



Keeyask Generation Project
Aquatic Effects Monitoring Plan

Walleye Movement Monitoring Report
AEMP-2020-04



KEEYASK GENERATION PROJECT

AQUATIC EFFECTS MONITORING PLAN

REPORT #AEMP-2020-04

WALLEYE MOVEMENT MONITORING IN THE NELSON RIVER BETWEEN CLARK LAKE AND THE LIMESTONE GENERATING STATION, OCTOBER 2018 TO OCTOBER 2019: YEAR 6 CONSTRUCTION

Prepared for

Manitoba Hydro

By

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SUMMARY

Background

The Keeyask Hydropower Limited Partnership (KHLP) was required to prepare a plan to monitor the effects of construction and operation of the Keeyask Generating Station (GS) on the environment. Besides measuring the accuracy of the predictions made and actual effects of the GS on the environment, monitoring results will provide information on how construction and operation of the GS will affect the environment and if more needs to be done to reduce harmful effects.

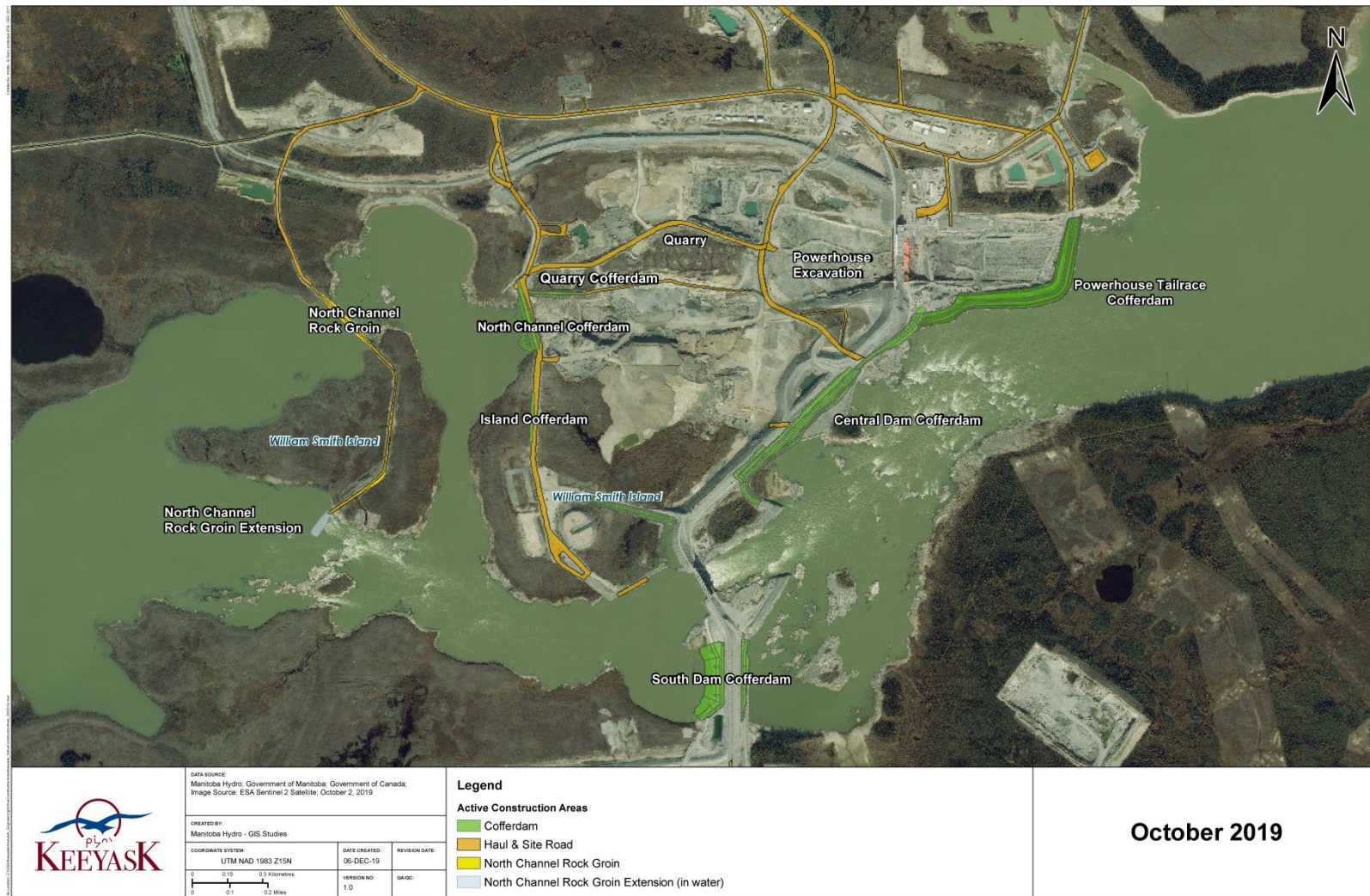
Construction of the Keeyask GS began in mid-July 2014 with the construction of cofferdams that blocked flow in the north and central channels of Gull Rapids (see instream structures map below). During the winter of 2015/2016 the Spillway Cofferdam, which partially blocks the south channel, was constructed. Beginning late in 2016 and continuing in 2017, the Tailrace Cofferdam was constructed. Work was completed in fall 2017 with the exception of an opening that was left to allow fish movement into and out of the cofferdam over the 2017/18 winter. This opening was closed in spring 2018, and the area was dewatered. The spillway was commissioned in August 2018. The South Dam Cofferdam was completed in fall 2018, blocking the channel and forcing the entire flow of the river through the spillway. Almost all work in 2019 was in the dry. The construction activities included the excavation of the tailrace, construction of the tailrace spawning shoal, and completion of the dams and dykes.

Movements of Walleye in relation to Birthday Rapids and Gull Rapids were monitored prior to the start of the construction monitoring program in 2013, but because different methods were used to collect data under the Aquatic Effects Monitoring Plan (AEMP), the results are not directly comparable. The earlier method involved recapturing Floy tagged fish and the latter involved tracking acoustically tagged fish, which measures movements at a much finer scale. Pre-construction studies did not record detailed fish movement patterns between Clark Lake and Stephens Lake, data indicated that the majority of Walleye continued to live in the waterbody where they had been tagged and some moved over Birthday and Gull rapids. It also indicated a small number of Walleye also moved downstream through the Kettle and Long Spruce generating stations.

This report presents results of Walleye movement monitoring from October 2018 to October 2019 and provides a summary of data collected since the monitoring program was initiated in June 2013. Tags were initially implanted into Walleye in 2013 and these tags expired in 2016. To continue the study, additional transmitters were applied to Walleye in 2016 (expire in 2021), 2018 (expire in 2023), and 2019 (expire in 2023). Monitoring these tags will continue prior to and after impoundment and commissioning of the Keeyask GS powerhouse in 2020.

Monitoring fish movements is an important component of the overall plan to monitor the impacts of construction and operation of the Keeyask GS on fish. Walleye was identified as one of the key species to monitor because it is: of commercial and domestic importance; abundant in the

Keeyask area; known to pass through Gull Rapids in either direction prior to the start of construction; and resilient enough to survive the acoustic tagging procedure.



Satellite Imagery - October, 2019

Map illustrating instream structures at the Keeyask Generating Station site, October 2019.

Why is the study being done?

Monitoring during construction is being done to answer two questions:

Are there Walleye close to the construction site, particularly during spawning?

If Walleye are in the river close to the construction area, they could be harmed by high amounts of mud in the water or they could be trapped inside an area that will be drained.

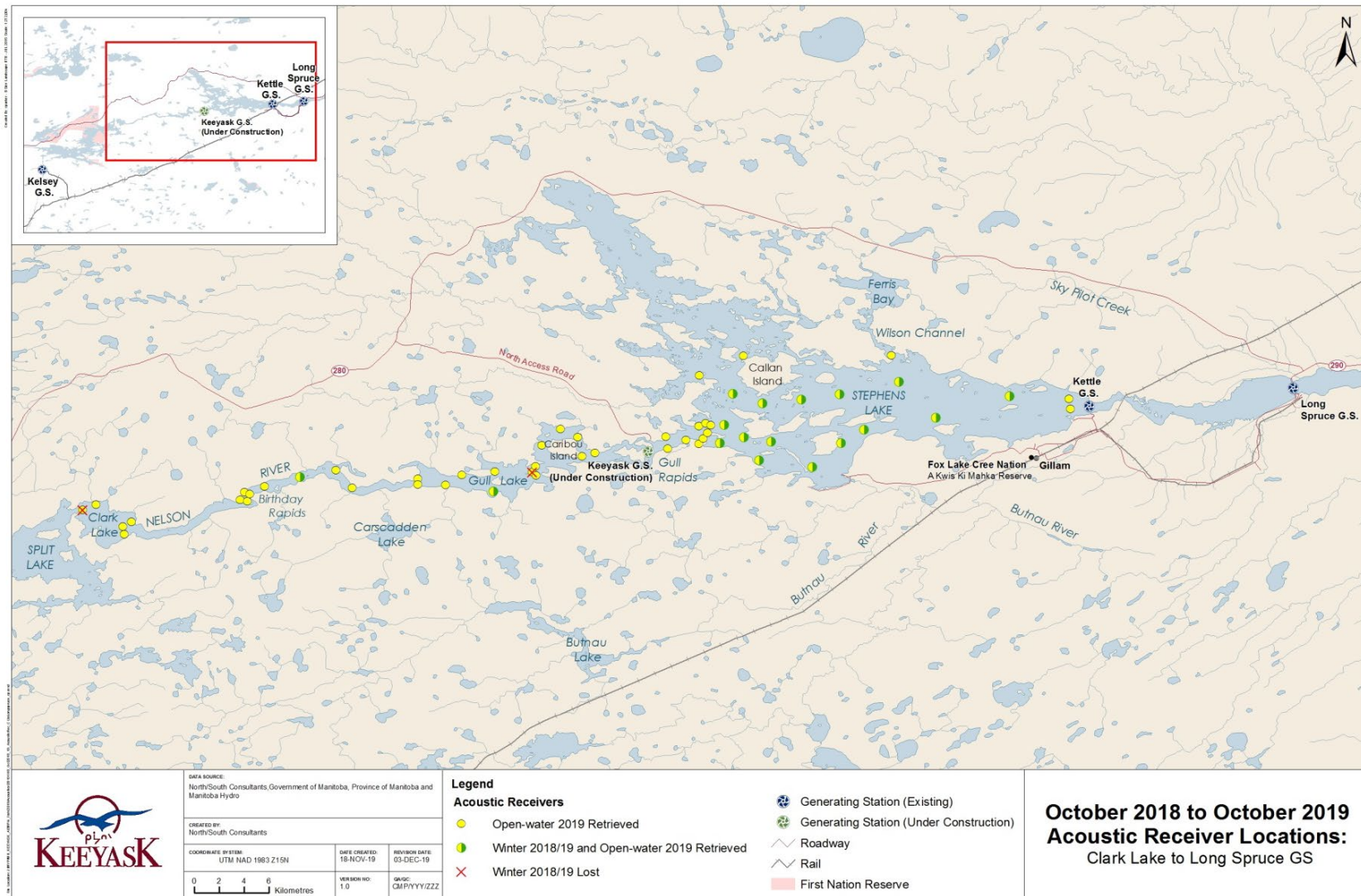
How many Walleye are moving through and/or away from Gull Rapids during construction and how far are they going?

Movement studies tell us how many Walleye are moving up or down through Gull Rapids or the Keeyask GS, how far they travel up or downstream away from the site, whether they are leaving the Keeyask area completely and when they are making these movements. The distance they travel is monitored as far upstream as the inlet to Clark Lake and downstream as far as the Limestone Reservoir.

What was done?

Movements of Walleye were tracked using acoustic telemetry. This is a technique in which a tag is surgically implanted inside a fish. Tags are implanted through a small incision which is then closed with sutures. Each tag sends out a sound signal (called a “ping”) that is picked up by receivers placed along the Nelson River between Clark Lake and the Kettle Generating Station (see study area map below). Each fish is given a battery powered transmitter that sends out a unique ping, and pings can be detected up to 1 kilometre (km) away from a receiver. By looking at detections recorded by different receivers, the movement of each fish can be tracked.

Eighty Walleye were tagged in 2013, 40 upstream and 40 downstream of Gull Rapids. Because the batteries in these transmitters expired in 2016, an additional 80 transmitters were applied to Walleye in June 2016: 40 upstream and 40 downstream of Gull Rapids. Because eight of the fish tagged in 2016 moved downstream through Gull Rapids shortly after being tagged, an additional eight tags were applied upstream of Gull Rapids in fall 2016. By October 2017, more fish were considered missing or had moved downstream. To replace these, 24 more tags were applied in spring 2018: 17 upstream of Gull Rapids/the Keeyask GS, and seven in Stephens Lake. The batteries in tags applied to Walleye in 2016 will expire in winter 2021, and those applied in 2018 will expire in winter 2023. In spring 2019, an additional 56 transmitters were applied to Walleye (27 upstream and 29 downstream). Movements of these fish will continue to be monitored until 2023, both prior to and after impoundment and commissioning of the Keeyask GS.



Map showing the study area. The dots represent the locations of receivers in the river. The different colours represent receivers that were in the river at different times of the year.



Measuring a Walleye prior to surgery (left), surgery on a Walleye (middle), and releasing a Walleye after surgery (right).

What was found?

Walleye tagged upstream of the Keeyask GS that remain in the area have consistently showed the same four general movement patterns since monitoring began in 2013. These fish either: remain in Gull Lake, move between Birthday Rapids and Gull Lake, move between Clark Lake and Gull Lake, or remain in the riverine area downstream of Birthday Rapids. Walleye tagged in Stephens Lake have been consistently split into two groups: those that remain exclusively within the upper portion (within 10.3 rkm of the Keeyask GS) of the lake; and those that move extensively throughout the lake.

Since tagging began in 2013, 36 fish have moved downstream through Gull Rapids or the spillway of the Keeyask GS. Sixteen of these movements likely happened because of tagging stress or mortality, while 20 movements occurred for another reason. Most of these 20 movements happened in 2017 (14%) and 2019 (13%). In all other monitoring years, the percentage of fish that have moved downstream through Gull Rapids has ranged from 0% (in 2013) to 8% (in 2015). The highest number of fish moving downstream through the Kettle GS also occurred in 2017 (19%) and 2019 (6%). The downstream movements in 2019 could not be confirmed because of a lack of receivers downstream of the Kettle GS, but fish are suspected to have moved down based on their last detection location. There does not appear to be a clear increasing or decreasing trend in the proportion of Walleye that move downstream past the Keeyask GS construction site.

No Walleye have moved upstream through Gull Rapids since construction began in 2014. Keeyask spillway commissioning began on August 3, 2018, after which upstream movements through Gull Rapids were no longer possible.

Monitoring since 2013 has shown that Walleye tagged upstream of Gull Rapids/the Keeyask GS that remain in Gull Lake do not spend much time in the vicinity of the construction site. In contrast, Walleye tagged in Stephens Lake, or those that have moved downstream from Gull Lake, regularly use habitat directly downstream of the construction site.

What does it mean?

Overall, fish upstream and downstream of the Keeyask GS have continued to use the same parts of the river during construction. Many Walleye use habitat immediately downstream of the construction site in Stephens Lake, including during the spawning period. The number of tagged Walleye moving downstream through Gull Rapids/the Keeyask GS and the Kettle GS was highest in 2017 and 2019. In 2017, movements may have been related to record-high flows. It is unclear why a large number of fish moved downstream in 2019.

What will be done next?

Fish that were tagged in 2016 can be tracked until 2021, and fish tagged in 2018 and 2019 can be tracked until 2023. Ongoing tracking of fish through GS construction will provide additional information about where the fish are moving, and if they continue to use areas near the GS after impoundment and commissioning in 2020.

ACKNOWLEDGEMENTS

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1.0 INTRODUCTION

The Keeyask Generation Project (the Project) is a 695-megawatt (MW) hydroelectric generating station at Gull (Keeyask) Rapids on the lower Nelson River in northern Manitoba. The Project is approximately 725 kilometres (km) northeast of Winnipeg, 35 km upstream of the existing Kettle Generating Station, where Gull Lake flows into Stephens Lake, 60 km east of the community of Split Lake, 180 km east-northeast of Thompson and 30 km west of Gillam (Map 1). Construction of the Project began in July 2014.

The *Keeyask Generation Project: Response to EIS Guidelines*, completed in June 2012, provides a summary of predicted effects and planned mitigation for the Project. Technical supporting information for the aquatic environment, including a description of the environmental setting, effects and mitigation, and a summary of proposed monitoring and follow-up programs is provided in the *Keeyask Generation Project Environmental Impact Statement: Aquatic Environment Supporting Volume* (AE SV). As part of the licensing process for the Project, an Aquatic Effects Monitoring Plan (AEMP) was developed detailing the monitoring activities of various components of the aquatic environment, including the focus of this report, Walleye (*Sander vitreus*) movement, for the construction and operation phases of the Project.

Pre-construction (baseline) movements of Walleye were monitored using radio telemetry from 2001 to 2005 (Barth *et al.* 2003; Murray *et al.* 2005; Murray and Barth 2007). Radio telemetry studies focused specifically on detecting the upstream and downstream movements of fish over rapids in the study area (Birthday Rapids and Gull Rapids). Pre-construction movement data revealed that the majority of Walleye did not move upstream or downstream over rapids into adjacent study reaches; instead, they remained within the reach where they had been tagged. Those few fish that moved over one or more sets of rapids did so in the summer or fall, suggesting that these movements were not associated with a life history event such as spawning. A small number of Walleye also moved downstream through the generating stations/spillways along the lower Nelson River. Additional information on long distance movements was obtained from mark-recapture studies. These results are not directly comparable to the movement data being collected under the AEMP.

In 2013, 80 Walleye were tagged with acoustic transmitters to assess the frequency of movement through Gull Rapids and to monitor the potential impact that construction of the Keeyask GS may have on movement (Hrenchuk and Barth 2014). Movements of these Walleye from the tagging date until October 2014 are provided in Murray *et al.* (2015); results from October 2014 to October 2015 are presented in Burnett *et al.* (2016); results from October 2015 to October 2016 are presented in Hrenchuk and Lacho (2017).

As the transmitters applied in 2013 reached the end of their battery life in 2016, additional transmitters were applied to Walleye in 2016 to continue the movement study until 2021. Additional tags were applied in 2018 and 2019 to compensate for tags lost through downstream movements. Results from June to October 2016 are presented in Hrenchuk and Lacho (2017), October 2016 to October 2017 are presented in Hrenchuk and Lacho (2018), and October 2017

to October 2018 are presented in Hrenchuk and Lacho (2019). This report provides results of Walleye movement monitoring from October 2018 to October 2019 and summarizes what has been observed since the program began in 2013.

Walleye movements in the main flow of the Nelson River near the construction site may be affected by the installation of cofferdams (Map 2) that block upstream and downstream movements and alter flow patterns, river diversion through the GS Spillway (in late summer 2018), and disturbances such as blasting that may increase emigration from the construction area. The broad objective of Walleye movement monitoring is to better understand movement and habitat use during generating station construction, with particular focus on movements in the vicinity of Gull Rapids.

As presented in the AEMP, the key questions to be answered about Walleye movement monitoring during construction of the Keeyask GS are:

- What is the number (or proportion) of tagged Walleye that move past the construction site?
- Are Walleye utilizing habitat in the vicinity of construction activities (particularly during spawning)?

2.0 STUDY SETTING

The study area encompasses an approximately 110 km long reach of the Nelson River from Clark Lake to the upstream end of the Limestone Reservoir (Map 1). This section of river offers a diversity of physical habitat conditions, including a variety of substrate types, and variable water depths (range 0–30 m) and velocities. Water velocities were classified as low (0.2–0.5 metres per second [m/s]), moderate (0.5–1.5 m/s), or high (greater than 1.5 m/s), as described in the Keeyask AE SV.

Clark Lake is located immediately downstream of Split Lake, and approximately 42 km upstream of the Keeyask GS (Map 1). Current is restricted to the main section of the lake, with off-current bays outside the main channel. The Assean River is the only major tributary to Clark Lake, and flows into the north side. Downstream from the outlet of Clark Lake, the Nelson River narrows and water velocity increases for a 3 km stretch, known as Long Rapids. For the next 7 km, the river widens, and water velocity decreases.

Birthday Rapids is located approximately 10 km downstream of Clark Lake and 30 km upstream of the Keeyask GS (Maps 1 and 3). The drop in elevation from the upstream to downstream side of Birthday Rapids is approximately 2 m. The 14 km reach of the Nelson River between Birthday Rapids and Gull Lake is characterized as a large and somewhat uniform channel with medium to high water velocities. There are a few large bays with reduced water velocity and a number of small tributaries that drain into the Nelson River.

Gull Lake is a section of the Nelson River where the river widens, with moderate to low water velocity. Gull Lake is herein defined as the reach of the Nelson River beginning approximately 17 km upstream of the Keeyask GS and 14 km downstream of Birthday Rapids, where the river widens to the north into a bay around a large point of land (Maps 1 and 3), and extending to the downstream end of Caribou Island, approximately 3 km upstream of the Keeyask GS. Gull Lake has three distinct basins, the first extending from the upstream end of the lake downstream approximately 6 km to a large island; the second extending from the large island to Morris Point (a constriction in the river immediately upstream of Caribou Island); and the third extending from Morris Point to the downstream end of Caribou Island (Map 3).

Gull Rapids, now the site of the Keeyask GS, was located approximately 3 km downstream of Caribou Island on the Nelson River (Map 1). Prior to construction, the rapids were approximately 2 km in length, and the river elevation dropped approximately 11 m along the 2 km length. Two large islands and several small islands occurred within the rapids, prior to the river narrowing; these features are within the Project footprint and have now been either dewatered, incorporated into the GS or will be flooded after impoundment (Map 2). A summary of construction activities is provided in Section 2.1.

Just below the Keeyask GS, the Nelson River enters Stephens Lake (Maps 1 and 7). Stephens Lake was formed in 1971 by construction of the Kettle GS. Between Gull Rapids and Stephens Lake, there is an approximately 6 km long reach of the Nelson River that, although affected by

water regulation at the Kettle GS, remains riverine habitat with moderate velocity. After August 2018, all flow has been passed through the Keeyask GS spillway (see Section 2.1).

Construction of the Kettle GS flooded Moose Nose Lake (north arm) and several other small lakes that previously drained into the Nelson River, as well as the old channels of the Nelson River that now lie within the southern portion of the lake (Map 4). Major tributaries of Stephens Lake include the North and South Moswakot rivers that enter the north arm of the lake. Looking Back Creek is a second order stream that drains into the north arm of Stephens Lake (Map 1). Kettle GS is located approximately 40 km downstream of the Keeyask GS.

The Long Spruce reservoir was formed in 1979 by the construction of the Long Spruce GS. It is a 16 km reach of the Nelson River extending from Long Spruce GS upstream to Kettle GS (Manitoba Hydro Public Affairs 1999). Kettle River and Boots Creek are the only major tributaries flowing into Long Spruce reservoir, with both tributaries entering the reservoir on the south shore (Maps 1 and 6).

The Limestone Reservoir was formed in 1990 by the construction of the Limestone GS. It is a 23 km reach of the Nelson River extending from Limestone GS upstream to Long Spruce GS. Four tributaries of the Nelson River enter the reservoir; Wilson Creek and Brooks Creek enter from the south, and Sky Pilot Creek and Leslie Creek enter from the north. Aquatic habitat within the reservoir ranges from a riverine environment in the upper reach, to more lacustrine conditions just upstream of the Limestone GS.

2.1 CONSTRUCTION SUMMARY

Construction of the Keeyask GS began in mid-July 2014 with the construction of cofferdams in the north and central channels of Gull Rapids (Map 2). These cofferdams resulted in the dewatering of the north and central channels and the diversion of all flow to the south channel. Construction of the Spillway Cofferdam (SWCD), which extends into the south channel of Gull Rapids, was completed in 2015. The rock placement for the inner and outer groins of the Tailrace Cofferdam (TRCD) started in late 2016 and the impervious fill placement was completed in fall 2017. An opening was created to allow fish to move freely over the winter of 2017-2018. The opening was closed in spring 2018 and dewatering of the TRCD occurred in July, at which time a fish salvage was completed. In preparation for commissioning of the spillway, the SWCD was watered-up on both sides of the structure in June 2018. Removal of the SWCD started in early July and continued into August. The spillway was commissioned between August 3 and 7, 2018. Closing the south channel with the upstream South Dam Cofferdam (SDCD) commenced at the beginning of August and river closure was achieved on August 16. This closure and the work that continued to seal the cofferdam forced the entire river flow through the spillway. The downstream SDCD was completed in September and the area between the two cofferdams was dewatered, allowing for fish salvage to be completed by late September 2018. Work continued on the upstream SDCD until it was complete in late fall 2018.

Almost all work in 2019 was in the dry. The construction activities included the excavation of the tailrace, construction of the tailrace spawning shoal, and completion of the dams and dykes.

2.2 FLOWS AND WATER LEVELS

From October 2018 to October 2019, calculated Split Lake outflows ranged from about 2,600 to 3,700 m³/s. However, over most of the period, outflows ranged from approximately 3,000 to 3,500 m³/s and were near the historical annual median flow of approximately 3,300 m³/s. Outflow increased from about 2,600 to 3,600 m³/s from October to December 2018, and then was variable through the remainder of the winter period. Between June and September 2019, the flow generally ranged from 3,300 to 3,500 m³/s. Flows dropped to about 2,900 m³/s in early October 2019 before rising again to almost 3,700 m³/s by the end of the month. Water levels varied in conjunction with flows, ranging from about 153.2–155.0 m ASL on Gull Lake.

3.0 METHODS

3.1 ACOUSTIC TELEMETRY

Acoustic telemetry involves tracking movements of fish surgically implanted with internal acoustic transmitters (tags). Each transmitter emits a unique signal, recognizable by stationary receivers. When tagged fish come into the detection range of a receiver (generally within 500 m to 1 km, depending on conditions), the transmitter code number, as well as the date and time, are stored in the receiver. Initially, the receiver array was designed to monitor adult Lake Sturgeon (Hrenchuk 2020a); however, the same array is also used to monitor movements of juvenile Lake Sturgeon (Hrenchuk 2020b), Walleye (the focus of this report), and Lake Whitefish (Hrenchuk 2020c).

3.1.1 ACOUSTIC TRANSMITTER APPLICATION

Acoustic transmitters (VEMCO V13-1x) were first applied to Walleye in 2013 (40 upstream and 40 downstream of Gull Rapids) and 2014 (nine upstream and two downstream) (Murray *et al.* 2015). These transmitters expired during the 2016 open-water period. To continue Walleye movement monitoring with a similar sample size, 80 acoustic transmitters (VEMCO V13-1x¹) were applied to Walleye between May 27 and June 7, 2016: 40 upstream, and 40 downstream of Gull Rapids (now referred to as the Keeyask GS) (Table 1). Shortly after tagging (*i.e.*, within 22 days), eight fish moved downstream into Stephens Lake. In order to return the number of tagged fish upstream of Gull Rapids to the original sample size, eight additional transmitters were applied on September 24, 2016 (Hrenchuk and Lacho 2017).

In October 2017, monitoring results indicated that several additional fish had either moved downstream out of Gull and Stephens lakes, or had gone missing (see Sections 4.1.1 and 4.1.2). Therefore, to maintain a similar sample size of tagged fish, additional transmitters (VEMCO V13-1x) were applied to Walleye upstream of the Keeyask GS and in Stephens Lake in spring 2018. Seventeen fish were tagged upstream of the Keeyask GS between May 27 and June 5, and seven fish were tagged in Stephens Lake between June 6 and 9 (Table 1).

Additional transmitters were applied to Walleye in 2019 (VEMCO V13-1x) to maintain the sample size during GS operation, while obtaining one full year of tracking prior to impoundment in 2020. Twenty-seven fish were tagged upstream of the Keeyask GS between May 23 and June 7, and 27 were tagged in Stephens Lake between May 30 and June 3. An additional two fish were tagged in Stephens Lake on September 16.

¹ Battery life for tags implanted in 2013 was estimated at 1,480 days; tags implanted in 2016 and 2018 had an estimated battery life of 1,735 days; and tags implanted in 2019 had an estimated battery life of 1,492 days.

Following capture, Walleye receiving tags were placed in a 76 L nesting fish tub fitted with an aquarium aerator for transport. All tagging was conducted on shore near the site of capture. Prior to transmitter implantation, Walleye were anaesthetized in a solution of clove oil and ethanol, adapted from Anderson et al. (1997). When the Walleye became immobile, they were placed in a surgery cradle ventral side up. Because the anesthetic renders a fish unable to ventilate on its own, freshwater was continuously pumped over the gills. A small incision was made through the ventral body wall using a sterilized scalpel. An acoustic transmitter was inserted into the body cavity and the incision was closed with sutures. Walleye were monitored in a recovery tank until they were able to maintain equilibrium and had regained their strength. They were released in off-current areas near the original capture site.

3.1.2 ACOUSTIC RECEIVERS

Since 2011, stationary acoustic receivers (VEMCO model VR2 and VR2W) have been used to continuously monitor tagged adult Lake Sturgeon in the Nelson River between Clark Lake and the Long Spruce GS; tagged Walleye have been monitored by these receivers since 2013. In spring 2016, the receiver array was extended to the upper Limestone Reservoir, with the placement of two receivers downstream of the Long Spruce GS. The intent of adding these receivers was to determine whether fish that had moved into the Long Spruce Reservoir had continued to move downstream. As noted below, these receivers could not be set in 2018 or 2019 due to low water conditions.

During the first five years of the construction phase of the Project (beginning in July 2014), receivers were deployed at the same sites as those established during the pre-construction phase (2011–2013). During the open-water period, receivers were deployed in calm water with a flat bottom free of large debris to maximize detection range, and spaced along the main river channel throughout the study area to maximize spatial coverage. In Stephens Lake, receivers were placed at locations within pre-flood river channels, based on the observation that sturgeon tend to stay within river channels, even in flooded environments. The same receivers have been effective in tracking Walleye movements. At constrictions within the river channel, a series of receivers were deployed to create “gates” with the intent of recording all fish that passed by the river cross-section (described in Section 3.1.2.2).

The retrieval of receivers deployed during winter has proven challenging and several were lost in previous winters, likely moved by ice (Hrenchuk and Barth 2013). Because it appears that receivers will only remain safe from ice if deployed in calm areas at depths greater than 10 m, the number of possible receiver locations during winter is limited, especially in Gull Lake.

3.1.2.1 WINTER 2018/2019

The stationary acoustic receiver array for the winter 2018/2019 (October 11, 2018, to April 30, 2019) period consisted of 19 receivers. Four were set upstream of the Keeyask GS and 15 throughout Stephens Lake (Maps 3 and 4). Low water levels prevented boat access to the river

section between Kettle GS and Long Spruce GS, and therefore, an acoustic receiver could not be set downstream of the Kettle GS during winter 2018/2019. A receiver set in this area in October 2017 has not yet been retrieved, however, it is unlikely that this receiver recorded data during winter 2018/2019 due to a lack of battery life. Other than this receiver, the winter 2018/2019 array did not differ from that used in winter 2017/2018.

3.1.2.2 OPEN-WATER 2019

An array of 57 acoustic receivers was used during the 2019 open-water period (defined as May 1 to October 7, 2019). Twenty-seven were set upstream of the Keeyask GS and 30 were set in Stephens Lake (Maps 5 and 6). The 2019 open-water array differed slightly from arrays used in 2018. One receiver (#125101) was set in a new location in Stephens Lake, closer to the construction site, at rkm 0.6 (Map 6).

As in 2018, receivers could not be set in the Long Spruce or Limestone reservoirs during the 2019 open-water period due to low water levels. Receivers will be set in both locations during open-water 2020 provided conditions are suitable.

Receiver “gates” were established in several key areas selected by river morphology (channel restrictions) and habitat characteristics (areas with low velocity adjacent to the main flow of the river). Receiver “gates” consisted of two or more acoustic receivers set parallel to flow to provide complete (or nearly complete) signal coverage of a river cross-section. Areas between the “gates” were referred to as river zones. Receiver gates provide confidence that movements past key points are being detected, which allows for extrapolation of coarse-scale positions (*i.e.*, which zone) during periods when fish remain undetected. When analyzing data, fish detected within a zone that subsequently go undetected for a period of time without passing through a gate, are assumed to be within the zone in which they were last detected.

Four gates were established between Clark Lake and the Keeyask GS (44.0, 34.0, 19.0, and 10.0 rkms upstream of the GS), and two were established in Stephens Lake (4.5 and 40.0 rkms downstream of the GS) (Maps 5 and 6). The area upstream of the Keeyask GS was divided into five zones (Map 5; Zones 1–5), while Stephens Lake was divided into two zones (Map 6; Zones 6 and 7). The Long Spruce Reservoir is referred to as Zone 8 and the Limestone Reservoir as Zone 9; however, monitoring did not occur in these areas in either 2018 or 2019. The location of the “gates” has remained consistent since initiation of the study in 2013.

On October 7, 2019, the majority of receivers were removed and a subset ($n = 21$) were redeployed to monitor movements during winter 2019/2020.

3.1.3 DATA ANALYSIS

False detections can arise on acoustic telemetry receivers due to code collisions and/or environmental noise (Pincock 2012). To filter out false detections, a fish was required to be detected at least two times within a 30-minute interval at a given stationary receiver. Single

detections were filtered and not used in most analyses; however, in instances when fish went undetected for lengthy periods, and/or rapid movements were suspected, raw data were also explored. In no instance did examination of raw data suggest that consideration of a single detection would result in a different behaviour or movement pattern compared with the result when single detections were removed.

Movements were analysed in terms of rkm distance, with the base of the Keeyask GS representing a distance of 0 rkm. The area located downstream of the Keeyask GS (*i.e.*, Stephens Lake and the Long Spruce Reservoir) were given positive (+) distance values from the GS, while the area located upstream (*i.e.*, Gull and Clark lakes) were given negative (-) distance values (Figures 1 and 2). The average rkm distance from the GS was calculated over a 4-hour interval and plotted versus time for each fish. Total detection ranges were calculated by subtracting the furthest downstream detection location from the location of the furthest upstream detection. The proportion of time that all fish spent within each river zone during each 4-hour interval was plotted and presented as a percentage of the study period. For example, a fish that spent 44% of the time between May 1 and May 31 within Zone 4 means that the fish was detected within Zone 4 for 44% of the 186 4-hour intervals between May 1 and May 31.

Rapid downstream movements observed within two weeks of tagging were classified as caused by tagging mortality or stress. If the fish made a rapid downstream movement within two weeks of tagging followed by upstream and downstream movements, it was classified as tagging stress. If a fish made a rapid downstream movement within two weeks of tagging and was not detected again or did not display upstream movements, it was classified as a tagging mortality. If a fish was not detected for more than one year, it was classified as missing.

4.0 RESULTS

Section 4.1 provides a movement summary for fish tagged in 2016 and 2018 prior to winter 2018/2019. Numbers of fish tagged upstream of the Keeyask GS and in Stephens Lake, by year, are provided in Table 1. Table 2 summarizes the proportional distribution of tagged fish upstream and downstream of the construction site (2013–2019). Table 3 summarizes movements through Gull Rapids (or the Keeyask GS) and the Kettle GS between 2013 and 2019. Figures 3 to 20 provide movement range, relative detection frequency, and proportional distribution of tagged fish both upstream and downstream of the construction site by season. Appendix A1 provides furthest upstream and downstream detection locations by river kilometre for each tagged fish (2016–2019) while Appendices A2 to A5 provide movement summaries, by river kilometre, for each Walleye tagged between 2016 and 2019. Biological information associated with each tagged fish is provided in Appendix A6.

4.1 2016-2018 RESULTS SUMMARY

4.1.1 UPSTREAM OF THE KEEYASK GS

Forty tags were applied to Walleye upstream of Gull Rapids between May 28 and June 7, 2016, eight transmitters were applied on September 24, 2016, and an additional 17 transmitters were applied between May 27 and June 5, 2018, bringing the total number of tagged fish to 65 (Table 1). Eight fish were only detected briefly in Gull Lake (between 1 and 18 days) after being tagged, and are considered missing:

- #53763 was tagged on June 5, 2016 at rkm -14.8. It was located in upper Gull Lake (rkm -19.5 to -14.8) until June 18, when it moved downstream. It was last detected at rkm -9.9 on June 19, 2016 (Appendix A2-4).
- #53766 was tagged on September 24, 2016 at rkm -12.5. It remained at this location until October 4, when it moved downstream to lower Gull Lake. It was last detected at rkm -9.5 on October 12, 2016 (Appendix A2-7)
- #53770 was tagged on June 5, 2016 at rkm -14.8. It was located at rkm -17.4 until June 11, 2016 (Appendix A2-11).
- #53774 was tagged on June 5, 2016 at rkm -14.8. It remained at rkm -17.4 until June 10, after which it moved downstream to lower Gull Lake. It was last detected at rkm -9.0 on June 16, 2016 (Appendix A2-15).

- #53778 was tagged on June 3, 2016 at rkm -14.8. It remained at rkm -17.4 until June 16. It then moved downstream and was last detected at rkm -9.5 on June 16, 2016 (Appendix A2-19).
- #53779 was tagged on June 3, 2016 at rkm -14.8. It was located at rkm -12.9 until June 13, 2016 (Appendix A2-20).
- #53790 was tagged on May 29, 2016 at rkm -17.4. It was located here until June 1, 2016 (Appendix A2-31).
- #53802 was tagged on June 7, 2016 at rkm -14.8. It moved downstream immediately and was last detected at rkm -5.8 on June 8, 2016 (Appendix A2-43).

An additional seven fish were detected longer (between 47 and 135 days) after tagging but have not been detected since open-water 2016 or winter 2016/2017 and are presumed missing:

- #53767 was tagged on September 24, 2016 at rkm -12.5. It was located here until October 16 and was last detected at rkm -10.1 on January 8, 2017 (Appendix A2-8).
- #53780 was tagged on May 30, 2016 at rkm -14.8. It was located here until July 13 after which it moved downstream and was last detected at rkm -5.8 on July 16, 2017 (Appendix A2-21).
- #53787 was tagged on May 30, 2016 at rkm -14.8. It moved between rkms -19.5 and -14.8 until August 13 after which it moved downstream and was last detected at rkm -5.8 on September 17, 2016 (Appendix A2-28).
- #53800 was tagged on June 7, 2016 at rkm -14.8. It moved between rkms -19.5 and -14.8 until August 29 after which it moved downstream and was last detected at rkm -5.8 on September 14, 2016 (Appendix A2-41).
- #53803 was tagged on September 24, 2016 at rkm -17.2. It moved between rkms -14.8 and -11.8 until October 16, 2016. It was last detected at rkm -10.1 on January 21, 2017 (Appendix A2-44).
- #53806 was tagged on June 6, 2016 at rkm -14.8. It moved between rkms -14.8 and -34.3 until October 19, 2016, when it was last detected at rkm -17.4 (Appendix A2-47).
- #53807 was tagged on June 6, 2016 at rkm -14.8. It moved upstream and was last located at rkm -48.2 (the inlet of Clark Lake) on August 19, 2016 (Appendix A2-48).

The 15 fish described above were not included in data analyses and are not discussed in the remainder of the report.

Prior to winter 2018/2019, 21 tagged Walleye moved downstream through Gull Rapids into Stephens Lake:

- Seven moved into Stephens Lake and made multiple upstream and downstream movements:

- #53758 was tagged on September 24, 2016, at rkm -17.5 and moved downstream through Gull Rapids between July 28 and August 11, 2017 (Appendix A2-1).
- #53759 was tagged on September 24, 2016, at rkm -17.5 and moved downstream through Gull Rapids on September 29, 2016 (Appendix A2-2).
- #53760 was tagged on September 24, 2016, at rkm -17.5 and moved downstream through Gull Rapids on October 3, 2016 (Appendix A2-3).
- #53775 was tagged on June 5, 2016, at rkm -14.8 and moved downstream through Gull Rapids on June 18, 2016 (Appendix A2-16).
- #53788 was tagged on May 30, 2016, at rkm -14.8 and moved downstream through Gull Rapids on June 21, 2016 (Appendix A2-29).
- #53793 was tagged on June 7, 2016, at rkm -17.4 and moved downstream through Gull Rapids on June 8, 2017 (Appendix A2-34).
- #25755 was tagged on June 1, 2018, at rkm -19.5 and moved downstream through Gull Rapids between June 11 and 12, 2018 (Appendix A2-64).
- Seven moved downstream through Gull Rapids into Stephens Lake, and then continued to move downstream into the Long Spruce Reservoir; two continued downstream into the Limestone Reservoir:
 - #53769 was tagged on June 5, 2016, at rkm -14.8. It moved through Gull Rapids between August 16 and September 1 and through the Kettle GS on September 11, 2016 (Appendix A2-10).
 - #53771 was tagged on May 31, 2016, at rkm -14.8. It moved downstream through Gull Rapids between July 27 and 31. It moved into the Long Spruce Reservoir on August 19 and was detected in the Limestone Reservoir on August 21, 2016 (Appendix A2-12).
 - #53773 was tagged on June 5, 2016, at rkm -14.8. It moved downstream and through the Kettle GS on July 19, 2017 (Appendix A2-14).
 - #53777 was tagged on May 29, 2016, at rkm -17.4. It moved downstream through Gull Rapids between August 14 and 23, 2017. It moved into the Long Spruce Reservoir on August 26 and was detected in the Limestone Reservoir on August 31, 2017 (Appendix A2-18).
 - #53782 was tagged on May 31, 2016, at rkm -19.5. It moved downstream through Gull Rapids between June 10 and 17, and moved through the Kettle GS between July 28 and August 8 (Appendix A2-23).
 - #53791 was tagged on May 29, 2016, at rkm -19.5. It moved downstream immediately after being tagged and was detected in Stephens Lake on June 5. It moved through the Kettle GS on June 27 (Appendix A2-32).

- #53799 was tagged on June 7, 2016, at rkm -14.8 and moved downstream through Gull Rapids on October 16, 2016. It moved through the Kettle GS on June 25, 2017 (Appendix A2-40).
- Two moved downstream through Gull Rapids into Stephens Lake and were last detected immediately upstream of the Kettle GS. These fish likely moved downstream into the Long Spruce Reservoir, however, due to a lack of receivers in the area, these movements could not be confirmed.
 - #25740 was tagged on June 5, 2018, at rkm -9.3 and moved between rkm -9.0 and -7.4 until June 14 and was detected in Stephens Lake on June 15. It moved between rkm 3.8 and 7.9 until June 18, after which it continued to move downstream. It was last detected in Stephens Lake at rkm 36.1 on July 27 (Appendix A2-50).
 - #25753 was tagged on May 27, 2018 at rkm -19.5. It then moved as far upstream as Birthday Rapids (rkm -32.3). It moved downstream through Gull Rapids on July 25 and was last detected at rkm 36.1 on August 11 (Appendix A2-62).
- Five moved downstream through Gull Rapids immediately after tagging and were detected briefly (for one to 15 days) in Stephens Lake with no upstream movements. These fish are considered tagging mortalities and are not discussed in the remainder of the report.
 - #53764 was tagged on June 5, 2016, at rkm -14.8 and moved downstream through Gull Rapids on June 12 (Appendix A2-5).
 - #53786 was tagged on May 30, 2016, at rkm -14.8 and moved downstream through Gull Rapids on June 2 (Appendix A2-27).
 - #53801 was tagged on June 7, 2016, at rkm -14.8 and moved downstream through Gull Rapids on the same day (Appendix A2-42).
 - #25748 was tagged on May 28, 2018, at rkm -20.0 and moved downstream through Gull Rapids on June 12 (Appendix A2-57).
 - #25752 was tagged on May 27, 2018, at rkm -19.5 and moved downstream through Gull Rapids on June 8 (Appendix A2-61).

To summarize, 65 Walleye were tagged upstream of Gull Rapids between 2016 and 2018. Fifteen fish are considered missing and 21 fish moved downstream into Stephens Lake. Therefore, 29 fish were available to be detected upstream of the Keeyask GS during winter 2018/2019.

One fish (#25739) moved downstream through the Keeyask GS into Stephens Lake during winter 2018/2019 (discussed in section 4.2.1). Nine additional fish that had not been detected since open-water 2017 were considered missing prior to the beginning of the 2019 open-water period.

- #53765 was tagged on September 24, 2016 at rkm -17.1. It was located between rkm -10.1 and -9.9 until July 23, 2017 (Appendix A2-6).

- #53768 was tagged on June 5, 2016 at rkm -14.8. It was located in upper Gull Lake (rkm -19.5 to -14.8) during the 2017 open-water period. It was last detected at rkm -12.4 on November 11, 2017 (Appendix A2-9).
- #53772 was tagged on June 5, 2016 at rkm -14.8. It moved between rkm -24.3 and -14.8 during open-water 2016. In 2017, it made a single downstream movement from rkm -29.4 to -7.4 in lower Gull Lake and was last detected on June 19 (Appendix A2-13).
- #53776 was tagged on May 30, 2016 at rkm -14.8. It moved throughout Gull Lake and was last detected at rkm -12.8 on August 22, 2017 (Appendix A2-17).
- #53783 was tagged on May 31, 2016 at rkm -19.5. It remained in the upper portion of Gull Lake for the majority of both the 2016 and 2017 open-water periods, moving upstream to Clark Lake at the end of August, and returning to Gull Lake in June. It was last detected at the inlet of Clark Lake (rkm -48.2) on August 23, 2017 (Appendix A2-24).
- #53785 was tagged on May 30, 2016 at rkm -14.8. It was located in Gull Lake during both the 2016 and 2017 open-water periods. It was last detected at rkm -5.8 on July 17, 2017 (Appendix A2-26).
- #53795 was tagged on June 1, 2016 at rkm -17.4. It remained in upper Gull Lake, moving no further downstream than rkm -14.8, and was last detected at rkm -19.4 on October 12, 2017 (Appendix A2-36).
- #53798 was tagged on June 7, 2016 at rkm -14.8. It moved throughout upper Gull Lake during open-water 2016, but was only detected briefly in 2017. It was last detected at rkm -10.1 on May 29, 2017 (Appendix A2-39).
- #53804 was tagged on September 24, 2016 at rkm -17.2. It was detected briefly in lower Gull Lake during open-water 2016, and was last detected at rkm -17.4 on June 6, 2017 (Appendix A2-45).

Therefore, accounting for the single fish that moved downstream and the nine additional missing fish, 19 Walleye were available to be detected upstream of the Keeyask GS during the 2019 open-water period.

4.1.2 STEPHENS LAKE

Forty tags were applied to Walleye in Stephens Lake between May 27 and June 1, 2016. An additional seven transmitters were applied between June 6 and 9, 2018, bringing the total number of tagged fish to 47. Since that time, 12 fish have gone missing:

- One (#53727) has never been detected since being tagged on May 28, 2016, at rkm 1.2.
- Seven were detected briefly (between six and 29 days) after being tagged and are considered missing:

- #53726 was tagged on May 27, 2016, at rkm 1.2. It was detected in upper Stephens Lake (rkm 1.2 to 4.4) until June 5. It moved downstream and was last located at rkm 16.8 on June 19, 2017 (Appendix A3-4).
- #53732 was tagged on May 28, 2016, at rkm 1.2. It was detected moving between rkm 1.2 and 4.5 until June 2, after which it moved downstream. It was last detected in the northern portion of Stephens Lake at rkm 13.0 on June 14, 2016 (Appendix A3-9).
- #53742 was tagged on May 30, 2016, at rkm 1.2. It was located between rkm 1.2 and 2.7 until June 11, 2016 (Appendix A3-19).
- #53743 was tagged on May 31, 2016, at rkm 1.2. It immediately moved downstream and was last located on June 13, 2016, at rkm 9.4 (Appendix A3-20).
- #53754 was tagged on May 31, 2016, at rkm 1.2. It immediately moved downstream and was last located on June 28, 2016, at rkm 18.6 (Appendix A3-31).
- #25734 was tagged on June 7, 2018, at rkm 1.2. It was last located at rkm 21.6 on June 13 (Appendix A3-41).
- #25738 was tagged on June 7, 2018, at rkm 1.2. It moved downstream and was last located at rkm 36.1 on July 6 (Appendix A3-45).
- Three were detected longer (between 65 and 136 days) after being tagged but have not been located since open-water 2016 and are considered missing:
 - #53733 was tagged on May 30, 2016, at rkm 1.2. It was detected regularly between rkms 1.2 and 13.9 until August 6, 2016, when it was last detected at rkm 13.9 (Appendix A3-10).
 - #53739 was tagged on May 31, 2016, at rkm 1.2. It was detected regularly between rkms 1.2 and 5.8 until October 14, 2016, when it was last detected at rkm 2.6 (Appendix A3-16).
 - #53812 was tagged on June 1, 2016, at rkm 1.2. It moved downstream on June 20, and was last detected at rkm 20 on August 5, 2016 (Appendix A3-39).
- One (#53735) has been located constantly at a single location. This fish was tagged on May 30, 2016, at rkm 1.2. It moved downstream immediately after tagging and was detected at rkm 18.6 on June 16, 2016. It has been located here on every day since this date with no upstream or downstream movements. It is likely that this fish represents a tagging mortality and the tag has remained within the detection range of this receiver (Appendix A3-12).

These 12 fish are not discussed in the remainder of this report.

Prior to winter 2018/2019, five Walleye moved downstream through the Kettle GS into the Long Spruce Reservoir. Three continued downstream and moved into the Limestone reservoir:

- #53728 was tagged on May 28, 2016, at rkm 1.2 and moved downstream through the Kettle GS between August 10 and 12, 2017. It was detected in the Limestone Reservoir on September 16, 2017 (Appendix A3-5).
- #53737 was tagged on May 29, 2016, at rkm 1.2 and moved downstream through the Kettle GS between July 14 and 16, 2017 (Appendix A3-14).
- #53746 was tagged on May 31, 2016, at rkm 1.2 and moved downstream through the Kettle GS between June 13 and August 4, 2017. It was detected in the Limestone Reservoir on August 8, 2017 (Appendix A3-23).
- #53747 was tagged on May 31, 2016, at rkm 1.2 and moved downstream through the Kettle GS between August 21 and 23, 2017 (Appendix A3-24).
- #53751 was tagged on May 31, 2016, at rkm 1.2 and moved downstream through the Kettle GS between August 4 and 6, 2017. It was detected in the Limestone Reservoir on August 8, 2017 (Appendix A3-5).

Three additional fish (#25732) likely moved downstream into the Long Spruce Reservoir, however, due to a lack of receivers in the area, these movements could not be confirmed.

- #53738 was tagged on May 31, 2016 at rkm 1.2. It was detected throughout upper Stephens Lake until July 17, 2017. It then moved steadily downstream and was last detected immediately upstream of the Kettle GS (rkm 40.8) on July 28 (Appendix A3-15).
- #53753 was tagged on May 31, 2016 at rkm 1.2. It was detected throughout upper and lower Stephens Lake until July 9, 2017. It then moved steadily downstream and was last detected immediately upstream of the Kettle GS (rkm 40.9) on August 8 (Appendix A3-30).
- #25732 was tagged on June 9, 2018, at rkm 1.2. It remained at this location until June 15, after which it began to move downstream. It was last located immediately upstream of the Kettle GS (rkm 40.9) on July 13 (Appendix A3-40).

To summarize, 21 fish moved downstream from Gull Lake and seven continued to be detected in Stephens Lake. Forty-seven Walleye were tagged in Stephens Lake in 2016 and 2018, 12 of which are considered missing, and eight of which moved downstream through the Kettle GS (five confirmed and three suspected). Therefore, 34 fish were available to be detected in Stephens Lake during winter 2018/2019.

One fish (#25739) moved downstream through the Keeyask GS into Stephens Lake during winter 2018/2019 (discussed in section 4.2.1). Nine additional fish that had not been detected since open-water 2017 were considered missing prior to the beginning of the 2019 open-water period.

- #53730 was tagged on May 28, 2019 at rkm 1.2. It moved throughout upper Stephens Lake until November 1, 2017, when it was last detected at rkm 9.4 (Appendix A3-7).

