16/16 1:00	-3419	-3581	0	-3576	-3256	5390	5237
7/16/16 2:00	-3374	-3400	0	-3466	-2702	7446	7169
7/16/16 3:00	-3402	-3470	-3525	-3433	-3240	7992	7741
7/16/16 4:00	-3267	-3402	-3573	-3369	-3927	9360	9017
7/16/16 5:00	-3220	-3330	-3410	-3366	-3689	9459	9142
7/16/16 6:00	-3274	0	0	-3471	377	8504	8254
7/16/16 7:00	0	0	0	0	4102	4171	4250
7/16/16 8:00	0	3932	0	0	6129	3128	3237
7/16/16 9:00	2410	2306	0	0	7365	2955	3142
7/16/16 10:00	0	4118	0	0	6610	3583	3763

Time Stamp	NMPS Unit 1	NMPS Unit 2	NMPS Unit 3	NMPS Unit 4	Gill Bank	NMPS Tailrace	Shearer Farms
7/16/16 11:00	5103	5003	0	0	9714	2595	2862
7/16/16 12:00	5102	5039	0	0	11594	1799	2081
7/16/16 13:00	5150		0	0	14098	3358	3524
7/16/16 14:00	5239	5212	3882	0	16860	3409	3618
7/16/16 15:00	5402	5224	5119	2272	18981	3313	3524
7/16/16 16:00	4353	5081	2365	2369	17940	3328	3533
7/16/16 17:00	2384	4319	0	0	14959	7666	7603
7/16/16 18:00	0	2445	0	0	12476	10728	10583
7/16/16 19:00	0	0	0	0	8121	8161	8193
7/16/16 20:00	0	0	0	0	5164	5153	5138
7/16/16 21:00	0	0	0	0	4494	4387	4268
7/16/16 22:00	0	0	0	0	1589	2463	2449
7/16/16 23:00	0	0	0	0	1566	2465	2425
7/17/16 0:00	-3565	-3707	0	-3612	-2883	5112	4933
7/17/16 1:00	-3453	-3522	-3627	-3548	-3818	8291	7978
7/17/16 2:00	-3399	-3463	-3696	-3514	-3822	9901	9548
7/17/16 3:00	-3368	-3420	-3551	-3483	-3214	10317	9961
7/17/16 4:00	-3287	-3323	-3436	-3401	-2912	10361	9995
7/17/16 5:00	-3216	-3400	-3422	-3411	-2954	10203	9834
7/17/16 6:00	-3243	-3307		-3387	-3014	10023	9648
7/17/16 7:00	-3228	0	0	-3418	1072	9092	8788
7/17/16 8:00	0	0	0	0	3944	4039	4144
7/17/16 9:00	0	0	0	0	3593	2539	2542
7/17/16 10:00	3519	4914	0	0	5650	-1453	-1220
7/17/16 11:00	2857	4967	0	0	5595	-2104	-1909
7/17/16 12:00	0	4895	0	0	4682	-1293	-1128
7/17/16 13:00	0	3600	0	0	4374	509	633
7/17/16 14:00	1037	4914	0	0	7160	2719	2792
7/17/16 15:00	2401	3060	0	0	9099	3033	3172
7/17/16 16:00	2414	4566	0	0	10189	3360	3486
7/17/16 17:00	3527	5125	2516	0	11019	2049	2268
7/17/16 18:00	2447	3212	2850	0	11208	1386	1603
7/17/16 19:00	2422	2405	0	0	8941	2636	2760
7/17/16 20:00	0	2405	2526	0	7161	1831	1991
7/17/16 21:00	0	0	0	0	1243	710	812
7/17/16 22:00	24	0	0	0	-492	410	454
7/17/16 23:00	-3496	0	0	0	-224	3152	3038
7/18/16 0:00	-3488	0	-3674	-3632	-3090	3877	3793
7/18/16 1:00	-3435	0	-3581	-3474	-3205	7065	6777
7/18/16 2:00	-3320	-3428	-3493	-3450	-3737	8045	7767
7/18/16 3:00	-3327	-3394	-3451	-3371	-4070	9173	8819
7/18/16 4:00	0	-3352	-3440	-3426	-1787	8941	8632
7/18/16 5:00	0	-3269	-3442	0	-68	6614	6486
7/18/16 6:00	0	0	0	0	2343	4841	4754