- #53745 was tagged on May 31, 2019 at rkm 1.2. It moved between upper and lower Stephens Lake until January 20, 2018, when it was last detected at rkm 9.4 (Appendix A3-22).
- #53749 was tagged on May 31, 2019 at rkm 1.2. It moved throughout Stephens Lake until July 29, 2017, when it was last detected at rkm 9.4 (Appendix A3-26).
- #53750 was tagged on May 31, 2019 at rkm 1.2. It was detected regularly moving throughout upper Stephens Lake until January 29, 2018, when it was last detected at rkm 9.4 (Appendix A3-27).
- #53756 was tagged on May 28, 2019 at rkm 1.2. It moved throughout Stephens Lake until September 23, 2017, when it was last detected at rkm 13.0 (Appendix A3-33).
- #53758 was tagged on September 24, 2016, at rkm -17.5 and moved downstream through Gull Rapids between July 28 and August 11, 2017, when it was last detected at rkm 1.2 (Appendix A2-1).
- #53760 was tagged on September 24, 2016, at rkm -17.5 and moved downstream through Gull Rapids on October 3, 2016. It remained in Stephens Lake and was last detected at rkm 5.2 on September 25, 2017 (Appendix A2-3).
- #53788 was tagged on May 30, 2016, at rkm -14.8 and moved downstream through Gull Rapids on June 21, 2016. It was last detected at rkm 1.2 on July 9, 2016 (Appendix A2-29).
- #53811 was tagged on June 1, 2019 at rkm 1.2. It was detected regularly moving throughout upper Stephens Lake until February 18, 2018, when it was last detected at rkm 7.9 (Appendix A3-38).

Therefore, accounting for the single fish that moved downstream and the nine additional missing fish, 24 Walleye were available to be detected in Stephens Lake during the 2019 open-water period.

4.1.3 LONG SPRUCE AND LIMESTONE RESERVOIRS

Six Walleye were last detected in the Long Spruce Reservoir, two (#53782 and #53791) in 2016 and four (#53737, #53747, #53769, and #53799) in 2017. Four Walleye were last detected in the Limestone Reservoir, one (#53771) in 2016 and three (#53728, #53746, and #53751) in 2017. Because no receivers have been set in either area since open-water 2017, these fish are not discussed further. Provided conditions are suitable, receivers will be set in both reservoirs in 2020.

4.2 WINTER 2018/2019

4.2.1 UPSTREAM OF THE KEEYASK GS

The 2018/2019 winter receiver array consisted of four receivers deployed in the Nelson River between Clark Lake and the Keeyask GS at rkms -48.2, -29.4, -12.4, and -10.3 (Figure 1). Two of the four acoustic receivers were retrieved; the receivers at rkm -48.2 and -10.3 could not be located and were likely moved by ice (Map 3).

Three of the 29 fish (10%) available to be detected were located a total of 1,312 times (range: 37–771 detections per individual) (Appendix A1-1). Tagged Walleye were only detected at the receiver set at rkm -12.4 (Figures 3 and 4). Fish were detected between eight and 54 days of the 202 day winter period (4–27% of the time).

One fish (#25739) moved downstream through the Keeyask GS spillway during winter 2018/2019. This fish was tagged on June 5, 2018 in Gull Lake. It was detected in lower Gull Lake (rkm -9.3 to -7.4) until the end of the 2018 open-water period (on October 3). It was next detected in Stephens Lake at rkm 5.2 on November 4. It displayed upstream and downstream movements within Stephens Lake, indicating that it survived passage. It was last detected at rkm 13.9 on November 20, 2018.

4.2.2 STEPHENS LAKE

Fifteen receivers were deployed in Stephens Lake during the 2018/2019 winter period, between rkms 5.2 and 36.1 (Figure 1). All of the 15 receivers were retrieved at the end of the study period (Map 4).

Positions were obtained for ten of the 34 fish (29%) available to be detected, for a total of 164,153 detections (range: 17–55,886 detections per individual) (Appendix A1-2). Fish were detected on six to 167 days of the 202 day winter period (3–83% of the time). On average, fish were detected on 92 days, or for 46% of the study period (StDev = 56 days). Five (50%) were located as far upstream as rkm 5.2, while one (10%) was located as far downstream as rkm 36.1 (Figure 5). The average overall movement range was 7.7 rkm (StDev = 6.2 rkm; range 0.6–19.3 rkm) (Figure 5; Appendix A1-2). The majority of detections were logged in the southern portion of Stephens Lake at rkms 18.6 ($n = 71,049$; 43%) and 9.4 ($n = 61,263$; 37%) (Figure 6).

4.3 OPEN-WATER 2019

4.3.1 ACOUSTIC RECEIVER RETRIEVAL

All stationary acoustic receivers deployed upstream of the Keeyask GS ($n = 27$) and in Stephens Lake ($n = 30$) during the 2019 open-water period were successfully retrieved (Maps 5 and 6). The receiver array was the same as in 2018, however, an additional receiver was

deployed in Stephens Lake 0.6 km downstream of the Keeyask GS spillway on the south shore (#125101; Map 6).

4.3.2 UPSTREAM OF THE KEEYASK GS

Nineteen Walleye tagged in 2016/2018 were available to be detected upstream of the Keeyask GS during the 2019 open-water period (Section 4.1.1). Nine (47%) were detected between 586 and 9,637 times for 8–83 days of the 160 day open-water period (5–52% of the time; Appendix A1-3). The average total movement range was 18.7 rkm (StDev = 14.5 rkm; range: 0.0–37.9 rkm) (Figure 7; Appendix A1-3). The farthest upstream detections occurred in Clark Lake at rkm -48.2 (by one fish; 11%) and -46.9 (by three fish; 33%), while the farthest downstream occurred at rkm -4.8 (by two fish; 22%) (Figures 7, 8, and 9; Appendix A1-3). No fish moved downstream through the Keeyask GS spillway into Stephens Lake.

Of the ten fish that were not detected:

- Five (#53784, #53792, #53805, #25744, and #25746) were detected for the majority of the 2018 open-water period moving throughout Gull Lake.
- Two (#53789 and #53794) were last detected in Clark Lake and likely moved upstream past the receiver array.
- One (#53781) was detected for ten days or less in all open-water periods and likely remains largely outside of the receiver array.
- Two (#25743 and #25745) were detected only briefly (2–7 days) after tagging and likely moved outside of the receiver array.

4.3.2.1 PROPORTIONAL DISTRIBUTION

As in previous study years, individual Walleye used Zone 4 (upper and middle basins of Gull Lake) most often, spending an average of 53% (StDev = 47%; range: 0–100%) of the study period in this area (Table 2; Figures 10 and 11). The remaining four zones were used less frequently:

- Zone 1 at 19% (StDev = 34%; range: 0–82%);
- Zone 2 at 1% (StDev = 2%; range: 0–6%);
- Zone 3 at 7% (StDev = 7%; range: 0–16%); and
- Zone 5 at 20% (StDev = 33%; range: 0–78%).

4.3.2.2 MOVEMENT PATTERNS

During the 2019 open-water period, the majority of detections were logged at the inlet of Gull Lake at rkm -19.5 (n = 16,554; 44%) (Figure 9). General movement patterns of Walleye can be split into four groups.

- Four (#53796, #25742, #25751, and #25754) remained in Gull Lake, moving between rkm -19.5 and -4.8.
- Two (#53797 and #25749) moved between Birthday Rapids and Gull Lake. Both fish displayed single upstream movements to Birthday Rapids in the spring (between May 27 and June 10) before returning to Gull Lake. These movements are likely related to spawning.
- Three (#25747, #25750, and #25756) moved between Clark Lake and Gull Lake.
 - #25747 was detected in Gull Lake at the beginning of the study period. It moved upstream into Clark Lake briefly (from June 15–29) before returning to Gull Lake. It was mainly located in lower Gull Lake (Zone 5) for the remainder of the study period.
 - #25750 and #25756 made single upstream movements into Clark Lake. Both fish were last located in Clark Lake (on August 9 and July 3, respectively) and likely continued to move upstream past the receiver array.

4.3.3 STEPHENS LAKE

Twenty-four Walleye tagged in 2016/2018 were available to be detected in Stephens Lake during the 2019 open-water period (Section 4.1.2). Thirteen (54%) were detected between 20 and 30,676 times for 1–102 days of the 160 day open-water period (1–64% of the time; Appendix A1-4). The average total movement range was 6.9 rkm (StDev = 6.7 rkm; range: 0.0–17.4 rkm) (Figure 12; Appendix A1-4). The farthest upstream detections occurred at rkm 1.2 (by eight fish; 62%) while the farthest downstream occurred at rkm 18.6 (by three fish; 23%) (Figures 12 and 13; Appendix A1-4).

Thirteen fish located during open-water 2018 were not detected during open-water 2019. Of these:

- One (#53740) was last detected during winter 2018/2019 (on February 20, 2019) at rkm 9.4.
- The remaining fish were last detected during open-water 2018.
 - Five (#53723, #53731, #53748, #25736, and 25739) were last detected in upper Stephens Lake, upstream of rkm 13.9.
 - Three (#53725, #53734, #53759) were last located at rkm 16.8.

- Four (#53752, #53808, #53809, #25755) were last located at rkm 18.6.

4.3.3.1 PROPORTIONAL DISTRIBUTION

Unlike in previous years, individual Walleye used Zone 6 (upper Stephens Lake closer to the Keeyask GS) slightly more frequently than Zone 7, spending an average of 56% (StDev = 44%, range: 0–100%) of the study period in this area. Zone 7 was used an average of 44% (StDev = 44%, range: 0–100%) of the time (Table 2; Figures 10 and 14). However, as in previous years, the largest proportion of fish were detected close to the Keeyask GS during the beginning of the study period. Zone 6 was used an average of:

- 80% (StDev = 10%; range: 67–92%) of the time between June 1 and 19, 2019; and
- 52% (StDev = 4%; range: 42–58%) of the time between June 20 and October 7.

4.3.3.2 MOVEMENTS

During the 2019 open-water period, the majority of detections were logged in upper Stephens Lake, upstream of rkm 10.3 ($n = 66,997$; 97%) (Figure 13). General movement patterns were as follows.

- Ten (#53724, #53729, #53736, #53744, #53755, #53775, #53793, #25735, #25737, and #25741) remained in upper Stephens Lake, moving no further downstream than rkm 9.7.
 - Five (#53729, #53736, #53744, #53755, and #25735) were located in the northern portion of Stephens Lake for part of the study period.
 - Two (#53724 and #53755) have been located exclusively in upper Stephens Lake since tagging in 2016.
- The remaining three Walleye (#53741, #53757, and #53810) moved further downstream, and were located as far as rkm 18.6.
 - All three fish were located within the northern portion of Stephens Lake for part of the study period.

4.4 2019 TAGGING

4.4.1 ACOUSTIC TRANSMITTER APPLICATION

As previously discussed (Section 3.1.1), 27 tags were applied to Walleye upstream of the Keeyask GS between May 23 and June 7, 2019 (Appendix A6-1). These fish had a mean fork length of 394 mm (StDev = 68 mm; range: 288–523 mm) and a mean weight of 776 g (StDev = 421 g; range: 300–1,769 g). In terms of tagging locations, one was tagged and released in the riverine area downstream of Birthday Rapids (rkm -26.7), 12 on the north and

five on the south shore at the upstream end of Gull Lake (rkm -19.5), five on the north and three on the south shore at rkm -17.4, and one on the north shore at rkm -12.5 (Map 8).

Twenty-nine tags were applied to Walleye in Stephens Lake between May 30 and June 3, and an additional two were applied on September 16, 2019 (Appendix A6-2). These fish had a mean fork length of 437 mm (StDev = 57 mm; range: 320–530 mm) and a mean weight of 1,000 g (StDev = 370 g; range: 400–1,600 g). Thirteen were tagged and released on the north shore 1.1 rkm downstream of the Keeyask GS, 16 on the south shore at rkm 1.3, and two at rkm 5.8 (Map 8).

4.4.2 UPSTREAM OF THE KEEYASK GS

Twenty-six of 27 Walleye tagged upstream of the Keeyask GS between May and June, 2019, were detected between seven and 66,867 times for 1–121 days (1–98% of potential detection days; Appendix A1-3). One fish (#20168) was never detected, indicating it may have remained outside of the receiver array or received a malfunctioning tag. The average total movement range was 19.5 rkm (StDev = 20.7 rkm; range: 0.0–69.9 rkm) (Figure 15; Appendix A1-5). The farthest upstream detections occurred in Clark Lake at rkm -48.2 and -46.9 (by two fish; 7%), while the farthest downstream occurred in lower Gull Lake at rkm -4.8 (by six fish; 23%) (Figure 15; Appendix A1-5). Eight fish (30%) moved downstream through the Keeyask GS spillway (discussed in Section 4.4.2.3).

4.4.2.1 PROPORTIONAL DISTRIBUTION

As with fish tagged in 2016/2018, individual Walleye used Zone 4 (upper and middle basins of Gull Lake) most often, spending an average of 84% (StDev = 18.3%; range: 44–100%) of the study period in this area. The remaining four zones were used less frequently (Table 2; Figures 11 and 16).

4.4.2.2 MOVEMENT PATTERNS

As with fish tagged in 2016/2018, the majority of detections of fish tagged in 2019 were logged at the inlet of Gull Lake (rkm -19.5; n = 261,178; 83%) (Figure 17). Of the 26 fish that were detected:

- Two moved upstream into Clark Lake.
 - #20170 was tagged in Gull Lake (rkm -17.4) on June 6. It made a single upstream movement and was located in Clark Lake on July 4. It moved downstream on July 7 and was located in lower Gull Lake (rkm -9.3) for the remainder of the study period.
 - #20175 was tagged in Gull Lake (rkm -17.4) on May 29. It moved between Birthday Rapids (rkm -33.8) and lower Gull Lake (rkm -9.3) for the majority of the

study period. It moved upstream into Clark Lake on September 16. It returned to the riverine area downstream of Birthday Rapids (rkm -33.8 to -24.7) and was located here for the remainder of the study period.

- Two (#20151 and #20188) were tagged in Gull Lake but made single upstream movements to the riverine area between Birthday Rapids and Gull Lake. Both fish returned to Gull Lake.
- Fourteen remained in Gull Lake for the entire open-water period.
 - Twelve remained in the upstream portion of Gull Lake, between rkm -19.5 and -9.9.
 - Two were located in both upper and lower Gull Lake.
 - #20148 was tagged and detected within lower Gull Lake rkm -9.3 until mid-June, after which it was only detected in the upstream portion of Gull Lake (rkm -19.5 to -9.9).
 - #20159 moved between upper and lower Gull Lake for the entire open-water period.
- Eight moved downstream through the Keeyask GS into Stephens Lake (discussed below in Section 4.4.2.3).

4.4.2.3 MOVEMENTS THROUGH THE KEEYASK GS

Eight Walleye tagged in spring 2019 moved through the Keeyask GS spillway. All fish displayed upstream movements in Stephens Lake, indicating they survived passage and were not dead prior to downstream movements.

- Two moved downstream within two weeks of tagging (ten days), indicating tagging stress.
 - #20158 was tagged on June 6 at rkm -19.5. It moved downstream through the Keeyask GS spillway on June 16. It was last detected at rkm 9.4 on June 21 (Appendix A4-11).
 - #20160 was tagged on June 7 at rkm -19.5. It remained at this location until June 13 when it began to move downstream, moving through the Keeyask GS Spillway on June 17. It was located at rkm 4.4 until the end of the study period (Appendix A4-13).
- Three continued to move downstream within Stephens Lake and were last located upstream of the Kettle GS. It is likely that these fish continued to move downstream through the GS into the Long Spruce forebay.
 - #20147 was tagged on June 5 at rkm -17.4. It moved between rkm -19.5 and -9.9 until July 24, when it moved downstream through the Keeyask GS Spillway. It

continued to move downstream in Stephens Lake, and was last detected immediately upstream of the Kettle GS on July 31 (Appendix A4-1).

- #20150 was tagged on June 5 at rkm -17.4. It moved downstream within Gull Lake and was last detected at rkm -4.8 on June 21. It moved through the Keeyask GS Spillway on the same day. It was last detected immediately upstream of the Kettle GS on July 2 (Appendix A4-4).
- #20163 was tagged on June 6 at rkm -19.5. It was located here until June 22 when it moved upstream. It was located in the riverine area of the Nelson River between Birthday Rapids and Gull Lake until July 31 when it returned to rkm -19.5. It moved downstream through the Keeyask GS spillway on August 9 and was last detected in lower Stephens Lake at rkm 36.1 on August 16 (Appendix A4-16).
- Three remained in Stephens Lake.
 - #20182 was tagged on May 25 at rkm -19.5. It was located here until June 5 when it moved downstream to rkm -12.9. It remained at this location until June 13 when it moved downstream through the Keeyask GS Spillway. It was last detected on June 15 at rkm 16.8 (Appendix A4-23).
 - #20186 was tagged on May 29 at rkm -12.5. It moved throughout Gull Lake, as far upstream as rkm -19.5 and as far downstream as rkm -7.4 until August 10 when it moved downstream through the Keeyask GS spillway. It remained in upper Stephens Lake, moving between rkm 1.2 and 5.4 until it was last detected on August 12 (Appendix A4-24).
 - #20187 was tagged on May 23 at rkm -19.5. It remained at this location until June 14 when it began moving downstream, passing through the Keeyask GS Spillway on June 19. It was last detected in lower Stephens Lake at rkm 24.7 on July 2 (Appendix A4-25).

4.4.3 STEPHENS LAKE

All 31 Walleye tagged in Stephens Lake between May and June and in September 2019 were detected between 181 and 55,200 times for 6–124 days (5–97% of potential detection days; Appendix A1-5). The average total movement range was 12.8 rkm (StDev = 10.0 rkm; range: 2.9–39.7 rkm) (Figure 18; Appendix A1-6). The farthest upstream detections occurred immediately downstream of the Keeyask GS spillway at rkm 0.6 (by six fish; 19%), while the farthest downstream occurred immediately upstream of the Kettle GS at rkm -40.9 (by one fish; 3%).

4.4.3.1 PROPORTIONAL DISTRIBUTION

Individual Walleye tagged in 2019 used Zone 6 (upper Stephens Lake closer to the Keeyask GS) and Zone 7 equally, spending an average of 50% of the study period in each area (Table 2; Figures 11 and 19). However, as was seen with the Walleye tagged in 2016, the largest proportion of fish were detected close to the Keeyask GS during the beginning of the open-water period. Zone 6 was used an average of:

- 73% (StDev = 7%; range: 64–86%) of the time between June 5 and 25; and
- 48% (StDev = 7%; range: 39–61%) of the time between June 26 and October 7, 2019.

4.4.3.2 MOVEMENT PATTERNS

As with fish tagged in 2016, the majority of detections were logged in upper Stephens Lake, upstream of rkm 10.3 ($n = 222,859$; 93%) (Figure 20). Of the 31 fish that were detected:

- Seventeen remained in upper Stephens Lake, moving no further downstream than rkm 10.3.
- Ten made more extensive movements throughout Stephens Lake:
 - Two (#20179 and #20184) moved as far downstream as rkm 13.9.
 - Seven made regular upstream and downstream movements, moving as far downstream as rkm 16.5 (#20174), 18.6 (#20130, #20131, and #20142), or 24.7 (#20136, #20137, and #20180).
 - One (#20139) moved as far downstream as rkm 36.1, upstream of the Kettle GS. This fish returned upstream and was located at rkm 13.0 for the remainder of the open-water period.
- Two may have moved downstream through the Kettle GS.
 - #20141 was tagged on May 31 at rkm 1.2. It moved between rkm 0.6 and 9.4 until June 14 when it moved rapidly downstream. It was last located at rkm 36.1 on June 15.
 - #20167 was tagged on September 16 at rkm 5.5. It moved downstream on September 20 and was last located immediately upstream of the Kettle GS (rkm 40.9) on September 27.
 - Due to the short amount of time between tagging and this downstream movement (four days), it likely represents tagging stress or mortality.
- Two (#20143 and #20183) were located for less than two weeks post-tagging (ten and 12 days, respectively).
 - #20143 was last detected in lower Stephens Lake at rkm 18.6.
 - #20183 was last detected at rkm 13.0.

5.0 DISCUSSION

Walleye movement monitoring was initiated in 2013 to describe movements during the pre-construction (2013) and construction phases (beginning July 2014) of the Project and to determine if disturbances associated with construction would alter habitat use and coarse-scale movement patterns upstream and downstream. Acoustic transmitters applied in 2013 and 2014 expired during the open-water period in 2016. Additional tags were applied both upstream and downstream of the construction site in 2016 to allow for continued monitoring during construction of the GS. The sample size of tagged Walleye was similar to 2013: 48 transmitters were applied upstream of Gull Rapids (now called the Keeyask GS), and 40 were applied in Stephens Lake. An additional 24 transmitters were applied in spring 2018 (17 upstream of the Keeyask GS and seven in Stephens Lake) to account for fish that had gone missing and return the number of fish monitored to the original sample size.

Although acoustic transmitters applied in 2016 and 2018 are not estimated to expire until winter 2021 and 2023, respectively, additional transmitters were applied to Walleye (27 upstream and 29 downstream) in spring 2019.). Movements of these fish will continue to be monitored until 2023, both prior to and after impoundment and commissioning of the Keeyask GS.

5.1 EVALUATION OF METHODOLOGY

Fish movement monitoring, via acoustic telemetry, is a significant component of the AEMP, and is being used to assess potential impacts of Keeyask GS construction on several fish species including Lake Sturgeon (adults and juveniles), Walleye, and Lake Whitefish. Of these fish species/life stages, the methodology is most effective for monitoring movements of adult and juvenile Lake Sturgeon. Lake Sturgeon have a low natural mortality rate and occupy main channel habitats where receivers are located, which allows frequent detections of tagged fish. Monitoring movements of Walleye and Lake Whitefish via acoustic telemetry has been less effective relative to Lake Sturgeon. This occurs for a variety of reasons including: i) tagged individuals are detected less frequently due to more frequent utilization of shallow water habitats outside the detection range of receivers; ii) potential use of tributaries and off-current embayments where receivers are not located; iii) stress from the tagging procedure may cause mortality or an initial downstream movement of some individuals which complicates data interpretation; and iv) a higher natural/harvest mortality rate relative to Lake Sturgeon causes a greater proportion of tags to go missing. These characteristics reduce the frequency of detection of tagged fish and the higher proportion of missing fish further complicates data interpretation. The proportion of detected Walleye has decreased with each study year, likely reflecting natural mortality rates or harvest. The proportion of detected fish tagged upstream of Gull Rapids in 2013/2014 decreased from 98% in 2013, 81% in 2014, 76% in 2015, and 61% in 2016. The same was true for detection of fish tagged in Stephens Lake in 2013/2014; 100% of tagged fish were detected in 2013, 85% in 2014, 68% in 2015, and 49% in 2016. Fish tagged in 2016/2018

continue to exhibit the same pattern. The proportion of fish detected has decreased from 100% in 2016, 75% in 2017, to 47% in both 2018 and 2019 upstream of the Keeyask GS, and from 98% in 2016, 87% in 2017, 71% in 2018, to 50% in Stephens Lake. Despite this, the data collected to date provide a good understanding of Walleye movement on a coarse scale. This has been facilitated by the extensive array of stationary acoustic receivers spread over a ~100 km length of the Nelson River between Clark Lake and the Limestone GS, and the inclusion of receiver gates which provide confidence that movements of Walleye past key points are being detected.

One additional receiver was added to the receiver array during the 2019 open-water period. A receiver was deployed at rkm 0.6 (in Stephens Lake) in order to monitor movements in close proximity to the Keeyask GS spillway. During open-water 2019, no fish tagged in 2016/2018 and six fish tagged in 2019 (19%) were detected at this receiver. It will continue to be deployed as part of the Stephens Lake receiver array.

5.2 MOVEMENT PATTERNS

Although different Walleye have been tagged and monitored over time, similar coarse-scale movement patterns have been observed both upstream and downstream of Gull Rapids/the Keeyask GS since the study began in 2013.

Each year, fish tagged upstream of the Keeyask GS that have remained in the area (*i.e.*, not moved downstream into Stephens Lake) have been split into four groups: those that remained in Gull Lake; those that moved between Birthday Rapids and Gull Lake; those that moved between Clark Lake and Gull Lake; and those that remain in the riverine area downstream of Birthday Rapids. Walleye upstream of the Keeyask GS have consistently spent little time in the vicinity of the construction site. Overall mean movement ranges (excluding large-scale downstream movements) have remained similar between tagging periods. Average total yearly movement ranges were between 9.9 and 16.7 rkm for fish tagged in 2013/2014, 10.8 and 12.5 rkm for fish tagged in 2016/2018, and 9.4 rkm for fish tagged in 2019.

Similarly, Walleye tagged in Stephens Lake have been consistently split into two groups: those that remain exclusively within the upper portion (within 10.3 rkm of the Keeyask GS) of the lake; and those that move extensively throughout. In contrast to those tagged upstream of the Keeyask GS, a high proportion of the Walleye tagged in Stephens Lake have continued to use habitat in the vicinity of the construction site. In all study years since initial tagging in 2013, Walleye have been detected near Gull Rapids (or the GS construction site) during the spring (likely for spawning) and have moved downstream in the summer and fall. Overall, mean movement ranges (excluding large-scale downstream movements) have remained similar between tagging periods. Average total yearly movement ranges were between 7.1 and 10.8 rkm for fish tagged in 2013/2014, 6.9 and 15.2 rkm for fish tagged in 2016/2018, and 11.9 rkm for fish tagged in 2019.

5.3 MOVEMENTS THROUGH BARRIERS

Since the study began in 2013, 37 Walleye have moved downstream through Gull Rapids/Keeyask GS. Seventeen of these movements occurred within two weeks of tagging and are likely related to tagging stress or mortality. Twenty movements occurred independently of tagging, ranging annually from 0% of tagged fish (in 2013) to 14% of tagged fish (in 2017). Twenty-two movements through the Kettle GS have (or are suspected to have) occurred, seven of which were related to tagging. Fifteen movements occurred independently of tagging, ranging annually from 0% of tagged fish (in 2018) to 19% (in 2017). This includes four suspected movements that occurred in 2019 (based on final detections immediately upstream of the Kettle GS) that could not be confirmed due to a lack of receivers downstream. Overall, the number of downstream movements through barriers has fluctuated with no clear increasing or decreasing pattern. Other than tagging stress, it is difficult to determine why these movements have occurred. The proportion of fish entrained through Gull Rapids or the Kettle GS was the highest in 2017. Hrenchuk and Lacho (2018) hypothesized that these movements may be attributed to record high flows observed in the area.

The second highest proportion of fish moving downstream occurred in 2019. Eight downstream movements occurred, six of which occurred independently of tagging (*i.e.*, after two weeks of tagging), representing 13% of tagged fish. All eight fish displayed upstream and downstream movements within Stephens Lake, indicating that they were not dead prior to moving downstream and survived passage. Four fish (7% of tagged) appeared to move downstream through the Kettle GS, however, because of a lack of receivers downstream of the Kettle GS, these movements could not be confirmed. Flows in 2019 were close to median, which suggests that downstream movements may not be related to flow as was suggested in 2017. It is currently unclear why these downstream movements occur.

5.4 KEY QUESTIONS

The key questions/objectives of Walleye movement monitoring during construction, as described in the AEMP, and presented in the introduction of this report, are addressed below:

How many (or what proportion of) tagged Walleye move past the construction site?

Since tagging began in 2013, 36 fish have moved downstream through Gull Rapids or the Keeyask GS. Sixteen of these movements likely occurred due to tagging stress or mortality, while 20 movements occurred independently of tagging. By year, the highest proportion of tagged Walleye moved downstream through the Keeyask GS construction site (independent of tagging stress) in 2017 (14%) and the Keeyask GS spillway in 2019 (13%). In all other years, the rate of downstream movement has ranged from 0% (in 2013) to 8% (in 2015). There does not appear to be a clear increasing or decreasing trend in the proportion of Walleye that move downstream past the Keeyask GS construction site.

No Walleye have moved upstream through Gull Rapids since construction began in 2014. Keeyask spillway commissioning began on August 3, 2018, after which upstream movements through Gull Rapids were no longer possible.

Are Walleye using habitat in the vicinity of construction activities, particularly during spawning?

Monitoring since 2013 has shown that Walleye tagged upstream of the Keeyask GS do not spend much time in the vicinity of the construction site. Since studies began, Walleye have rarely been detected at the receiver set closest to Gull Rapids or the Keeyask GS construction site (rkm -5.8 from 2013–2017 and -4.8 from 2018–2019). For example, with the exception of the fish that moved through the Keeyask GS, three Walleye were detected by the closest receiver to the Keeyask GS (4.8 rkm upstream) between 34 and 133 times on four to ten days in 2019.

In contrast, Walleye in Stephens Lake regularly use habitat directly downstream of the construction site. In all study years, Walleye have been detected near Gull Rapids or the Keeyask GS construction site (at rkm 1.2) during the spring and have likely continued to spawn in this area during the construction period. For example, in 2019, six Walleye were detected at the receiver set immediately downstream of the Keeyask GS spillway at rkm 0.6.

6.0 SUMMARY AND CONCLUSIONS

- Acoustic transmitters were applied to Walleye upstream and downstream of the Keeyask GS construction site in 2013, 2014, 2016, 2018, and 2019. The transmitters applied in 2013/2014 have expired. Movements of Walleye tagged in 2016/2018 and 2019 were the focus of this report.
- Fifty-six acoustic transmitters were applied in spring and fall 2019 (27 upstream of the Keeyask GS and 29 in Stephens Lake). Acoustic transmitters applied in 2016/2018 and 2019 will remain active until winter 2021 and 2023, respectively.
- Walleye tagged upstream of the Keeyask GS that remain in the area (*i.e.*, have not moved downstream into Stephens Lake) have consistently displayed four general movement patterns since monitoring began in 2013. These fish either: remain in Gull Lake, move between Birthday Rapids and Gull Lake, move between Clark Lake and Gull Lake, or remain in the riverine area downstream of Birthday Rapids.
- Walleye tagged in Stephens Lake that remain in the area (*i.e.*, have not moved downstream through the Kettle GS) have been consistently split into two groups: those that remain exclusively within the upper portion (within 10.3 rkm of the Keeyask GS) of the lake; and those that move extensively throughout the lake.
- The key questions, as described in the AEMP, for Walleye movement monitoring during construction of the Keeyask GS are as follows:
 - *What is the number (or the proportion) of tagged Walleye that move past the construction site?*

Since tagging began in 2013, 36 fish have moved downstream through Gull Rapids or the Keeyask GS. Sixteen of these movements likely occurred due to tagging stress or mortality (*i.e.*, occurred within two weeks of tagging), while 20 movements occurred independently of tagging. The highest proportion of tagged Walleye moved downstream through the Keeyask GS construction site (independent of tagging stress) in 2017 (14%) and the Keeyask GS spillway in 2019 (13%). In all other monitoring years, the rate of downstream movement has ranged from 0% (in 2013) to 8% (in 2015). There does not appear to be a clear increasing or decreasing trend in the proportion of Walleye that move downstream past the Keeyask GS construction site.

No Walleye have moved upstream through Gull Rapids since construction began in 2014. Keeyask spillway commissioning began on August 3, 2018, after which upstream movements through Gull Rapids were no longer possible.

- *Are Walleye utilizing habitat in the vicinity of construction activities (particularly during spawning)?*

Monitoring since 2013 has shown that Walleye tagged upstream of the Keeyask GS that remain in Gull Lake do not spend much time in the vicinity of the construction site. In contrast, Walleye tagged in Stephens Lake, or those that have moved downstream from Gull Lake, regularly use habitat directly downstream of the construction site.

- Fish that were tagged in 2016 can be tracked until 2021, and fish tagged in 2018 and 2019 can be tracked until 2023. Movements will continue to be monitored through GS construction, impoundment, and operation.

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TABLES

Table 1: Number of acoustic tags applied to Walleye and active for each study year in the Keeyask Study Area (upstream of Gull Rapids/the Keeyask GS and in Stephens Lake) between June 2013 and October 2019

Year	Upstream of Gull Rapids		Stephens Lake	
	Number of Tags Applied	Number of Active Tags	Number of Tags Applied	Number of Active Tags
2013	40	40	40	40
2014	9	42	2	40
2015	0	40	0	43
2016	48	79	40	88
2017	0	28	0	42
2018	17	34	7	42
2019	27	46	29	55

*Tags no longer active during the current reporting period. Detailed information on movements (2013–2016) can be found in Hrenchuk and Barth (2014), Murray *et al.* (2015), Burnett *et al.* (2016), and Hrenchuk and Lacho (2017).

Table 2: Proportion of time spent in each river zone by Walleye tagged upstream of Gull Rapids/the Keeyask GS and in Stephens Lake in both 2013/2014 and 2016/2018 during a portion of the 2013 (June 4 to October 15), 2014 (June 4 to October 3), 2015 (June 4 to October 11), 2016 (June 4 to October 19), 2017 (June 7 to October 16), 2018 (June 6 to October 10), and 2019 (June 2 to October 7) open-water periods.

Tagging Year	Study Year	Upstream of Gull Rapids					Stephens Lake	
		1	2	3	4	5	6	7
2013	2013	4.0	1.3	2.0	84.0	8.7	66.0	34.0
	2014	6.9	1.2	4.8	82.7	4.3	59.0	41.0
	2015	10.4	4.2	6.5	71.8	7.1	76.5	23.5
	2016	8.5	0.1	19.9	61.0	5.9	58.2	41.8
2016/2018	2016	3.7	0.6	6.1	78.6	8.7	30.0	70.0
	2017	5.9	1.8	12.3	63.7	16.3	33.8	66.2
	2018	9.6	0.9	9.2	56.5	23.8	35.5	64.5
	2019	18.7	1.3	6.9	53.4	19.8	56.1	43.9
2019	2019	0.1	0.1	5.3	83.7	10.8	50.0	50.0

Table 3: Proportion of tagged Walleye that moved downstream through Gull Rapids (now the Keeyask GS) and the Kettle GS each year since studies began in 2013. The total number of movements, the proportion of movements suspected to have occurred due to tagging stress or mortality (i.e., within two weeks of tagging), and the adjusted number of movements interpreted to have occurred outside of tagging stress (i.e., total movements minus movements due to stress) are provided. Grey highlighting indicates movements that occurred prior to the onset of construction.

Year	Gull Rapids/Keeyask GS									Kettle GS								
	Total Movements ¹			Tagging Stress/Mortality ²			Adjusted Movements ³			Total Movements ¹			Tagging Stress/Mortality ²			Adjusted Movements ³		
	Total Fish	Total Move	% ⁴	# Fish Tagged	Total Move	% ⁵	Total Fish	Total Move	% ⁴	Total Fish ⁶	n	%	# Fish Tagged	n	% ⁴	Total Move	n	%
2013	40	2	5	40	2	5	40	0	0	40	-	-	40	-	-	40	-	-
2014	42	1	2	9	0	0	42	1	2	40	1	3	2	0	0	40	1	3
2015	40	3	8	0	-	-	40	3	8	43	1	2	0	-	-	43	1	2
2016	79	12	15	48	8	17	79	4	5	88	4	5	40	3	6	88	1	1
2017	28	4	14	0	-	-	28	4	14	42	8	19	0	-	-	42	8	19
2018	34	6	18	17	4	24	34	2	6	42	3	7	7	3	43	42	0	0
2019	46	8	17	27	2	7	46	6	13	55	5	9	31	1	3	55	4	7

1. Includes all downstream movements, including those that are interpreted to have occurred due to tagging stress and mortality.
2. Includes only Walleye that moved downstream within two weeks of tagging. These movements are likely caused by tagging stress or mortality
3. Does not include fish interpreted to have moved downstream due to tagging stress or mortality.
4. Proportion is calculated as a percentage of the total number of fish available for detection in the current year.
5. Proportion is calculated as a percentage of those tagged in the current year.
6. Includes all fish tagged in Stephens Lake as well as those that moved downstream from Gull Lake.

FIGURES

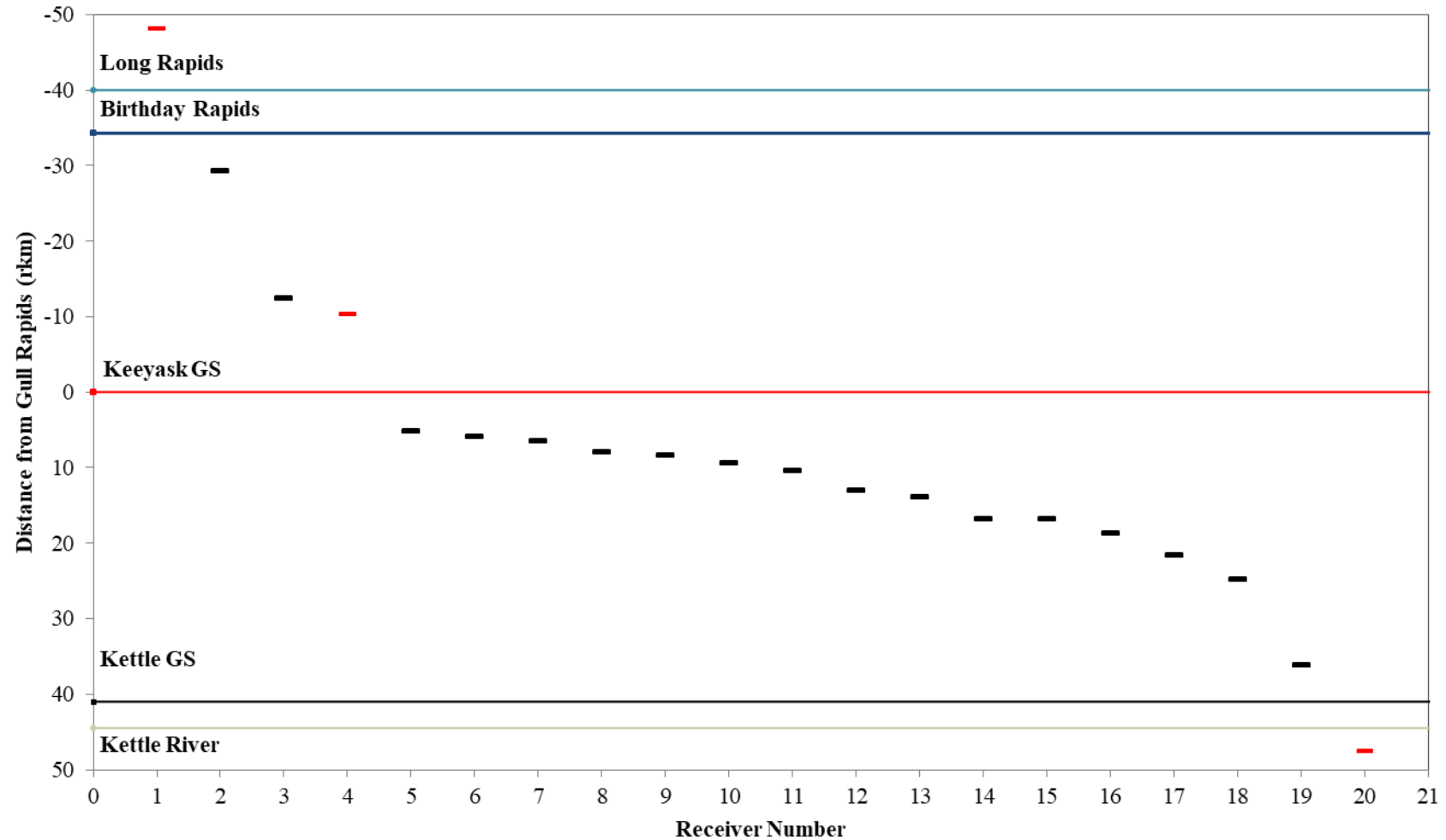


Figure 1: Locations of stationary acoustic receivers (dashes) in relation to the base of the Keeyask GS (rkm 0) and other major landmarks (lines) in the Nelson River between Clark Lake and the Limestone GS between October, 2018 and June, 2019. A red dash indicates a receiver that was lost.

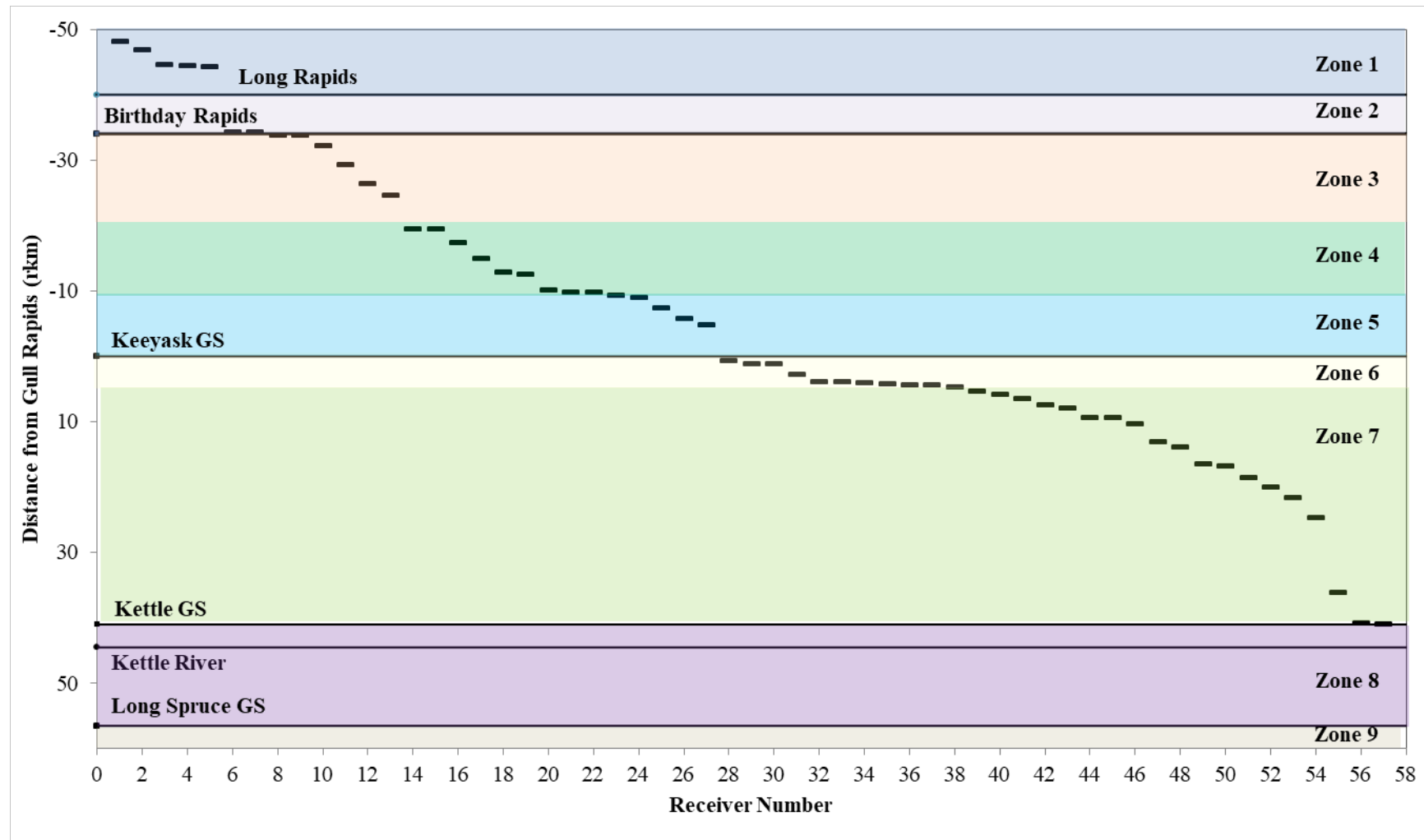


Figure 2: Locations of stationary acoustic receivers (dashes) in relation to the base of the Keeyask GS (rkm 0) and other major landmarks (lines) in the Nelson River between Clark Lake and the Limestone GS between June and October, 2019. River zones upstream and downstream of the Keeyask GS are indicated by different colours.

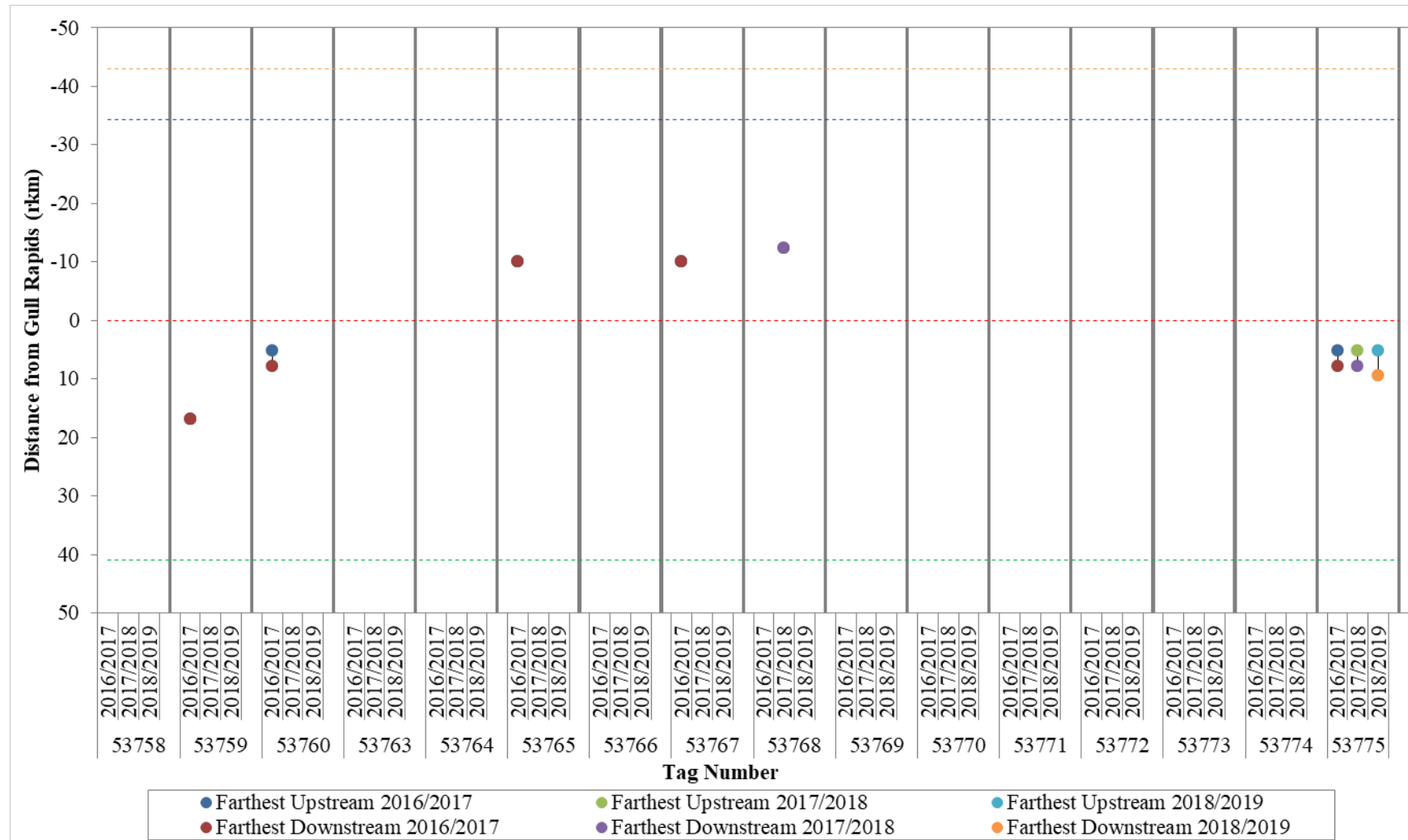


Figure 3: Detection ranges for individual Walleye tagged with acoustic transmitters upstream of the Keeyask GS in 2016 and 2018 during the winter period (2016–2019). Horizontal dotted lines indicate locations of landmarks (orange = Clark Lake outlet; blue = Birthday Rapids, red = the Keeyask GS; green = Kettle GS).

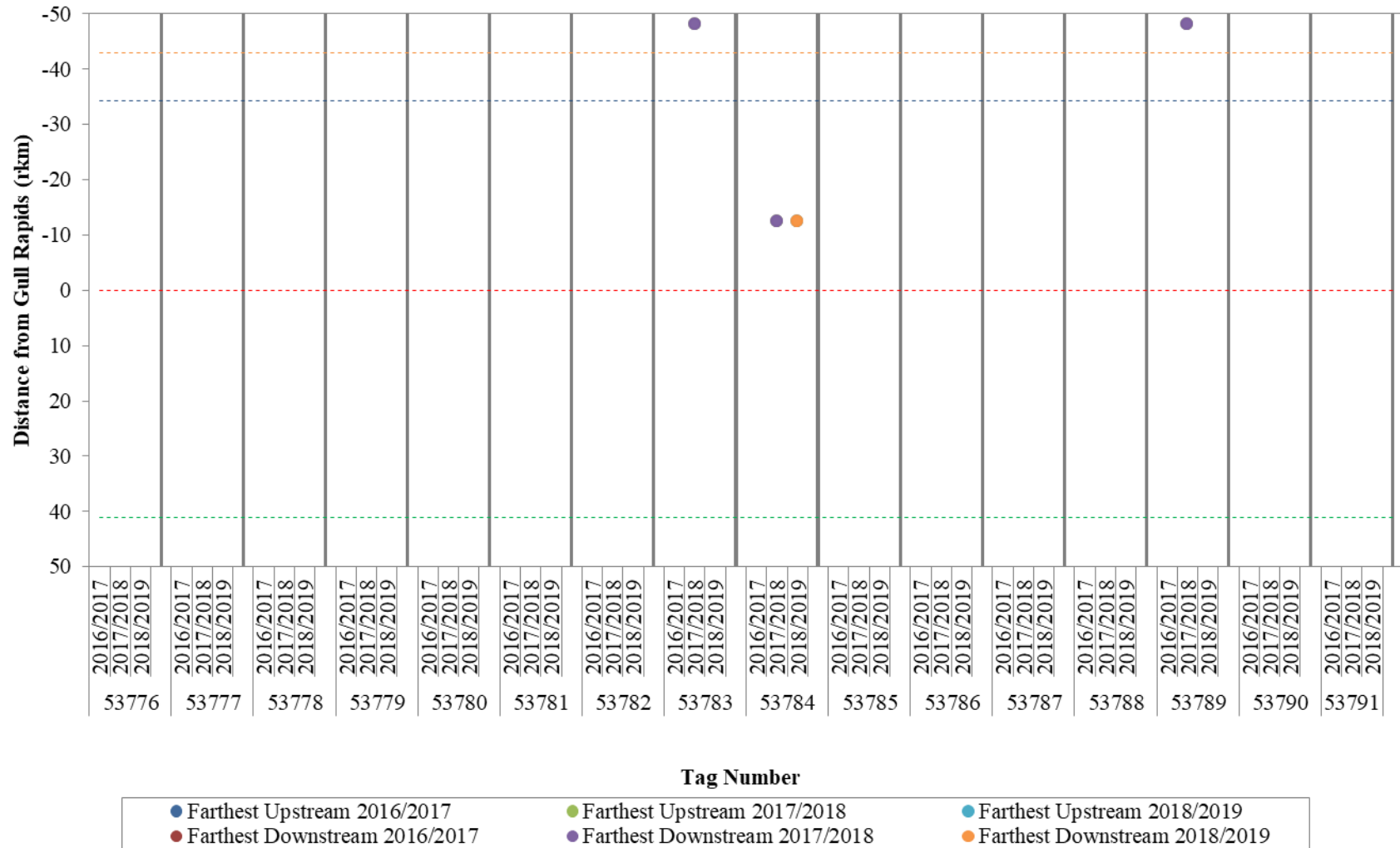


Figure 3: Detection ranges for individual Walleye tagged with acoustic transmitters upstream of the Keeyask GS in 2016 and 2018 during the winter period (2016–2019). Horizontal dotted lines indicate locations of landmarks (orange = Clark Lake outlet; blue = Birthday Rapids, red = the Keeyask GS; green = Kettle GS) (continued).

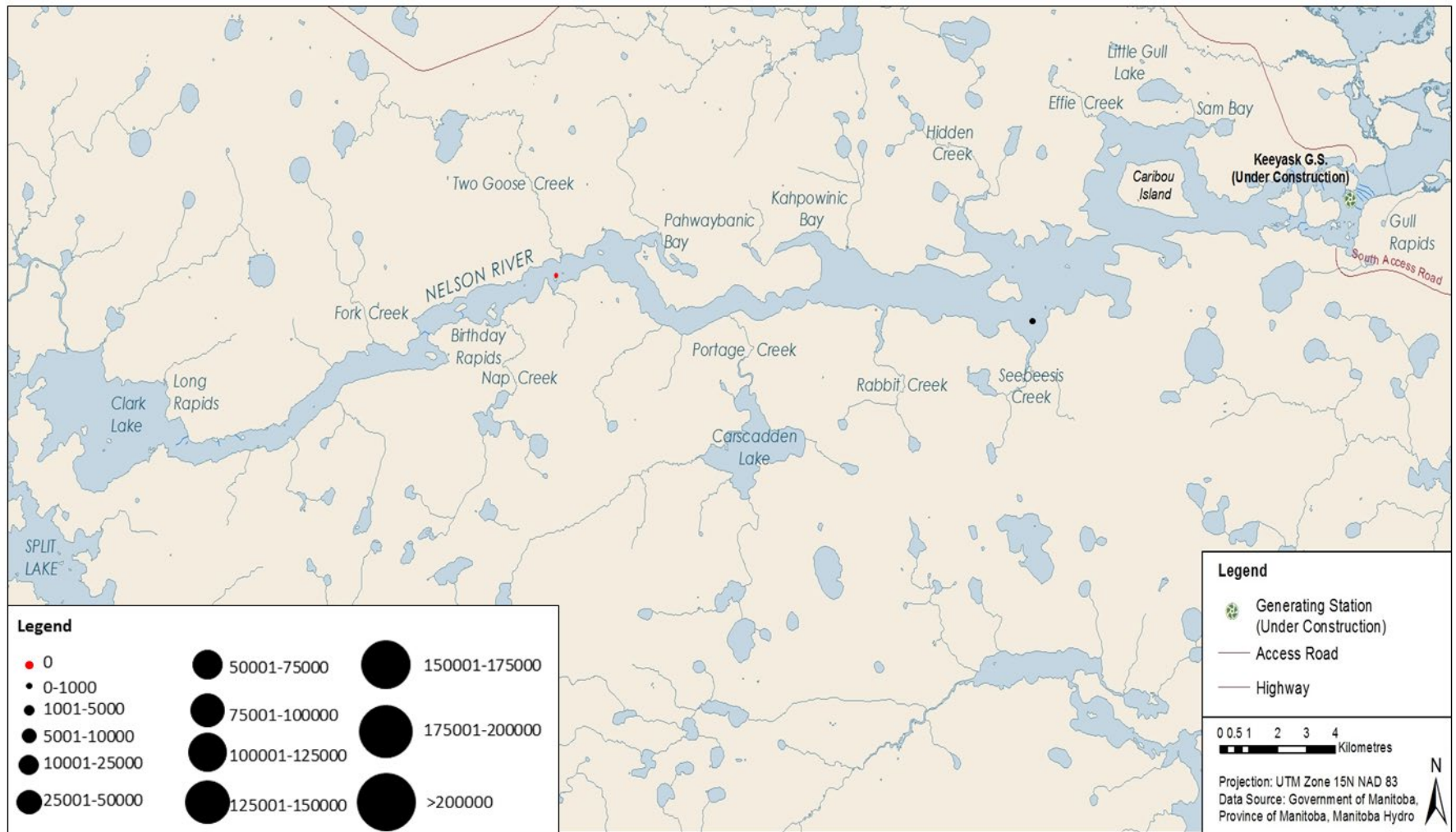


Figure 4: Relative number of detections of Walleye tagged in 2016 and 2018 at each acoustic receiver set between Clark Lake and the Keeyask GS during winter 2018/2019 (October 11, 2018, to April 30, 2019). Number of detections are indicated by the size of the bubble (defined in legend). Receivers with no detections are indicated with a red dot.

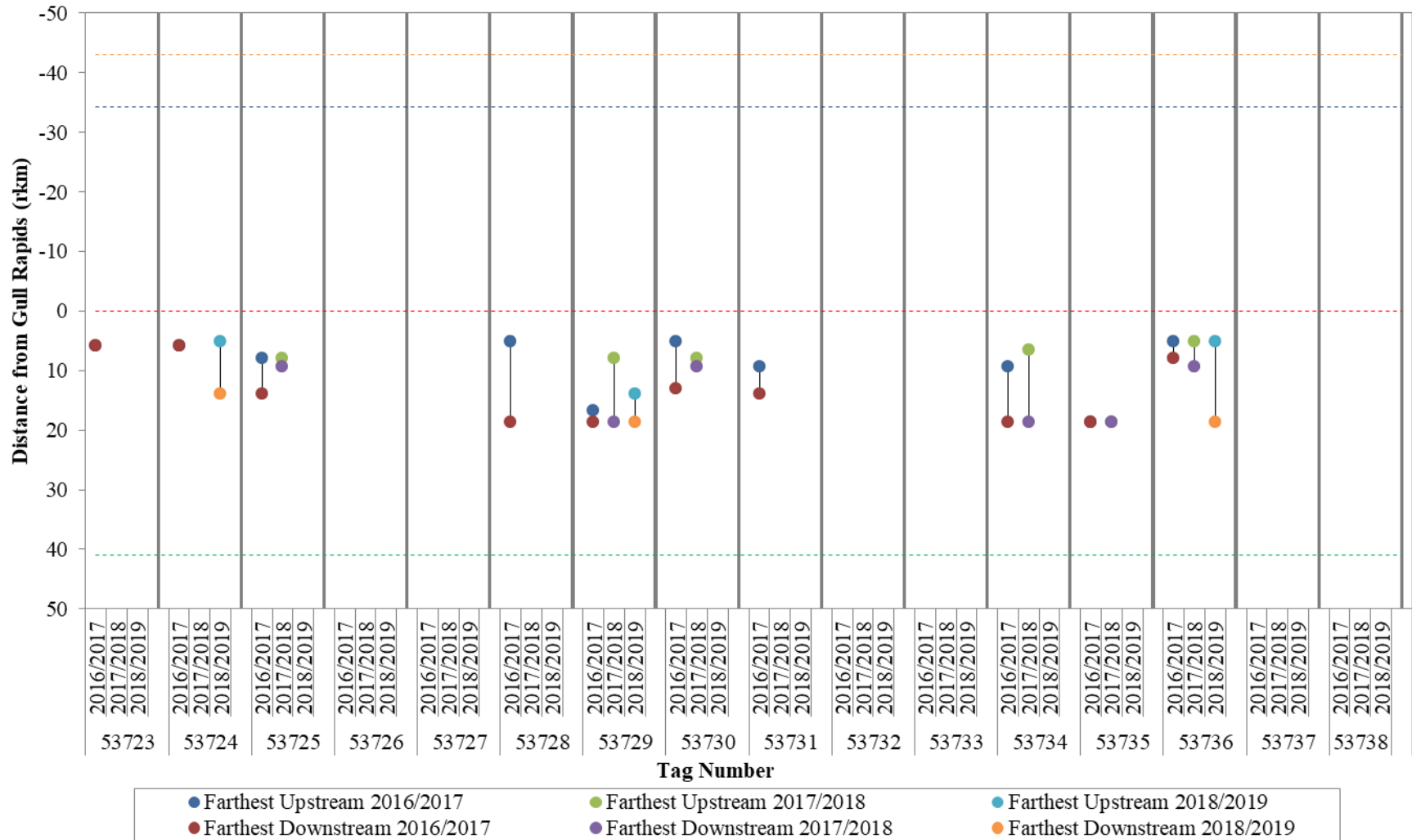


Figure 5: Detection ranges for individual Walleye tagged with acoustic transmitters in Stephens Lake in 2016 and 2018 during the winter period (2016–2019). Horizontal dotted lines indicate locations of landmarks (orange = Clark Lake outlet; blue = Birthday Rapids, red = the Keeyask GS; green = Kettle GS).

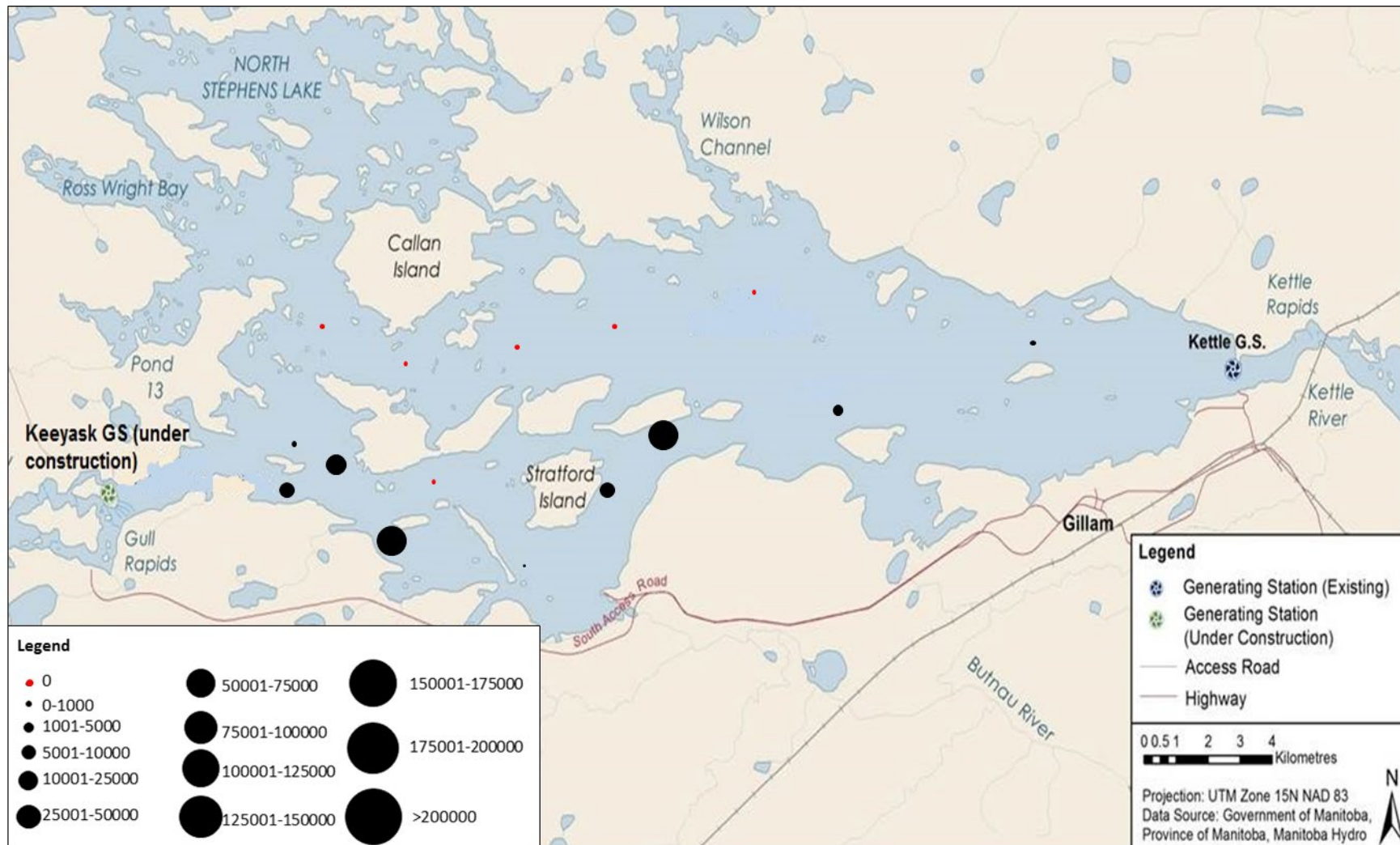


Figure 6: Relative number of detections of Walleye tagged in 2016 and 2018 at each acoustic receiver set in Stephens Lake during winter 2018/2019 (October 11, 2018, to April 30, 2019). Number of detections are indicated by the size of the bubble (defined in legend). Receivers with no detections are indicated with a red dot.

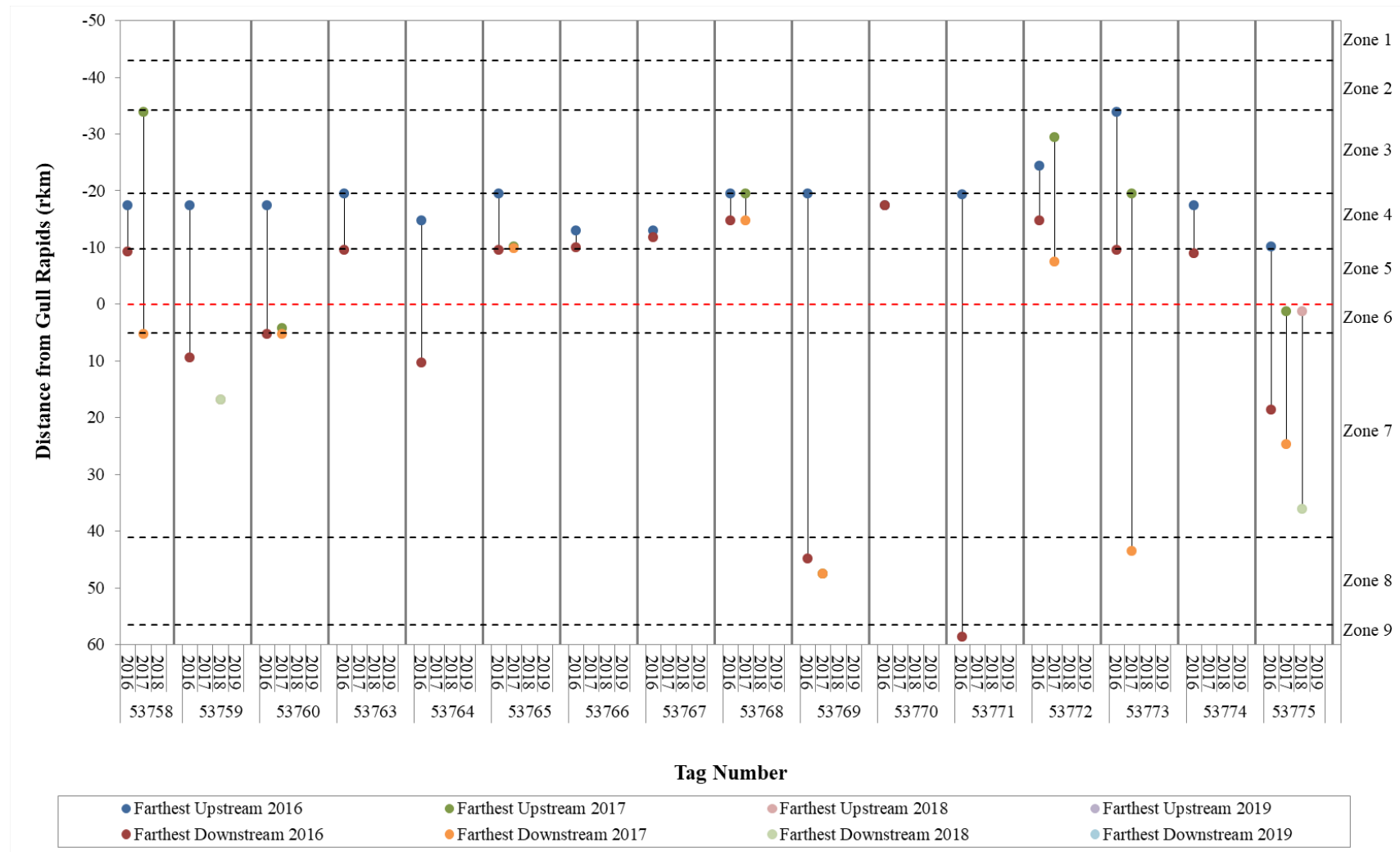


Figure 7: Detection ranges for individual Walleye tagged with acoustic transmitters upstream of the Keeyask GS in 2016 and 2018 during the open-water period (2016–2019). Horizontal dotted lines demarcate zones. Horizontal dotted lines demarcate zones with the red line representing the Keeyask GS.

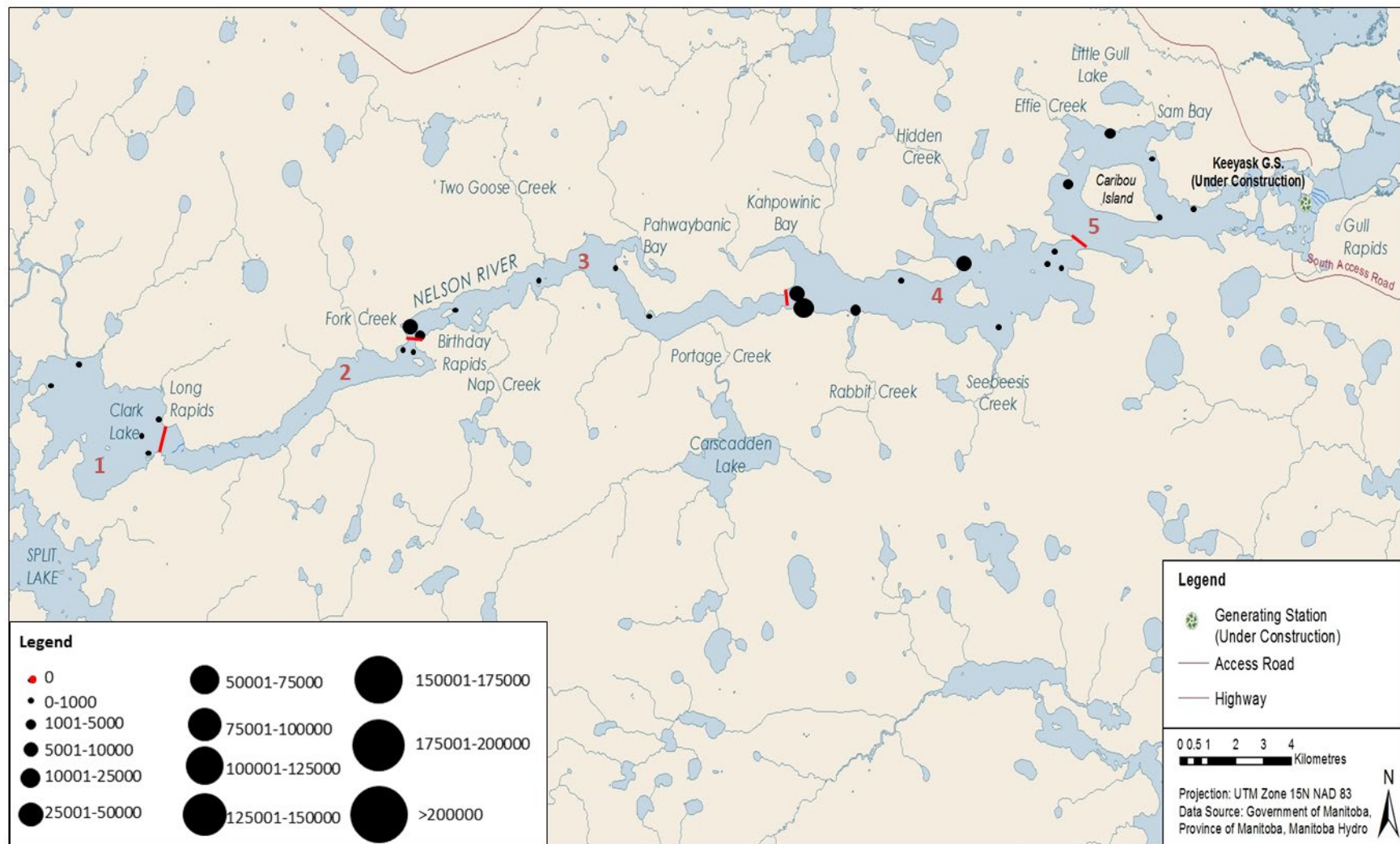


Figure 9: Relative number of detections of Walleye tagged in 2016 and 2018 at each acoustic receiver set between Clark Lake and the Keeyask GS during the 2019 open-water period (May 1 to October 7). Number of detections are indicated by the size of the bubble (defined in legend). Receivers with no detections are indicated with a red dot.

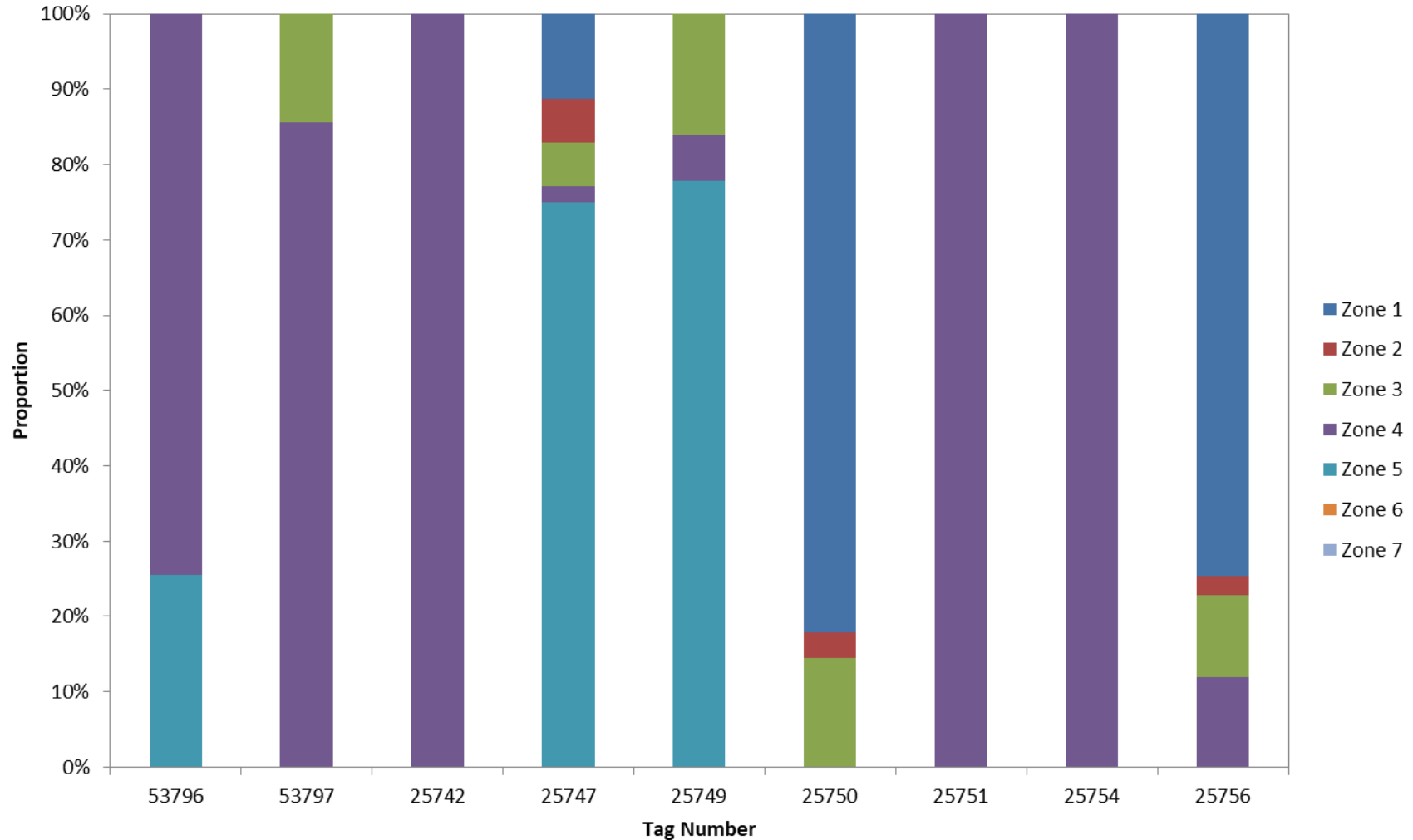


Figure 10: Proportional distributions, by zone, for individual Walleye tagged with acoustic transmitters upstream of Keeyask GS in 2016 and 2018 during a portion of the 2019 open-water period (June 2 to October 7).

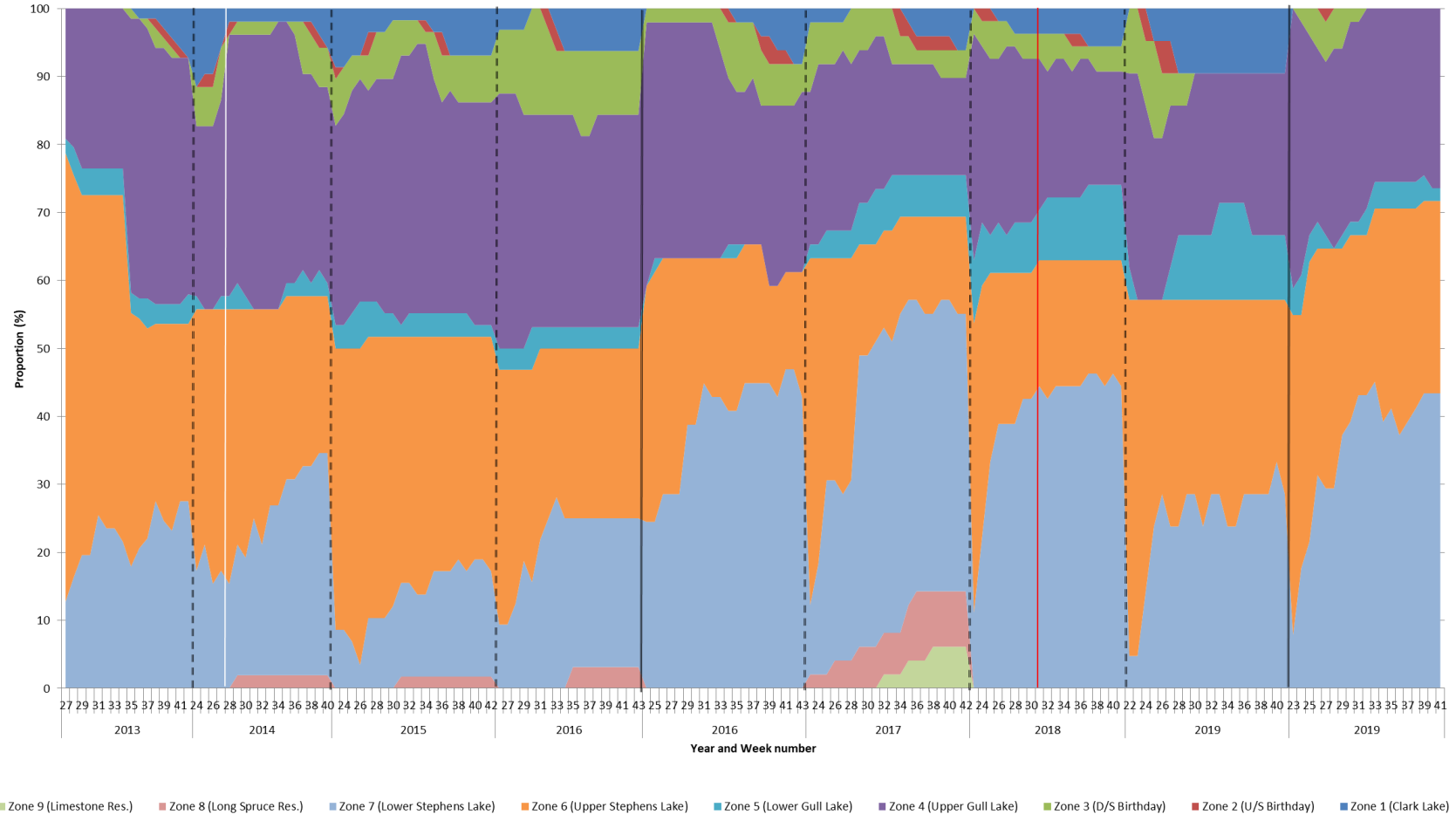


Figure 11: Proportional distribution by zone, for Walleye tagged with acoustic transmitters in the Keeyask GS Area during a portion of the 2013 (June 4 to October 15), 2014 (June 4 to October 3), 2015 (June 4 to October 11), 2016 (June 4 to October 19), 2017 (June 7 to October 16), 2018 (June 6 to October 10), and 2019 (June 2 to October 7) open-water periods. Black dashed lines indicate study years. Solid black line indicates new fish tagged. White line indicates start of Keeyask construction. Red line indicates start of Keeyask spillway commissioning.

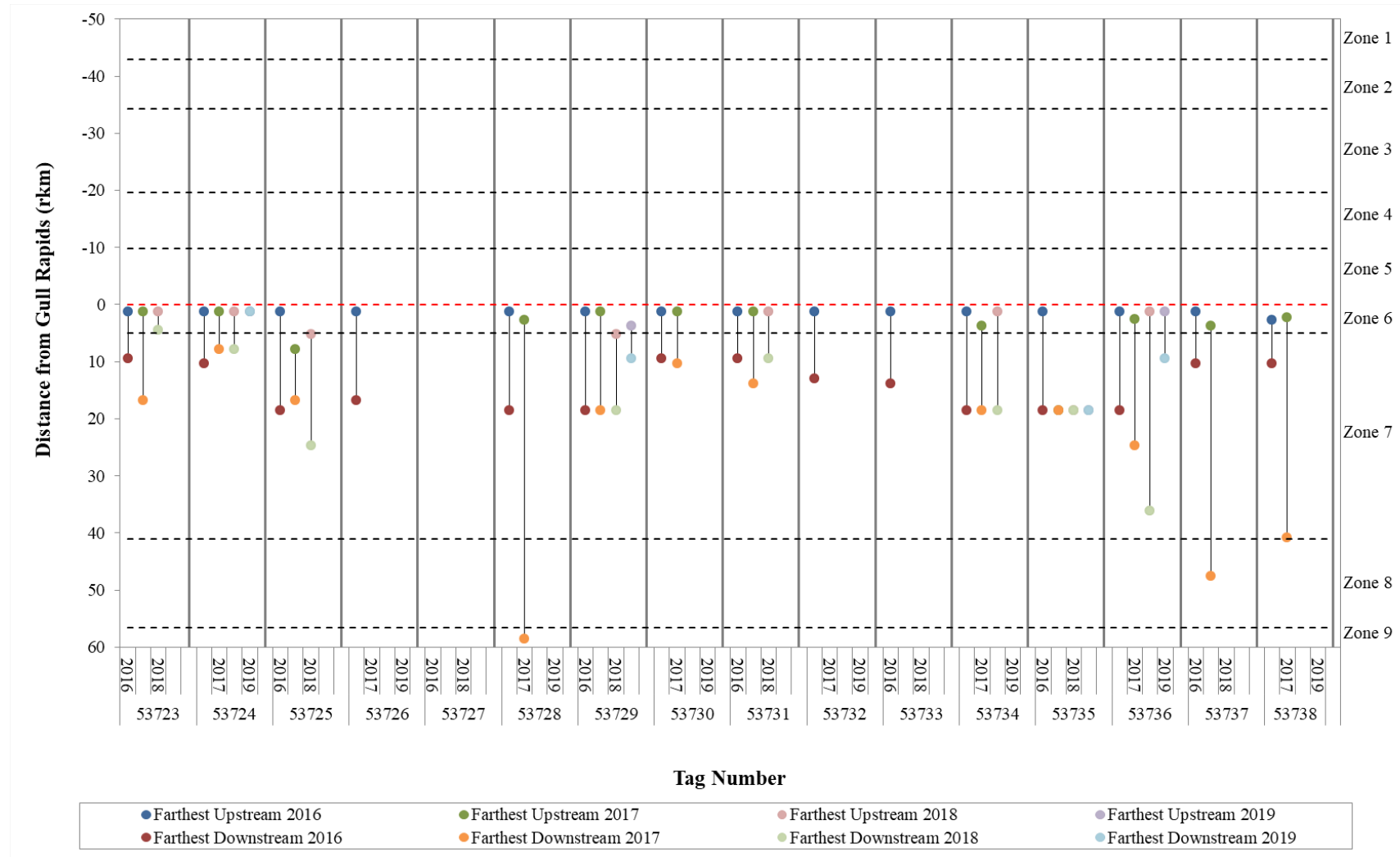


Figure 12: Detection ranges for individual Walleye tagged with acoustic transmitters in Stephens Lake in 2016 and 2018 during the open-water period (2016–2019). Horizontal dotted lines demarcate zones with the red line representing the Keeyask GS.

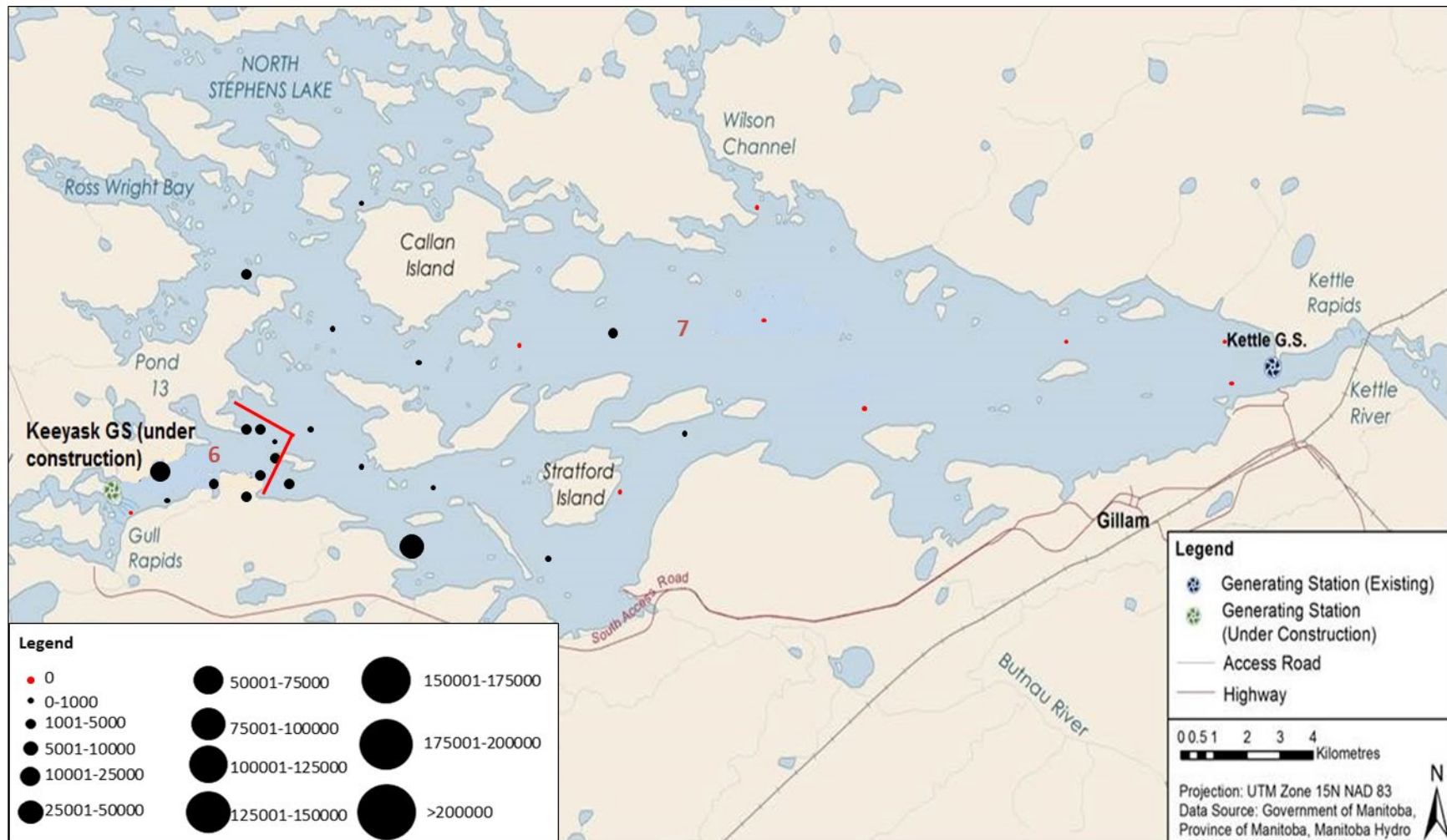


Figure 13: Relative number of detections of Walleye tagged in 2016 and 2018 at each acoustic receiver set in Stephens Lake during the 2019 open-water period (May 1 to October 7). Number of detections indicated by size of bubble (defined in legend). Receivers with no detections indicated with red dot.

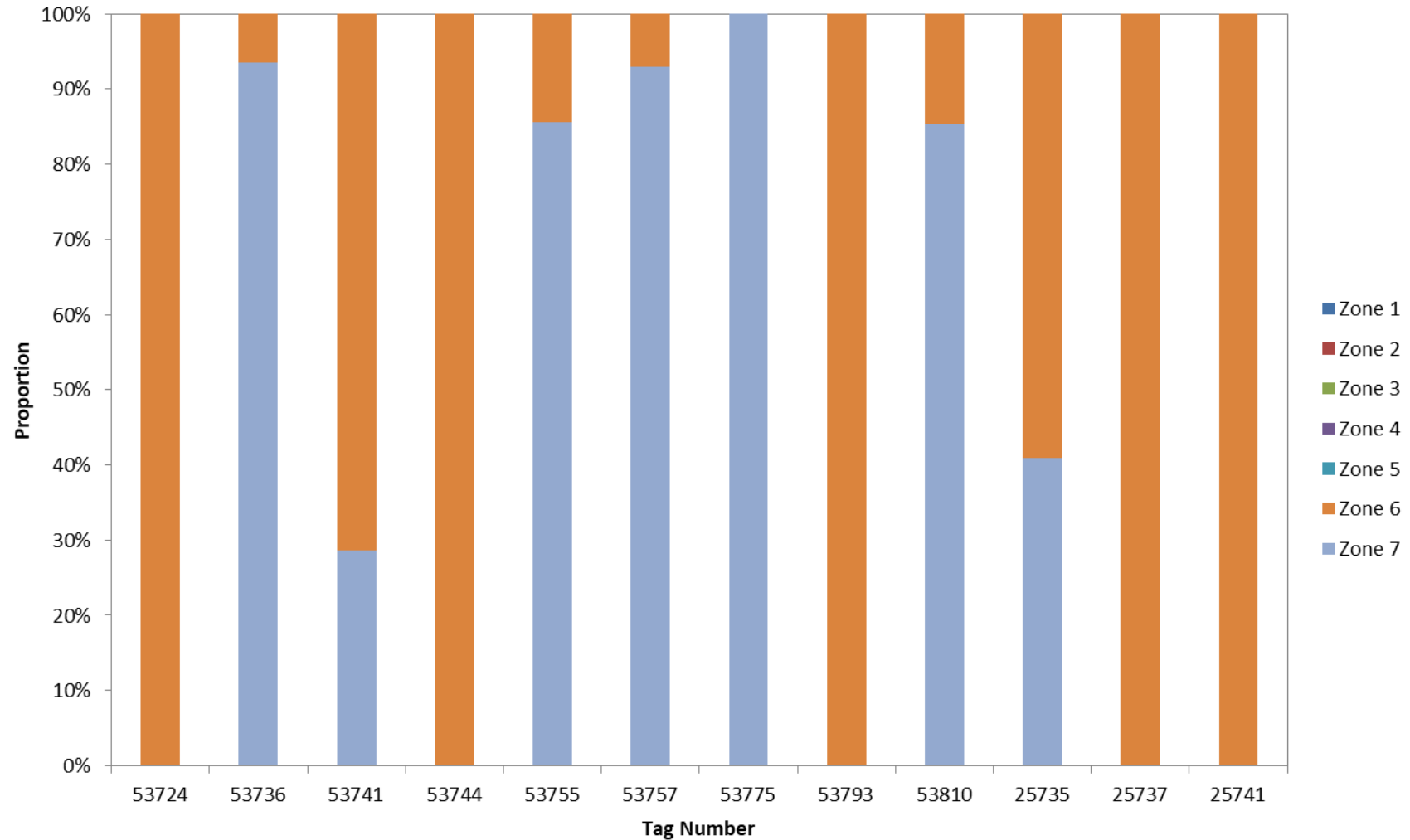


Figure 14: Proportional distributions by zone for individual Walleye tagged with acoustic transmitters in Stephens Lake in 2016 and 2018 during a portion of the 2019 open-water period (June 2 to October 7).

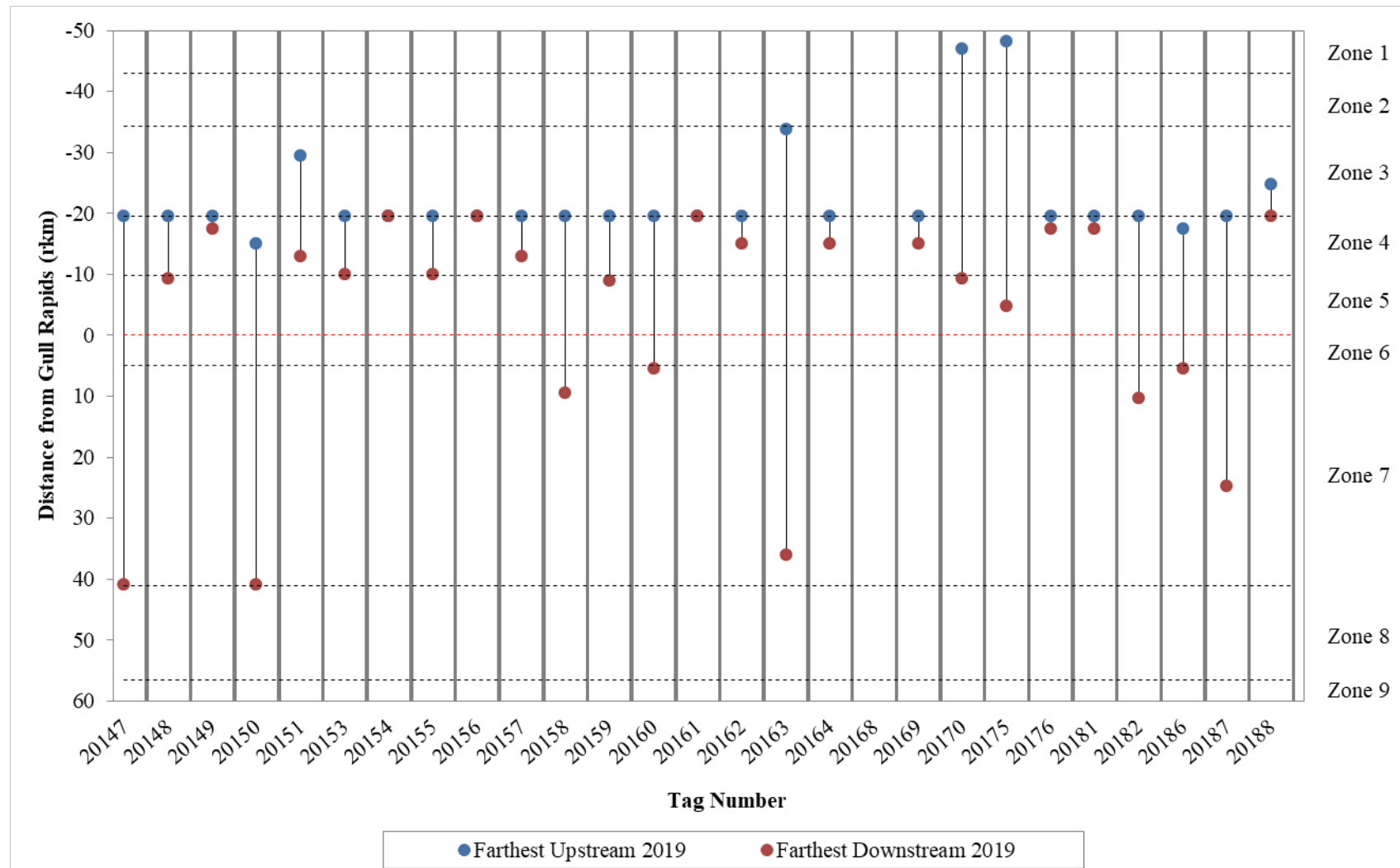


Figure 15: Detection ranges for individual Walleye tagged with acoustic transmitters upstream of the Keeyask GS in 2019 during the open-water period. Horizontal dotted lines demarcate zones with the red line representing the Keeyask GS.

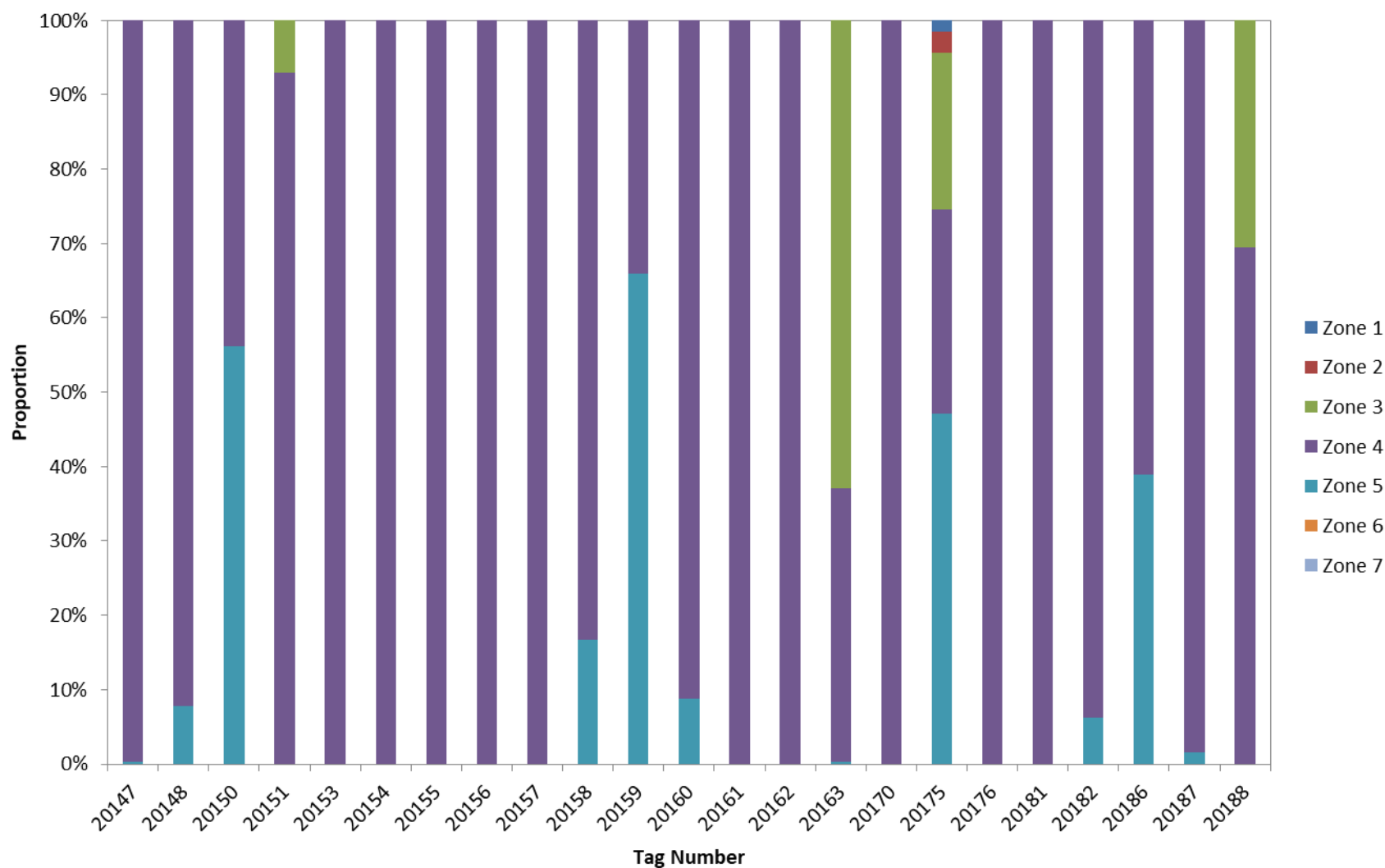


Figure 16: Proportional distributions by zone, for individual Walleye tagged with acoustic transmitters upstream of the Keeyask GS in 2019 during a portion of the 2019 open-water period (June 2 to October 7).

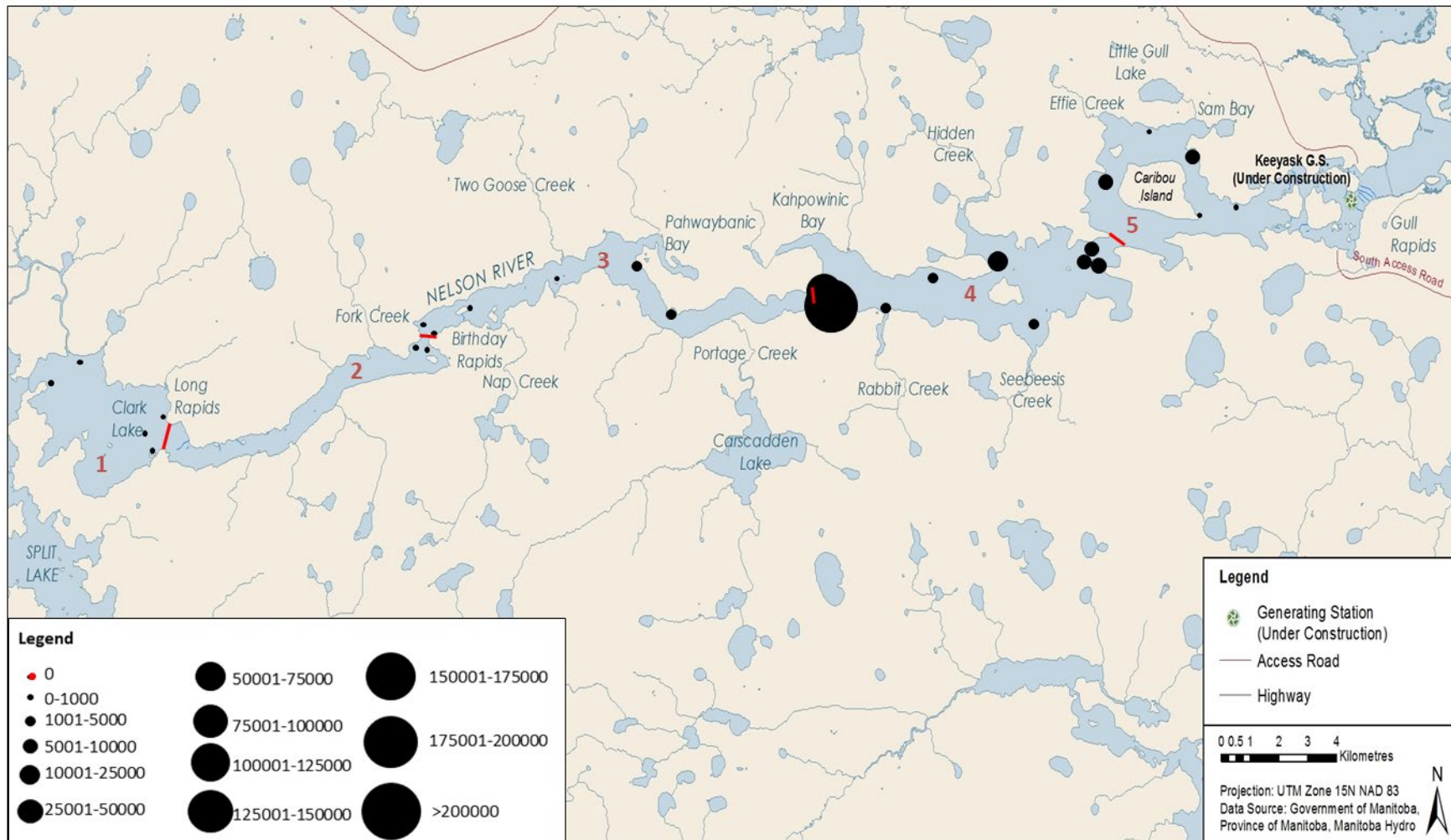


Figure 17: Relative number of detections of Walleye tagged in 2019 at each acoustic receiver set upstream of the Keeyask GS during the 2019 open-water period (May 1 to October 7). Number of detections are indicated by size of circle (defined in legend). Receivers with no detections are indicated with a red dot. The river is divided into five "zones" based on placement of receiver "gates."