7/18/16 7:00	0	0	0	0	2686	2691	2697
7/18/16 8:00	0	0	0	0	2001	1987	1971
7/18/16 9:00	0	0	0	0	1725	1726	1727

Time Stamp	NMPS Unit 1	NMPS Unit 2	NMPS Unit 3	NMPS Unit 4	Gill Bank	NMPS Tailrace	Shearer Farms
7/18/16 10:00	0	0	0	0	2956	1771	1833
7/18/16 11:00	2390	3185	0	0	6079	-45	218
7/18/16 12:00	2334	4986	0	0	7734	722	932
7/18/16 13:00	2358	5022	2479	0	9521	-542	-214
7/18/16 14:00	3716	5074	2391	0	11254	-601	-305
7/18/16 15:00	5436	5136	0	0	10844	1380	1557
7/18/16 16:00	3045	5121	0	0	10308	1263	1494
7/18/16 17:00	0	3314	0	0	8392	2770	2898
7/18/16 18:00	0	2384	0	0	6800	4036	4121
7/18/16 19:00	0	2390	0	0	5824	4128	4233
7/18/16 20:00	0	0	0	0	4793	4820	4849
7/18/16 21:00	0	0	0	0	3694	3707	3721
7/18/16 22:00	0	26	0	0	881	1791	1813
7/18/16 23:00	0	-3525	0	0	116	3578	3450
7/19/16 0:00	-3397	-3500	-3583	0	-3260	6177	5948
7/19/16 1:00	-3347	-3489	-3534	0	-2954	7322	7083
7/19/16 2:00	-3334	-3386	-3496	-3388	-4070	8486	8181
7/19/16 3:00	-3250	-3365	-3473	-3426	-4011	9177	8841
7/19/16 4:00	0	-3333	-3380	-3396	-2305	9191	8864
7/19/16 5:00	0	-3289	-3367	0	207	7572	7376
7/19/16 6:00	0	0	0	0	2895	4536	4511
7/19/16 7:00	0	0	0	0	2953	2932	2907
7/19/16 8:00	0	0	0	0	1641	1654	1667
7/19/16 9:00	0	0	0	0	1608	1608	1609
7/19/16 10:00	0	0	0	0	1753	1779	1810
7/19/16 11:00	0	0	0	0	2206	2230	2258
7/19/16 12:00	0	0	4392	0	4298	2146	2200
7/19/16 13:00	0	0	5030	0	5568	977	1122
7/19/16 14:00	0	0	2360	0	5770	2142	2232
7/19/16 15:00	0	0	2364	0	5909	3126	3233
7/19/16 16:00	0	0	0	0	5262	3185	3335
7/19/16 17:00	0	0	0	0	4118	4190	4270
7/19/16 18:00	0	0	0	0	4422	4492	4573
7/19/16 19:00	0	0	0	0	4057	4150	4254
7/19/16 20:00	0	0	0	0	3495	3569	3652
7/19/16 21:00	0	0	0	0	1592	1672	1759
7/19/16 22:00	0	0	0	0	-222	-152	-74
7/19/16 23:00	0	-3403	0	0	51	1655	1590
7/20/16 0:00	0	-3326	0	0	-391	2895	2821
7/20/16 1:00	0	-3368	-3504	0	-2005	4658	4502
7/20/16 2:00	-3274	-3259	-3460	0	-2100	6027	5816
7/20/16 3:00	0	-3231	-3346	0	-1257	5330	5199
7/20/16 4:00	0	-3245	-3373	0	-564	5090	4943
7/20/16 5:00	0	-3258	0	0	642	3812	3744
7/20/16 6:00	0	0	0	0	2682	2653	2621
7/20/16 7:00	0	0	0	0	2112	2091	2066
7/20/16 8:00	0	0	0	0	1591	1589	1585

Time Stamp	NMPS Unit 1	NMPS Unit 2	NMPS Unit 3	NMPS Unit 4	Gill Bank	NMPS Tailrace	Shearer Farms
7/20/16 9:00	0	0	0	0	1327	1327	1328
7/20/16 10:00	0	0	0	0	1262	1263	1266
7/20/16 11:00	0	0	0	0	1330	1332	1334
7/20/16 12:00	0	0	0	0	1946	1956	1967
7/20/16 13:00	2362	0	0	0	3855	2722	2781
7/20/16 14:00	2305	0	0	0	4939	2735	2874
7/20/16 15:00	4935	0	0	2297	6974	649	942