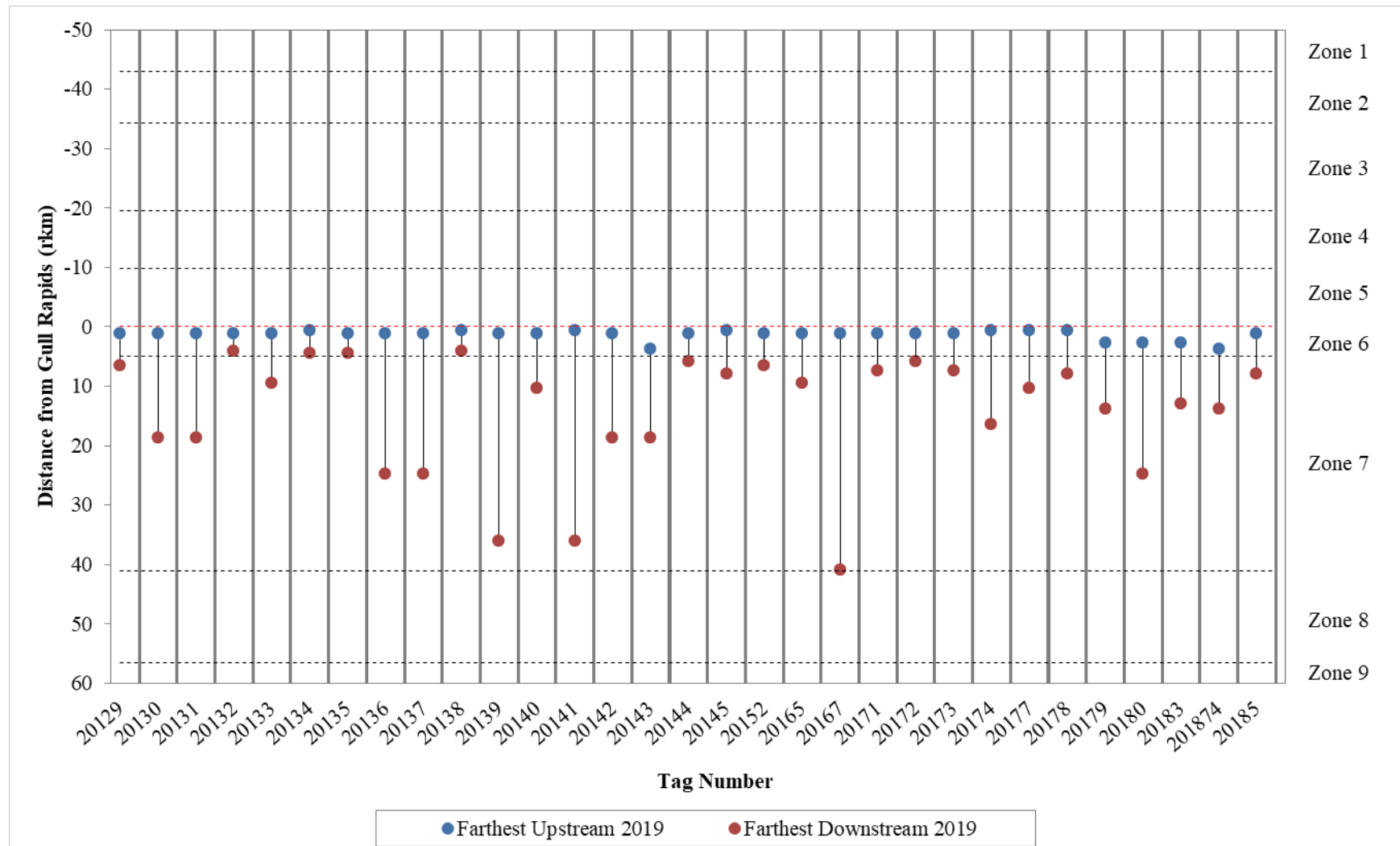


Figure 18: Detection ranges for individual Walleye tagged with acoustic transmitters in Stephens Lake in 2019 during the open-water period. Horizontal dotted lines demarcate zones with the red line representing the Keeyask GS.

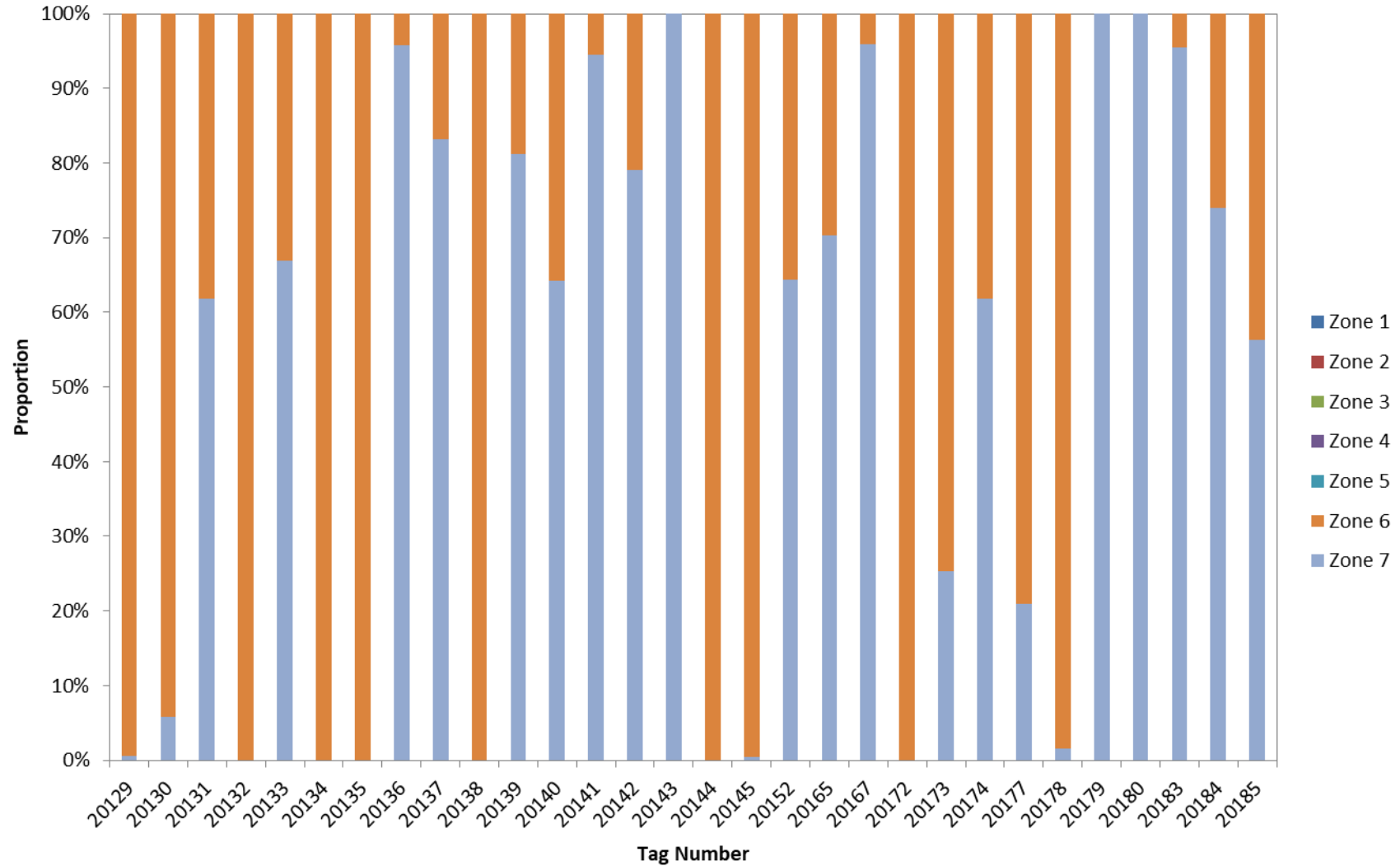


Figure 19: Proportional distributions by zone, for individual Walleye tagged with acoustic transmitters in Stephens Lake in 2019 during a portion of the 2019 open-water period (June 2 to October 7).

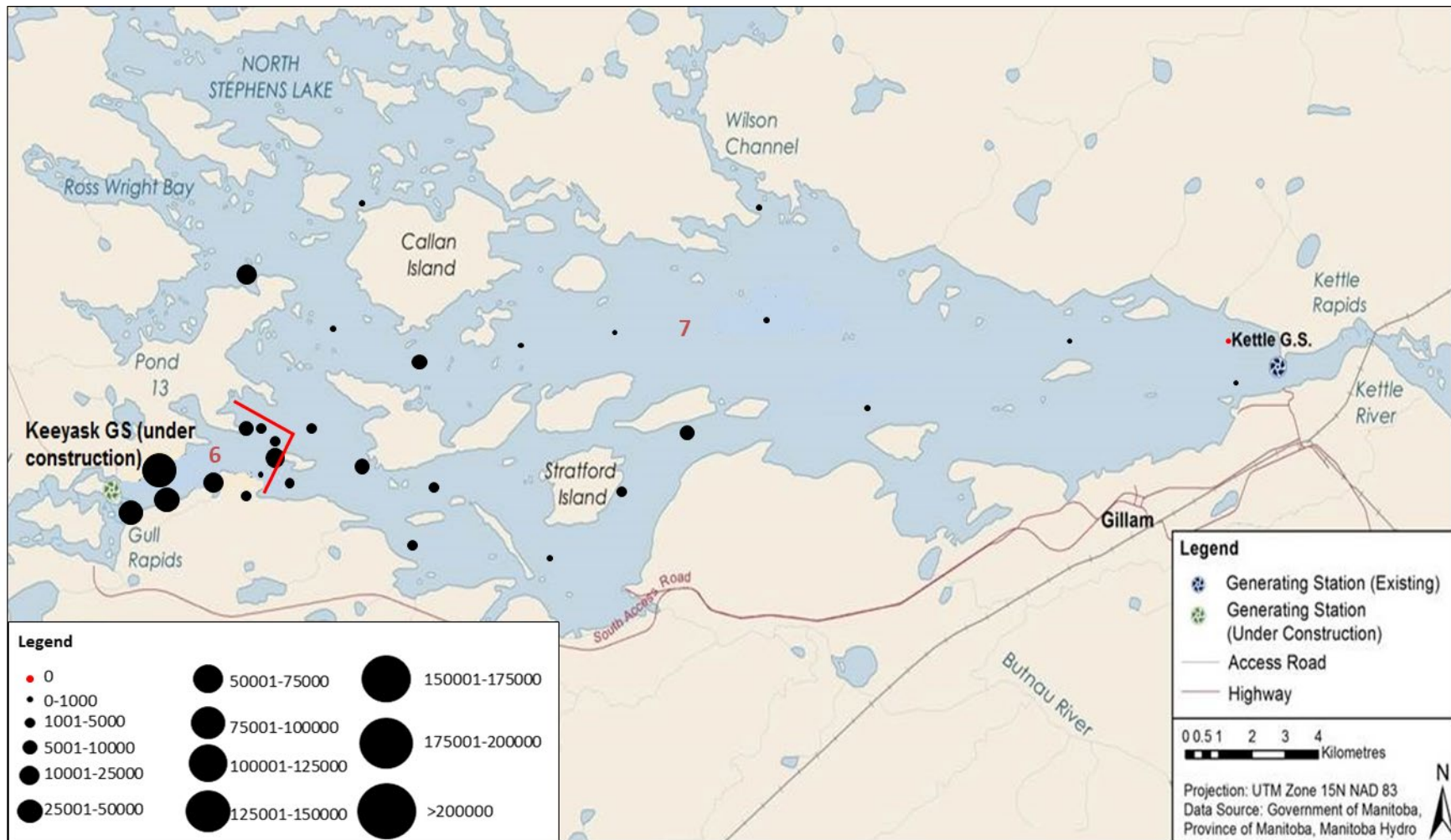
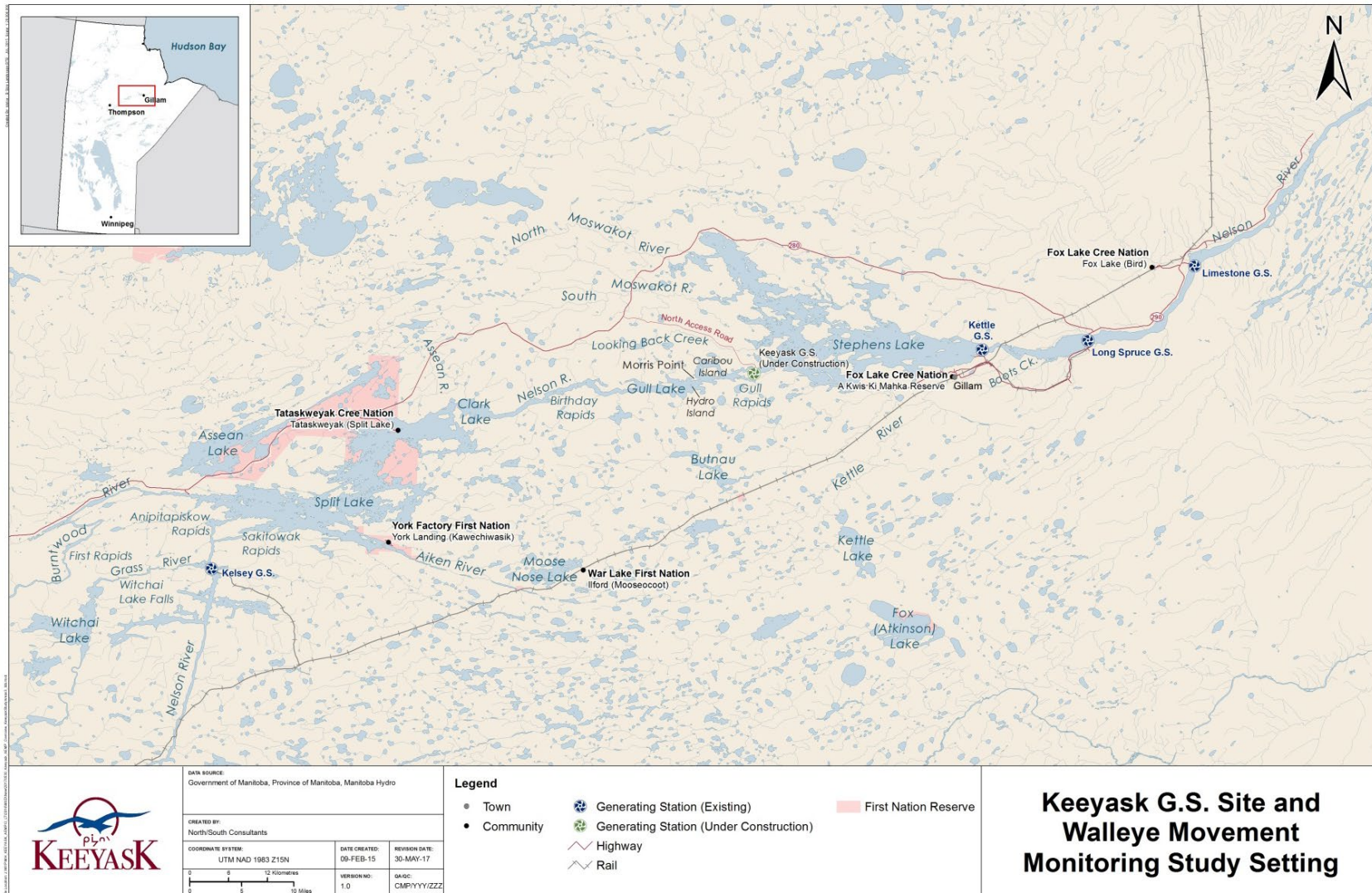
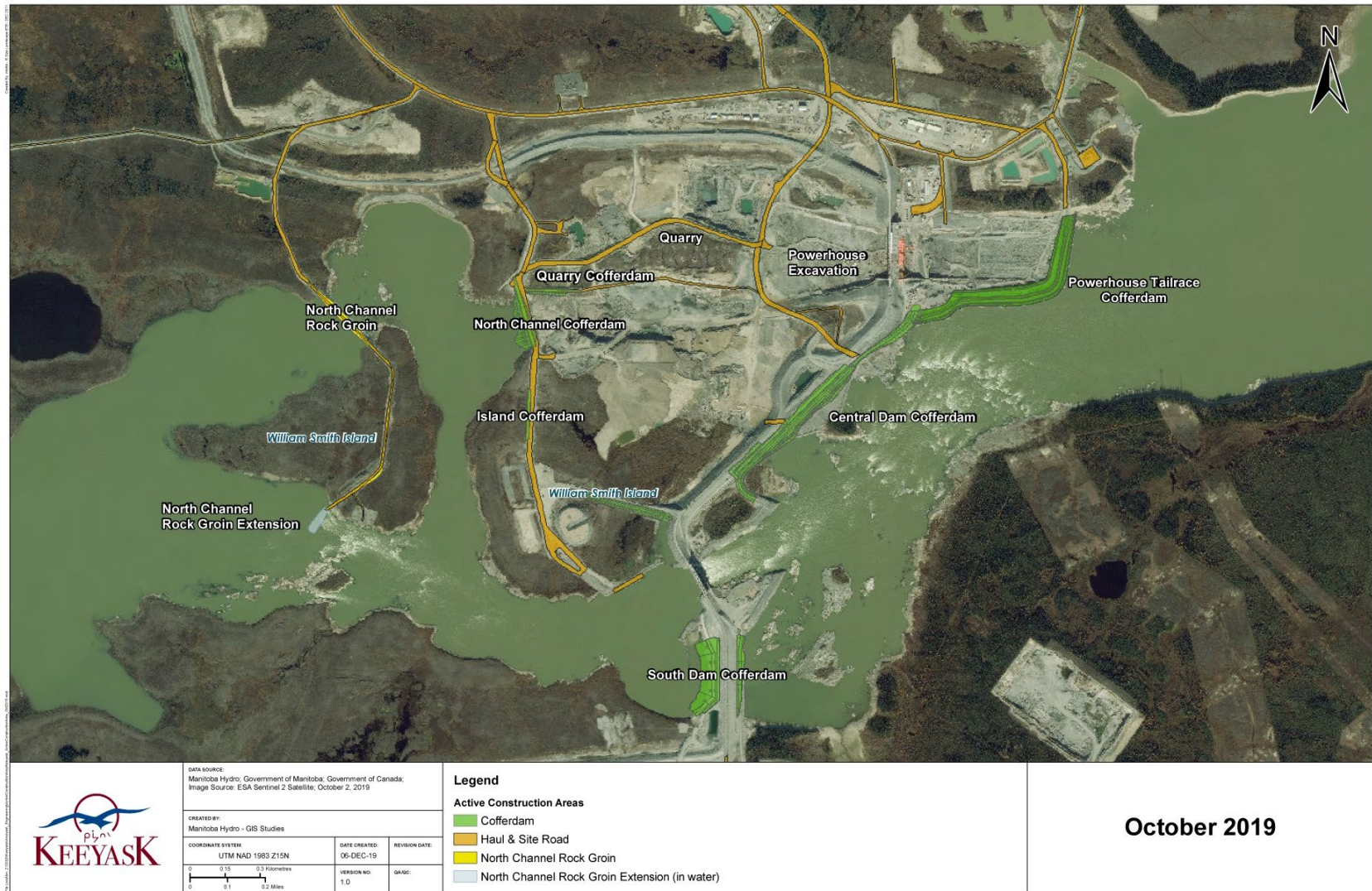


Figure 20: Relative number of detections of Walleye tagged in 2019 at each acoustic receiver set in Stephens Lake during the 2019 open-water period (May 1 to October 7). Number of detections indicated by size of circle (defined in legend). Receivers with no detections indicated with red dot. The river is divided into two "zones" based on placement of receiver "gates."

MAPS

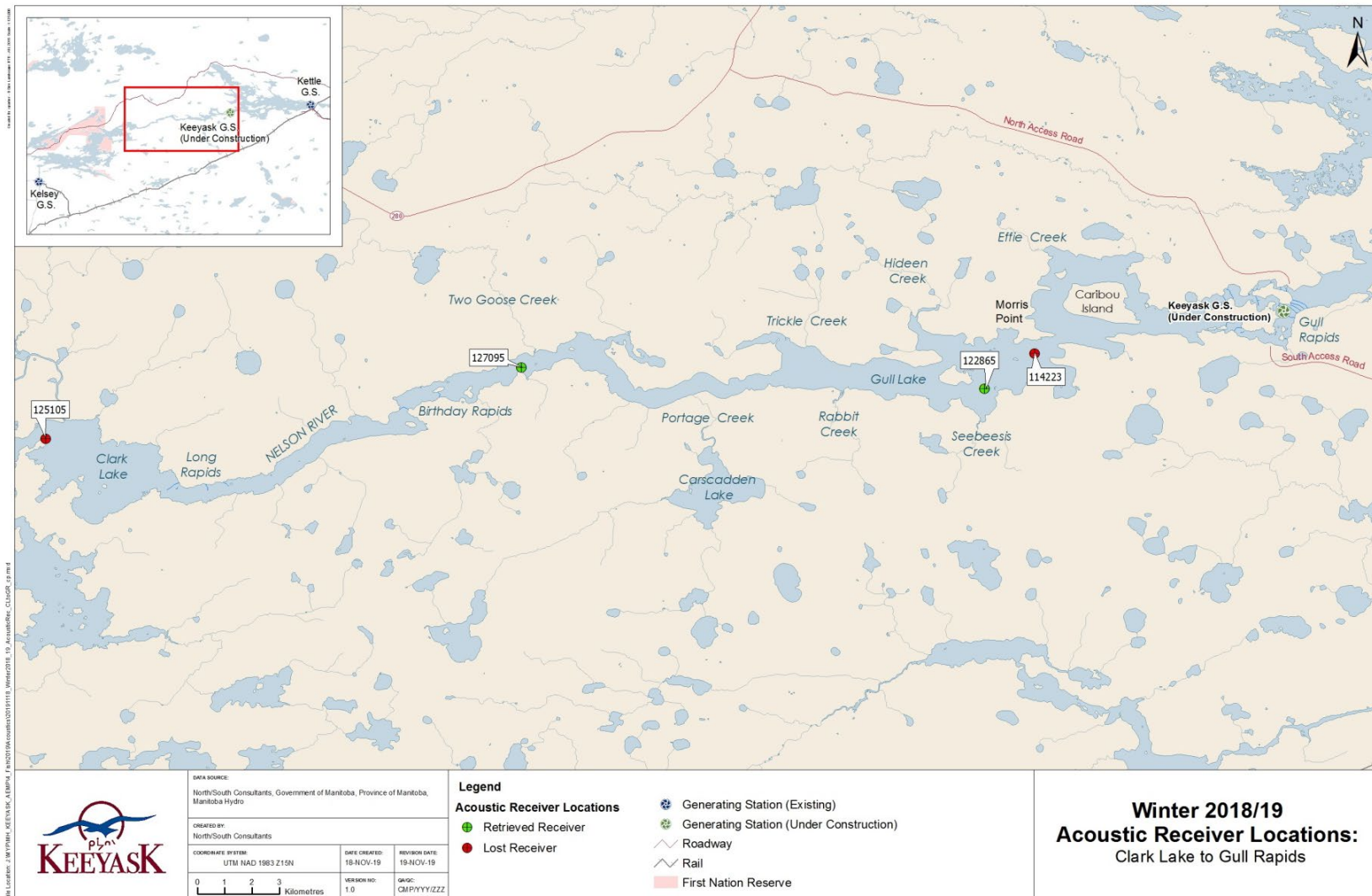


Map 1: Map of the lower Nelson River showing the site of the Keeyask Generating Station and the Walleye movement monitoring study setting.

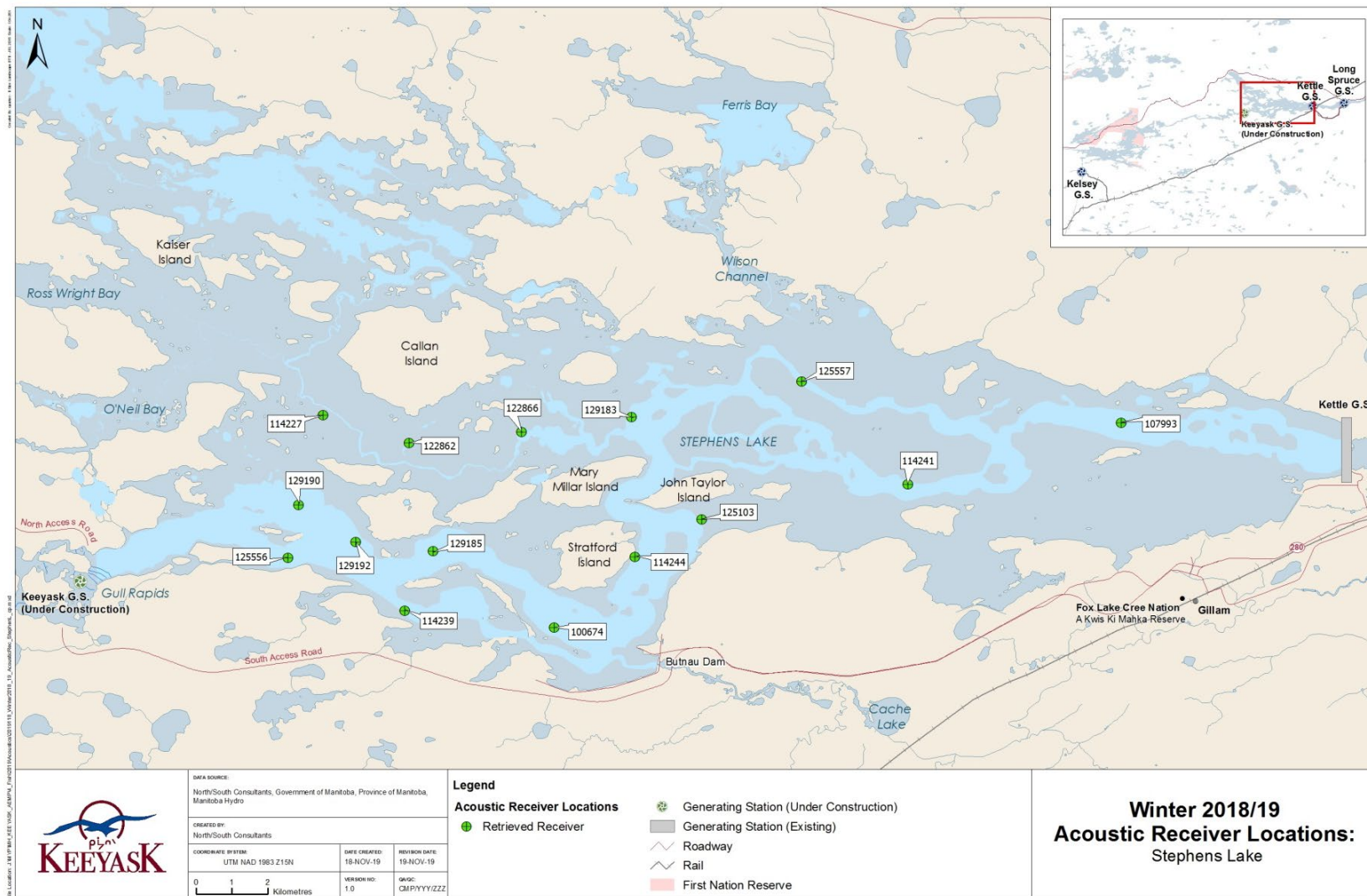


Satellite Imagery - October, 2019

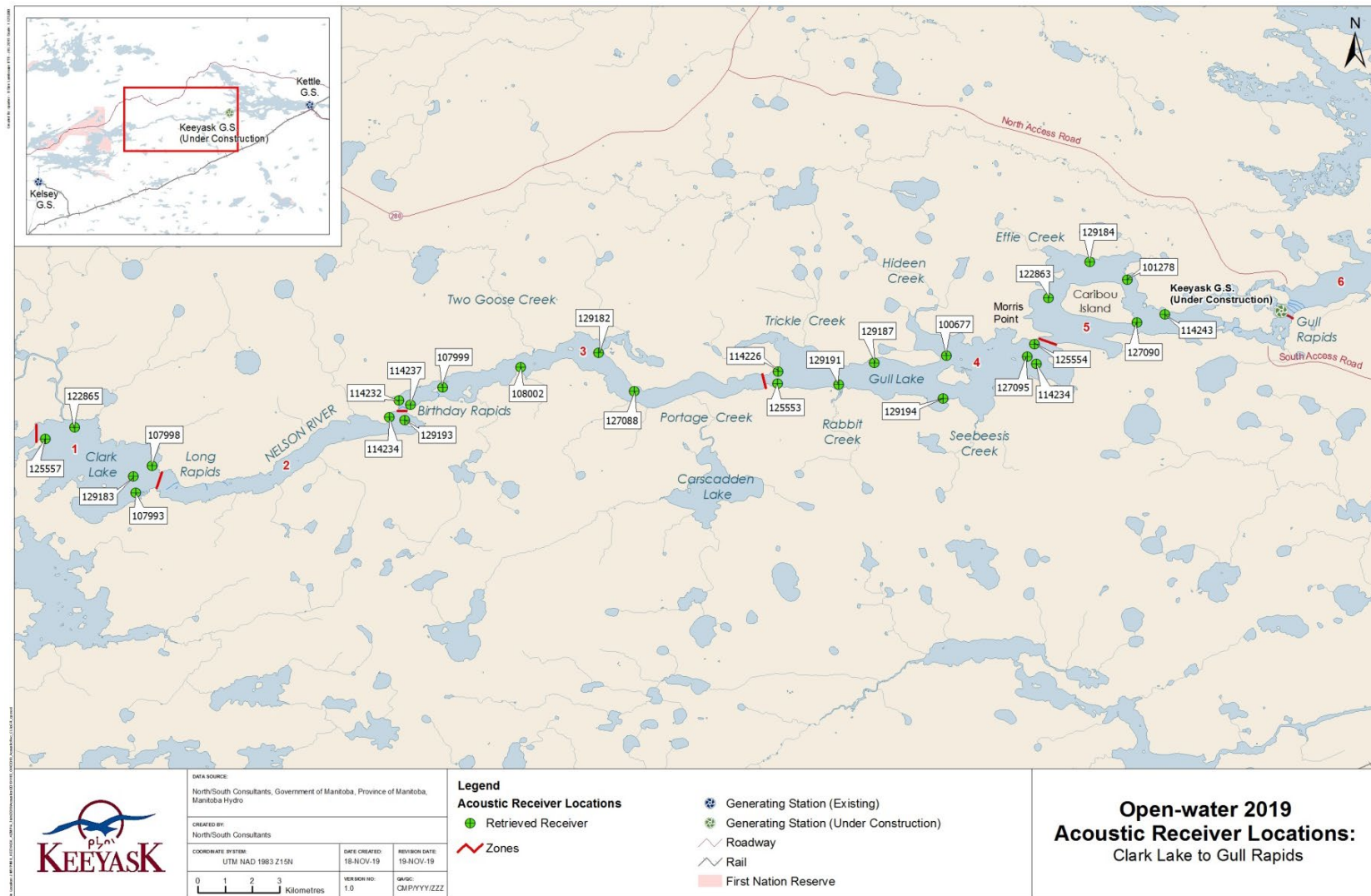
Map 2: Map of instream structures at the Keeyask Generating Station site, October 2019.

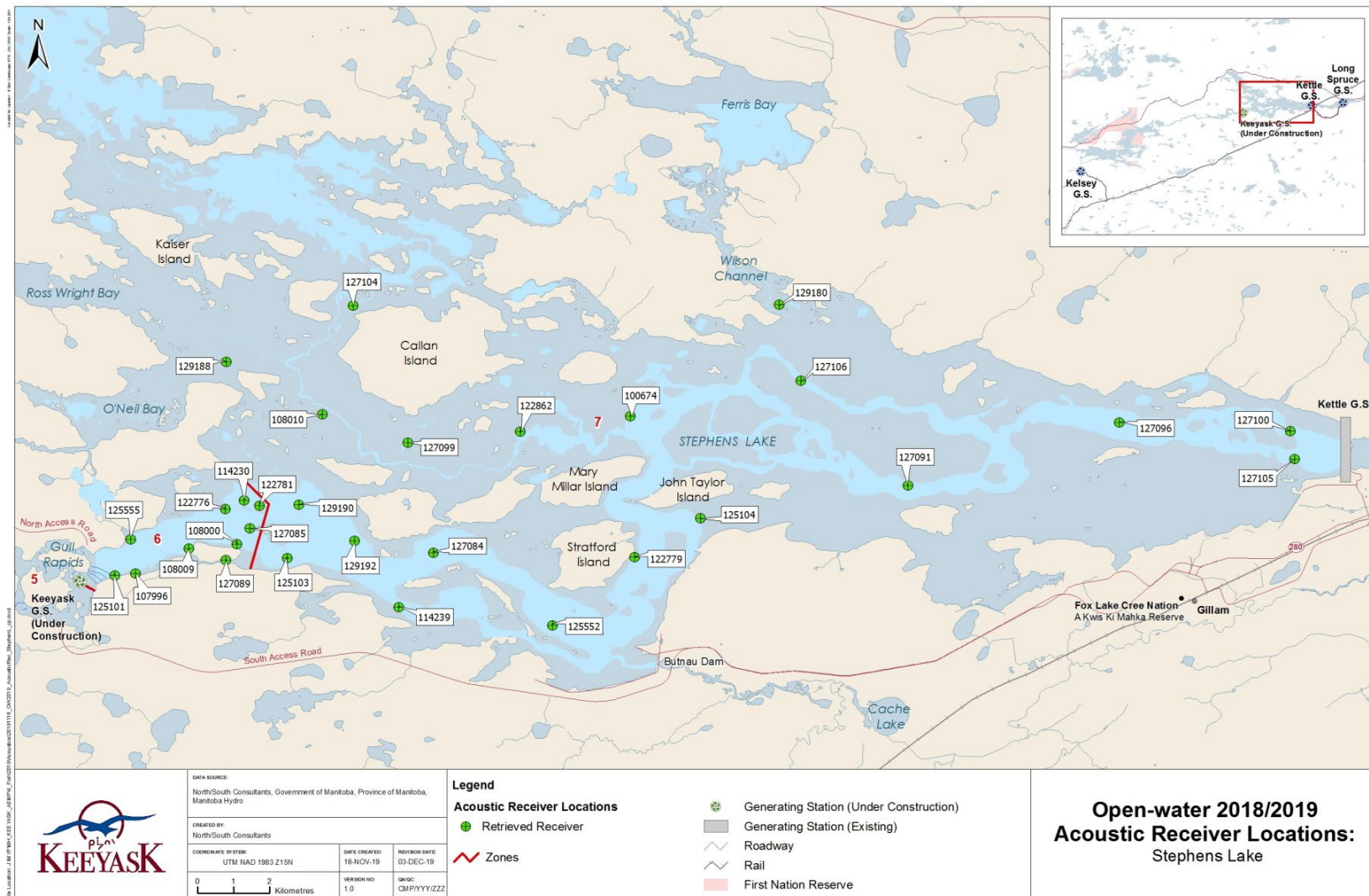


Map 3: Locations of stationary receivers set in the Nelson River from Clark Lake to the Keeyask GS between October 2018 and June 2019.

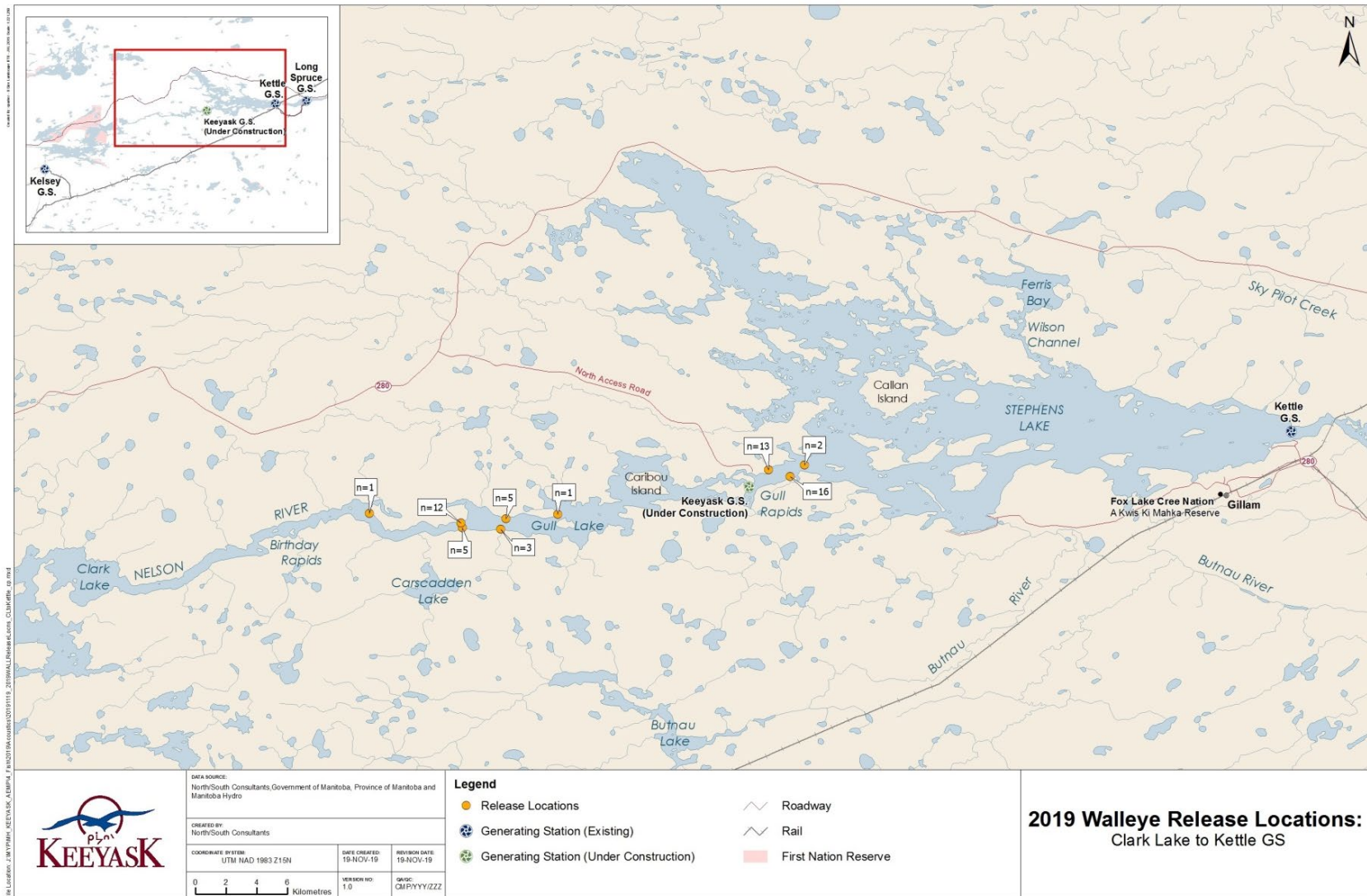


Map 4: Locations of stationary receivers set in Stephens Lake from the Keeyask GS to Kettle GS between October 2018 and June 2019. The former (pre-impoundment for Kettle GS) river channel is shown in light blue.





Map 6: Locations of stationary receivers set in Stephens Lake between June and October 2019. The river is divided into two "zones" based on placement of receiver "gates." The pre-impoundment river channel is shown in light blue.



Map 7: Release locations for Walleye tagged with acoustic transmitters upstream of the Keeyask GS and in Stephens Lake in spring, 2019.

APPENDICES

APPENDIX 1:

DETECTION SUMMARIES FOR WALLEYE TAGGED AND MONITORED IN THE KEEYASK STUDY AREA BETWEEN 2016 AND 2019

Table A1-1:	Detection summary for Walleye tagged prior to 2019 and monitored upstream of the Keeyask GS during the winter 2016/2017 (October 20, 2015 to April 30, 2017), 2017/2018 (October 17, 2017 to April 30, 2018), and 2018/2019 (October 11, 2018 to April 30, 2019) periods.	68
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Table A1-1: Detection summary for Walleye tagged prior to 2019 and monitored upstream of the Keeyask GS during the winter 2016/2017 (October 20, 2015 to April 30, 2017), 2017/2018 (October 17, 2017 to April 30, 2018), and 2018/2019 (October 11, 2018 to April 30, 2019) periods. Tag ID highlighted yellow = lost tag. Tag ID highlighted purple = moved downstream through Gull Rapids/the Keeyask GS. Tag ID highlighted orange = moved downstream through Kettle GS. Tag ID highlighted green = suspected to have moved downstream through Kettle GS. Tag ID highlighted red = moved downstream through Long Spruce GS.

Tag ID	Date tagged	2016/2017					2017/2018					2018/2019				
		n	# Days	Furthest U/S (rkm)	Furthest D/S (rkm)	Range (rkm)	n	# Days	Furthest U/S (rkm)	Furthest D/S (rkm)	Range (rkm)	n	# Days	Furthest U/S (rkm)	Furthest D/S (rkm)	Range (rkm)
53758	24-Sep-16	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53759	24-Sep-16	26	1	16.8	16.8	0.0	0	-	-	-	-	0	-	-	-	-
53760	24-Sep-16	238	6	5.2	7.9	2.7	0	-	-	-	-	0	-	-	-	-
53763	5-Jun-16	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53764	5-Jun-16	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53765	24-Sep-16	1663	46	-10.1	-10.1	0.0	0	-	-	-	-	0	-	-	-	-
53766	24-Sep-16	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53767	24-Sep-16	19	1	-10.1	-10.1	0.0	0	-	-	-	-	0	-	-	-	-
53768	5-Jun-16	0	-	-	-	-	126	10	-12.4	-12.4	0.0	0	-	-	-	-
53769	5-Jun-16	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53770	5-Jun-16	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53771	5-Jun-16	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53772	5-Jun-16	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53773	5-Jun-16	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53774	5-Jun-16	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53775	5-Jun-16	12123	75	5.2	7.9	2.7	9231	76	5.2	7.9	2.7	55886	167	5.2	9.4	
53776	30-May-16	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53777	29-May-16	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53778	3-Jun-16	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53779	3-Jun-16	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53780	3-Jun-16	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53781	2-Jun-16	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53782	31-May-16	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-

Table A1-1: Detection summary for Walleye tagged prior to 2019 and monitored upstream of the Keeyask GS during the winter 2016/2017 (October 20, 2015 to April 30, 2017), 2017/2018 (October 17, 2017 to April 30, 2018), and 2018/2019 (October 11, 2018 to April 30, 2019) periods (continued). Tag ID highlighted yellow = lost tag. Tag ID highlighted purple = moved downstream through Gull Rapids/the Keeyask GS. Tag ID highlighted orange = moved downstream through Kettle GS. Tag ID highlighted green = suspected to have moved downstream through Kettle GS. Tag ID highlighted red = moved downstream through Long Spruce GS.

Tag ID	Date tagged	2016/2017					2017/2018					2018/2019				
		n	# Days	Furthest U/S (rkm)	Furthest D/S (rkm)	Range (rkm)	n	# Days	Furthest U/S (rkm)	Furthest D/S (rkm)	Range (rkm)	n	# Days	Furthest U/S (rkm)	Furthest D/S (rkm)	Range (rkm)
53783	31-May-16	0	-	-	-	-	7	2	-48.2	-48.2	0.0	0	-	-	-	-
53784	30-May-16	0	-	-	-	-	41	6	-12.4	-12.4	0.0	504	54	-12.4	-12.4	0.0
53785	30-May-16	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53786	30-May-16	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53787	30-May-16	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53788	30-May-16	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53789	30-May-16	0	-	-	-	-	2	1	-48.2	-48.2	0.0	0	-	-	-	-
53790	29-May-16	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53791	29-May-16	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53792	28-May-16	0	-	-	-	-	5142	65	-12.4	-12.4	0.0	0	-	-	-	-
53793	7-Jun-16	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53794	7-Jun-16	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53795	7-Jun-16	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53796	7-Jun-16	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53797	7-Jun-16	15	1	-48.2	-48.2	0.0	0	-	-	-	-	0	-	-	-	-
53798	7-Jun-16	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53799	7-Jun-16	14789	65	5.2	9.4	4.2	0	-	-	-	-	0	-	-	-	-
53800	7-Jun-16	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53801	7-Jun-16	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53802	7-Jun-16	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53803	24-Sep-16	2	1	-10.1	-10.1	0.0	0	-	-	-	-	0	-	-	-	-
53804	24-Sep-16	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-

Table A1-1: Detection summary for Walleye tagged prior to 2019 and monitored upstream of the Keeyask GS during the winter 2016/2017 (October 20, 2015 to April 30, 2017), 2017/2018 (October 17, 2017 to April 30, 2018), and 2018/2019 (October 11, 2018 to April 30, 2019) periods (continued). Tag ID highlighted yellow = lost tag. Tag ID highlighted purple = moved downstream through Gull Rapids/the Keeyask GS. Tag ID highlighted orange = moved downstream through Kettle GS. Tag ID highlighted green = suspected to have moved downstream through Kettle GS. Tag ID highlighted red = moved downstream through Long Spruce GS.

Tag ID	Date tagged	2016/2017					2017/2018					2018/2019				
		n	# Days	Furthest U/S (rkm)	Furthest D/S (rkm)	Range (rkm)	n	# Days	Furthest U/S (rkm)	Furthest D/S (rkm)	Range (rkm)	n	# Days	Furthest U/S (rkm)	Furthest D/S (rkm)	Range (rkm)
53805	6-Jun-16	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53806	6-Jun-16	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53807	6-Jun-16	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
25739	5-Jun-18	-	-	-	-	-	-	-	-	-	-	919	9	5.2	13.9	
25740	5-Jun-18	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-
25742	5-Jun-18	-	-	-	-	-	-	-	-	-	-	771	10	-12.4	-12.4	0
25743	5-Jun-18	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-
25744	5-Jun-18	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-
25745	5-Jun-18	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-
25746	5-Jun-18	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-
25747	28-May-18	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-
25748	28-May-18	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-
25749	28-May-18	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-
25750	1-Jun-18	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-
25751	5-Jun-18	-	-	-	-	-	-	-	-	-	-	37	8	-12.4	-12.4	0
25752	27-May-18	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-
25753	27-May-18	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-
25754	27-May-18	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-
25755	1-Jun-18	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-
25756	1-Jun-18	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-

Table A1-2: Detection summary for Walleye tagged and monitored in Stephens Lake during the winter 2016/2017 (October 20, 2015 to April 30, 2017), 2017/2018 (October 17, 2017 to April 30, 2018), and 2018/2019 (October 11, 2018 to April 30, 2019) periods. Tag ID highlighted yellow = lost tag. Tag ID highlighted orange = moved downstream through Kettle GS. Tag ID highlighted green = suspected to have moved downstream through Kettle GS. Tag ID highlighted red = moved downstream through Long Spruce GS.

Tag ID	Date tagged	2016/2017					2017/2018					2018/2019				
		n	# Days	Furthest U/S (rkm)	Furthest D/S (rkm)	Range (rkm)	n	# Days	Furthest U/S (rkm)	Furthest D/S (rkm)	Range (rkm)	n	# Days	Furthest U/S (rkm)	Furthest D/S (rkm)	Range (rkm)
53723	28-May-16	5	1	5.8	5.8	0	0	-	-	-	-	0	-	-	-	-
53724	28-May-16	87	7	5.8	5.8	0	0	-	-	-	-	17	6	5.2	5.8	0.6
53725	27-May-16	18620	110	7.9	13.9	6	7577	44	7.9	9.4	1.5	0	-	-	-	-
53726	27-May-16	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53727	28-May-16	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53728	28-May-16	15806	111	5.2	18.6	13.4	0	-	-	-	-	0	-	-	-	-
53729	28-May-16	11525	58	16.8	18.6	1.8	15155	59	7.9	18.6	10.7	13677	100	13.9	18.6	4.7
53730	28-May-16	569	9	5.2	13	7.8	98	2	7.9	9.4	1.5	0	-	-	-	-
53731	28-May-16	128	12	9.4	13.9	4.5	0	-	-	-	-	0	-	-	-	-
53732	28-May-16	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53733	30-May-16	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53734	30-May-16	23970	90	9.4	18.6	9.2	30201	127	6.5	18.6	12.1	0	-	-	-	-
53735	30-May-16	108116	192	18.6	18.6	0	106681	196	18.6	18.6	0	0	-	-	-	-
53736	30-May-16	43994	159	5.2	7.9	2.7	20686	96	5.2	9.4	4.2	4127	105	5.2	18.6	13.4
53737	29-May-16	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53738	31-May-16	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53739	31-May-16	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53740	31-May-16	10630	101	7.9	9.4	1.5	32179	124	7.9	10.3	2.4	14495	90	7.9	9.4	1.5
53741	30-May-16	32009	171	16.8	18.6	1.8	64072	176	16.8	18.6	1.8	29227	162	16.8	18.6	1.8
53742	30-May-16	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-

Table A1-2: Detection summary for Walleye tagged and monitored in Stephens Lake during the winter 2016/2017 (October 20, 2015 to April 30, 2017), 2017/2018 (October 17, 2017 to April 30, 2018), and 2018/2019 (October 11, 2018 to April 30, 2019) periods (continued). Tag ID highlighted yellow = lost tag. Tag ID highlighted orange = moved downstream through Kettle GS. Tag ID highlighted green = suspected to have moved downstream through Kettle GS. Tag ID highlighted = moved downstream through Kettle GS.

Tag ID	Date tagged	2016/2017					2017/2018					2018/2019				
		n	# Days	Furthest U/S (rkm)	Furthest D/S (rkm)	Range (rkm)	n	# Days	Furthest U/S (rkm)	Furthest D/S (rkm)	Range (rkm)	n	# Days	Furthest U/S (rkm)	Furthest D/S (rkm)	Range (rkm)
53743	31-May-16	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53744	31-May-16	37297	118	18.6	24.7	6.1	45114	119	18.6	36.1	17.5	28697	112	16.8	36.1	19.3
53745	31-May-16	13041	108	5.2	18.6	13.4	7093	88	5.2	18.6	13.4	0	-	-	-	-
53746	31-May-16	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53747	31-May-16	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53748	31-May-16	23	5	13	13	0	15	2	8.4	8.4	0	0	-	-	-	-
53749	31-May-16	198	3	16.8	24.7	7.9	0	-	-	-	-	0	-	-	-	-
53750	31-May-16	9445	128	7.9	9.4	1.5	3480	55	7.9	9.4	1.5	0	-	-	-	-
53751	31-May-16	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53752	31-May-16	5868	28	16.8	24.7	7.9	1135	18	16.8	18.6	1.8	0	-	-	-	-
53753	31-May-16	495	19	13.9	18.6	4.7	0	-	-	-	-	0	-	-	-	-
53754	31-May-16	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53755	31-May-16	2086	8	5.2	9.4	4.2	253	15	6.5	8.4	1.9	0	-	-	-	-
53756	01-Jun-16	11795	77	9.4	18.6	9.2	0	-	-	-	-	0	-	-	-	-
53757	01-Jun-16	13752	120	5.2	18.6	13.4	16216	156	5.2	18.6	13.4	8919	123	5.2	18.6	13.4
53808	01-Jun-16	203	2	9.4	9.4	0	0	-	-	-	-	0	-	-	-	-
53809	01-Jun-16	15097	148	13.9	18.6	4.7	30603	116	13.9	18.6	4.7	0	-	-	-	-
53810	01-Jun-16	6638	54	9.4	18.6	9.2	9560	71	9.4	18.6	9.2	8189	48	9.4	18.6	9.2
53811	01-Jun-16	20720	126	5.2	7.9	2.7	6122	78	5.2	7.9	2.7	0	-	-	-	-
53812	01-Jun-16	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
25732	9-Jun-18	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-

Table A1-2: Detection summary for Walleye tagged and monitored in Stephens Lake during the winter 2016/2017 (October 20, 2015 to April 30, 2017), 2017/2018 (October 17, 2017 to April 30, 2018), and 2018/2019 (October 11, 2018 to April 30, 2019) periods (continued). Tag ID highlighted yellow = lost tag. Tag ID highlighted orange = moved downstream through Kettle GS. Tag ID highlighted green = suspected to have moved downstream through Kettle GS. Tag ID highlighted blue = moved downstream through Kettle GS.

Tag ID	Date tagged	2016/2017					2017/2018					2018/2019				
		n	# Days	Furthest U/S (rkm)	Furthest D/S (rkm)	Range (rkm)	n	# Days	Furthest U/S (rkm)	Furthest D/S (rkm)	Range (rkm)	n	# Days	Furthest U/S (rkm)	Furthest D/S (rkm)	Range (rkm)
25734	7-Jun-18	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-
25735	6-Jun-18	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-
25736	7-Jun-18	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-
25737	6-Jun-18	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-
25738	6-Jun-18	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-
25741	6-Jun-18	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-

Table A1-3: Detection summary for Walleye tagged prior to 2019 and monitored upstream of the Keeyask GS during the open-water 2016 (May 1 to October 19), 2017 (May 1 to October 16), 2018 (May 1 to October 10), and 2019 (May 1 to October 7) periods. Tag ID highlighted yellow = lost tag. Tag ID highlighted purple = moved downstream through Gull Rapids/the Keeyask GS. Tag ID highlighted orange = moved downstream through Kettle GS. Tag ID highlighted green = suspected to have moved downstream through Kettle GS. Tag ID highlighted red = moved downstream through Long Spruce GS.

Tag ID	Date tagged	Fork length (mm)	Weight (g)	2016					2017					2018					2019				
				n	# Days	U/S (rkm)	D/S (rkm)	Range (rkm)	n	# Days	U/S (rkm)	D/S (rkm)	Range (rkm)	n	# Days	U/S (rkm)	D/S (rkm)	Range (rkm)	n	# Days	U/S (rkm)	D/S (rkm)	Range (rkm)
53758	24-Sep-16	423	750	409	10	-17.4	-9.3	8.1	6376	46	-33.8	5.2	39.0	0	-	-	-	-	0	-	-	-	-
53759	24-Sep-16	362	500	2725	18	-17.4	9.4	26.8	0	-	-	-	-	2	1	16.8	16.8	0.0	0	-	-	-	-
53760	24-Sep-16	512	1825	360	10	-17.4	5.2	22.6	35	8	4.2	5.2	1.0	0	-	-	-	-	0	-	-	-	-
53763	5-Jun-16	510	-	369	11	-19.5	-9.5	10	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53764	5-Jun-16	560	-	717	6	-14.8	10.3	25.1	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53765	24-Sep-16	491	1300	5790	20	-19.5	-9.5	10	1122	36	-10.1	-9.9	0.2	0	-	-	-	-	0	-	-	-	-
53766	24-Sep-16	484	1250	1164	11	-12.9	-10	3.4	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53767	24-Sep-16	508	1450	1490	16	-12.9	-11.8	1.1	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53768	5-Jun-16	520	-	5426	127	-19.5	-14.8	4.7	9240	117	-19.5	-14.8	4.7	0	-	-	-	-	0	-	-	-	-
53769	5-Jun-16	393	-	16254	94	-19.5	44.9	64.4	410	4	47.5	47.5	0.0	0	-	-	-	-	0	-	-	-	-
53770	5-Jun-16	350	-	299	3	-17.4	-17.4	0	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53771	5-Jun-16	353	-	1919	26	-19.4	58.6	78	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53772	5-Jun-16	400	-	2950	19	-24.3	-14.8	9.5	656	8	-29.4	-7.4	22.0	0	-	-	-	-	0	-	-	-	-
53773	5-Jun-16	405	-	7239	74	-33.8	-9.5	24.3	2895	36	-19.5	43.5	63.0	0	-	-	-	-	0	-	-	-	-
53774	5-Jun-16	522	-	1403	7	-17.4	-9	8.4	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53775	5-Jun-16	514	-	9686	68	-10.1	18.6	28.7	7764	67	1.2	24.7	23.5	5945	46	1.2	36.1	34.9	30676	83	9.4	9.7	0.0
53776	30-May-16	535	-	10606	110	-19.5	-12.9	6.6	4044	33	-12.8	-12.8	0.0	0	-	-	-	-	0	-	-	-	-
53777	29-May-16	404	1050	8877	99	-48.2	-11.8	36.4	5624	55	-26.5	58.6	85.1	0	-	-	-	-	0	-	-	-	-
53778	3-Jun-16	523	-	6979	15	-19.5	-9.5	10	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53779	3-Jun-16	400	-	389	7	-12.9	-12.9	0	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53780	3-Jun-16	660	-	3585	28	-12.9	-5.8	7.1	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-

Table A1-3: Detection summary for Walleye tagged prior to 2019 and monitored upstream of the Keeyask GS during the open-water 2016 (May 1 to October 19), 2017 (May 1 to October 16), 2018 (May 1 to October 10), and 2019 (May 1 to October 7) periods (continued). Tag ID highlighted yellow = lost tag. Tag ID highlighted purple = moved downstream through Gull Rapids/the Keeyask GS. Tag ID highlighted orange = moved downstream through Kettle GS. Tag ID highlighted green = suspected to have moved downstream through Kettle GS. Tag ID highlighted red = moved downstream through Long Spruce GS.

Tag ID	Date tagged	Fork length (mm)	Weight (g)	2016					2017					2018					2019				
				n	# Days	U/S (rkm)	D/S (rkm)	Range (rkm)	n	# Days	U/S (rkm)	D/S (rkm)	Range (rkm)	n	# Days	U/S (rkm)	D/S (rkm)	Range (rkm)	n	# Days	U/S (rkm)	D/S (rkm)	Range (rkm)
53781	2-Jun-16	525	-	344	10	-12.9	-9.5	3.4	21	2	-9.3	-9.3	0.0	13	4	-9.3	-9.3	0.0	0	-	-	-	-
53782	31-May-16	509	1550	11144	48	-19.5	43.5	63	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53783	31-May-16	388	850	18635	92	-48.2	-14.8	33.4	7435	44	-48.2	-14.8	33.4	0	-	-	-	-	0	-	-	-	-
53784	30-May-16	510	-	3309	85	-19.5	-11.8	7.7	6111	41	-33.8	-12.8	21.0	1669	38	-19.5	-12.8	6.7	0	-	-	-	-
53785	30-May-16	526	-	30891	132	-19.5	-12.9	6.6	4227	42	-17.4	-5.8	11.6	0	-	-	-	-	0	-	-	-	-
53786	30-May-16	400	-	266	4	-14.8	2.7	17.5	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53787	30-May-16	360	-	6972	92	-19.5	-5.8	13.7	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53788	30-May-16	603	-	2521	24	-19.5	5.2	24.7	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53789	30-May-16	577	-	17373	84	-44.3	-32.3	12	7018	51	-44.7	-32.3	12.4	4078	47	-48.2	-32.3	15.9	0	-	-	-	-
53790	29-May-16	533	2000	1177	4	-17.4	-17.4	0	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53791	29-May-16	400	725	1265	17	-19.5	44.9	64.4	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53792	28-May-16	559	-	18568	130	-19.5	-11.8	7.7	19717	122	-19.5	-11.9	7.6	18260	114	-24.7	-12.9	11.8	0	-	-	-	-
53793	7-Jun-16	560	2125	40350	133	-19.5	-12.9	6.6	56	3	-12.8	2.7	15.5	290	12	2.7	2.7	0.0	2	1	2.7	2.7	0.0
53794	7-Jun-16	440	1200	14606	97	-29.4	-11.8	17.6	4327	63	-33.8	-10.1	23.7	466	7	-48.2	-17.4	30.8	0	-	-	-	-
53795	7-Jun-16	410	900	7864	105	-19.5	-9.5	10	24523	122	-19.5	-17.4	2.1	0	-	-	-	-	0	-	-	-	-
53796	7-Jun-16	441	1150	4385	62	-26.5	-17.4	9.1	1926	44	-26.5	-19.4	7.1	1529	31	-26.5	-17.4	9.1	2776	39	-19.5	-4.8	14.7
53797	7-Jun-16	520	1700	17953	86	-48.2	-17.4	30.8	12338	93	-48.2	-17.4	30.8	34552	129	-48.2	-17.4	30.8	9637	55	-33.8	-15	18.8
53798	7-Jun-16	495	1500	11017	85	-19.5	-12.9	6.6	3	1	-10.1	-10.1	0.0	0	-	-	-	-	0	-	-	-	-
53799	7-Jun-16	511	1650	7477	59	-14.8	10.3	25.1	312	12	1.2	47.5	46.3	0	-	-	-	-	0	-	-	-	-
53800	7-Jun-16	530	1750	22181	94	-19.5	-5.8	13.7	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53801	7-Jun-16	360	600	1488	8	-14.8	18.6	33.4	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-

Table A1-3: Detection summary for Walleye tagged prior to 2019 and monitored upstream of the Keeyask GS during the open-water 2016 (May 1 to October 19), 2017 (May 1 to October 16), 2018 (May 1 to October 10), and 2019 (May 1 to October 7) periods (continued). Tag ID highlighted yellow = lost tag. Tag ID highlighted purple = moved downstream through Gull Rapids/the Keeyask GS. Tag ID highlighted orange = moved downstream through Kettle GS. Tag ID highlighted green = suspected to have moved downstream through Kettle GS. Tag ID highlighted red = moved downstream through Long Spruce GS.

Tag ID	Date tagged	Fork length (mm)	Weight (g)	2016					2017					2018					2019				
				n	# Days	U/S (rkm)	D/S (rkm)	Range (rkm)	n	# Days	U/S (rkm)	D/S (rkm)	Range (rkm)	n	# Days	U/S (rkm)	D/S (rkm)	Range (rkm)	n	# Days	U/S (rkm)	D/S (rkm)	Range (rkm)
53802	7-Jun-16	468	1300	118	2	-14.8	-5.8	9	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53803	24-Sep-16	484	1550	1530	21	-14.8	-11.8	3	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53804	24-Sep-16	410	700	1829	17	-14.8	-11.8	3	160	4	-10.1	-7.4	2.7	0	-	-	-	-	0	-	-	-	-
53805	6-Jun-16	532	-	17640	129	-14.8	-14.8	0	8346	100	-19.5	-14.8	4.7	6114	74	-19.5	-9.9	9.6	0	-	-	-	-
53806	6-Jun-16	405	-	24853	125	-34.3	-14.8	19.5	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53807	6-Jun-16	451	-	7475	63	-48.2	-14.8	33.4	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
25739	5-Jun-18	410	800	-	-	-	-	-	-	-	-	-	-	996	30	-9.3	-7.4	1.9	0	-	-	-	-
25740	5-Jun-18	388	550	-	-	-	-	-	-	-	-	-	-	3587	29	-9.3	36.1	45.4	0	-	-	-	-
25742	5-Jun-18	320	400	-	-	-	-	-	-	-	-	-	-	14026	101	-15.0	-9.9	5.1	586	8	-12.9	-12.9	0.0
25743	5-Jun-18	442	925	-	-	-	-	-	-	-	-	-	-	597	7	-10.2	-4.8	5.4	0	-	-	-	-
25744	5-Jun-18	525	1575	-	-	-	-	-	-	-	-	-	-	5128	44	-19.5	-9.3	10.2	0	-	-	-	-
25745	5-Jun-18	438	850	-	-	-	-	-	-	-	-	-	-	225	2	-12.8	-12.8	0.0	0	-	-	-	-
25746	5-Jun-18	504	1750	-	-	-	-	-	-	-	-	-	-	1946	28	-19.5	-12.8	6.7	0	-	-	-	-
25747	28-May-18	374	575	-	-	-	-	-	-	-	-	-	-	12012	100	-24.7	-7.4	17.3	4724	53	-46.9	-9	37.9
25748	28-May-18	398	525	-	-	-	-	-	-	-	-	-	-	625	6	-19.5	24.7	44.2					
25749	28-May-18	393	550	-	-	-	-	-	-	-	-	-	-	9675	75	-48.2	-9.3	38.9	2504	64	-33.8	-4.8	29.0
25750	1-Jun-18	403	725	-	-	-	-	-	-	-	-	-	-	3401	49	-26.5	-9.0	17.5	6437	35	-48.2	-17.4	30.8
25751	5-Jun-18	343	450	-	-	-	-	-	-	-	-	-	-	3274	72	-19.5	-12.8	6.7	3532	83	-12.9	-12.5	0.4
25752	27-May-18	404	700	-	-	-	-	-	-	-	-	-	-	2272	21	-19.5	40.8	60.3	0	-	-	-	-
25753	27-May-18	356	425	-	-	-	-	-	-	-	-	-	-	11695	58	-32.3	36.1	68.4	0	-	-	-	-
25754	27-May-18	367	550	-	-	-	-	-	-	-	-	-	-	5119	60	-24.7	-12.9	11.8	4147	58	-19.5	-15	4.5
25755	1-Jun-18	396	775	-	-	-	-	-	-	-	-	-	-	564	11	-24.7	40.9	65.6	0	-	-	-	-
25756	1-Jun-18	452	1050	-	-	-	-	-	-	-	-	-	-	5983	54	-19.5	-9.9	9.6	3332	22	-46.9	-15	31.9

Table A1-4: Detection summary for Walleye tagged prior to 2019 and monitored in Stephens Lake during the open-water 2016 (May 1 to October 19), 2017 (May 1 to October 16), 2018 (May 1 to October 10), and 2019 (May 1 to October 7) periods. Tag ID highlighted yellow = lost tag. Tag ID highlighted orange = moved downstream through Kettle GS. Tag ID highlighted green = suspected to have moved downstream through Kettle GS. Tag ID highlighted red = moved downstream through Long Spruce GS.

Tag ID	Date tagged	Fork length (mm)	Weight (g)	2016					2017					2018					2019				
				n	# Days	U/S (rkm)	D/S (rkm)	Range (rkm)	n	# Days	U/S (rkm)	D/S (rkm)	Range (rkm)	n	# Days	U/S (rkm)	D/S (rkm)	Range (rkm)	n	# Days	U/S (rkm)	D/S (rkm)	Range (rkm)
53723	28-May-16	510	1500	6822	52	1.2	9.4	8.2	11415	64	1.2	16.8	15.6	1096	15	1.2	4.4	3.2	0	-	-	-	-
53724	28-May-16	433	1050	16473	97	1.2	10.3	9.1	2937	36	1.2	7.9	6.7	492	11	1.2	7.9	6.7	20	1	1.2	1.2	0.0
53725	27-May-16	480	1200	1918	22	1.2	18.6	17.4	5934	35	7.9	16.8	8.9	594	13	5.2	24.7	19.5	0	-	-	-	-
53726	27-May-16	412	800	1862	17	1.2	16.8	15.6	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53727	28-May-16	486	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53728	28-May-16	507	1650	13006	102	1.2	18.6	17.4	4712	42	2.7	58.6	55.9	0	-	-	-	-	0	-	-	-	-
53729	28-May-16	375	560	3470	41	1.2	18.6	17.4	2432	46	1.2	18.6	17.4	571	23	5.2	18.6	13.4	234	6	3.8	9.4	5.6
53730	28-May-16	491	1700	1907	15	1.2	9.4	8.2	4610	43	1.2	10.3	9.1	0	-	-	-	-	0	-	-	-	-
53731	28-May-16	442	950	4702	19	1.2	9.4	8.2	1757	26	1.2	13.9	12.7	924	14	1.2	9.4	8.2	0	-	-	-	-
53732	28-May-16	530	1825	380	7	1.2	13.0	11.8	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53733	30-May-16	322	500	2770	34	1.2	13.9	12.7	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53734	30-May-16	460	1325	2165	13	1.2	18.6	17.4	2137	28	3.8	18.6	14.8	736	19	1.2	18.6	17.4	0	-	-	-	-
53735	30-May-16	374	600	71469	135	1.2	18.6	17.4	98904	168	18.6	18.6	0.0	93804	160	18.6	18.6	0.0	90394	158	18.6	18.6	0.0
53736	30-May-16	398	900	5122	42	1.2	18.6	17.4	5996	48	2.6	24.7	22.1	713	19	1.2	36.1	34.9	284	7	1.2	9.4	8.2
53737	29-May-16	508	1625	2237	64	1.2	10.3	9.1	1772	21	3.8	47.5	43.7	0	-	-	-	-	0	-	-	-	-
53738	31-May-16	522	1875	7820	75	2.7	10.3	7.6	692	20	2.6	40.8	38.2	0	-	-	-	-	0	-	-	-	-
53739	31-May-16	480	1300	9452	111	1.2	6.5	5.3	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53740	31-May-16	482	1400	12989	77	1.2	9.4	8.2	6334	60	1.2	9.4	8.2	6514	84	1.2	9.4	8.2	0	-	-	-	-
53741	30-May-16	404	975	4836	76	1.2	18.6	17.4	11129	90	2.7	18.6	15.9	15069	122	1.2	18.6	17.4	6450	102	1.2	18.6	17.4
53742	30-May-16	452	1250	1118	12	1.2	2.7	1.5	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53743	31-May-16	469	1450	466	9	1.2	9.4	8.2	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53744	31-May-16	405	750	5132	56	1.2	18.6	17.4	6665	69	1.2	24.7	23.5	3812	48	1.2	24.7	23.5	1442	33	2.7	9.4	6.7
53745	31-May-16	453	1200	249	4	2.7	18.6	15.9	2884	25	3.8	24.7	20.9	0	-	-	-	-	0	-	-	-	-

Table A1-4: Detection summary for Walleye tagged prior to 2019 and monitored in Stephens Lake during the open-water 2016 (May 1 to October 19), 2017 (May 1 to October 16), 2018 (May 1 to October 10), and 2019 (May 1 to October 7) periods (continued). Tag ID highlighted yellow = lost tag. Tag ID highlighted orange = moved downstream through Kettle GS. Tag ID highlighted green = suspected to have moved downstream through Kettle GS. Tag ID highlighted red = moved downstream through Kettle GS.

Tag ID	Date tagged	Fork length (mm)	Weight (g)	2016					2017					2018					2019				
				n	# Days	U/S (rkm)	D/S (rkm)	Range (rkm)	n	# Days	U/S (rkm)	D/S (rkm)	Range (rkm)	n	# Days	U/S (rkm)	D/S (rkm)	Range (rkm)	n	# Days	U/S (rkm)	D/S (rkm)	Range (rkm)
53746	31-May-16	467	1380	310	4	1.2	18.6	17.4	1449	19	3.8	58.6	54.8	0	-	-	-	-	0	-	-	-	-
53747	31-May-16	520	1600	19408	65	1.2	10.3	9.1	6715	47	1.2	47.5	46.3	0	-	-	-	-	0	-	-	-	-
53748	31-May-16	442	975	4332	57	2.7	13.0	10.3	558	20	6.5	13	6.5	23	2	9.4	13	3.6	0	-	-	-	-
53749	31-May-16	411	750	34767	132	1.2	10.3	9.1	2531	12	1.2	10.3	9.1	0	-	-	-	-	0	-	-	-	-
53750	31-May-16	531	1800	4459	52	1.2	10.3	9.1	15866	72	3.8	9.4	5.6	0	-	-	-	-	0	-	-	-	-
53751	31-May-16	422	825	8287	56	1.2	18.6	17.4	633	25	1.2	58.6	57.4	0	-	-	-	-	0	-	-	-	-
53752	31-May-16	468	1400	12710	51	1.2	20.0	18.8	7479	67	1.2	24.7	23.5	2768	26	1.2	18.6	17.4	0	-	-	-	-
53753	31-May-16	488	1325	23679	89	1.2	21.0	19.8	3253	39	2.6	40.9	38.3	0	-	-	-	-	0	-	-	-	-
53754	31-May-16	475	1375	1653	11	1.2	18.6	17.4	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
53755	31-May-16	506	1475	12782	65	1.2	13.0	11.8	13253	100	1.2	13	11.8	10782	66	1.2	7.9	6.7	7520	29	3.8	9.4	5.6
53756	01-Jun-16	495	1800	2800	39	1.2	13.0	11.8	7437	91	2.7	16.8	14.1	0	-	-	-	-	0	-	-	-	-
53757	01-Jun-16	530	1750	714	5	1.2	18.6	17.4	1466	20	3.8	24.7	20.9	3292	28	2.7	18.6	15.9	5133	28	1.2	18.6	17.4
53808	01-Jun-16	360	600	5683	43	1.2	18.6	17.4	7513	63	1.2	13.9	12.7	5168	32	1.2	18.6	17.4	0	-	-	-	-
53809	01-Jun-16	468	1300	3821	62	1.2	18.6	17.4	4659	58	3.8	18.6	14.8	1654	32	1.2	18.6	17.4	0	-	-	-	-
53810	01-Jun-16	532	-	1340	43	1.2	18.6	17.4	2374	68	3.8	18.6	14.8	1625	75	1.2	18.6	17.4	4054	42	1.2	18.6	17.4
53811	01-Jun-16	405	-	62445	123	1.2	7.9	6.7	61299	156	1.2	9.4	8.2	0	-	-	-	-	0	-	-	-	-
53812	01-Jun-16	451	-	5047	27	1.2	20.0	18.8	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
25732	9-Jun-18	415	525	-	-	-	-	-	-	-	-	-	-	2502	19	1.2	40.9	39.7	0	-	-	-	-
25734	7-Jun-18	395	600	-	-	-	-	-	-	-	-	-	-	1429	7	1.2	21.6	20.4	0	-	-	-	-
25735	6-Jun-18	468	1250	-	-	-	-	-	-	-	-	-	-	1572	34	1.2	7.9	6.7	2081	33	1.2	9.4	8.2
25736	7-Jun-18	482	1400	-	-	-	-	-	-	-	-	-	-	4814	18	1.2	10.3	9.1	0	-	-	-	-
25737	6-Jun-18	390	650	-	-	-	-	-	-	-	-	-	-	13243	78	1.2	4.4	3.2	11124	78	1.2	4.4	3.2
25738	6-Jun-18	569	1725	-	-	-	-	-	-	-	-	-	-	2300	20	1.2	36.1	34.9	0	-	-	-	-
25741	6-Jun-18	409	625	-	-	-	-	-	-	-	-	-	-	45733	120	1.2	2.7	1.5	156	21	1.2	1.2	0.0

Table A1-5: Detection summary for Walleye tagged in 2019 and monitored upstream of the Keeyask GS during the 2019 open-water period (June 1 to October 7). Tag highlighted purple = moved downstream through Keeyask GS. Tag highlighted green = suspected to have moved downstream through Kettle GS.

Tag ID	Date Tagged	n	Potential Detection Days	# Days Detected	% of Potential Detection Days	U/S (rkm)	D/S (rkm)	Range (rkm)
20147	05-Jun-19	11721	124	46	37.1	-19.5	40.9	60.4
20148	05-Jun-19	25306	124	116	93.5	-19.5	-9.3	10.2
20149	06-Jun-19	7	123	1	0.8	-19.5	-17.4	2.1
20150	05-Jun-19	1783	124	8	6.5	-15.0	40.9	55.9
20151	05-Jun-19	7125	124	97	78.2	-29.4	-12.9	16.5
20153	06-Jun-19	1607	123	9	7.3	-19.5	-9.9	9.6
20154	06-Jun-19	66867	123	115	93.5	-19.5	-19.5	0.0
20155	06-Jun-19	621	123	5	4.1	-19.5	-9.9	9.6
20156	06-Jun-19	62130	123	121	98.4	-19.5	-19.5	0.0
20157	06-Jun-19	1174	123	9	7.3	-19.5	-12.9	6.6
20158	06-Jun-19	1697	123	6	4.9	-19.5	9.4	28.9
20159	07-Jun-19	10988	122	82	67.2	-19.5	-9.0	10.5
20160	07-Jun-19	9846	122	10	8.2	-19.5	5.4	24.9
20161	07-Jun-19	4014	122	81	66.4	-19.5	-19.5	0.0
20162	06-Jun-19	537	123	13	10.6	-19.5	-15.0	4.5
20163	06-Jun-19	6084	123	53	43.1	-33.8	36.1	69.9
20164	06-Jun-19	106	123	1	0.8	-19.5	-15.0	4.5
20168	07-Jun-19	0	122	-	-	-	-	-
20169	07-Jun-19	27	122	4	3.3	-19.5	-15.0	4.5
20170	06-Jun-19	6259	123	89	72.4	-46.9	-9.3	37.6
20175	29-May-19	6127	131	65	49.6	-48.2	-4.8	43.4
20176	29-May-19	42406	131	118	90.1	-19.5	-17.4	2.1
20181	29-May-19	6572	131	93	71.0	-19.5	-17.4	2.1
20182	25-May-19	10080	135	22	16.3	-19.5	10.3	29.8
20186	29-May-19	10480	131	74	56.5	-17.4	5.4	22.8
20187	23-May-19	4991	137	35	25.5	-19.5	24.7	44.2
20188	23-May-19	31081	137	102	74.5	-24.7	-19.5	5.2

Table A1-6: Detection summary for Walleye tagged in 2019 and monitored in Stephens Lake during the 2019 open-water period (June 1 to October 7). Tag highlighted green = suspected to have moved downstream through Kettle GS.

Tag ID	Date Tagged	n	Potential Detection Days	# Days Detected	% of Potential Detection Days	U/S (rkm)	D/S (rkm)	Range (rkm)
20129	03-Jun-19	2257	126	23	18.3	1.2	6.5	5.3
20130	01-Jun-19	3708	128	25	19.5	1.2	18.6	17.4
20131	31-May-19	11481	129	79	61.2	1.2	18.6	17.4
20132	01-Jun-19	20473	128	103	80.5	1.2	4.1	2.9
20133	31-May-19	6795	129	44	34.1	1.2	9.4	8.2
20134	31-May-19	771	129	11	8.5	0.6	4.4	3.8
20135	01-Jun-19	55200	128	124	96.9	1.2	4.4	3.2
20136	01-Jun-19	673	128	18	14.1	1.2	24.7	23.5
20137	31-May-19	2094	129	29	22.5	1.2	24.7	23.5
20138	31-May-19	22235	129	95	73.6	0.6	4.1	3.5
20139	31-May-19	2457	129	39	30.2	1.2	36.1	34.9
20140	31-May-19	1190	129	50	38.8	1.2	10.3	9.1
20141	31-May-19	2202	129	15	11.6	0.6	36.1	35.5
20142	31-May-19	9295	129	91	70.5	1.2	18.6	17.4
20143	01-Jun-19	181	128	6	4.7	3.8	18.6	14.8
20144	01-Jun-19	5023	128	31	24.2	1.2	5.8	4.6
20145	01-Jun-19	883	128	20	15.6	0.6	7.9	7.3
20152	31-May-19	11491	129	41	31.8	1.2	6.5	5.3
20165	16-Sep-19	5391	21	11	52.4	1.2	9.4	8.2
20167	16-Sep-19	1661	21	9	42.9	1.2	40.9	39.7
20171	27-May-19	1870	133	14	10.5	1.2	7.4	6.2
20172	30-May-19	5131	130	43	33.1	1.2	5.8	4.6
20173	30-May-19	2377	130	45	34.6	1.2	7.4	6.2
20174	30-May-19	20228	130	60	46.2	1.0	16.5	15.5
20177	30-May-19	11339	130	100	76.9	0.6	10.3	9.7
20178	30-May-19	4293	130	26	20.0	0.6	7.9	7.3
20179	30-May-19	2746	130	35	26.9	2.7	13.9	11.2
20180	30-May-19	1874	130	37	28.5	2.7	24.7	22.0
20183	30-May-19	1338	130	12	9.2	2.7	13.0	10.3
20184	30-May-19	2823	130	16	12.3	3.8	13.9	10.1
20185	30-May-19	5527	130	63	48.5	1.2	7.9	6.7

APPENDIX 2:

LOCATION SUMMARY FOR INDIVIDUAL ACOUSTIC TAGGED WALLEYE UPSTREAM OF GULL RAPIDS/THE KEEYASK GS JUNE 2016 TO OCTOBER 2019

Figure A2-1: Position of a Walleye tagged with an acoustic transmitter (code #53758) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019.	87
Figure A2-2: Position of a Walleye tagged with an acoustic transmitter (code #53759) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019.	88
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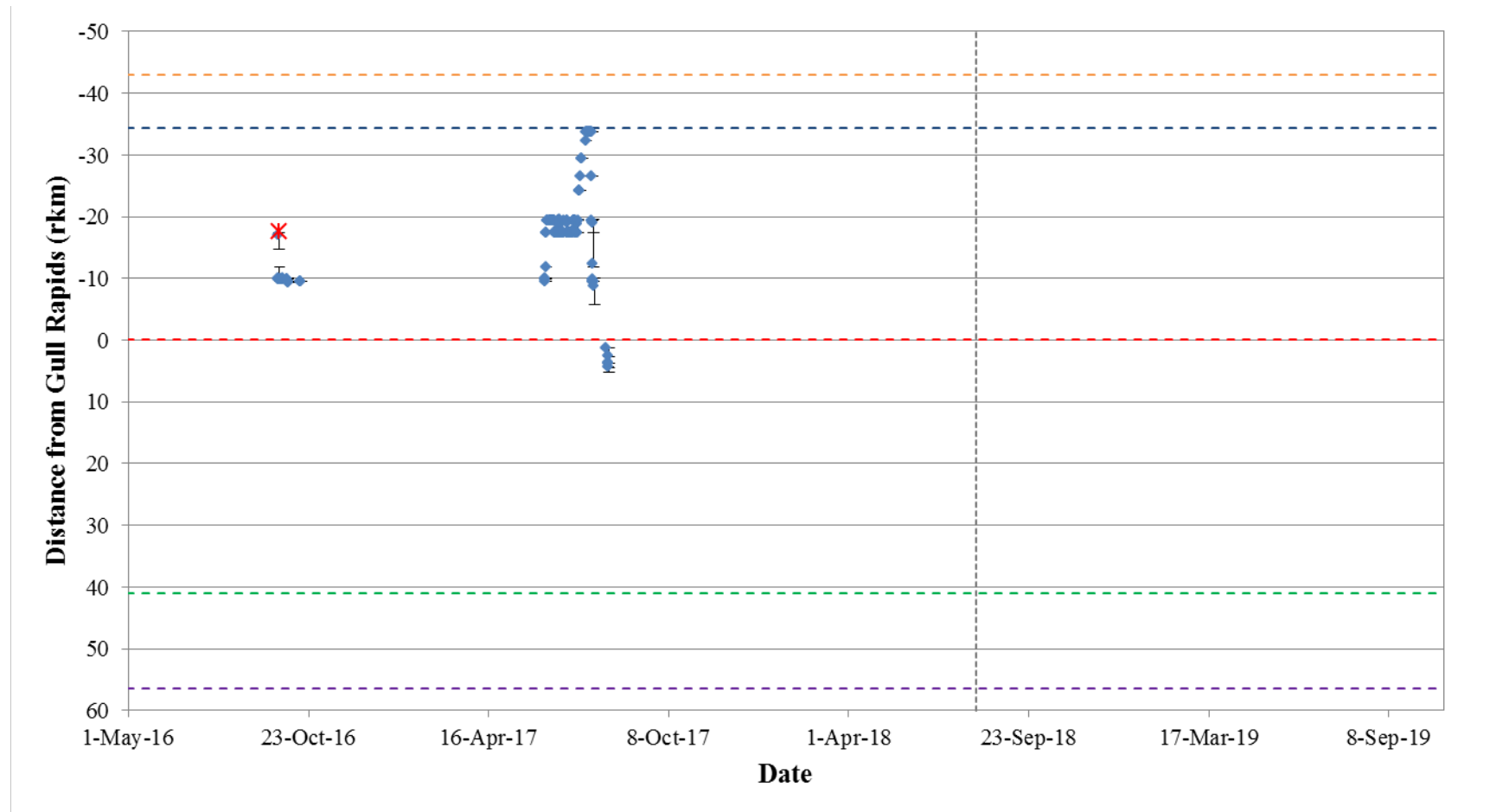


Figure A2-1: Position of a Walleye tagged with an acoustic transmitter (code #53758) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

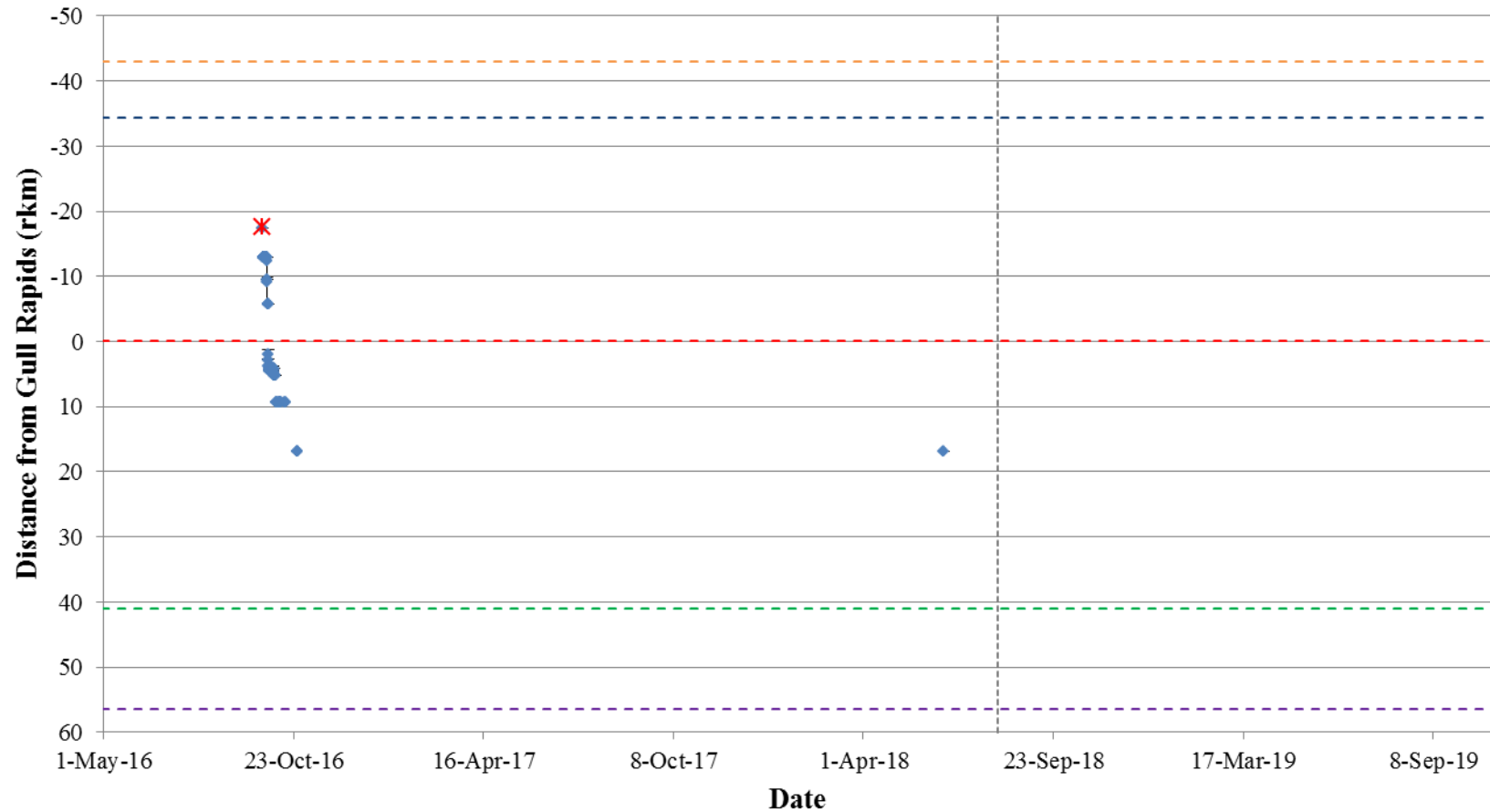


Figure A2-2: Position of a Walleye tagged with an acoustic transmitter (code #53759) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

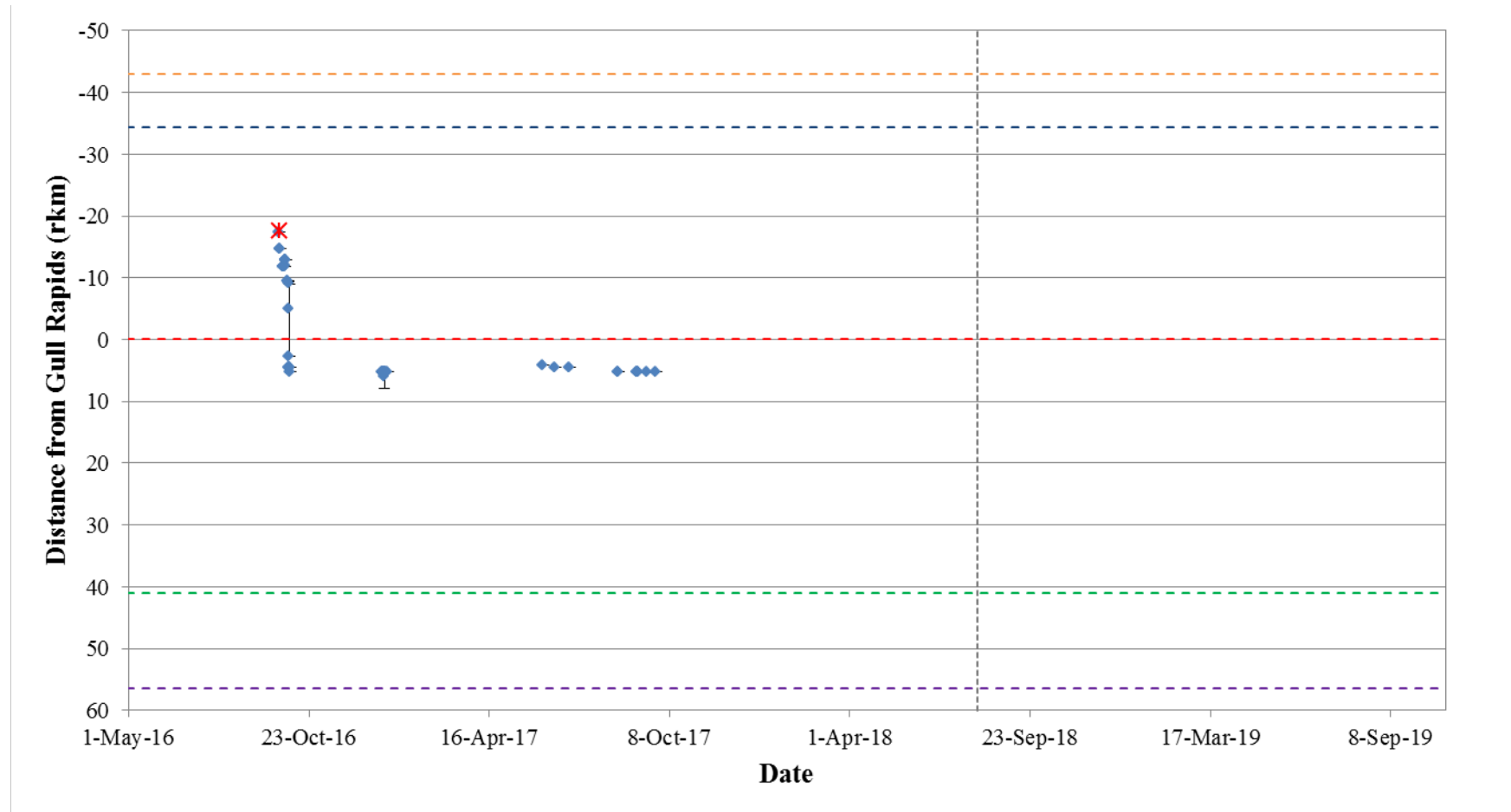


Figure A2-3: Position of a Walleye tagged with an acoustic transmitter (code #53760) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

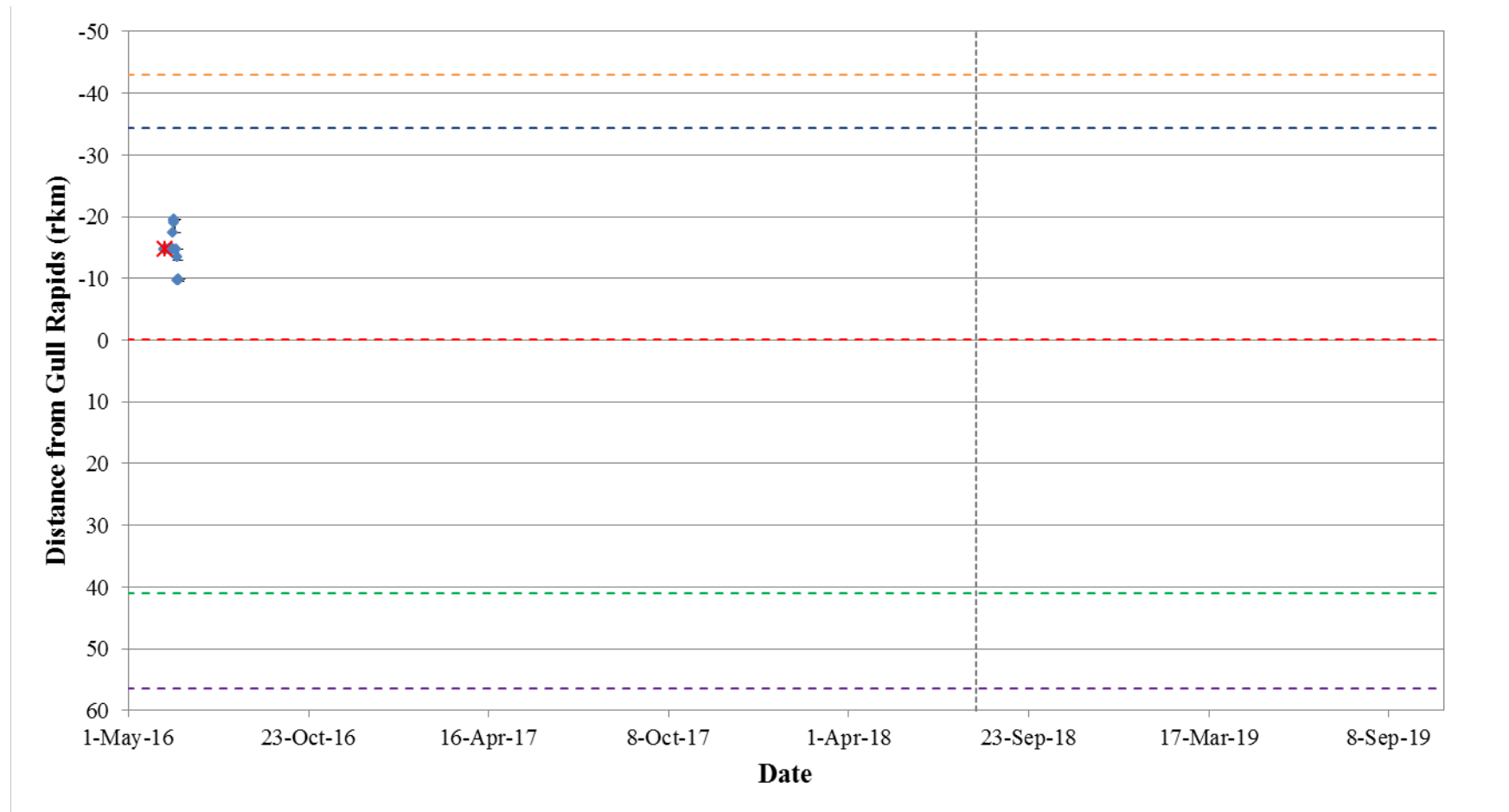


Figure A2-4: Position of a Walleye tagged with an acoustic transmitter (code #53763) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

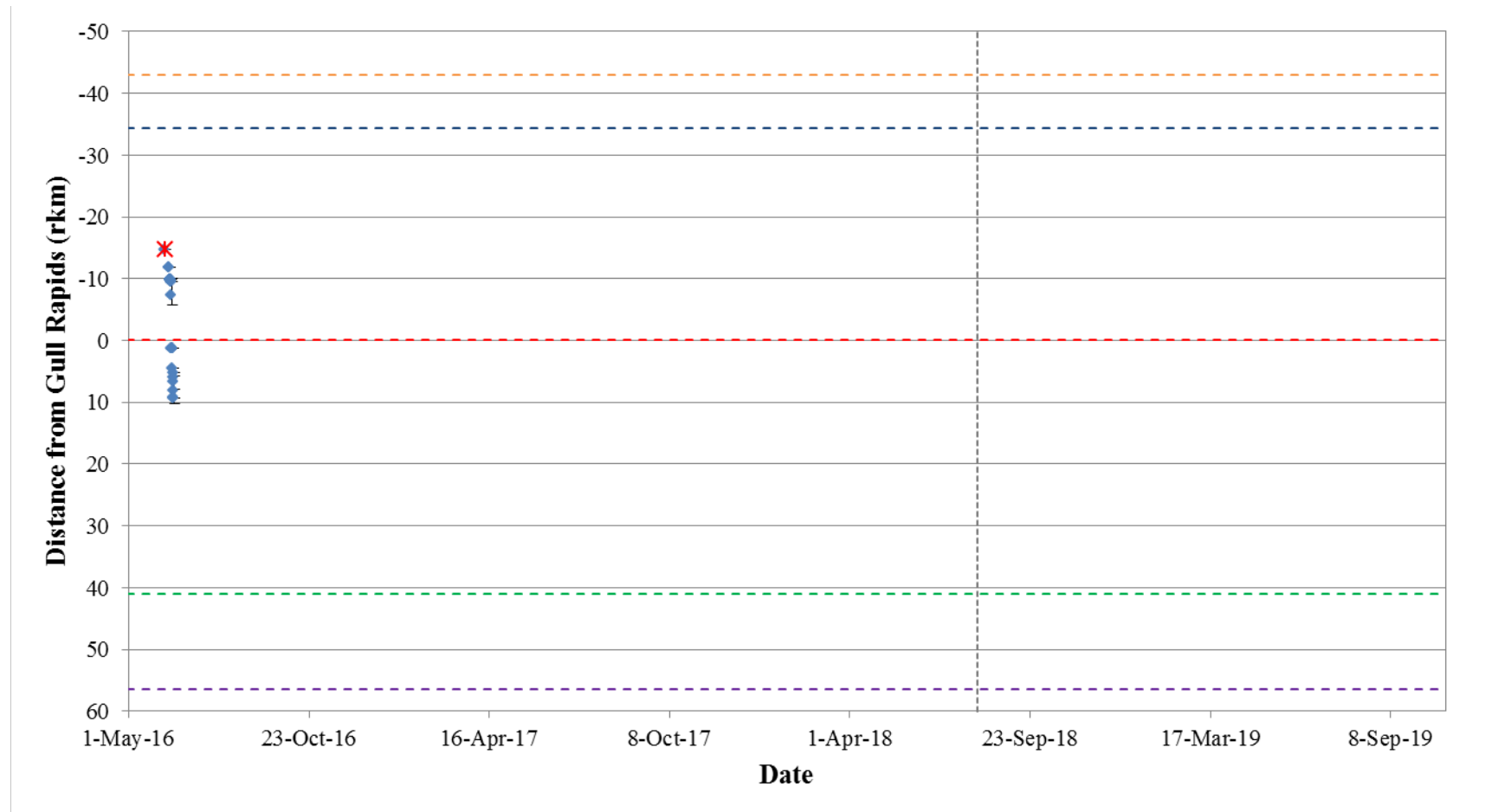


Figure A2-5: Position of a Walleye tagged with an acoustic transmitter (code #53764) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

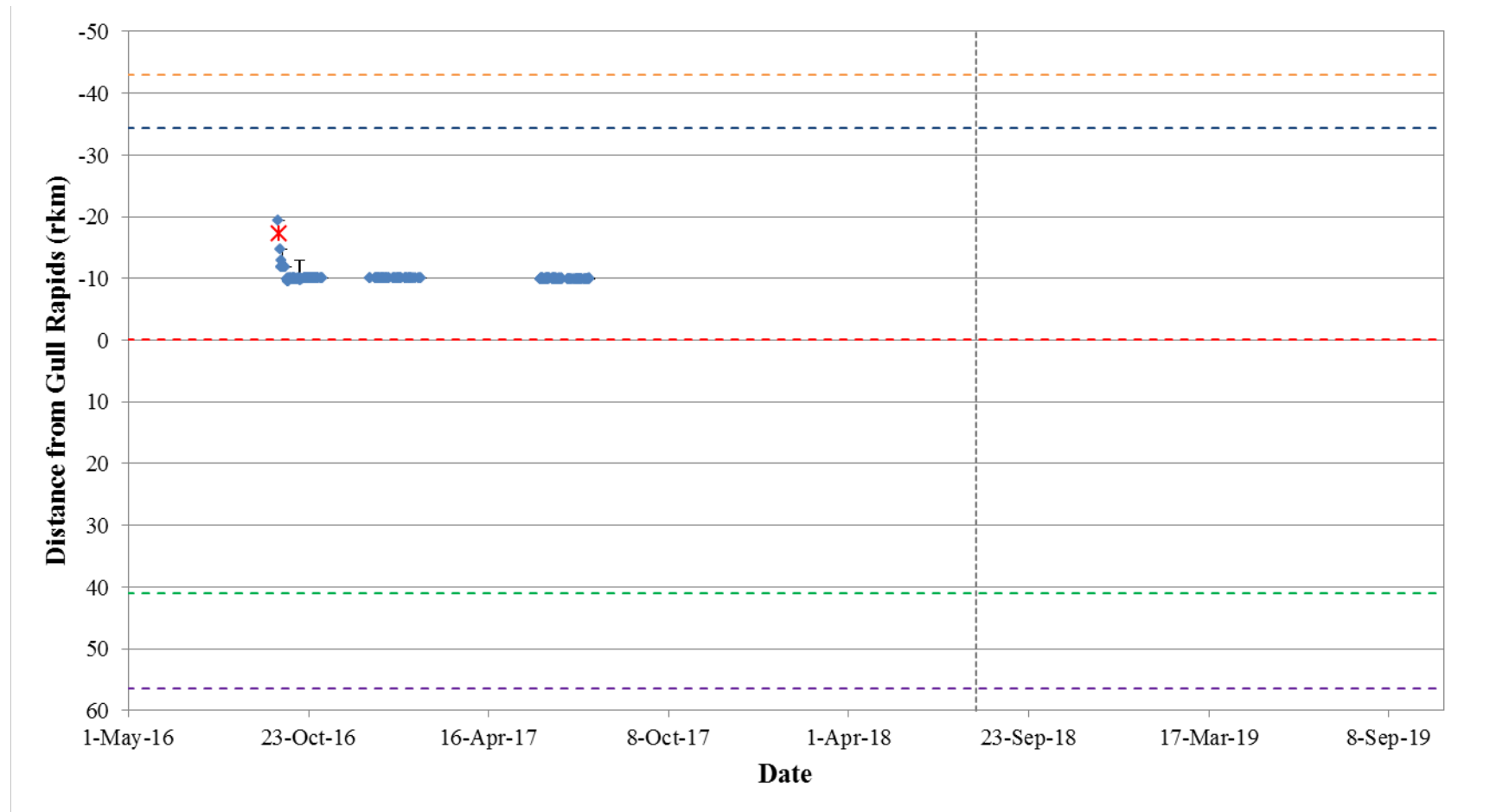


Figure A2-6: Position of a Walleye tagged with an acoustic transmitter (code #53765) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

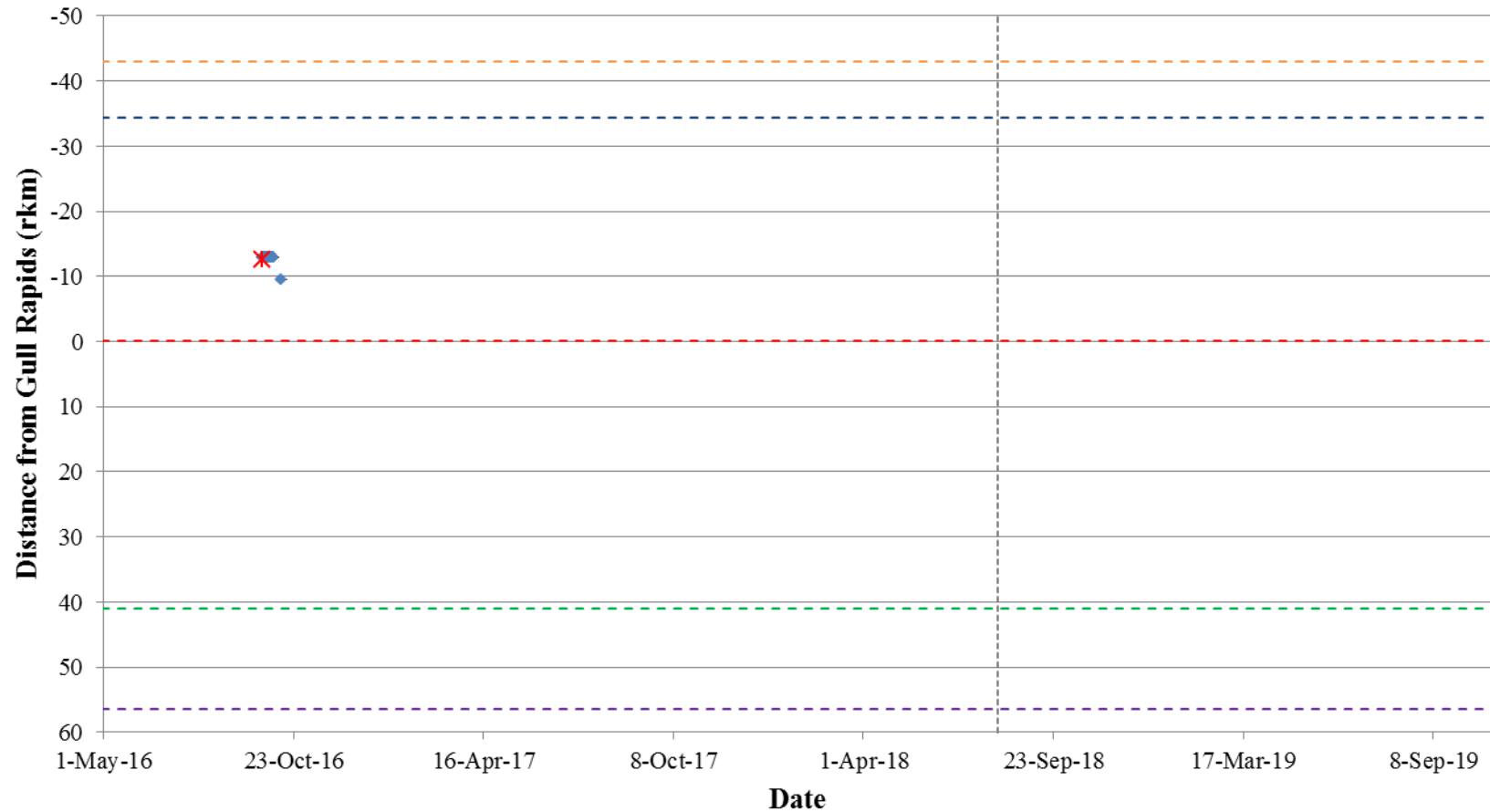


Figure A2-7: Position of a Walleye tagged with an acoustic transmitter (code #53766) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