7/20/16 16:00	4453	2402	0	2253	7517	-2306	-1900
7/20/16 17:00	5028	0	0	2262	5543	-132	86
7/20/16 18:00	2335	0	0	0	3460	1312	1510
7/20/16 19:00	2328	0	0	0	2887	1340	1564
7/20/16 20:00	2400	0	0	0	3019	1976	2153
7/20/16 21:00	2414	0	0	0	2754	1115	1293
7/20/16 22:00	0	0	0	0	161	248	343
7/20/16 23:00	0	0	0	0	937	939	943
7/21/16 0:00	0	0	0	0	1716	1705	1692
7/21/16 1:00	0	0	0	0	1332	1348	1365
7/21/16 2:00	0	0	0	0	1085	1097	1112
7/21/16 3:00	0	0	0	0	485	1355	1350
7/21/16 4:00	0	0	-3524	0	-758	3464	3355
7/21/16 5:00	0	0	-3488	0	-690	4357	4242
7/21/16 6:00	0	0	-3543	0	380	3807	3735
7/21/16 7:00	0	0	-3472	0	1229	3722	3631
7/21/16 8:00	0	0	0	0	1626	1648	1671
7/21/16 9:00	0	0	0	0	1880	1845	1809
7/21/16 10:00	0	0	0	0	1923	1903	1881
7/21/16 11:00	0	0	0	0	1173	1190	1208
7/21/16 12:00	2407	0	0	0	3014	1851	1890
7/21/16 13:00	2769	0	0	0	6470	3906	3944
7/21/16 14:00	5112	0	0	2328	8352	2847	3042
7/21/16 15:00	5021	0	0	3327	9632	1956	2168
7/21/16 16:00	5111	2426	0	2676	11451	2281	2450
7/21/16 17:00	5064	0	0	2745	13082	3957	4043
7/21/16 18:00	2374	0	0	0	11106	6700	6664
7/21/16 19:00	0	0	0	0	8757	7563	7539
7/21/16 20:00	0	0	0	0	7492	7429	7355
7/21/16 21:00	0	0	0	0	4549	4534	4513
7/21/16 22:00	0	0	0	0	1695	1705	1714
7/21/16 23:00	0	0	0	0	-5	1701	1661
7/22/16 0:00	-3245	-3302	-3459	-3407	-4696	6912	6603
7/22/16 1:00	-3286	-3334	-3444	-3403	-3856	7753	7526
7/22/16 2:00	-3145	-3288	-3388	-3293	-4276	8664	8369
7/22/16 3:00	-3160	-3260	-3345	-3328	-2849	9189	8866
7/22/16 4:00	-3218	0	0	-3361	-314	7730	7521
7/22/16 5:00	-3145	0	0	0	1449	6180	6028
7/22/16 6:00	-3174	0	0	0	1794	4107	4044
7/22/16 7:00	0	0	0	0	2282	2276	2271

Time Stamp	NMPS Unit 1	NMPS Unit 2	NMPS Unit 3	NMPS Unit 4	Gill Bank	NMPS Tailrace	Shearer Farms
7/22/16 8:00	0	0	0	0	1951	1927	1900
7/22/16 9:00	0	0	0	0	1593	1589	1585
7/22/16 10:00	0	0	2752	0	2340	814	849
7/22/16 11:00	0	3443	2799	0	4117	-1725	-1564
7/22/16 12:00	0	4722	5032	2328	6626	-4451	-4188
7/22/16 13:00	0	4991	5082	2887	7110	-5848	-5560
7/22/16 14:00	2437	5093	5133	2333	8842	-5839	-5483
7/22/16 15:00	2447		5172	2351	11277	-3524	-3145
7/22/16 16:00	2447	5216	5242	2265	14055	-881	-518
7/22/16 17:00	2470	3736	5294	2302	16884	1421	1709
7/22/16 18:00	3064	3072	3111	2976	19086	3372	3527
7/22/16 19:00	0	2428	2290	0	14962	9938	9652
7/22/16 20:00	0	2527	2494	0	11886	8750	8623
7/22/16 21:00	0	2493	0	0	8123	5568	5504
7/22/16 22:00	0	0	0	0	5196	4163	4064
7/22/16 23:00	0	-3540	0	-3606	-503	4808	4651
7/23/16 0:00	-29	-3527	0	-3625	-2363	5625	5455