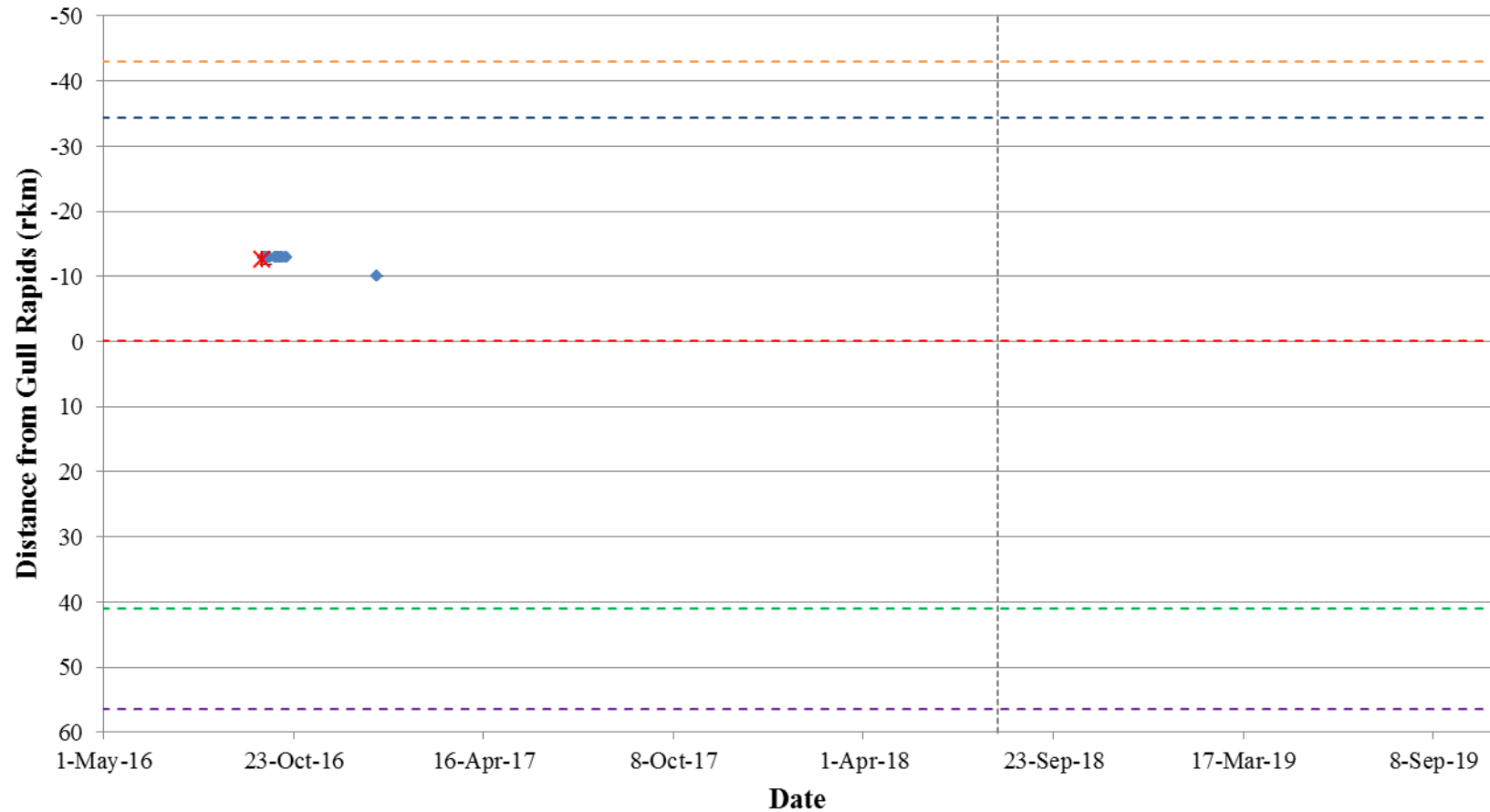


Figure A2-8: Position of a Walleye tagged with an acoustic transmitter (code #53767) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

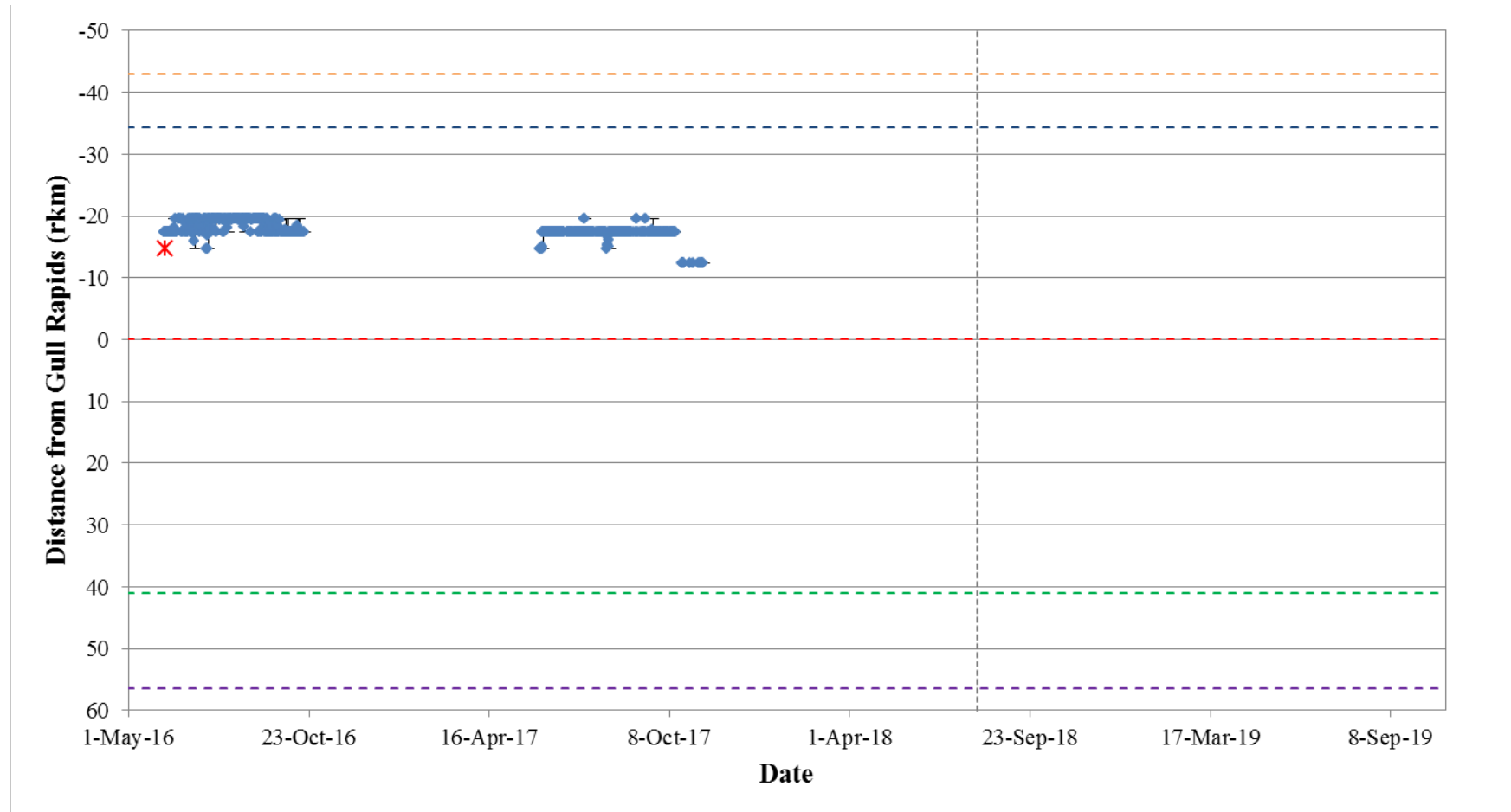


Figure A2-9: Position of a Walleye tagged with an acoustic transmitter (code #53768) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

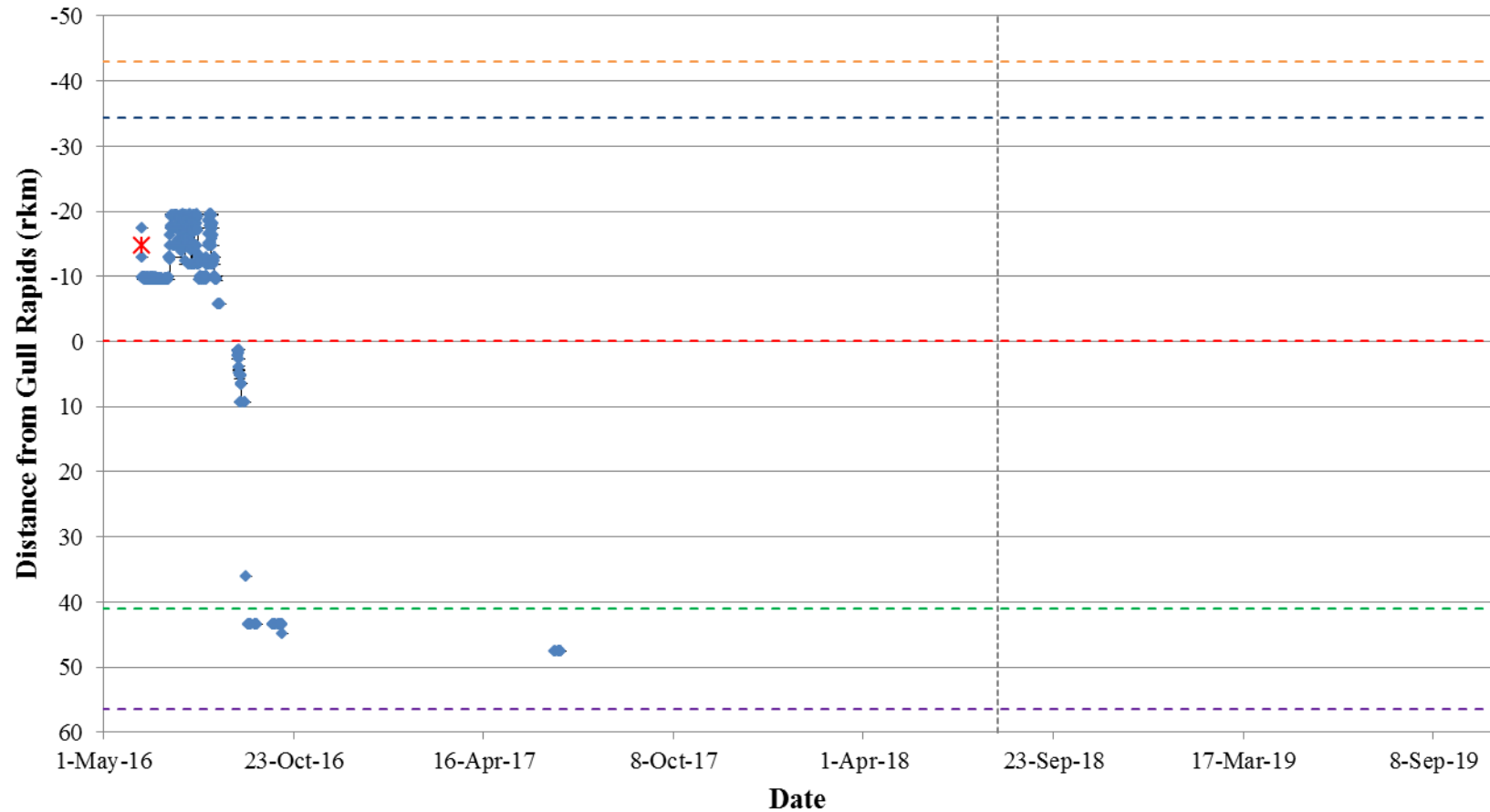


Figure A2-10: Position of a Walleye tagged with an acoustic transmitter (code #53769) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

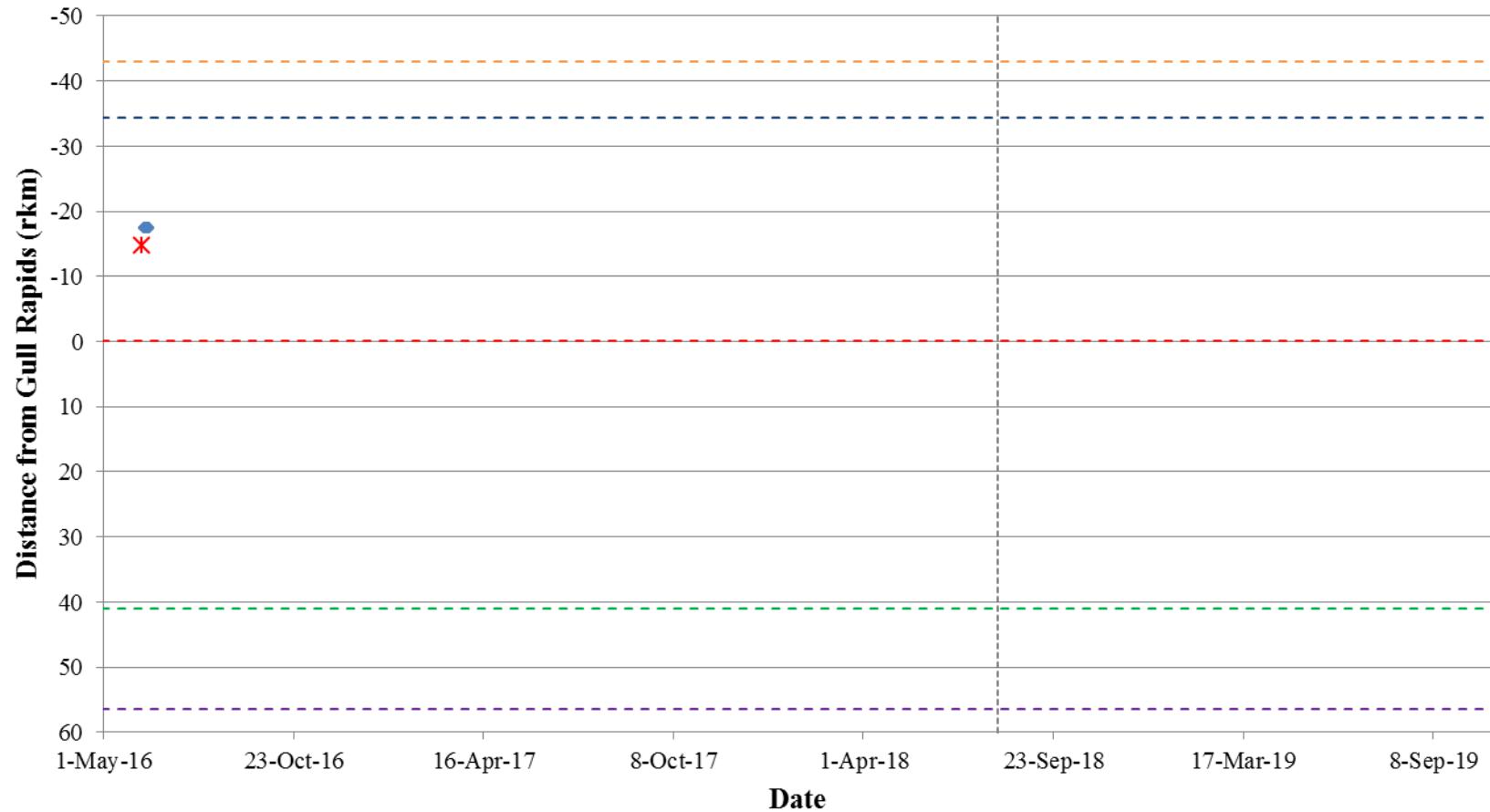


Figure A2-11: Position of a Walleye tagged with an acoustic transmitter (code #53770) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

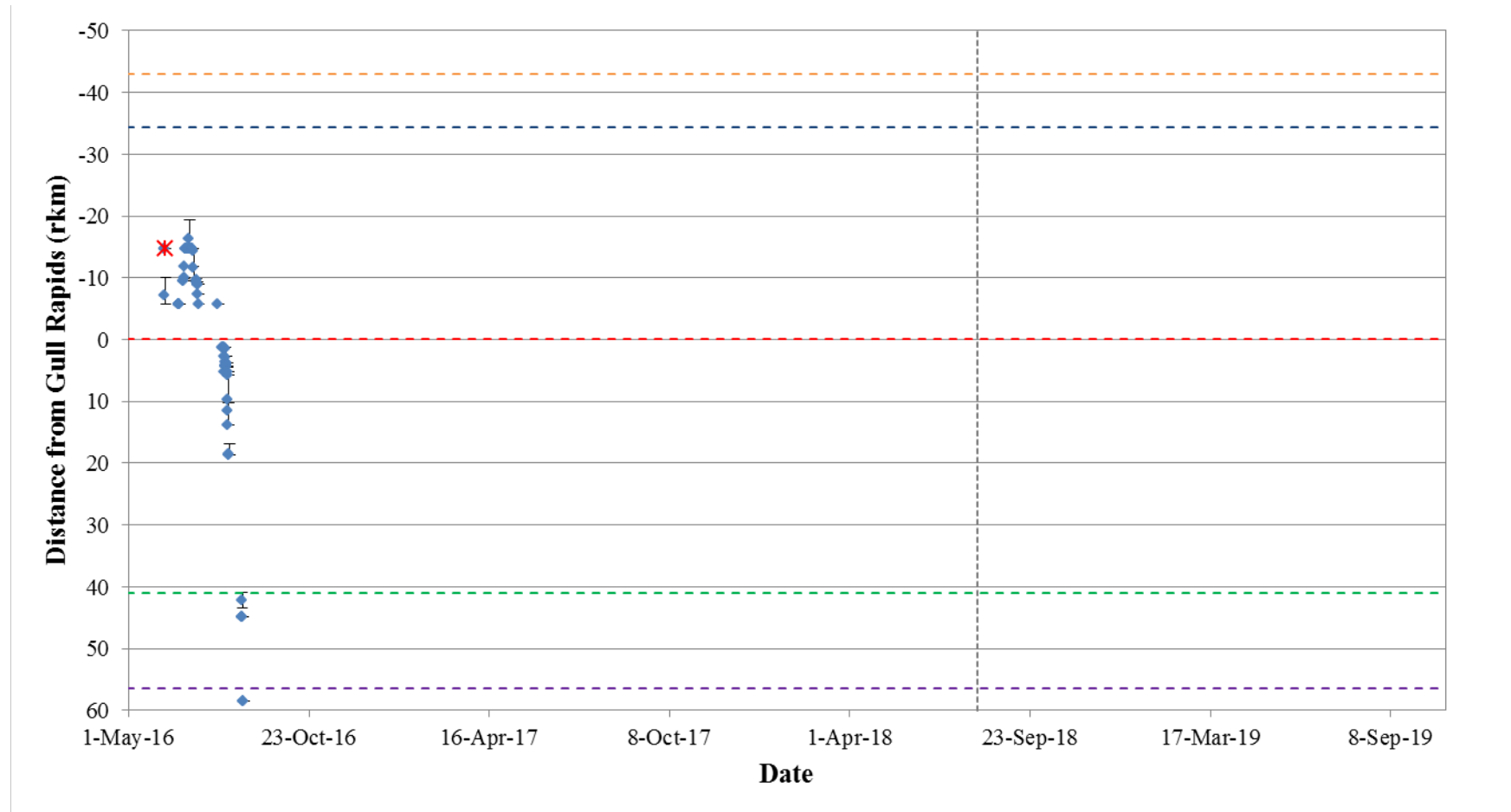


Figure A2-12: Position of a Walleye tagged with an acoustic transmitter (code #53771) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

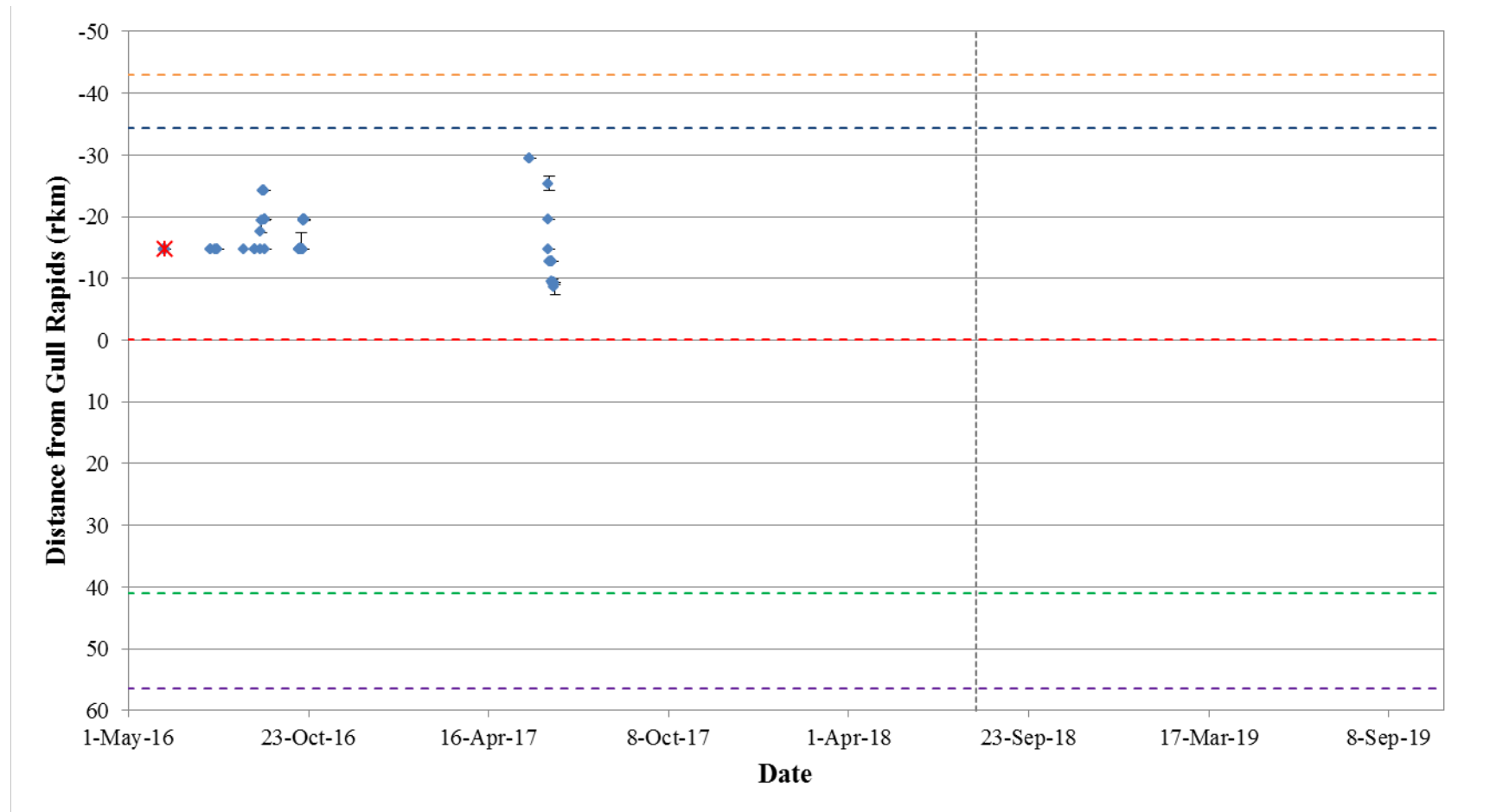


Figure A2-13: Position of a Walleye tagged with an acoustic transmitter (code #53772) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

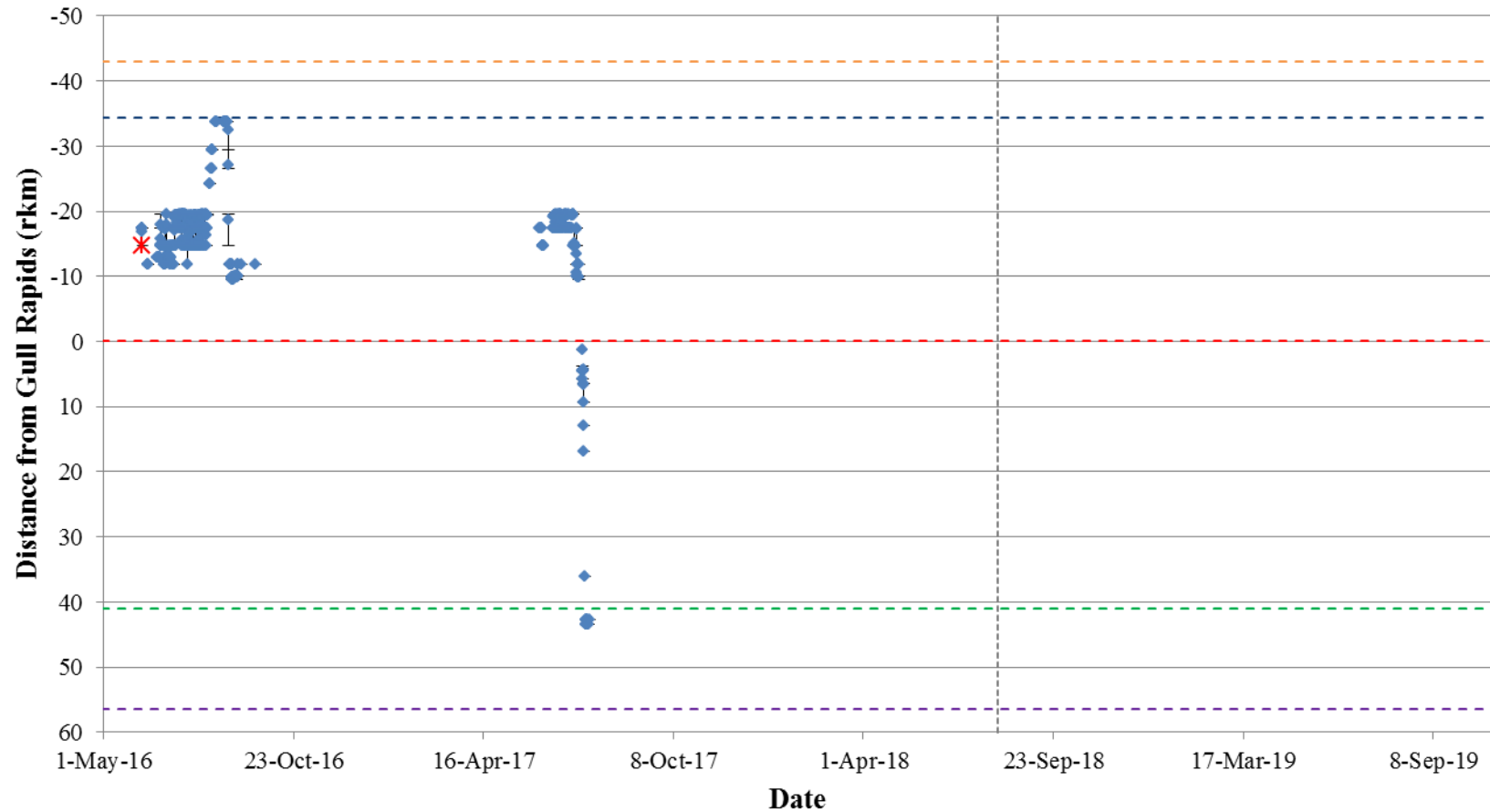


Figure A2-14: Position of a Walleye tagged with an acoustic transmitter (code #53773) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

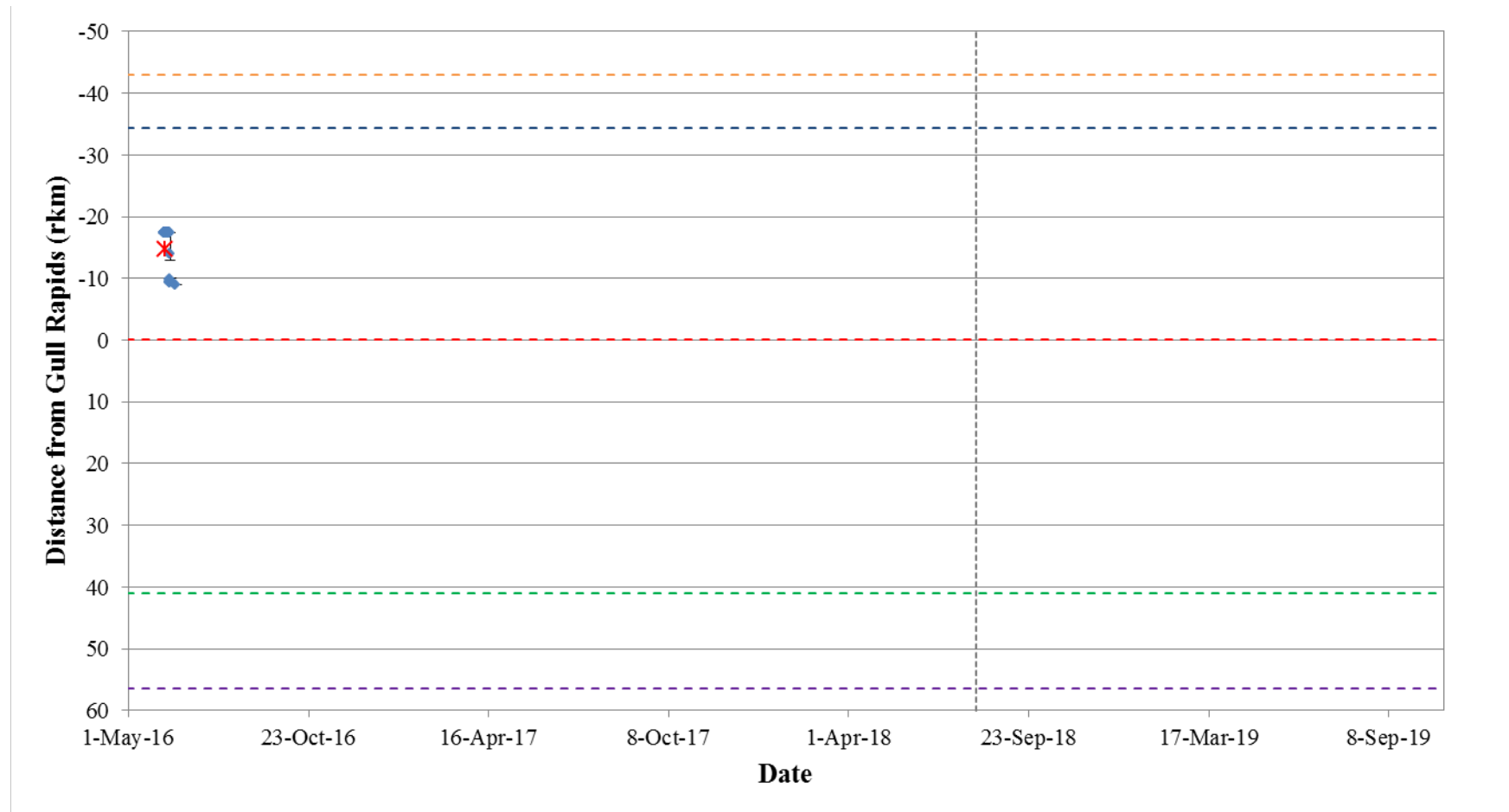


Figure A2-15: Position of a Walleye tagged with an acoustic transmitter (code #53774) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

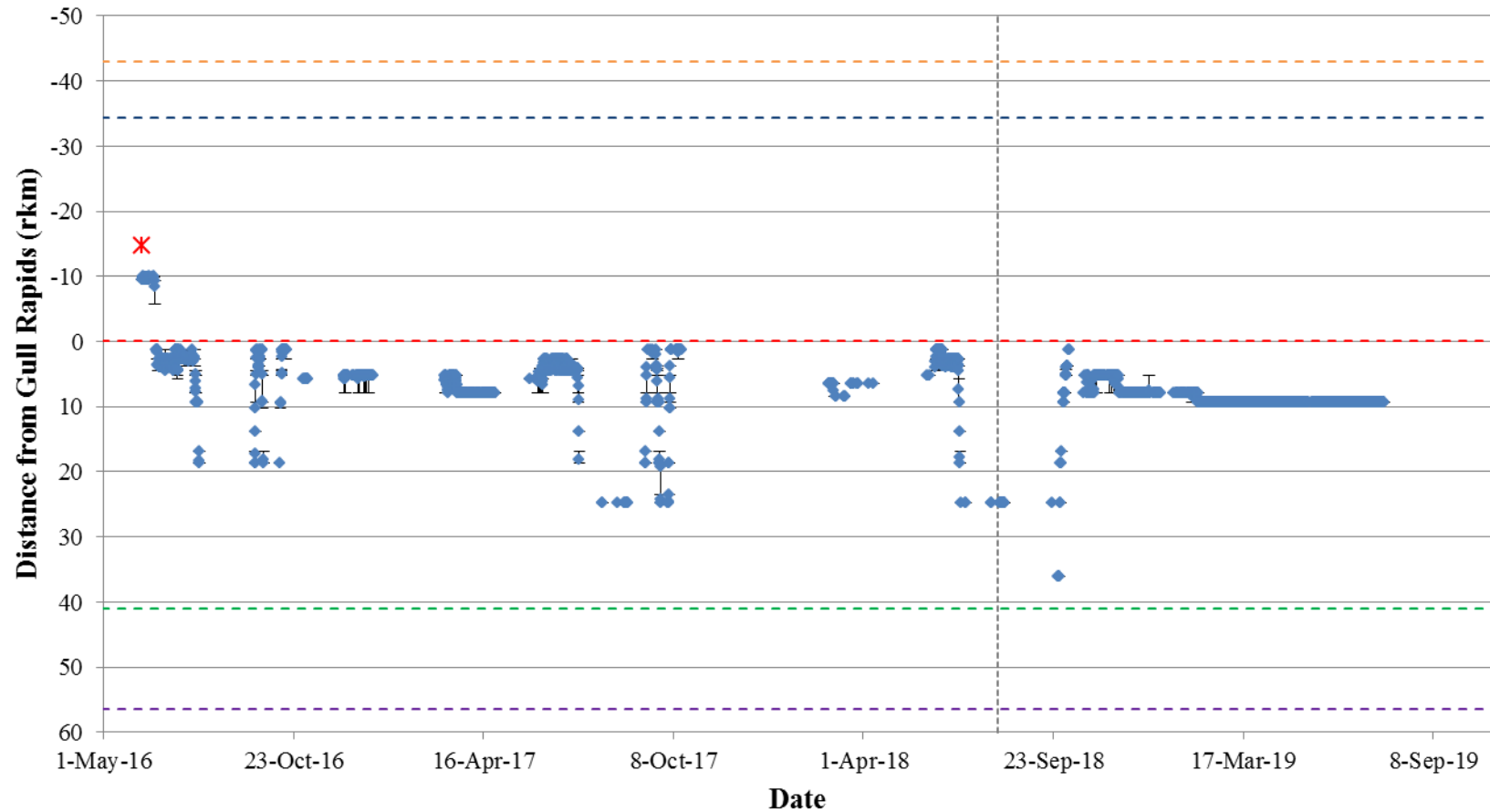


Figure A2-16: Position of a Walleye tagged with an acoustic transmitter (code #53775) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

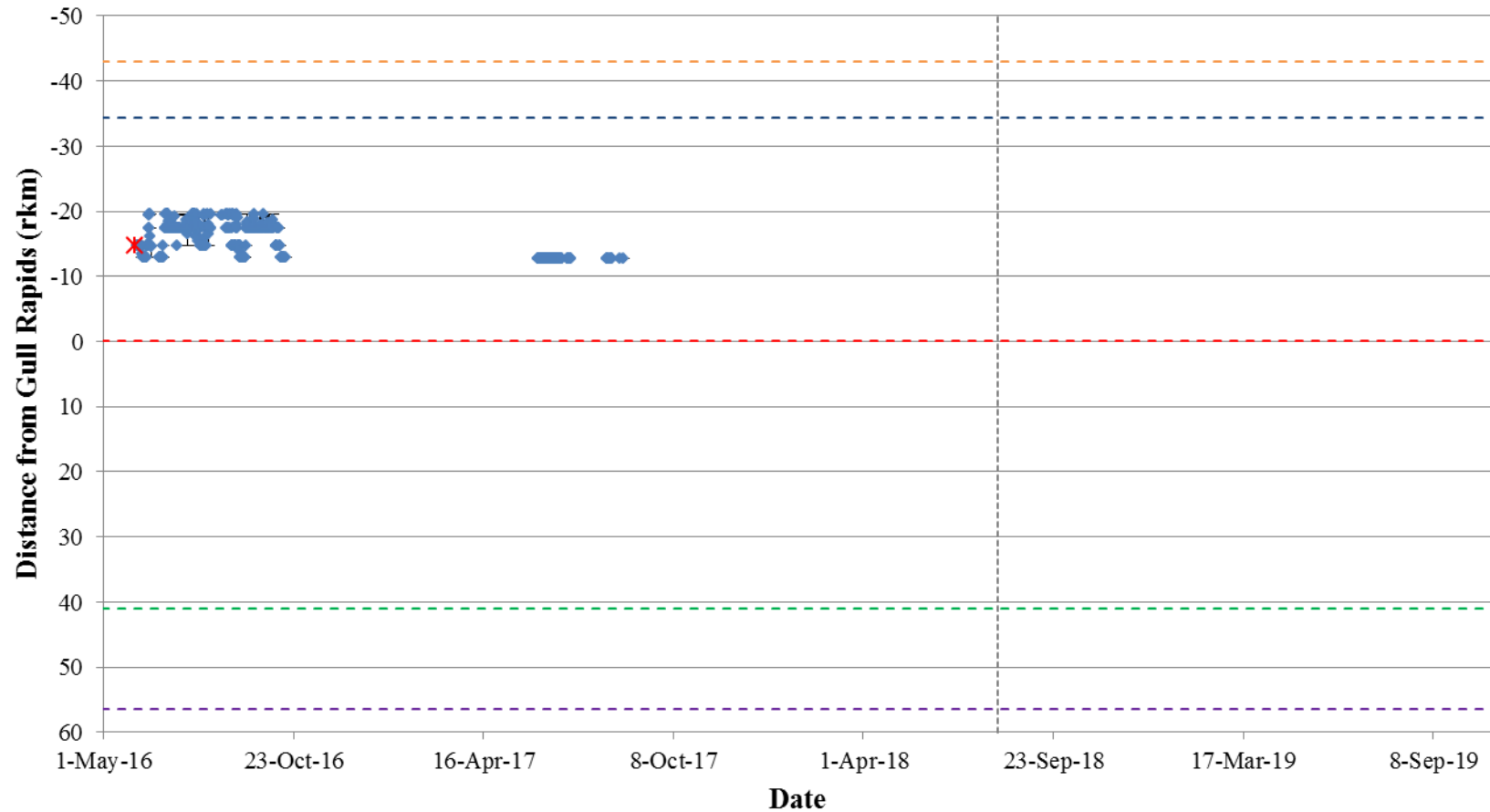


Figure A2-17: Position of a Walleye tagged with an acoustic transmitter (code #53776) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

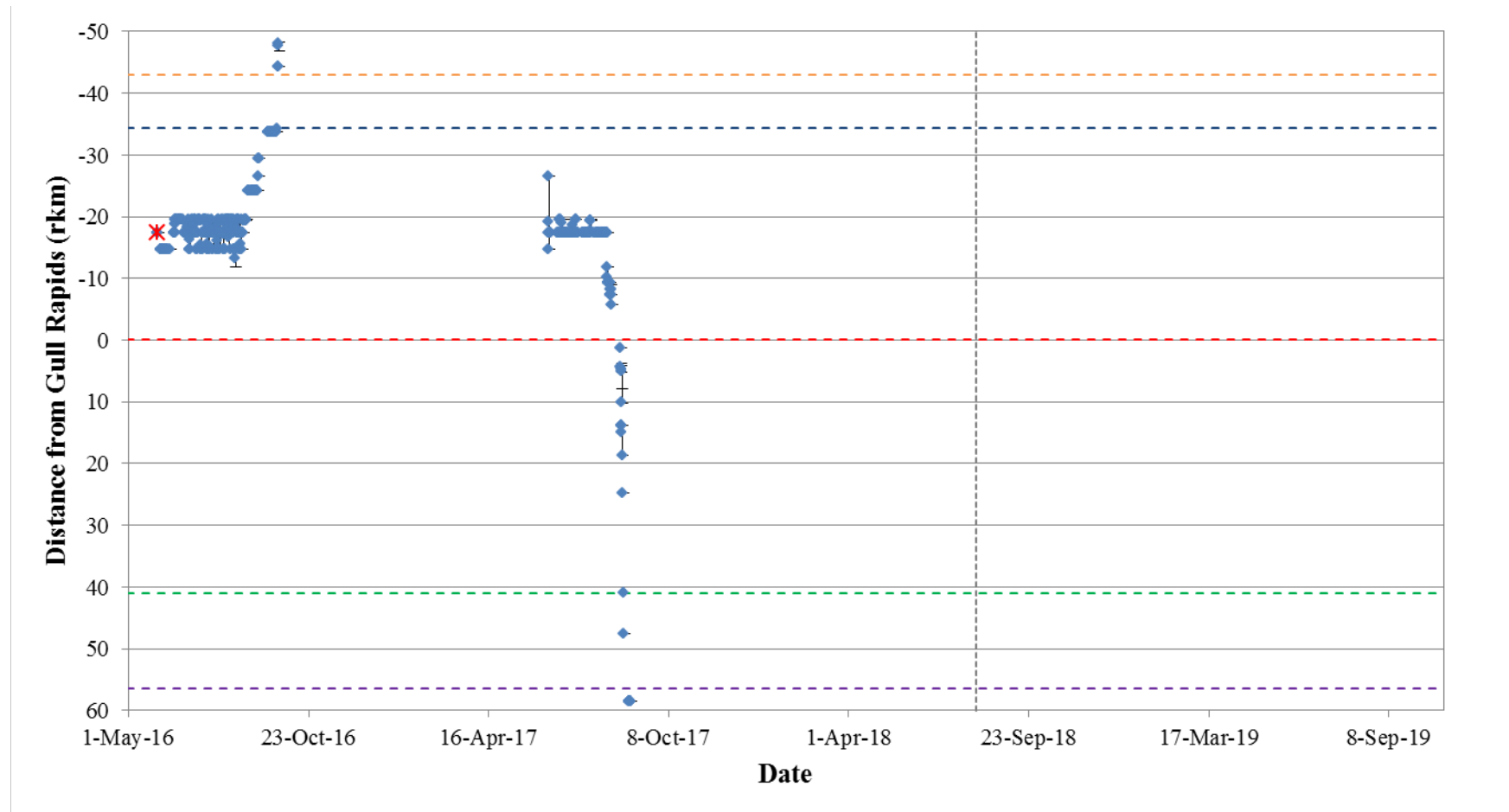


Figure A2-18: Position of a Walleye tagged with an acoustic transmitter (code #53777) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

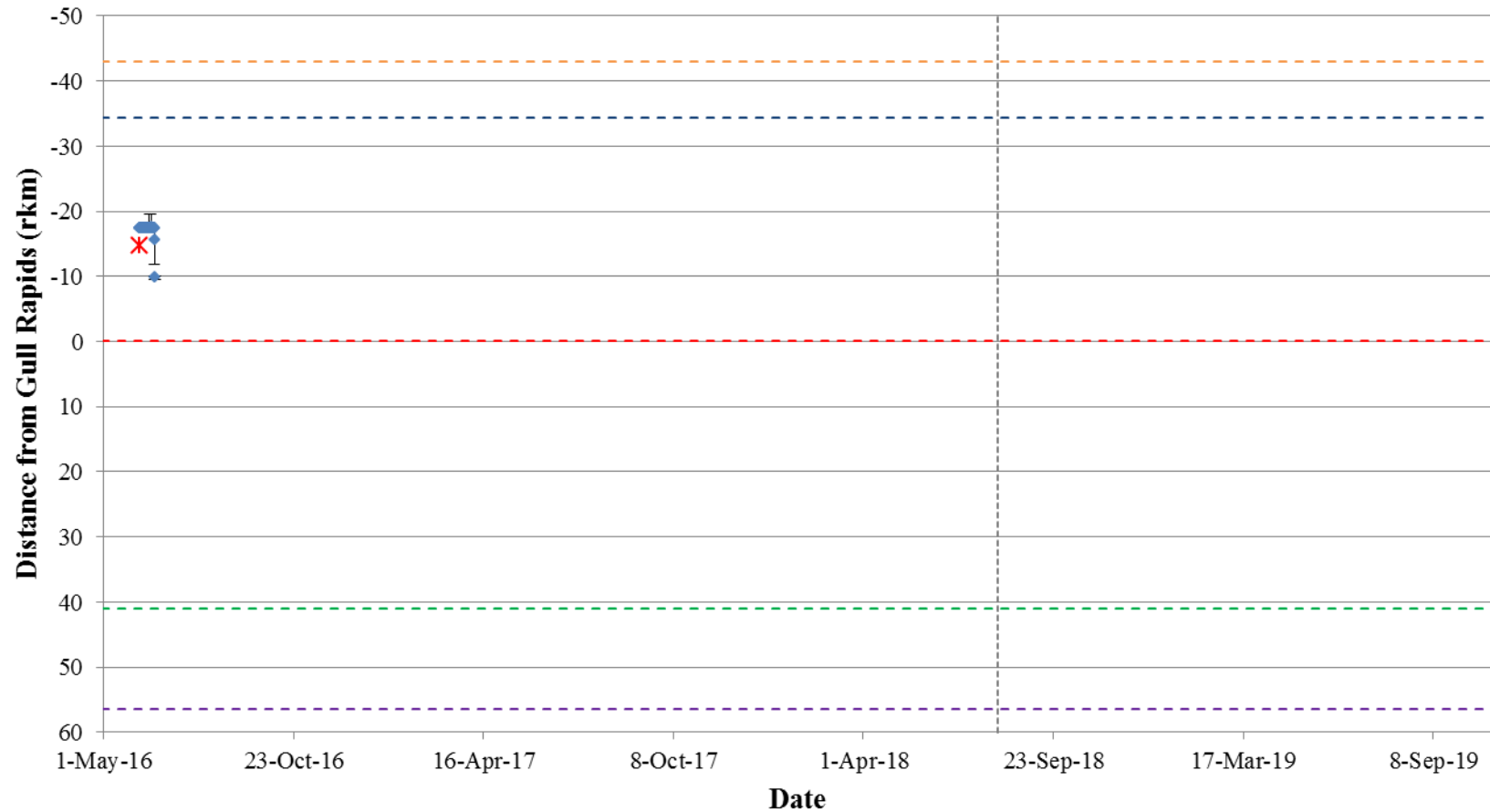


Figure A2-19: Position of a Walleye tagged with an acoustic transmitter (code #53778) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

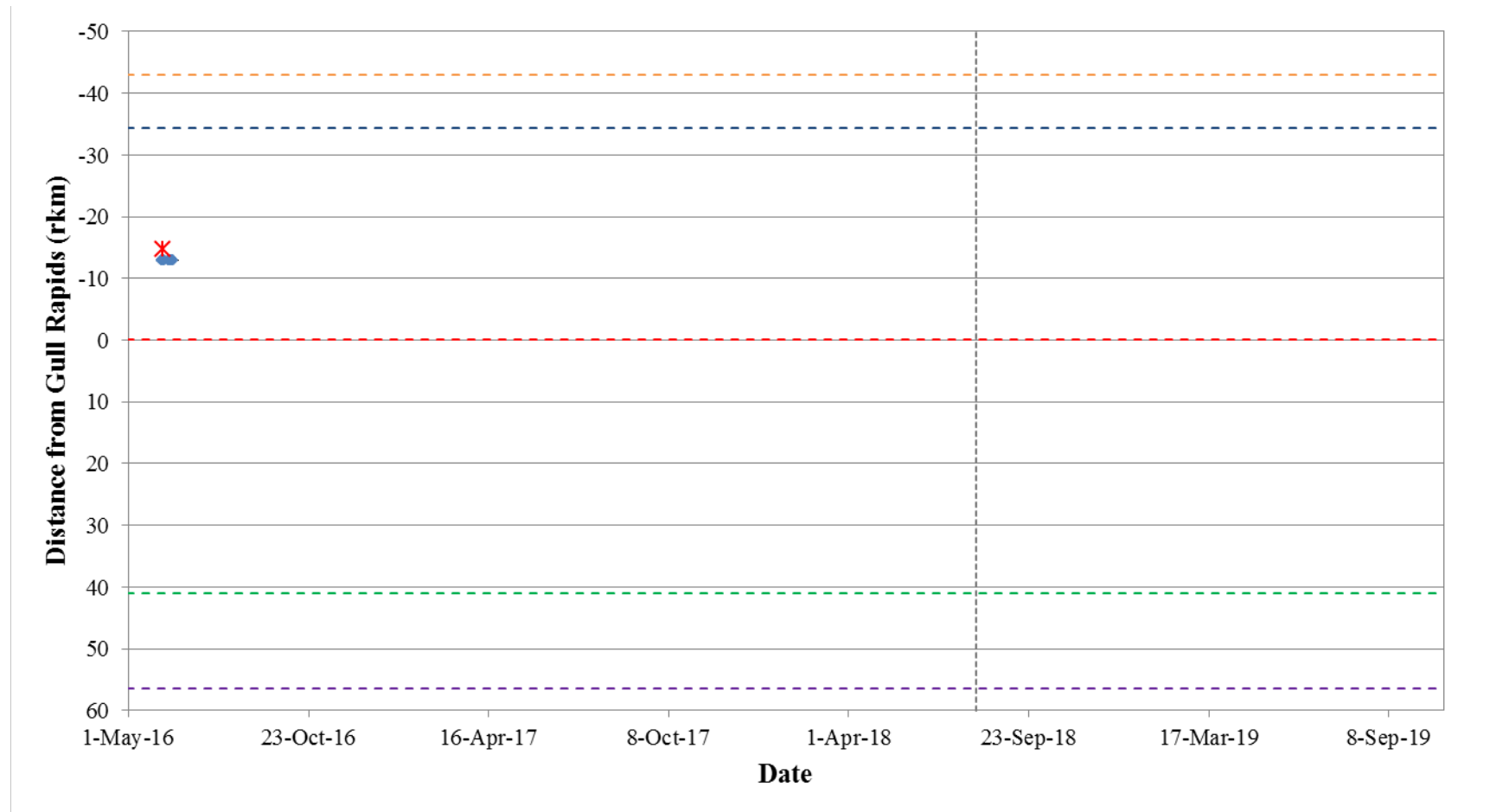


Figure A2-20: Position of a Walleye tagged with an acoustic transmitter (code #53779) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

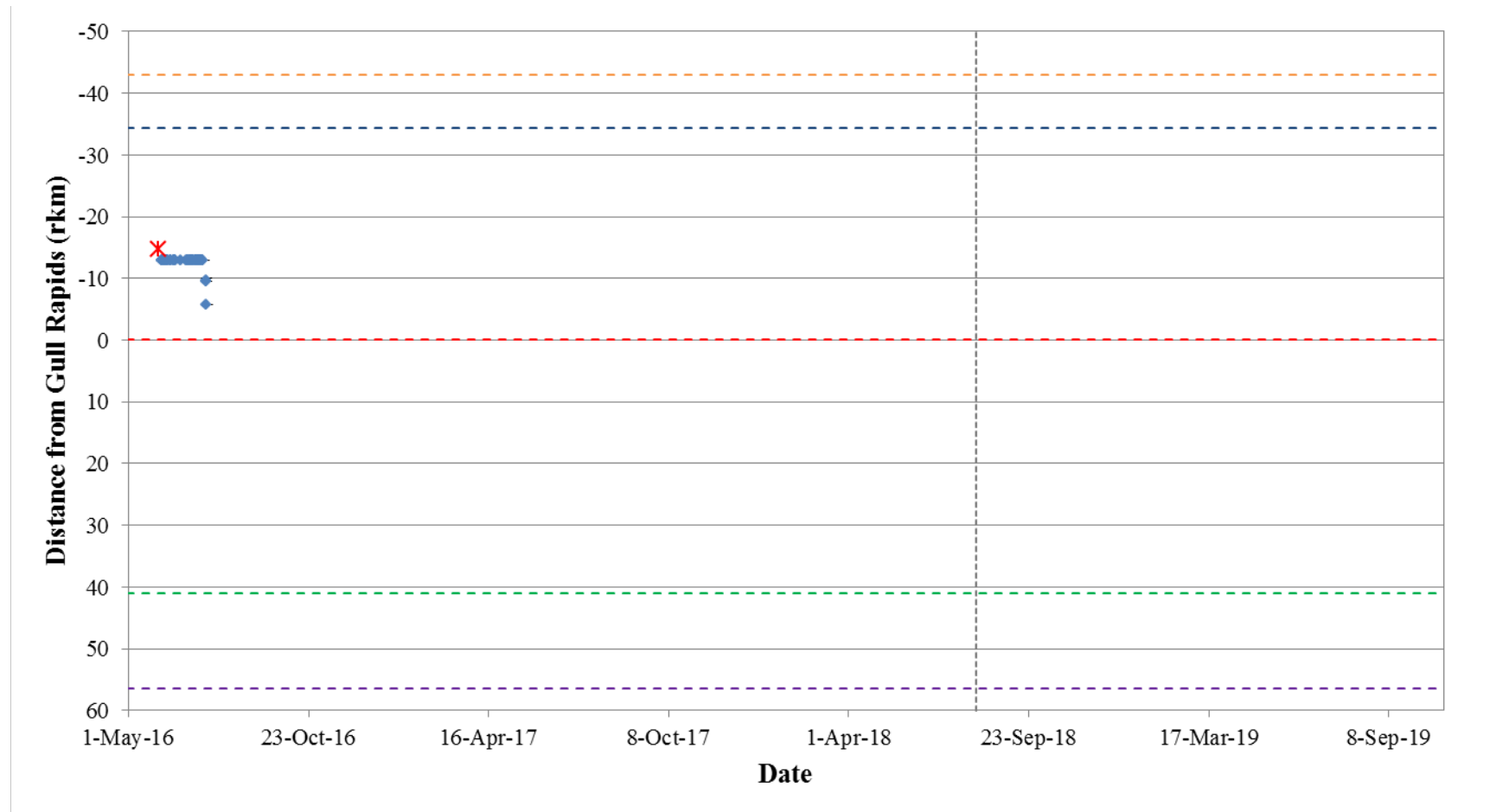


Figure A2-21: Position of a Walleye tagged with an acoustic transmitter (code #53780) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

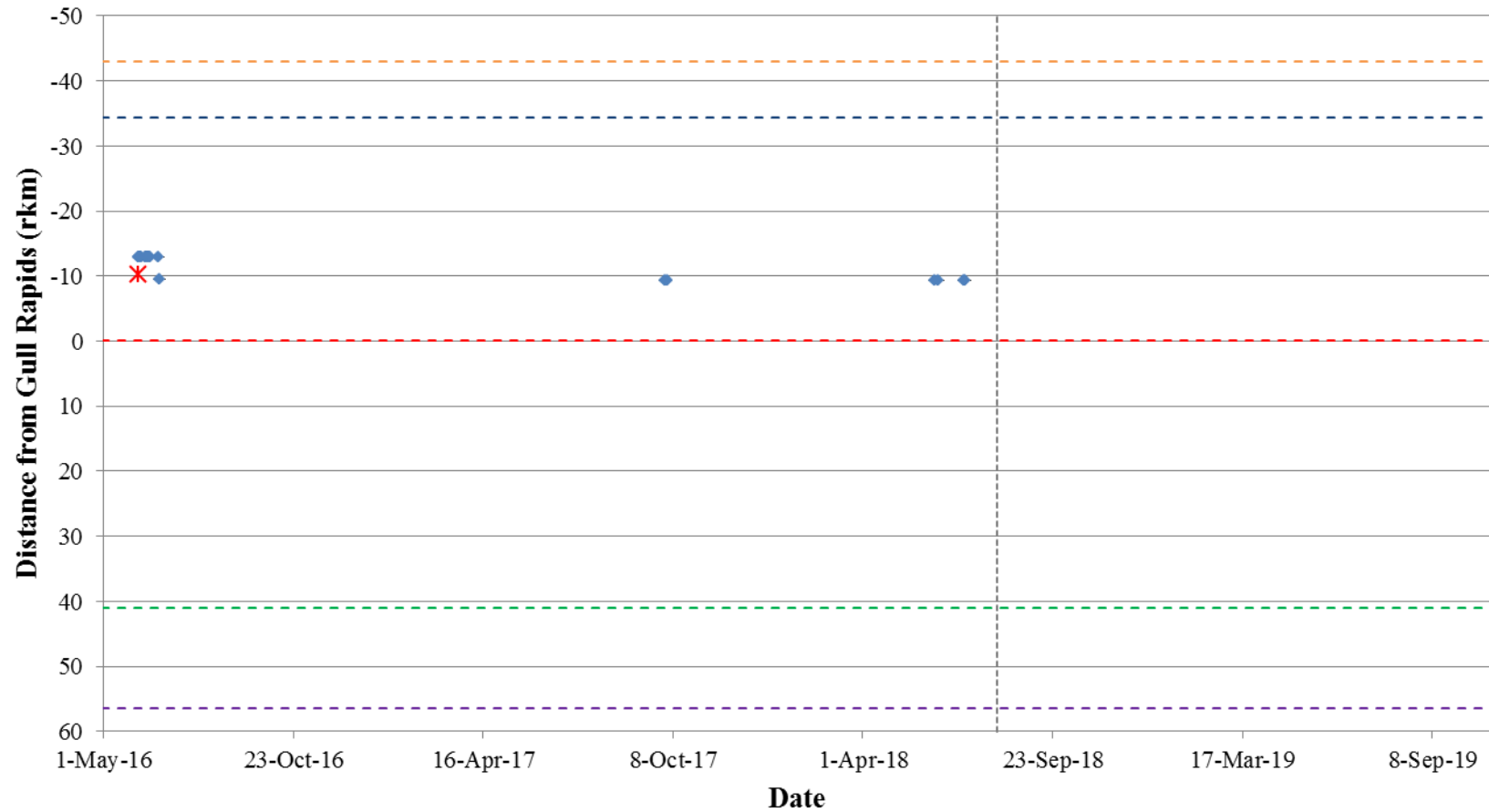


Figure A2-22: Position of a Walleye tagged with an acoustic transmitter (code #53781) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

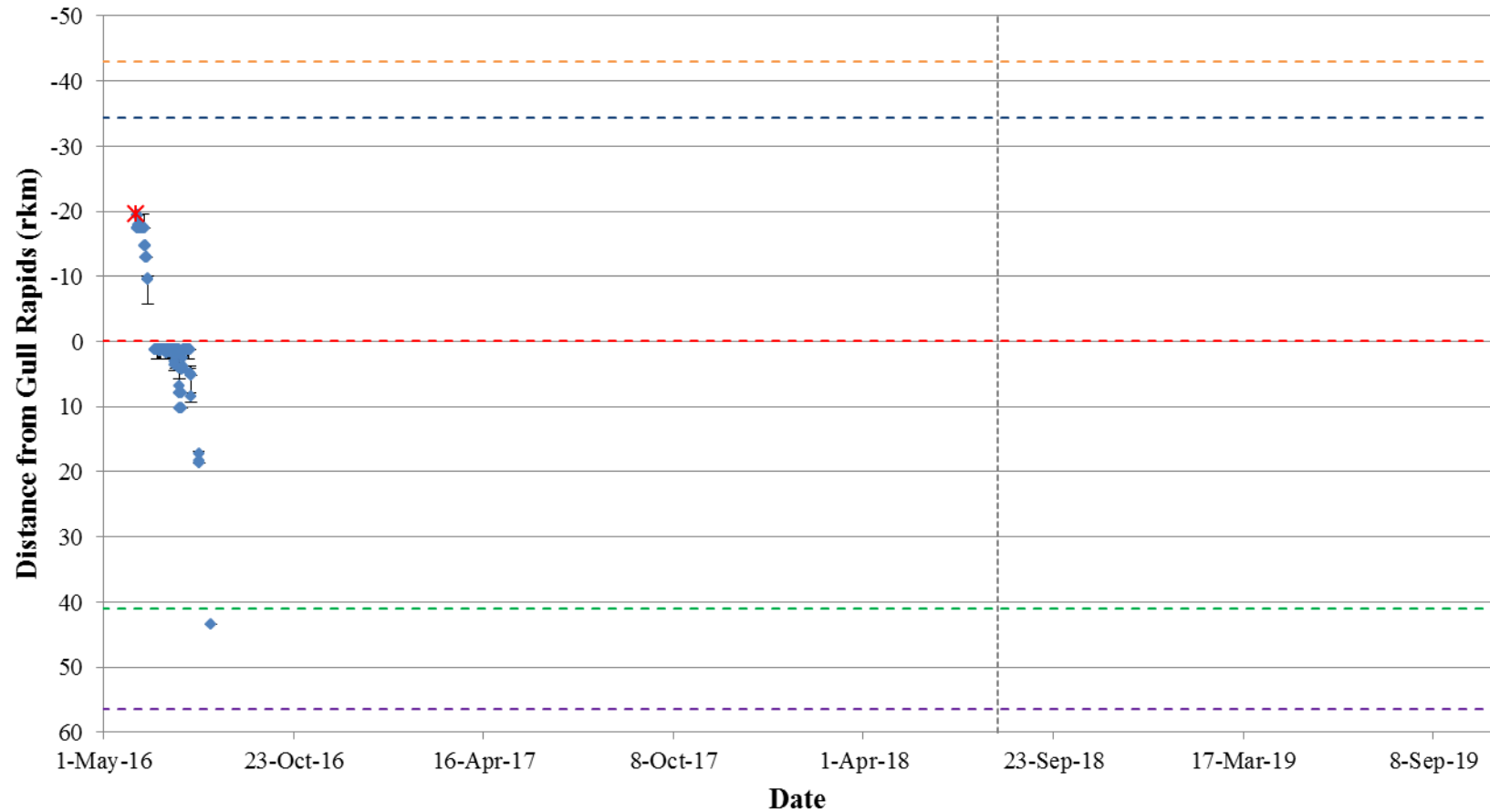


Figure A2-23: Position of a Walleye tagged with an acoustic transmitter (code #53782) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

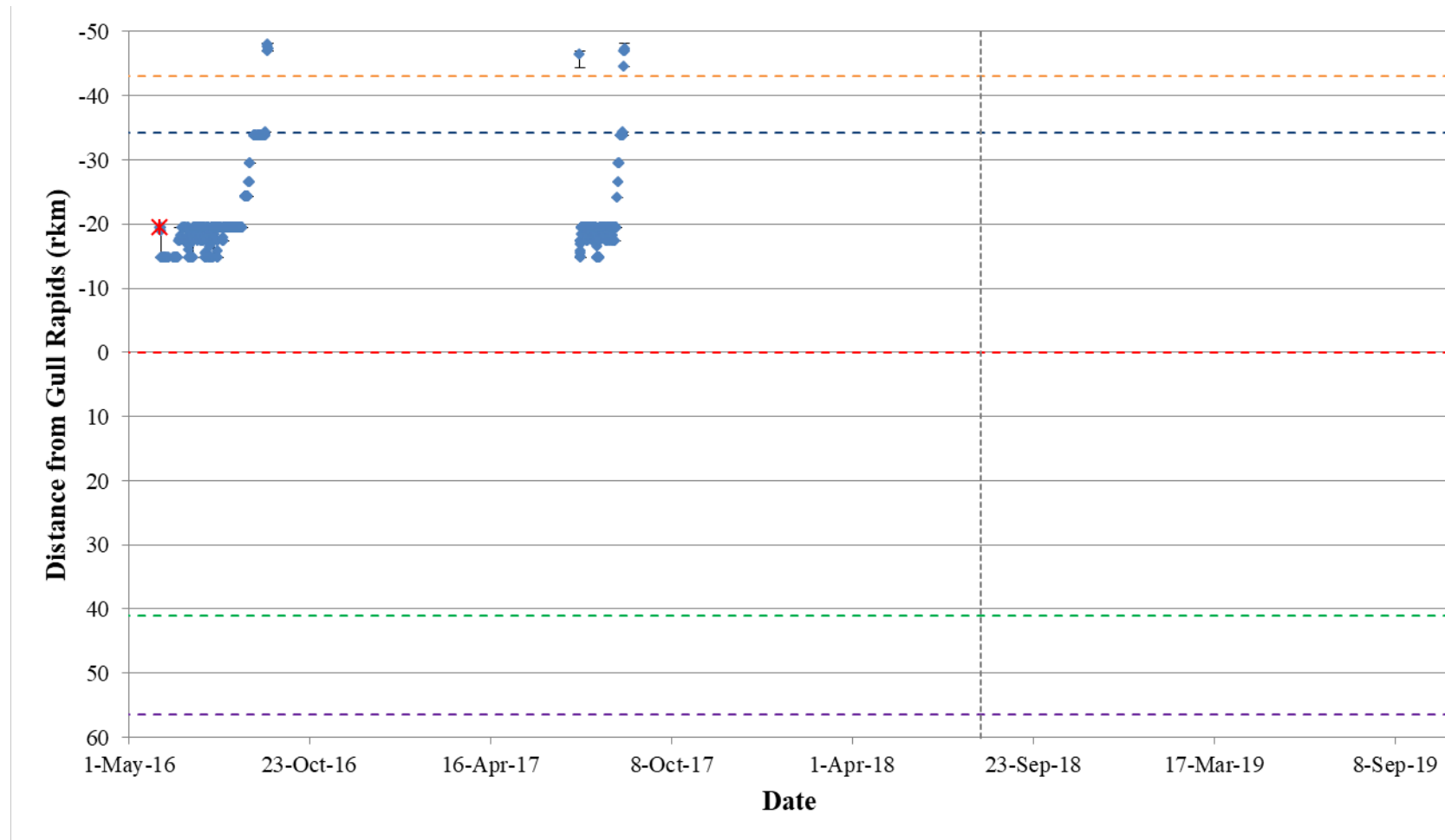


Figure A2-24: Position of a Walleye tagged with an acoustic transmitter (code #53783) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

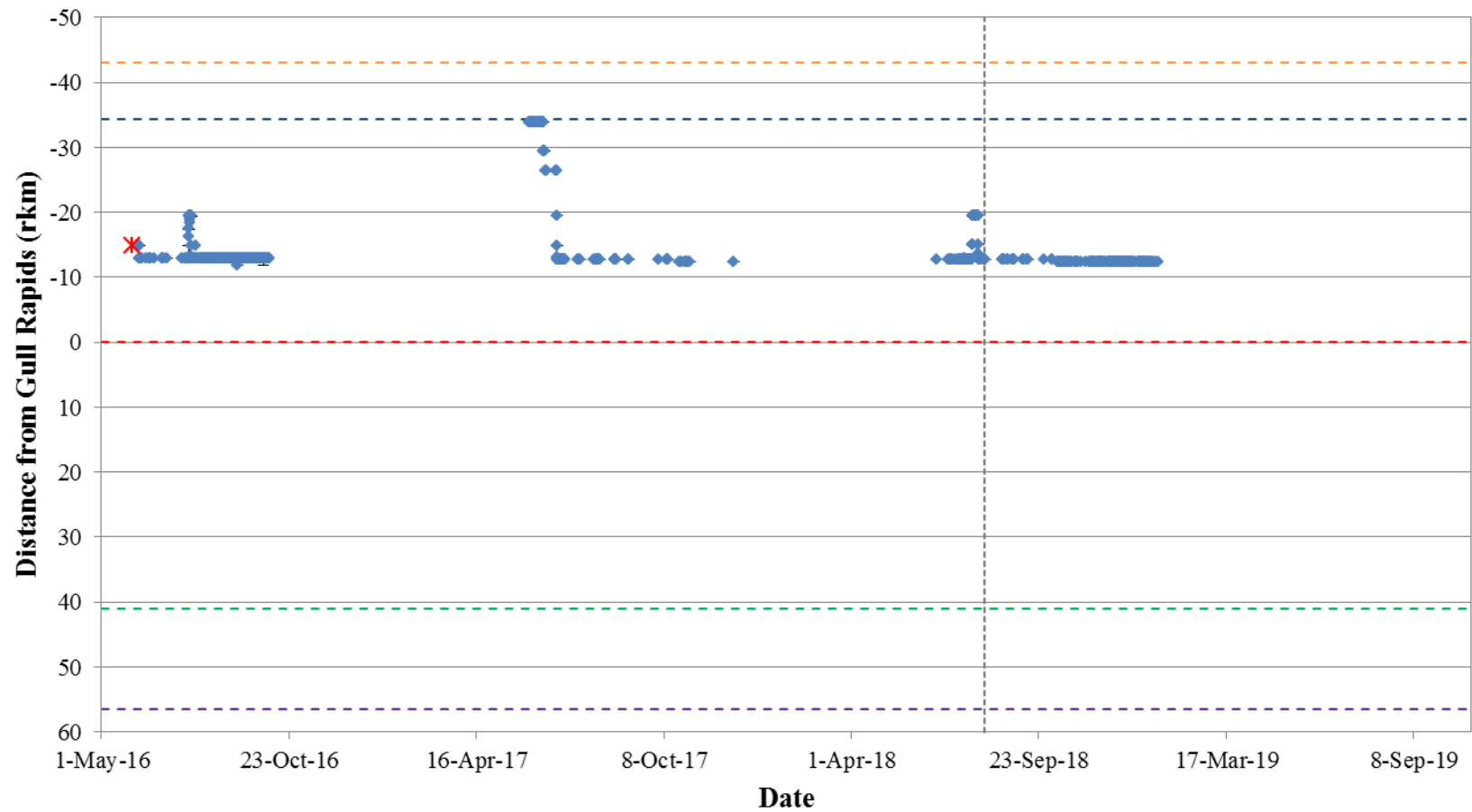


Figure A2-25: Position of a Walleye tagged with an acoustic transmitter (code #53784) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

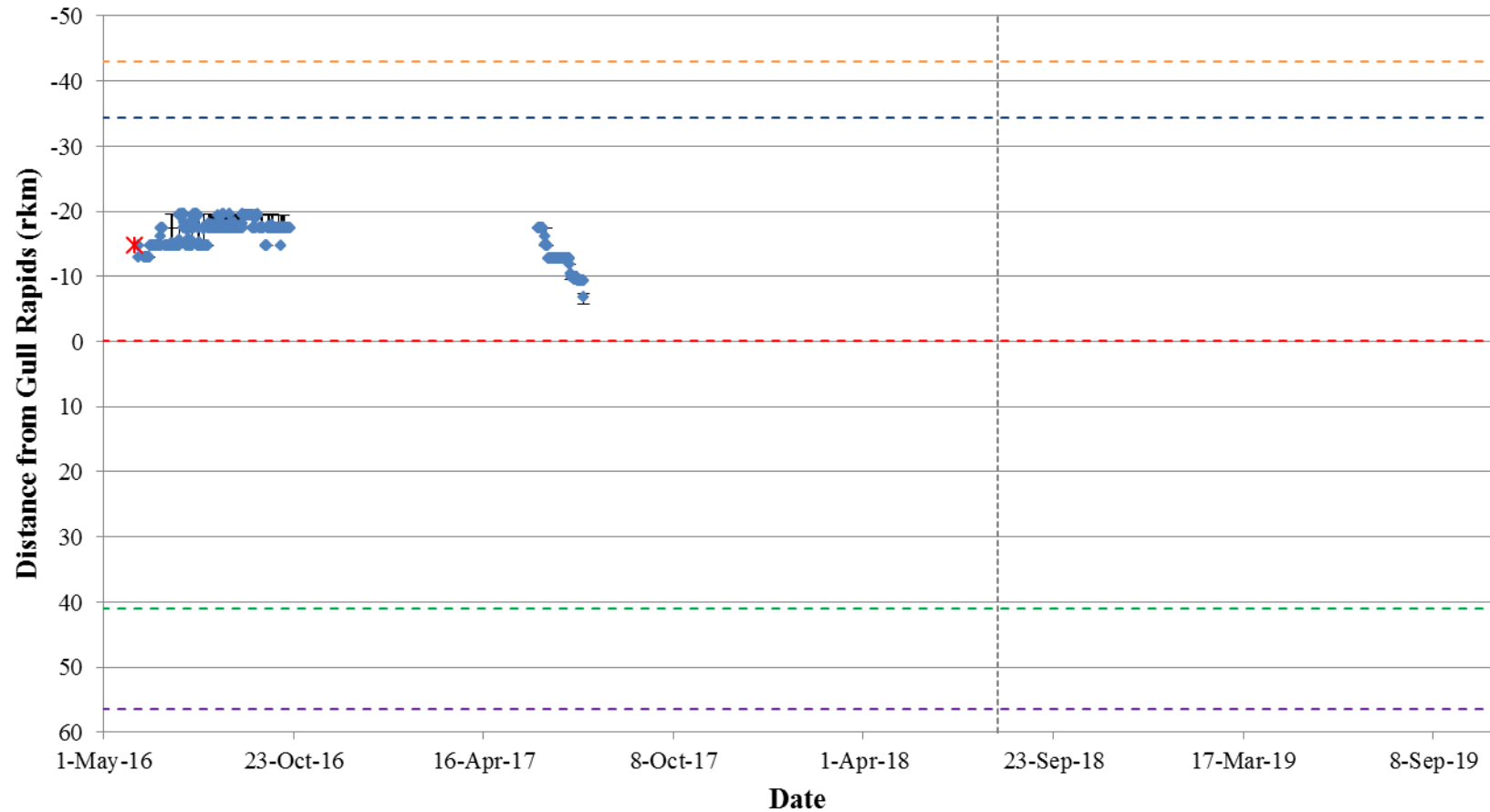


Figure A2-26: Position of a Walleye tagged with an acoustic transmitter (code #53785) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

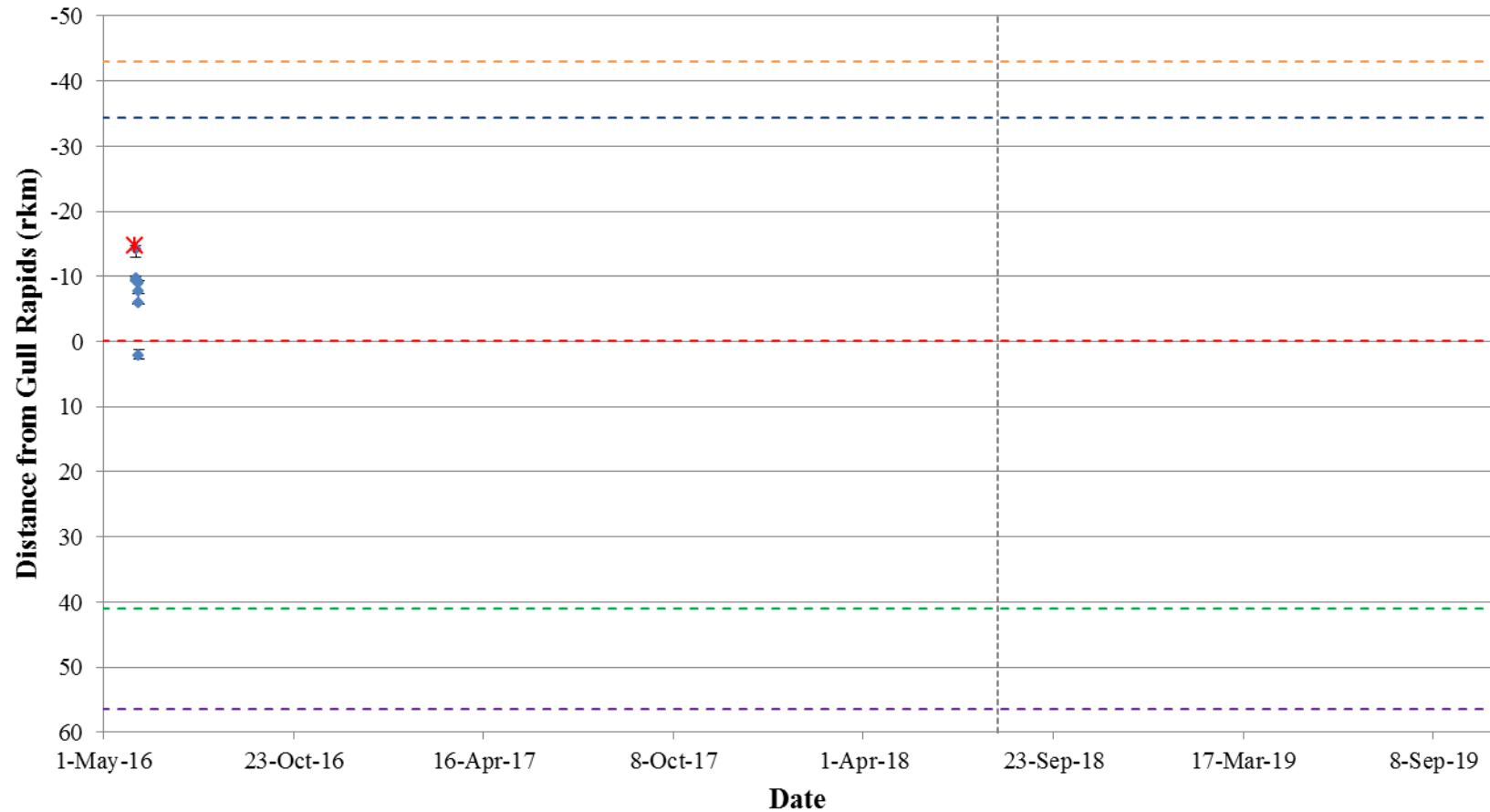


Figure A2-27: Position of a Walleye tagged with an acoustic transmitter (code #53786) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

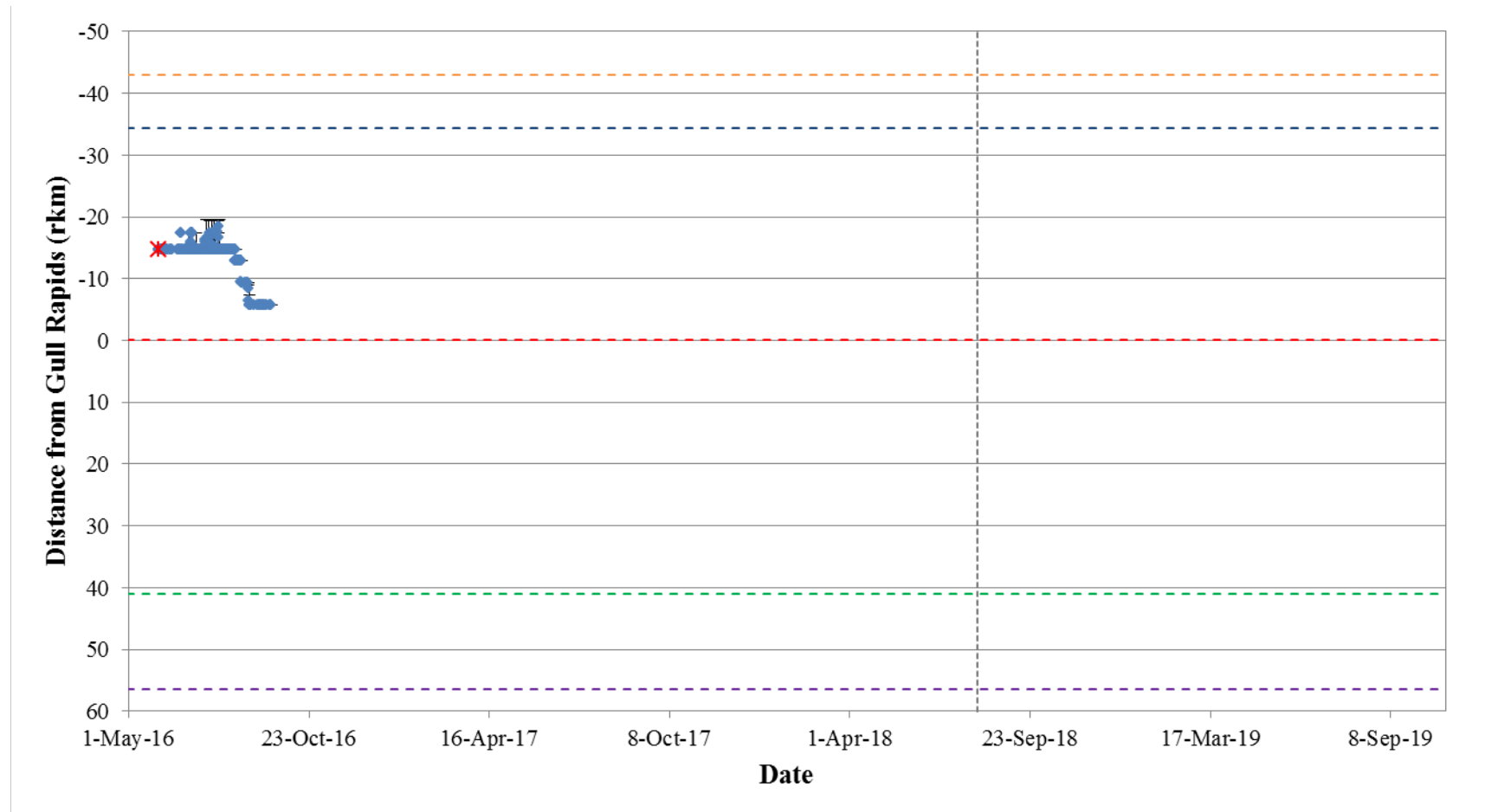


Figure A2-28: Position of a Walleye tagged with an acoustic transmitter (code #53787) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

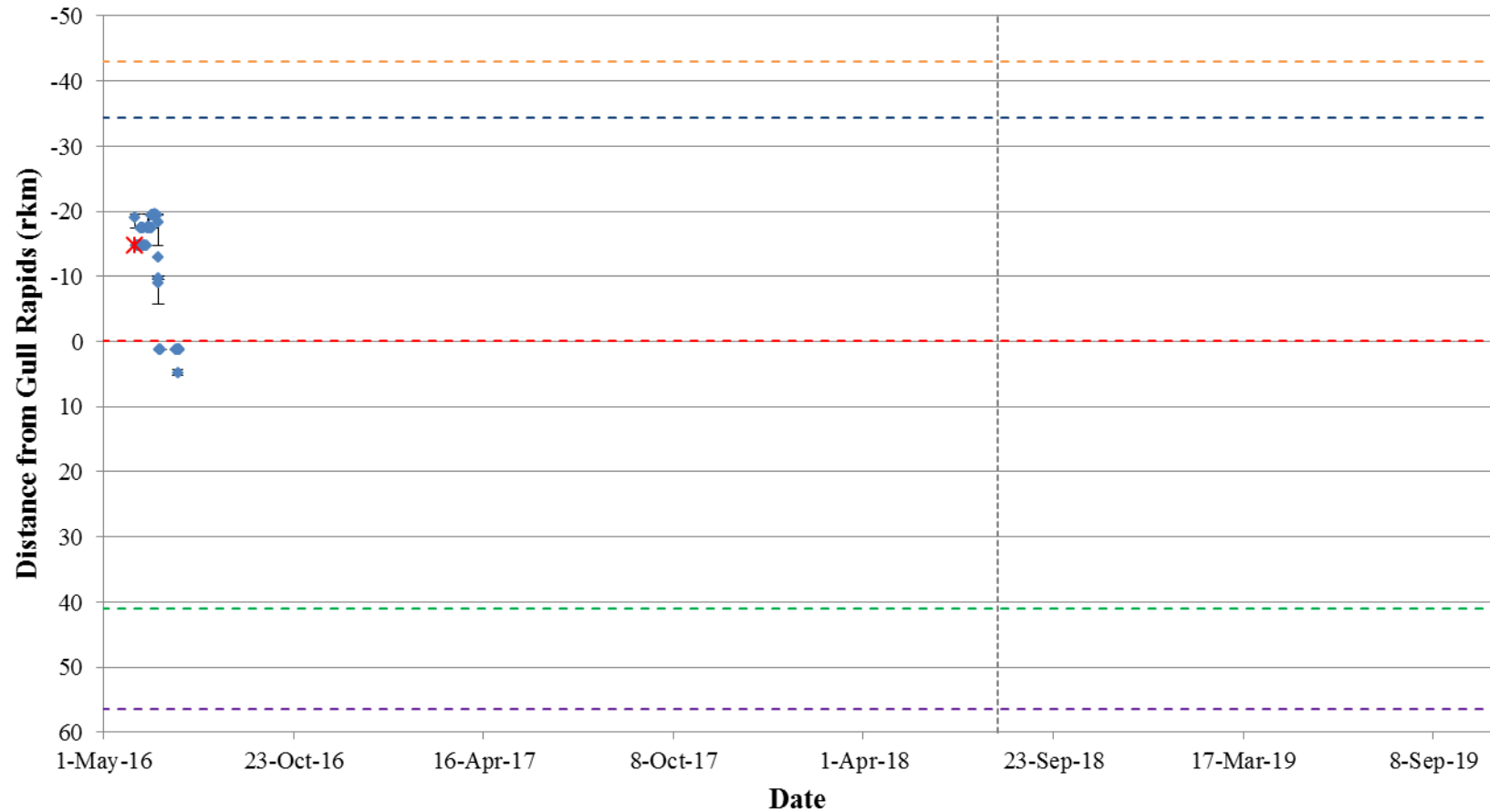


Figure A2-29: Position of a Walleye tagged with an acoustic transmitter (code #53788) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

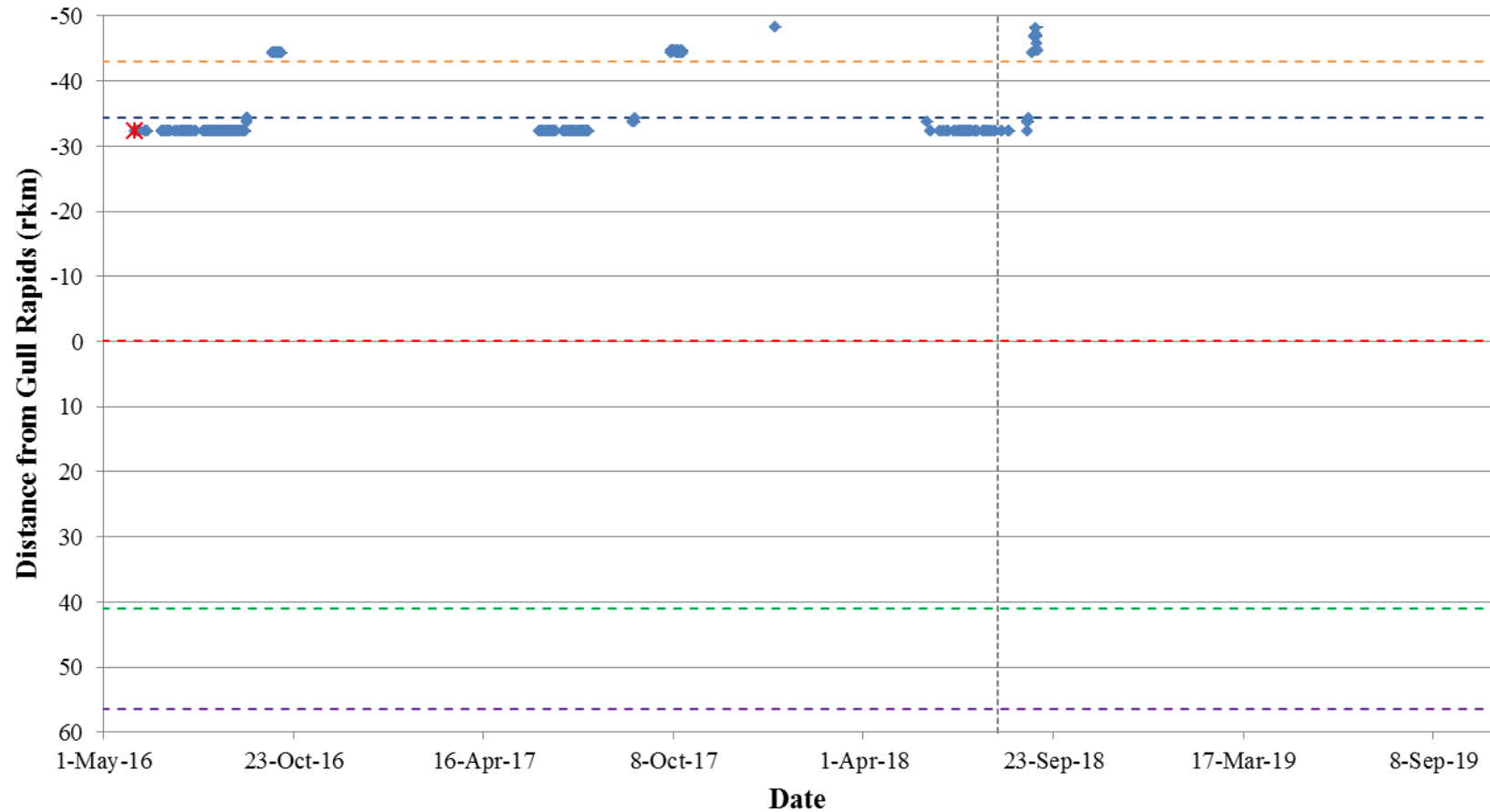


Figure A2-30: Position of a Walleye tagged with an acoustic transmitter (code #53789) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

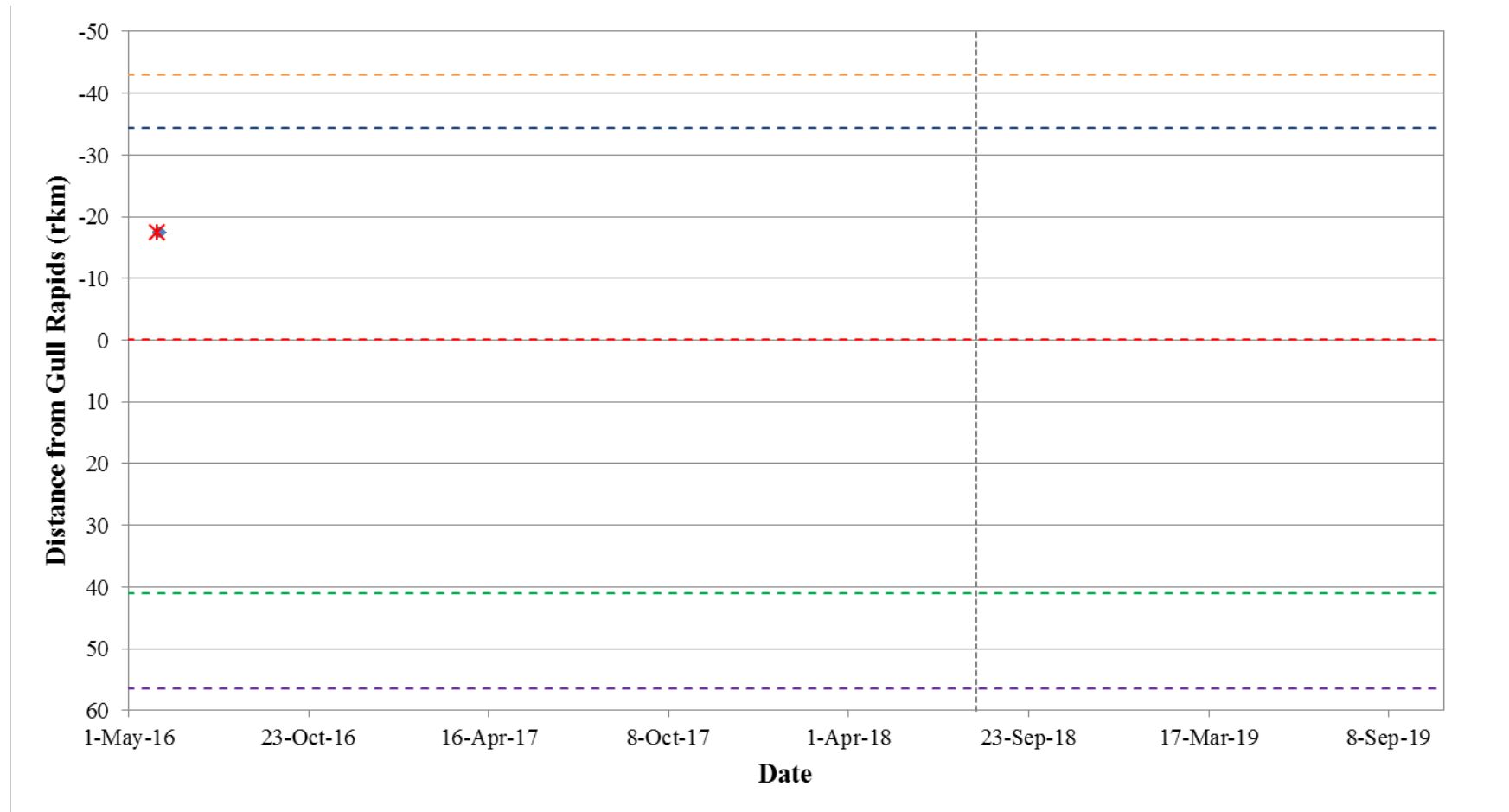


Figure A2-31: Position of a Walleye tagged with an acoustic transmitter (code #53790) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

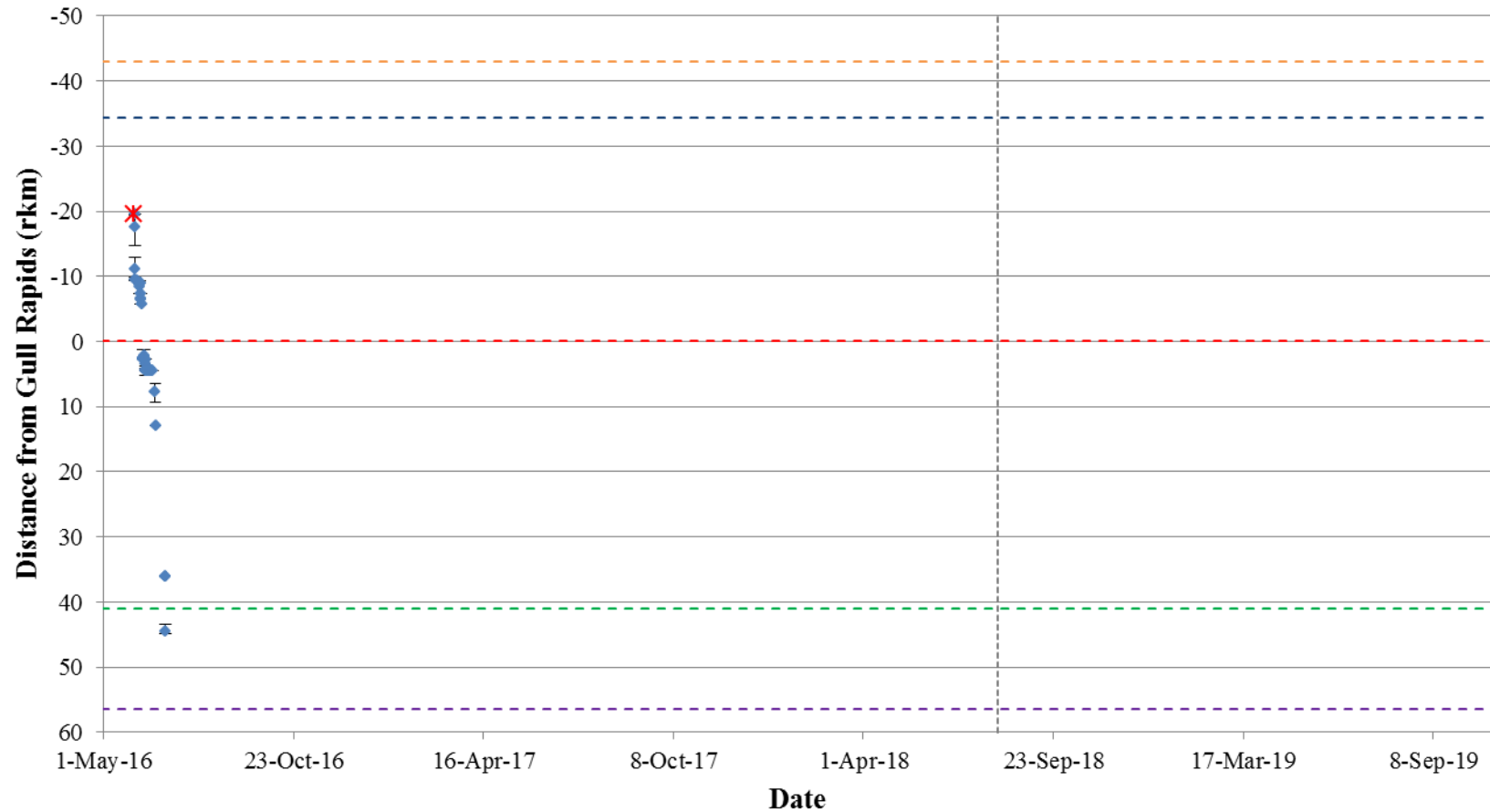


Figure A2-32: Position of a Walleye tagged with an acoustic transmitter (code #53791) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

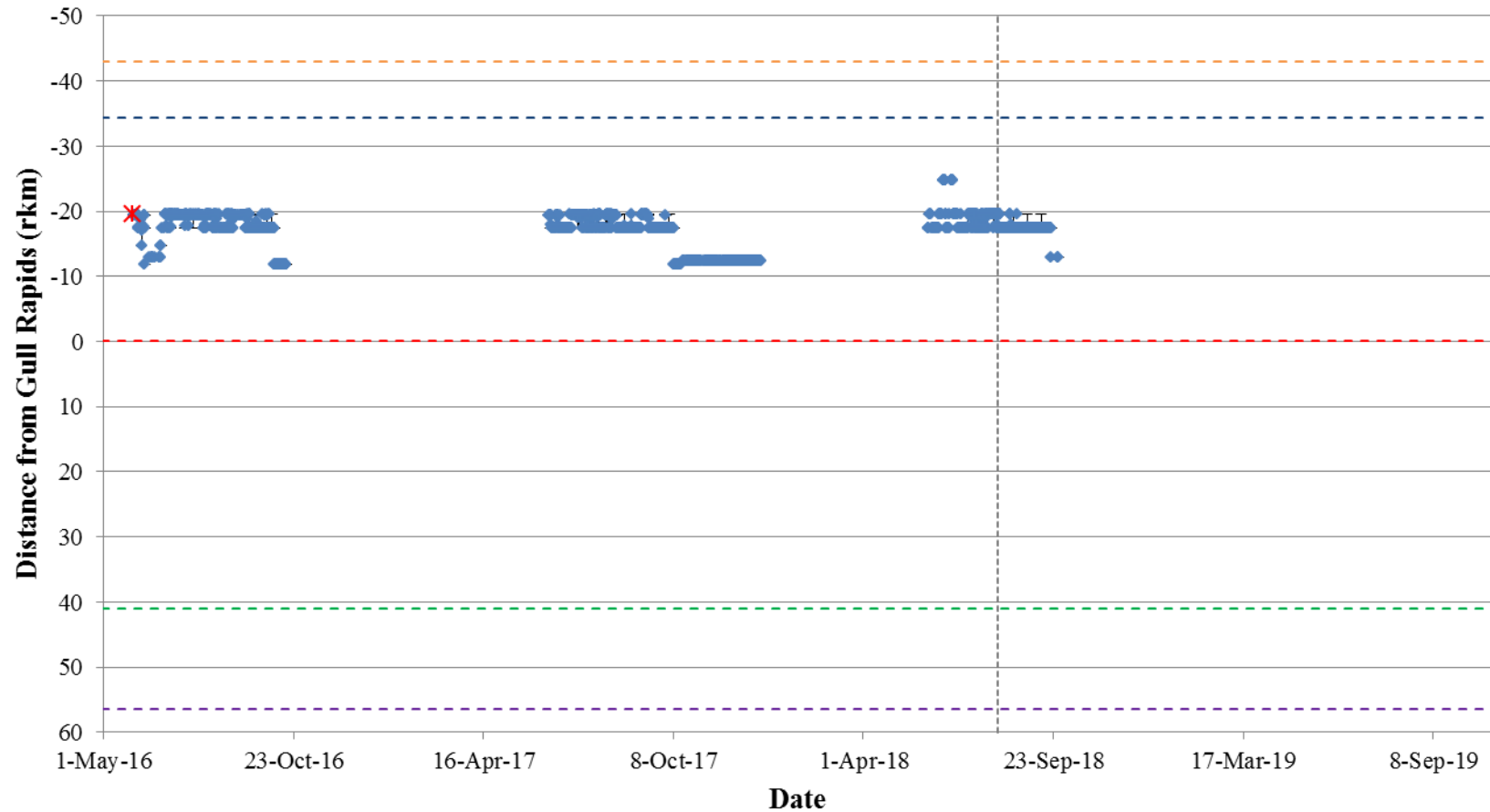


Figure A2-33: Position of a Walleye tagged with an acoustic transmitter (code #53792) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).