7/23/16 1:00	-3389	-3519	0	-3561	-2754	7547	7280
7/23/16 2:00	-3353	-3377	-3537	-3493	-3472	8406	8128
7/23/16 3:00	-3333	-3394	0	-3535	-1966	8108	7865
7/23/16 4:00	-3324	-3480	0	-3422	-2610	8231	7959
7/23/16 5:00	-3287	-3326	-3506	-3419	-3325	9085	8743
7/23/16 6:00	0	-3386	-3493	-3435	-518	7876	7655
7/23/16 7:00	0	0	0	-3402	1898	5232	5162
7/23/16 8:00	0	0	0	0	2720	2725	2730
7/23/16 9:00	0	0	0	0	2366	2329	2288
7/23/16 10:00	0	0	0	0	1880	1872	1863
7/23/16 11:00	0	0	2969	0	2107	668	725
7/23/16 12:00	0	5083	5164	0	4877	-1561	-1391
7/23/16 13:00	0	2328	5102	0	5755	-2427	-2193
7/23/16 14:00	2451	5118	5156	0	8431	-2892	-2592
7/23/16 15:00	2473	5182	5222	0	8277	-4239	-3851
7/23/16 16:00	2492	4376	5279	0	7693	-3900	-3564
7/23/16 17:00	0	2413	5289	2236	8677	-1488	-1270
7/23/16 18:00	0	2435	2290	0	6998	361	538
7/23/16 19:00	0	0	0	0	3702	2599	2679
7/23/16 20:00	0	0	0	0	2851	2920	2996
7/23/16 21:00	0	0	0	0	2388	2405	2425
7/23/16 22:00	0	0	0	0	915	1840	1836
7/23/16 23:00	0	-3515	-3633	0	-1374	3968	3837
7/24/16 0:00	20	-3548	-3685	0	-3027	5705	5531
7/24/16 1:00	-3434	-3402	-3621	-3444	-4577	9035	8682
7/24/16 2:00	-3320	-3461	-3549	-3469	-4173	9329	9036
7/24/16 3:00	-3299	-3382	-3495	-3367	-3607	9631	9302
7/24/16 4:00	-3263	-3410	-3417	-3356	-3381	9712	9373
7/24/16 5:00	-3196	-3351	-3394	-3338	-3439	9491	9163
7/24/16 6:00	-3131	-3268	-3314	-3300	-2119	9114	8799

Time Stamp	NMPS Unit 1	NMPS Unit 2	NMPS Unit 3	NMPS Unit 4	Gill Bank	NMPS Tailrace	Shearer Farms
7/24/16 7:00	0	0	0	0	3958	4815	4831
7/24/16 8:00	0	0	0	0	3070	3048	3019
7/24/16 9:00	0	0	0	0	2039	2029	2017
7/24/16 10:00	0	0	0	0	1546	1546	1547
7/24/16 11:00	0	0	0	0	1444	1447	1451
7/24/16 12:00	0	0	0	0	1541	1585	1634
7/24/16 13:00	0	2225	0	0	3906	2834	2923
7/24/16 14:00	0	3431	0	0	6112	3200	3392
7/24/16 15:00	0	4880	0	0	6388	2464	2752
7/24/16 16:00	0	4923	0	0	6243	1612	1935
7/24/16 17:00	0	4973	0	0	5951	1280	1594
7/24/16 18:00	0	2292	0	0	5215	1825	2096
7/24/16 19:00	0	2314	0	0	4925	2772	2960
7/24/16 20:00	0	2331	0	0	2465	308	492
7/24/16 21:00	0	0	0	0	228	-314	-269
7/24/16 22:00	0	0	0	0	1267	1227	1186
7/24/16 23:00	0	0	0	-3451	-865	2539	2484
7/25/16 0:00	0	-3334	0	-3377	-1526	3452	3372
7/25/16 1:00	-3202	-3281	0	-3330	-2459	5645	5442
7/25/16 2:00	0	-3301	0	-3364	-1153	6942	6704
7/25/16 3:00	0	-3268	0	-3408	-1025	5576	5454
7/25/16 4:00	0	0	0	-3351	369	5216	5065
7/25/16 5:00	0	0	0	0	1970	3595	3538
7/25/16 6:00	0	0	0	0	1890	1891	1892
7/25/16 7:00	0	0	0	0	1584	1566	1547
7/25/16 8:00	0	0	0	0	1329	1327	1324
7/25/16 9:00	0	0	2407	0	3064	680	714
7/25/16 10:00	0	0	2356	0	3556	1167	1163
7/25/16 11:00	0	4906	2355	0	5212	-118	-36
7/25/16 12:00	0	5002	4760	2331	5853	-3569	-3337
7/25/16 13:00	0	2331	2380	2273	4393	-5279	-5016
7/25/16 14:00	0	2459	2509	2388	4333	-3595	-3447
7/25/16 15:00	0	2686	2704	2597	8730	1338	1444
7/25/16 16:00	3611	3392	3440	3292	13572	2487	2734
7/25/16 17:00	5238	3134	3156	3024	16896	2470	2735
7/25/16 18:00	3758	2432	2465	2361	16927	4192	4337
7/25/16 19:00	0	0	0	0	11868	9385	9240
7/25/16 20:00	0	0	0	0	9497	9485	9465
7/25/16 21:00	0	0	0	0	7905	8749	8703
7/25/16 22:00	0	0	0	-3542	2578	6079	6015
7/25/16 23:00	-564	0	0	-3521	-929	4338	4225
7/26/16 0:00	-3360	-3413	-3499	-3473	-4785	7767	7411
7/26/16 1:00	-3327	-3448	-3537	-3391	-4563	8725	8418
7/26/16 2:00	-3208	-3346	-3436	-3386	-4171	8939	8636
7/26/16 3:00	-3212	-3259	-3359	-3318	-3786	9211	8879
7/26/16 4:00	-3213	-3337	-3348	-3321	-2923	9067	8746
7/26/16 5:00	0	-3240	0	-3392	-122	7130	6950

Time Stamp	NMPS Unit 1	NMPS Unit 2	NMPS Unit 3	NMPS Unit 4	Gill Bank	NMPS Tailrace	Shearer Farms
7/26/16 6:00	0	0	0	-3343	1189	5207	5093
7/26/16 7:00	0	0	0	0	2316	2331	2349
7/26/16 8:00	0	0	0	0	2459	2420	2377
7/26/16 9:00	0	0	0	0	3518	3536	3558
7/26/16 10:00	0	2359	0	0	5449	4361	4469
7/26/16 11:00	0	2333	0	2295	6538	2841	3125
7/26/16 12:00	0	2564	0	2427	7446	2090	2386
7/26/16 13:00	0	3413	0	4186	9676	1814	2106
7/26/16 14:00	2418	5031	0	4814	12164	-6	385
7/26/16 15:00	3648	3624	0	3582	12695	2103	2322
7/26/16 16:00	2346	2338	0	2265	13089	5055	5147
7/26/16 17:00	3582	3496	0	3424	13968	5741	5861
7/26/16 18:00	3124	3037	0	2946	14627	6756	6816
7/26/16 19:00	0	2354	0	0	12580	9332	9247
7/26/16 20:00	0	2372	0	0	10536	8217	8209
7/26/16 21:00	0	0	0	0	5875	5844	5799
7/26/16 22:00	0	-3570	0	0	2054	3752	3687
7/26/16 23:00	0	-3459	-3579	0	-1624	3479	3378
7/27/16 0:00	0	-3394	-3532	0	-2637	5006	4829
7/27/16 1:00	-3225	-3427	-3523	0	-3729	7077	6819
7/27/16 2:00	-3205	-3285	-3419	-3382	-4272	8783	8455
7/27/16 3:00	-3253	-3288	-3355	-3335	-3747	9217	8895
7/27/16 4:00	-3144	-3232	-3344	0	-2142	9007	8700
7/27/16 5:00	0	-3237	-3308	0	-303	7663	7447
7/27/16 6:00	0	0	0	0	3063	4641	4603
7/27/16 7:00	0	0	0	0	2393	2401	2407
7/27/16 8:00	0	0	0	0	1955	1932	1906
7/27/16 9:00	0	0	0	0	1607	1603	1598
7/27/16 10:00	0	0	0	0	1147	606	660
7/27/16 11:00	0	4900	0	2296	3800	-883	-769
7/27/16 12:00	0	4910	0	2308	4515	-2513	-2335
7/27/16 13:00	0	4926	0	2305	4276	-2787	-2617
7/27/16 14:00	0	4963	0	3314	4623	-2999	-2818
7/27/16 15:00	0	4980	0	3330	5630	-2984	-2767
7/27/16 16:00	2432	5030	0	3363	9432	-1027	-771
7/27/16 17:00	3377	3370	2509	3264	13179	1794	2018
7/27/16 18:00	3020	2781	0	2865	11936	2764	2965
7/27/16 19:00	0	0	0	0	5597	4141	4114
7/27/16 20:00	0	2458	0	0	1310	200	321
7/27/16 21:00	0	2475	0	2280	2885	-655	-598
7/27/16 22:00	0	0	0	0	1927	177	204
7/27/16 23:00	0	-3500	0	0	-646	1937	1906
7/28/16 0:00	0	-3438	0	0	-1400	2874	2827
7/28/16 1:00	-3309	-3438	-3563	0	-2934	5535	5336
7/28/16 2:00	-3208	-3387	-3500	-3453	-3899	7738	7455
7/28/16 3:00	-3270	-3283	-3428	-3368	-3491	8755	8446
7/28/16 4:00	-3241	-3310	-3450	0	-1499	7499	7301

Time Stamp	NMPS Unit 1	NMPS Unit 2	NMPS Unit 3	NMPS Unit 4	Gill Bank	NMPS Tailrace	Shearer Farms
7/28/16 5:00	0	-3331	0	0	1639	5740	5612
7/28/16 6:00	0	0	0	0	2675	2687	2699
7/28/16 7:00	0	0	0	0	2039	2009	1974
7/28/16 8:00	0	0	0	0	1498	1493	1487
7/28/16 9:00	0	0	0	0	1274	1277	1280
7/28/16 10:00	0	0	2732	0	3017	732	768
7/28/16 11:00	0	0	3439	0	4198	450	493
7/28/16 12:00	0	2410	5063	0	6079	-1306	-1174
7/28/16 13:00	2434	5047	5123	0	7634	-3378	-3168
7/28/16 14:00	2420	2414		0	8099	-85	-18
7/28/16 15:00	2455	2387	2457	0	10338	2417	2509
7/28/16 16:00	2464	2868	2888	0	9577	1622	1781
7/28/16 17:00	2471	4786	5222	0	9003	-1357	-1163
7/28/16 18:00	0	2400	5235	0	5361	-3528	-3338
7/28/16 19:00	2507	2411		0	5701	-4174	-3971
7/28/16 20:00	2443	2517	4679	2345	5617	-4301	-4082
7/28/16 21:00	0	2524	2287	0	4064	-1919	-1819
7/28/16 22:00	0	0	0	0	1544	-156	-91
7/28/16 23:00	0	-71	0	0	697	1639	1641
7/29/16 0:00	0	-3705	0	-3707	-678	4679	4531
7/29/16 1:00	-3466	-3626	0	-3531	-3047	5773	5611
7/29/16 2:00	-3443	-3478	0	-3556	-2772	7553	7286
7/29/16 3:00	0	-3518	0	-3503	-1448	7175	6970
7/29/16 4:00	0	-3524	0	0	682	5855	5713
7/29/16 5:00	0	0	0	0	2340	4019	3949
7/29/16 6:00	0	0	0	0	2203	2197	2189
7/29/16 7:00	0	0	0	0	1927	1900	1870
7/29/16 8:00	0	0	0	0	1592	1588	1583
7/29/16 9:00	0	0	0	2233	1836	717	754
7/29/16 10:00	0	0	0	2372	2022	-283	-203
7/29/16 11:00	0	0	0	2380	2386	50	100
7/29/16 12:00	0	0	0	4849	3237	-621	-520
7/29/16 13:00	0	2462	0	5120	4945	-1865	-1714
7/29/16 14:00	3569	3579	0	5228	8327	-1967	-1831
7/29/16 15:00	2475	2462	0	2305	8712	-883	-743
7/29/16 16:00	2750	2713	0	2637	12350	3145	3176
7/29/16 17:00	0	0	0	2270	9868	5896	5887
7/29/16 18:00	0	0	0	0	6825	6770	6700
7/29/16 19:00	0	0	0	0	2479	2561	2645
7/29/16 20:00	0	0	0	0	714	725	739
7/29/16 21:00	0	0	0	0	1681	1633	1582
7/29/16 22:00	0	0	0	0	1404	1416	1429
7/29/16 23:00	0	0	0	0	1177	1196	1216
7/30/16 0:00	0	-3619	-68	0	-960	1810	1789