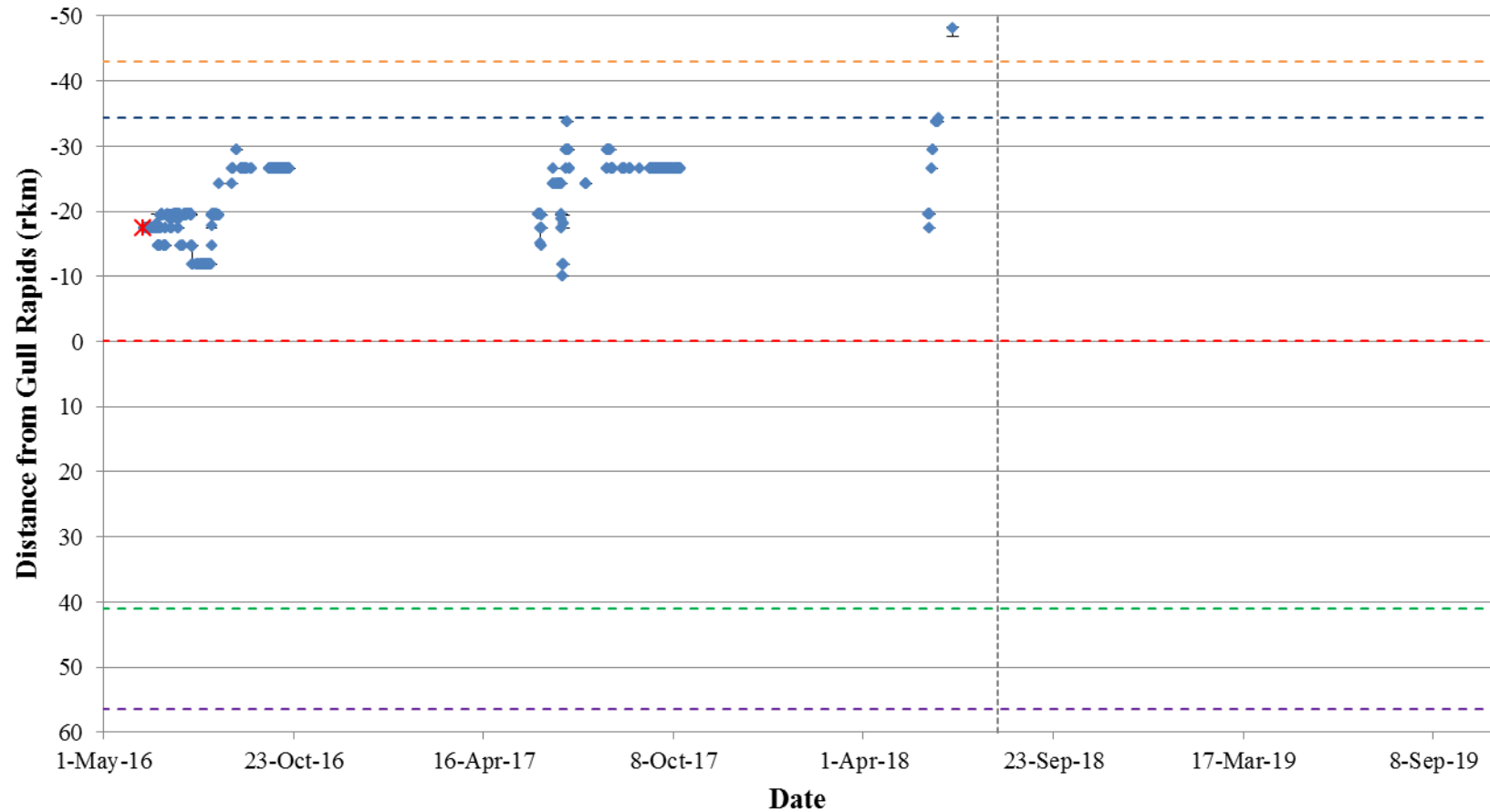


Figure A2-35: Position of a Walleye tagged with an acoustic transmitter (code #53794) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

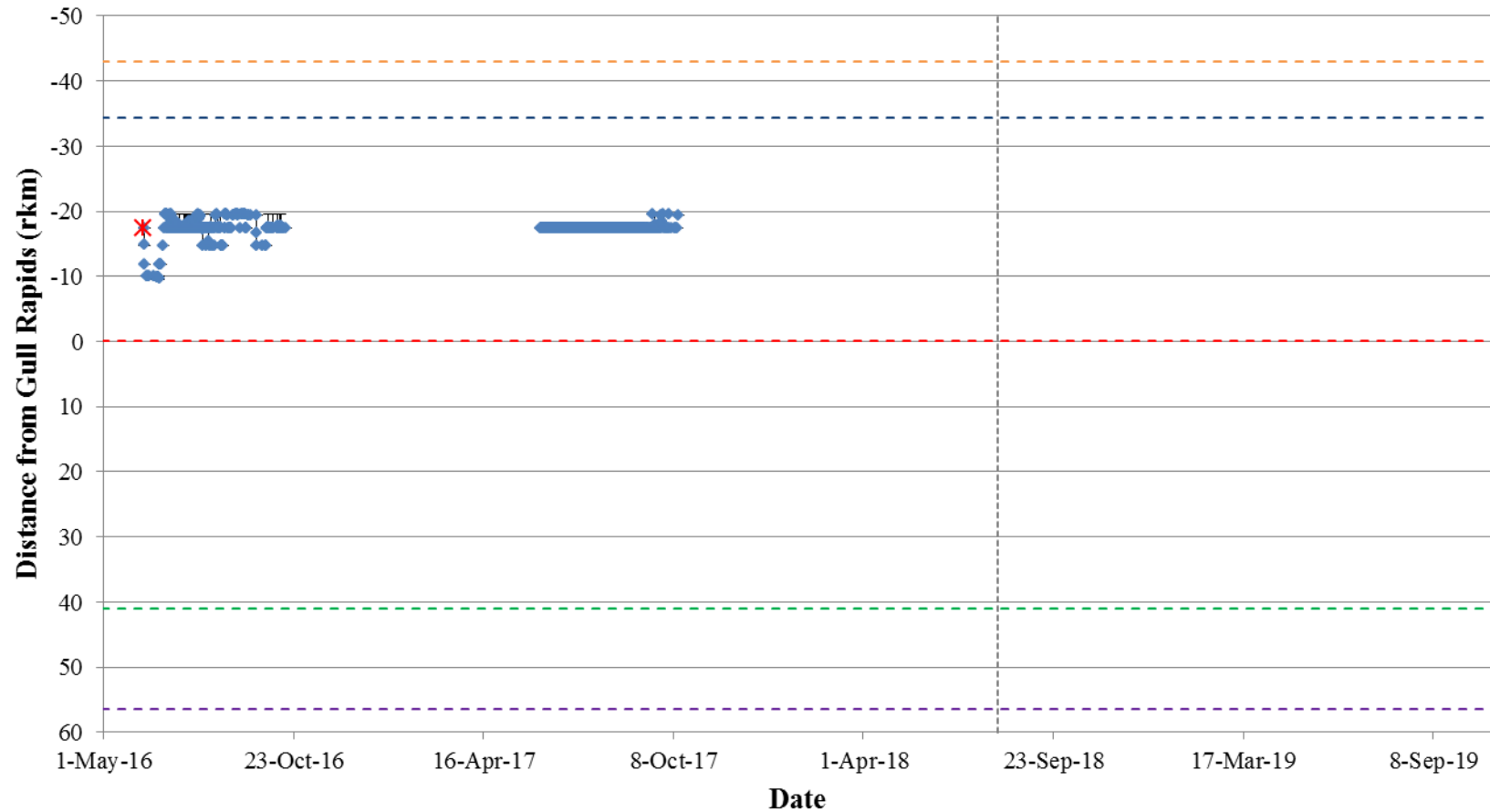


Figure A2-36: Position of a Walleye tagged with an acoustic transmitter (code #53795) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

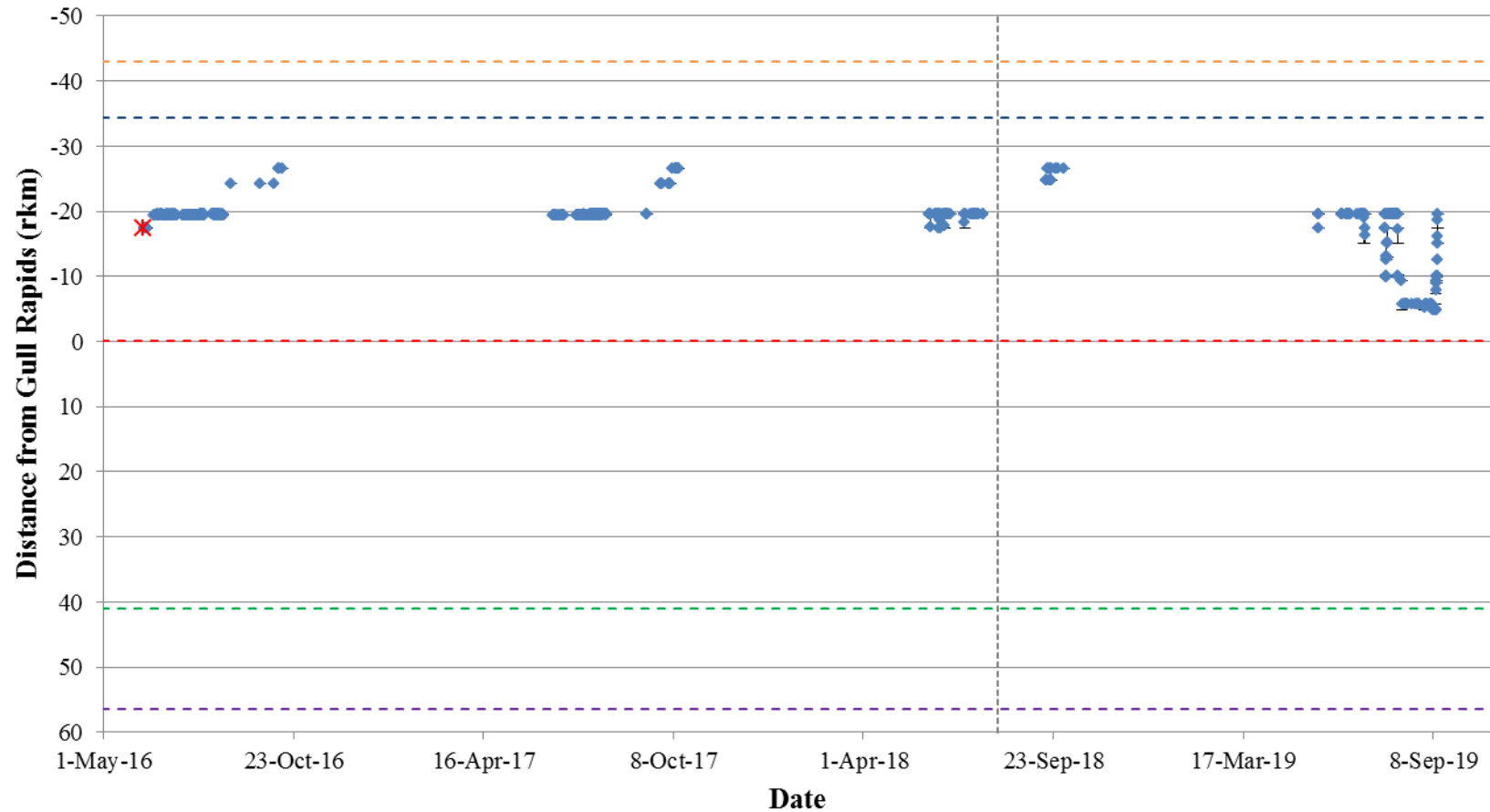


Figure A2-37: Position of a Walleye tagged with an acoustic transmitter (code #53796) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

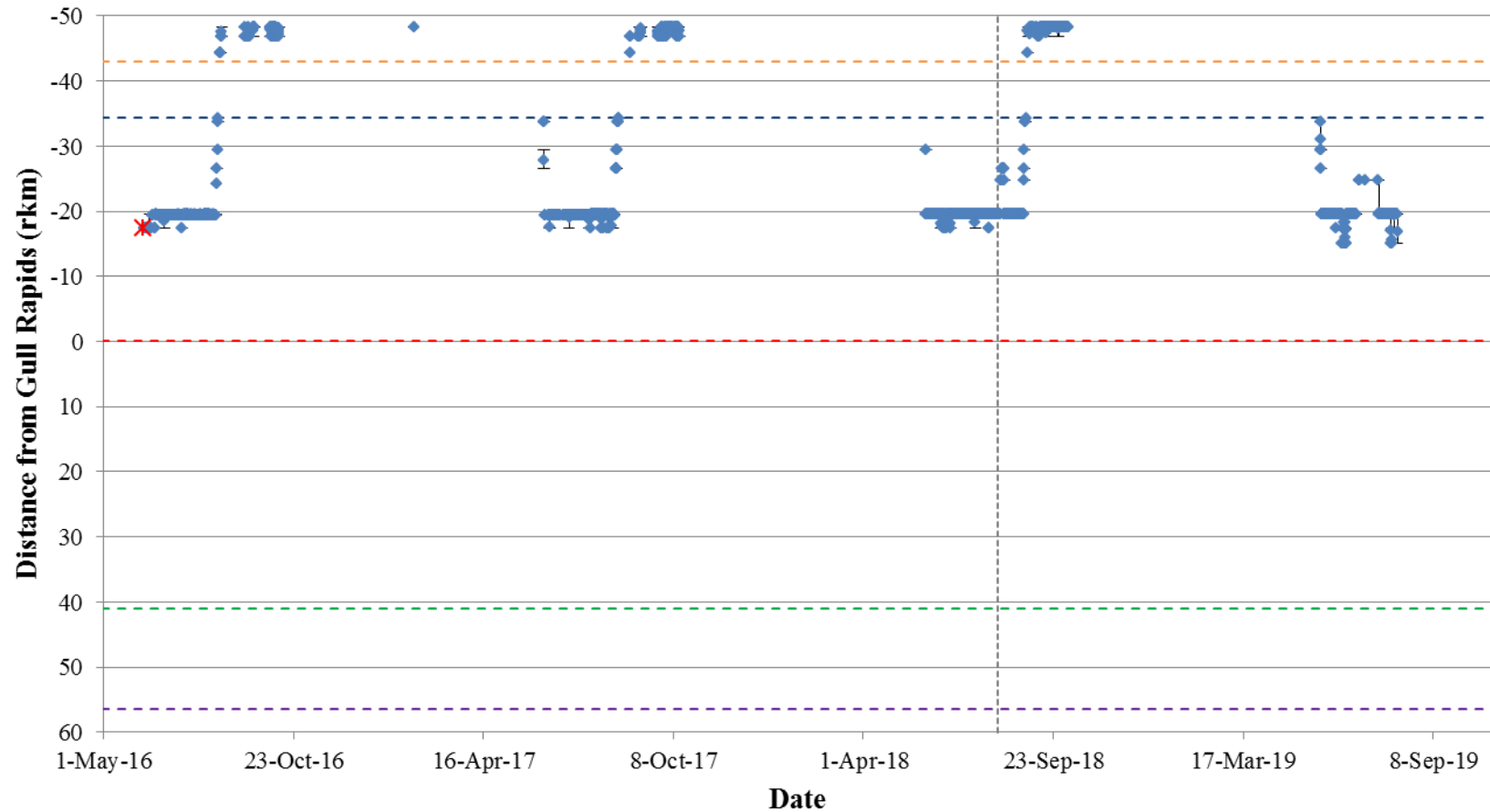


Figure A2-38: Position of a Walleye tagged with an acoustic transmitter (code #53797) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

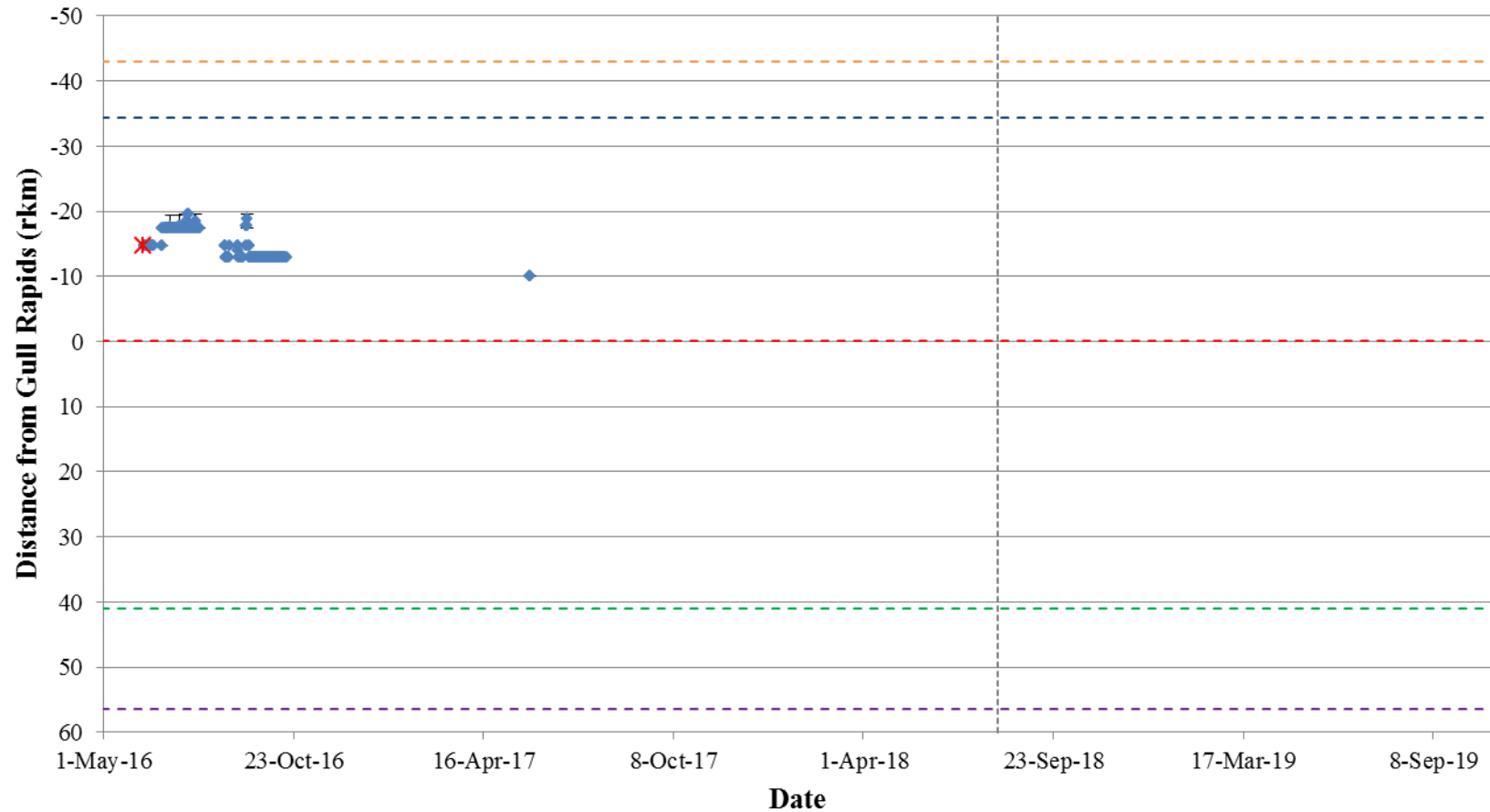


Figure A2-39: Position of a Walleye tagged with an acoustic transmitter (code #53798) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

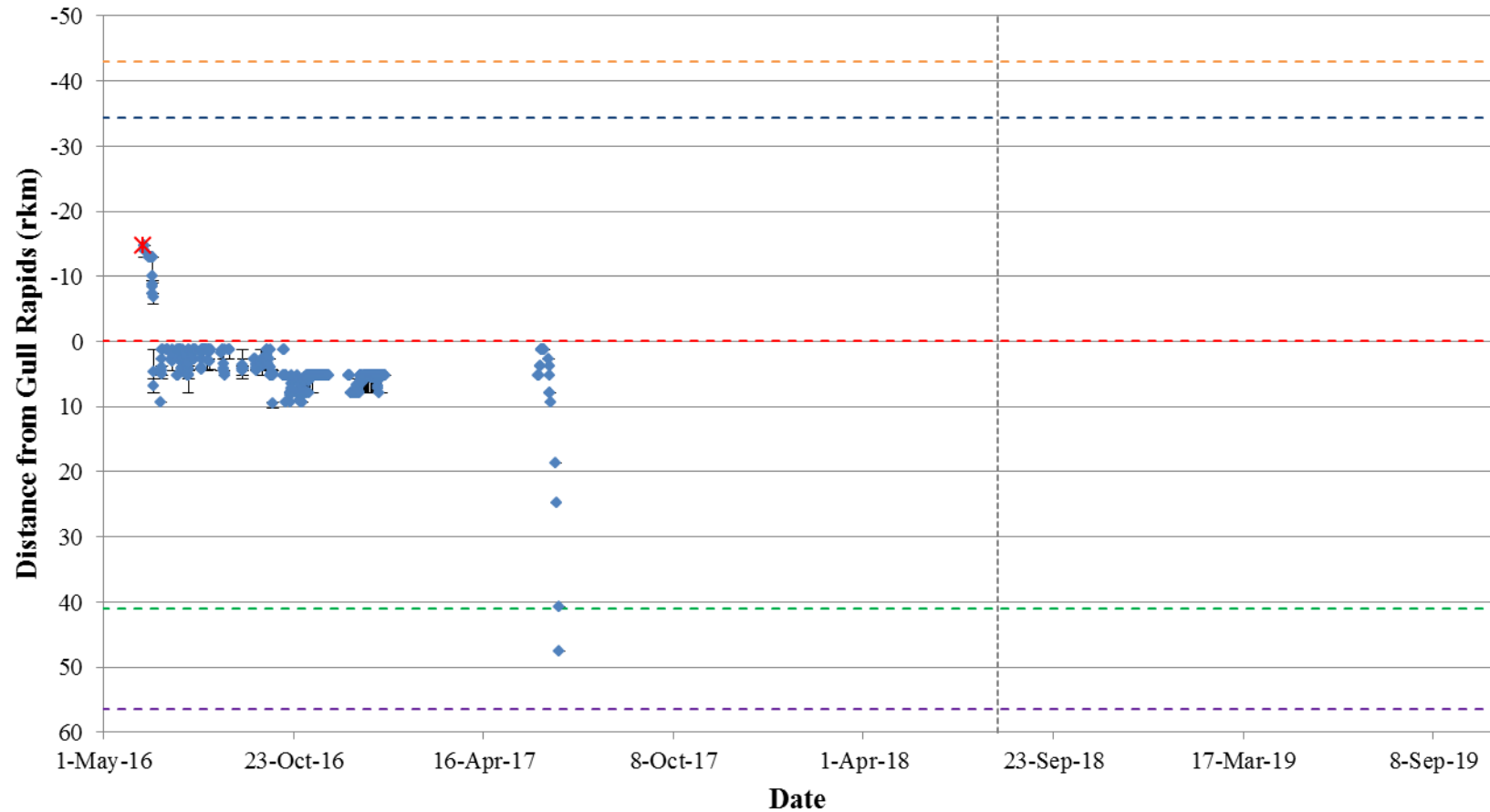


Figure A2-40: Position of a Walleye tagged with an acoustic transmitter (code #53799) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

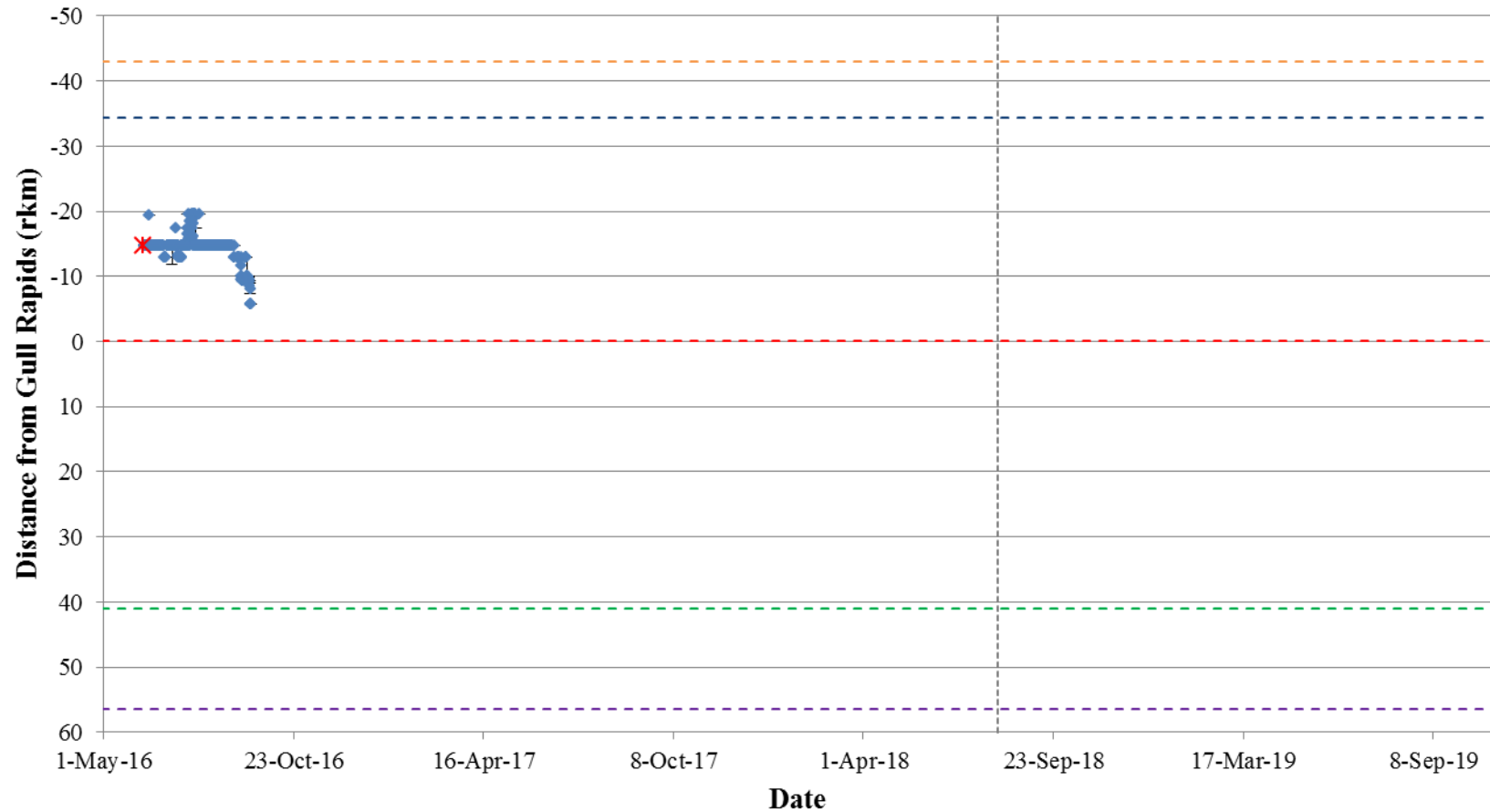


Figure A2-41: Position of a Walleye tagged with an acoustic transmitter (code #53800) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

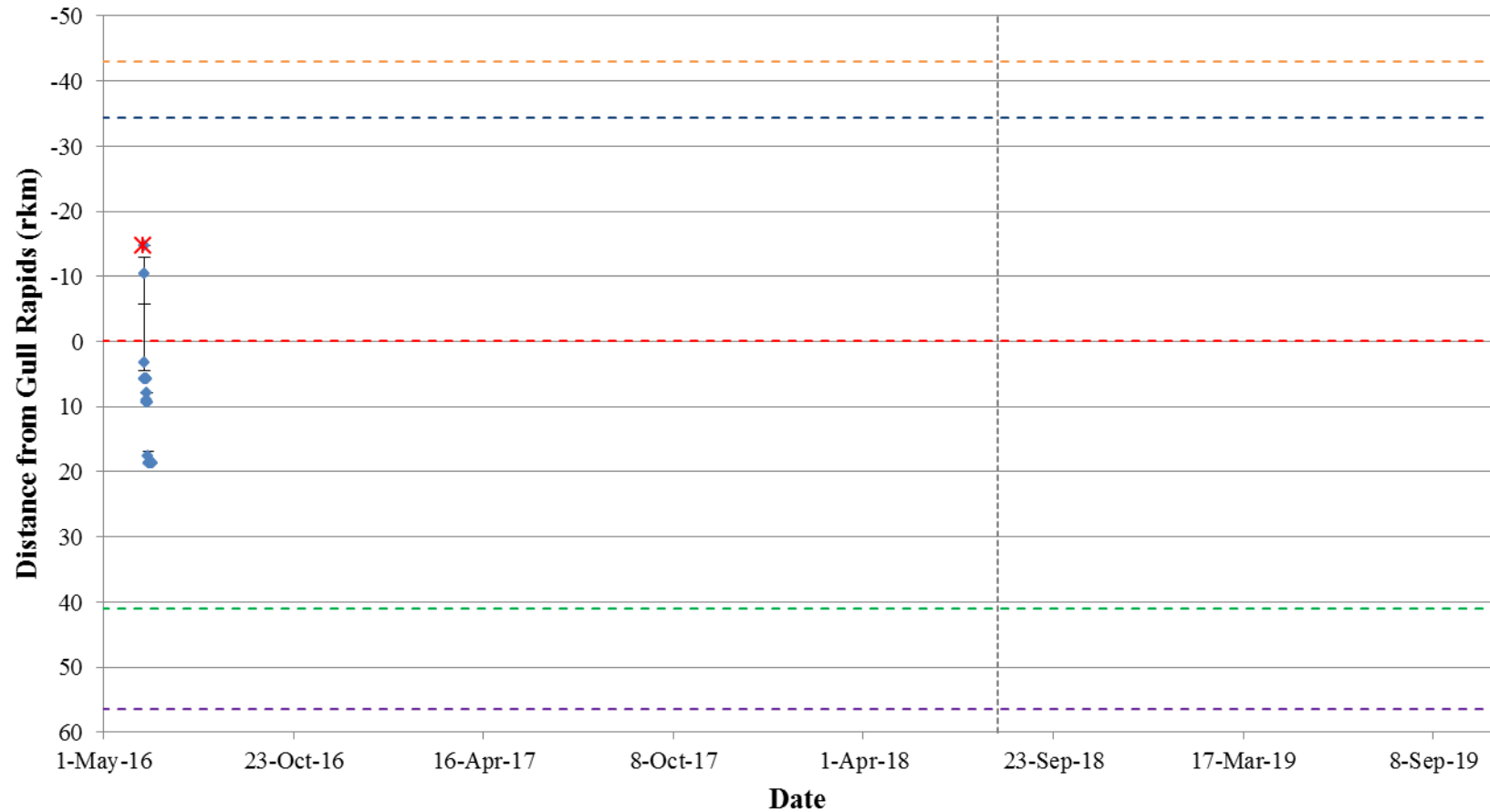


Figure A2-42: Position of a Walleye tagged with an acoustic transmitter (code #53801) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

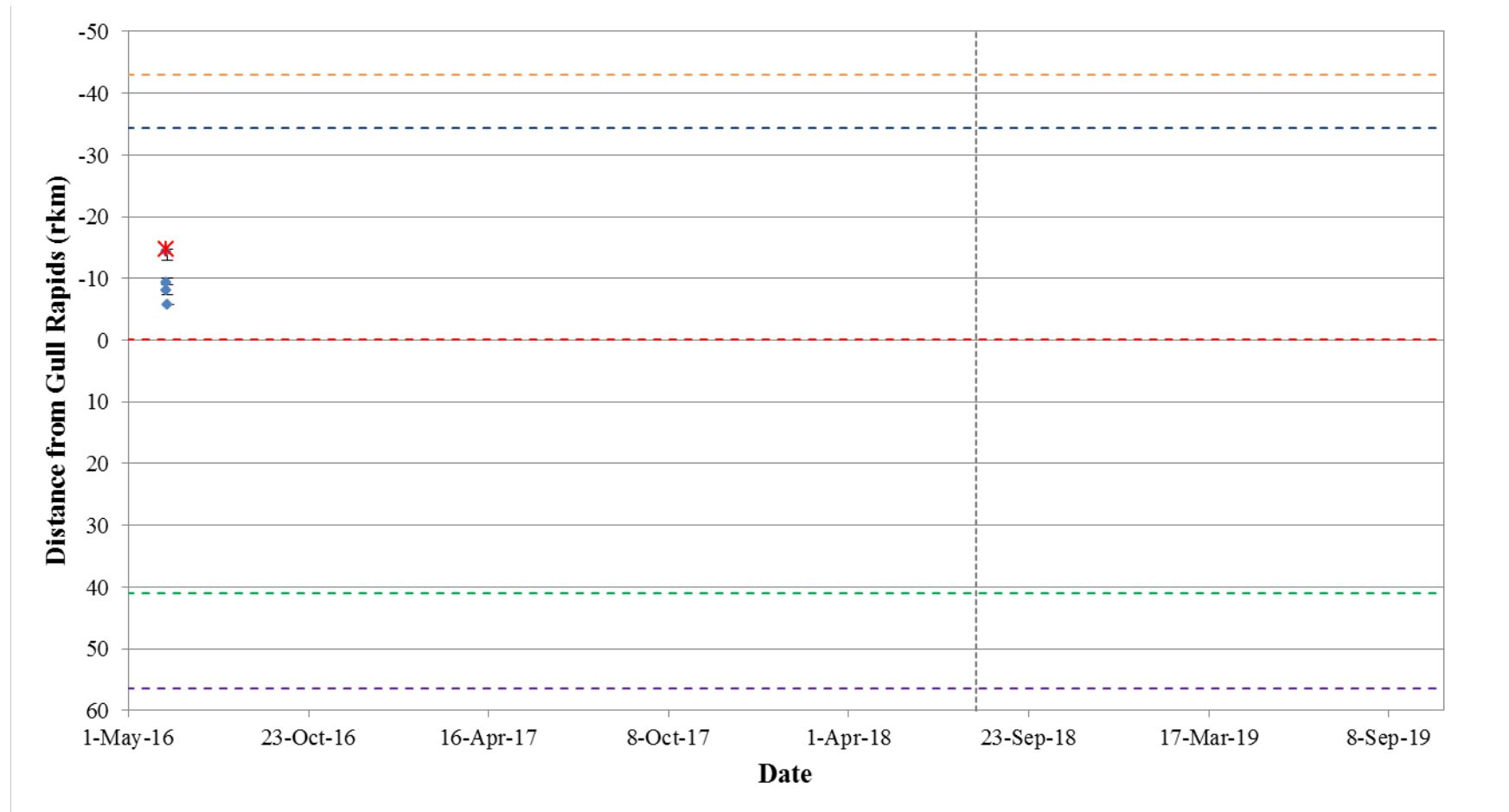


Figure A2-43: Position of a Walleye tagged with an acoustic transmitter (code #53802) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

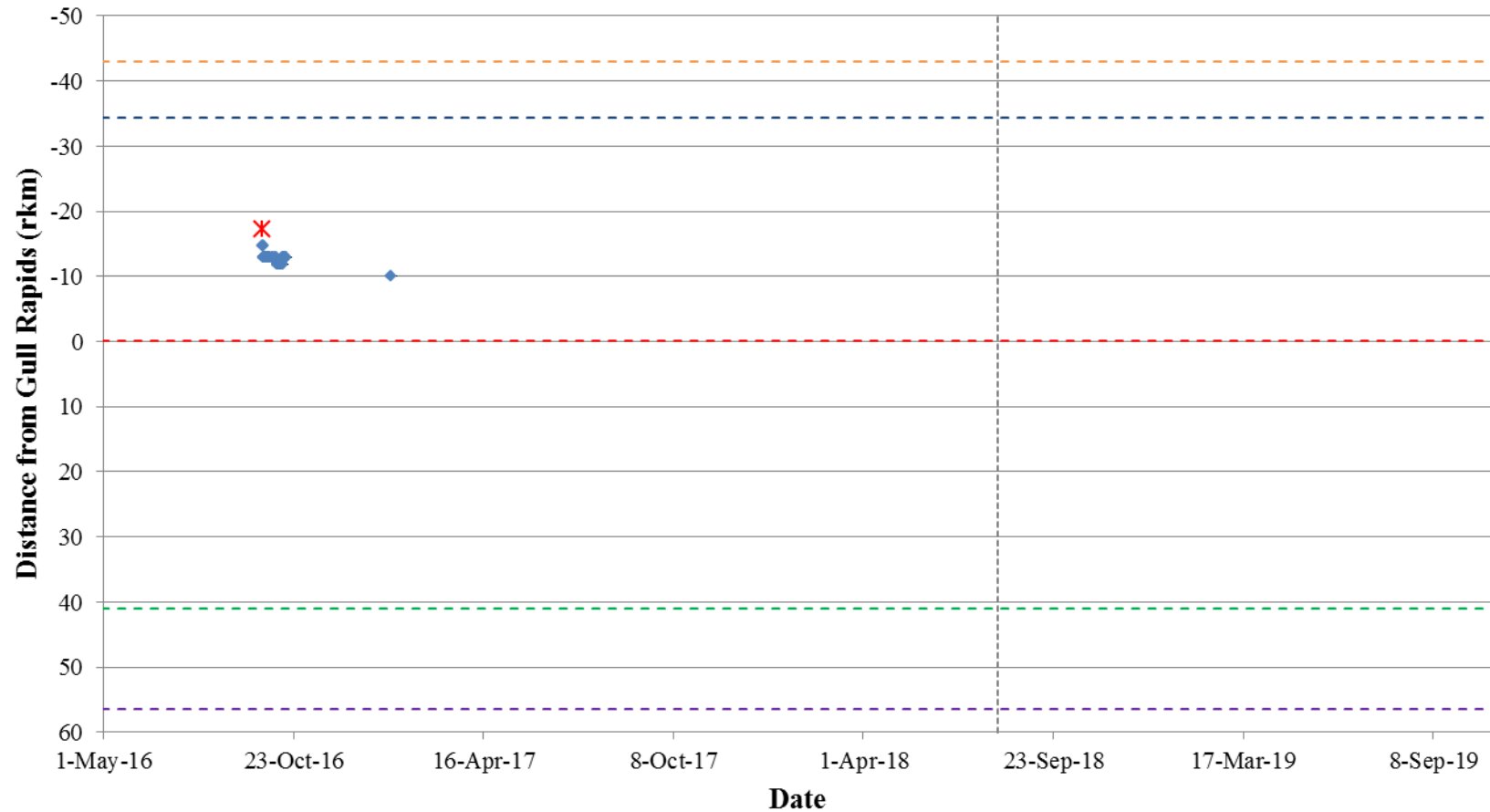


Figure A2-44: Position of a Walleye tagged with an acoustic transmitter (code #53803) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

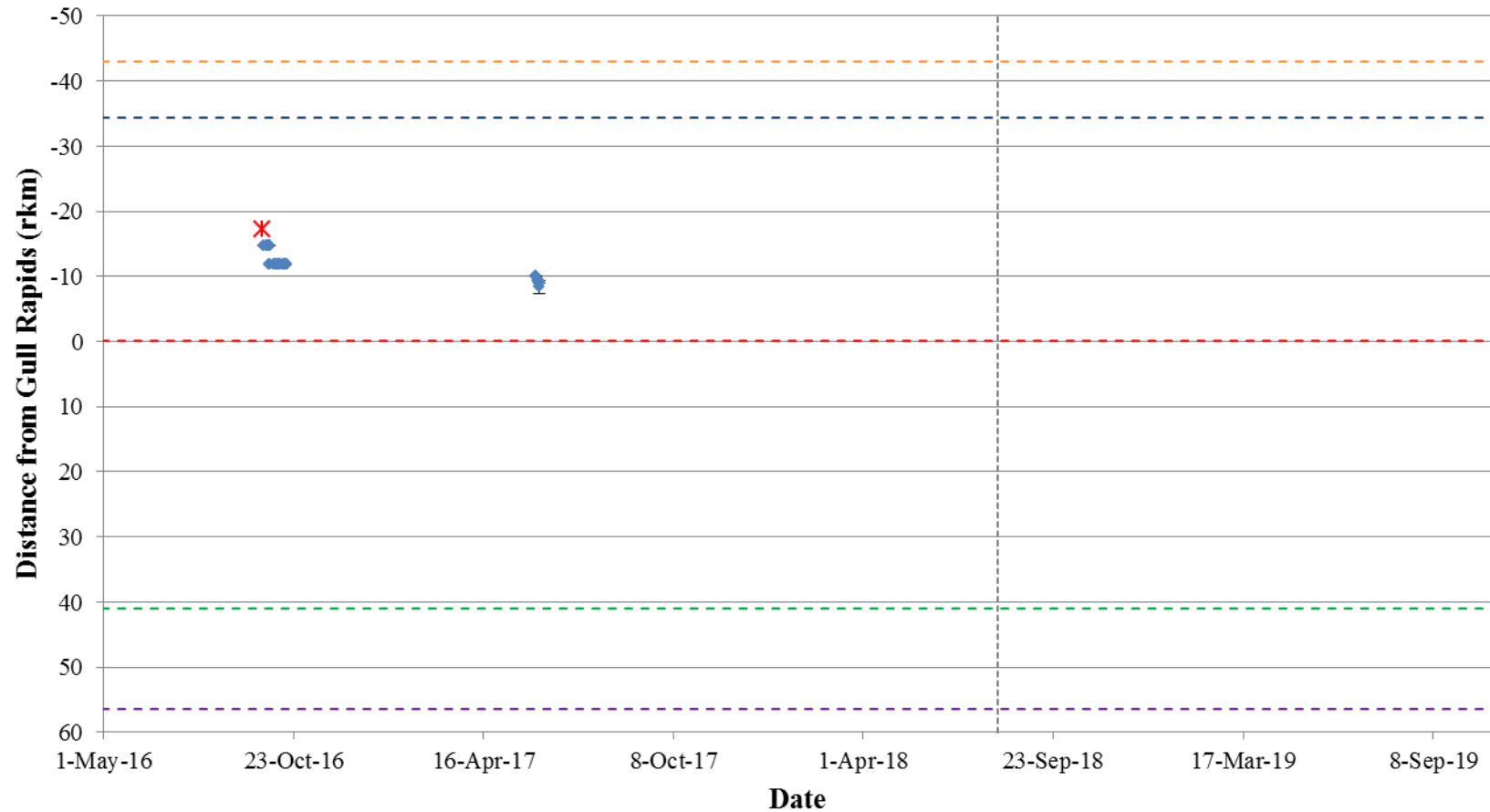


Figure A2-45: Position of a Walleye tagged with an acoustic transmitter (code #53804) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

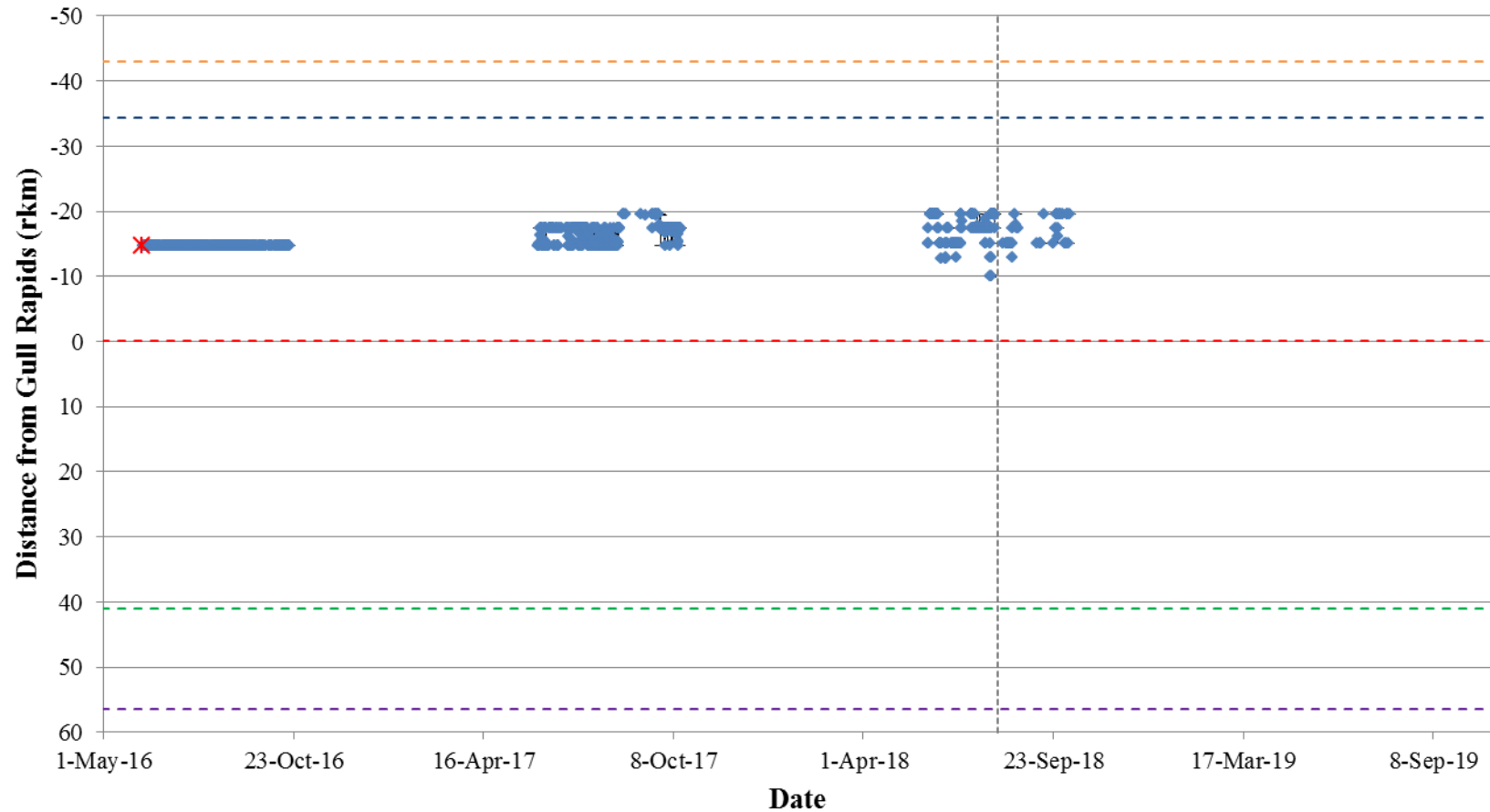


Figure A2-46: Position of a Walleye tagged with an acoustic transmitter (code #53805) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

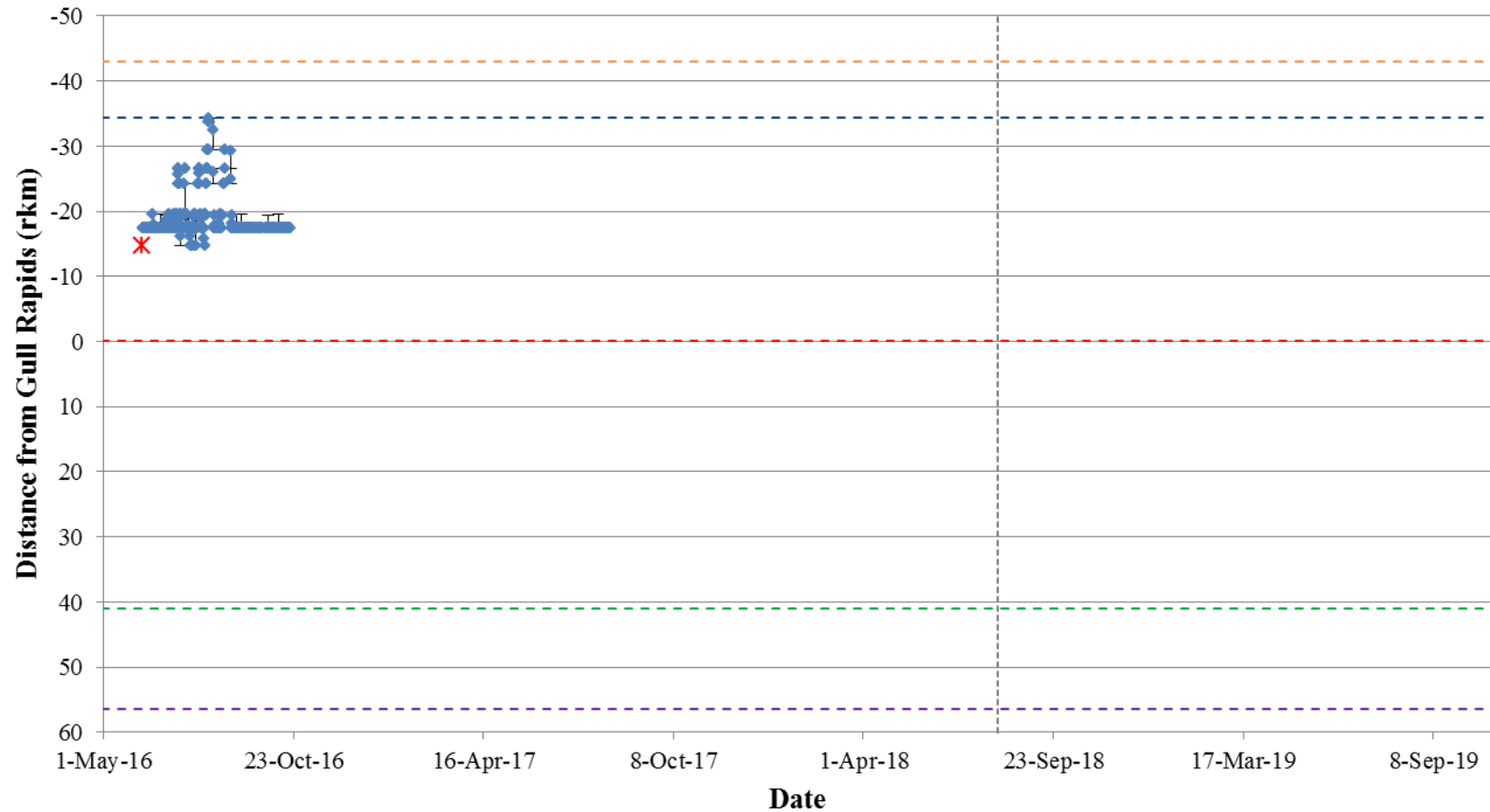


Figure A2-47: Position of a Walleye tagged with an acoustic transmitter (code #53806) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

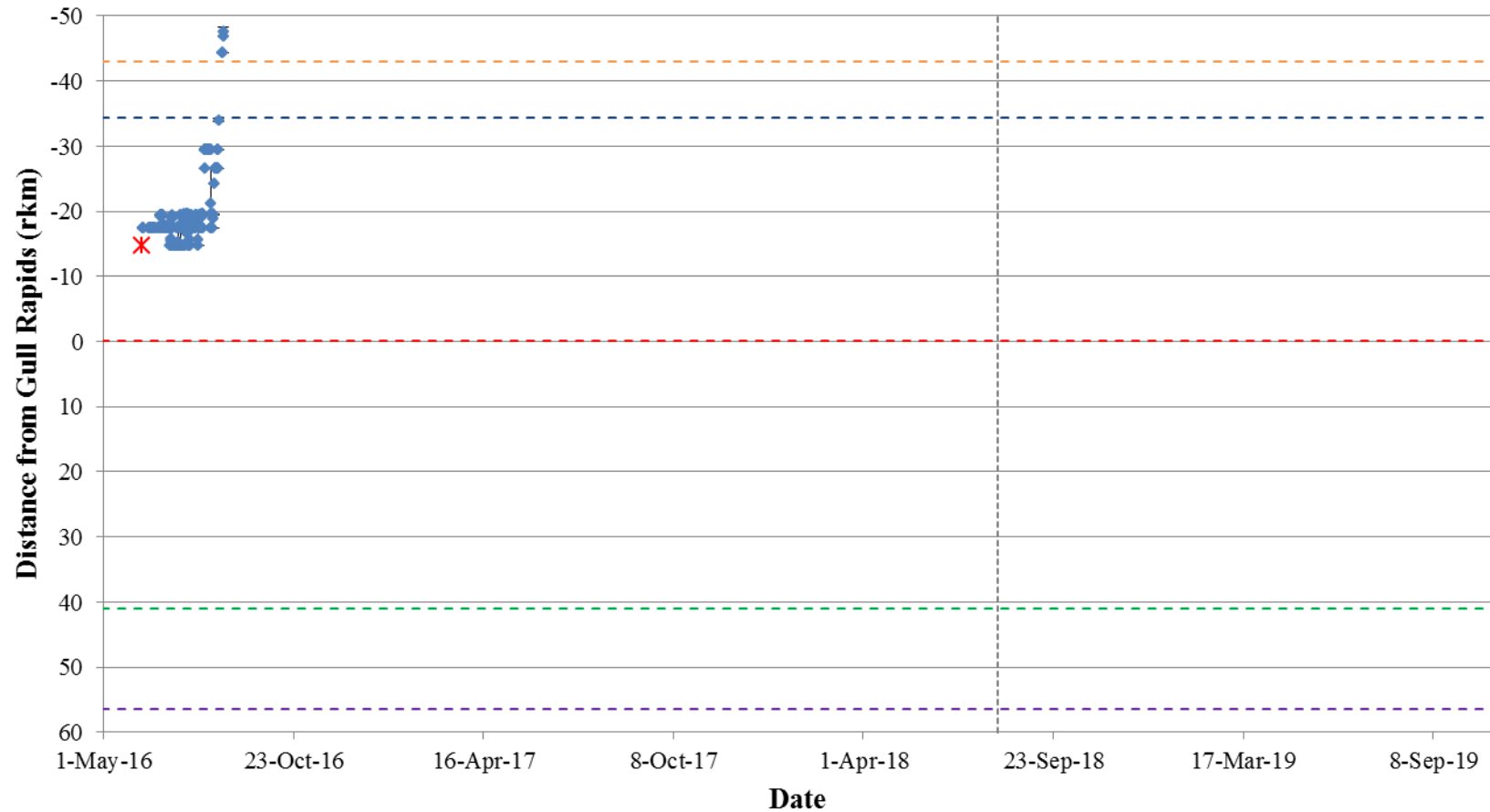


Figure A2-48: Position of a Walleye tagged with an acoustic transmitter (code #53807) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

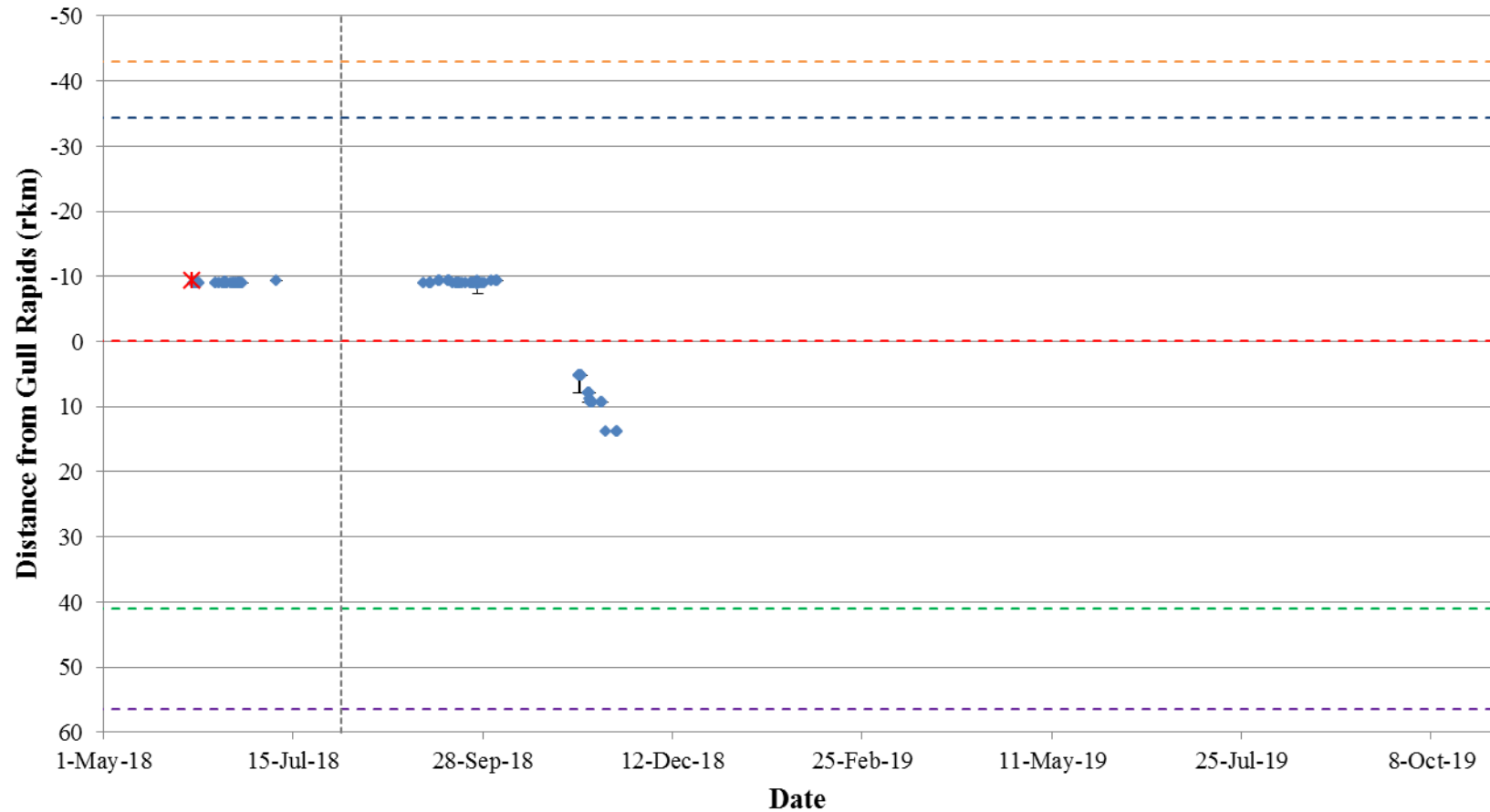


Figure A2-49: Position of a Walleye tagged with an acoustic transmitter (code #25739) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2018, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).



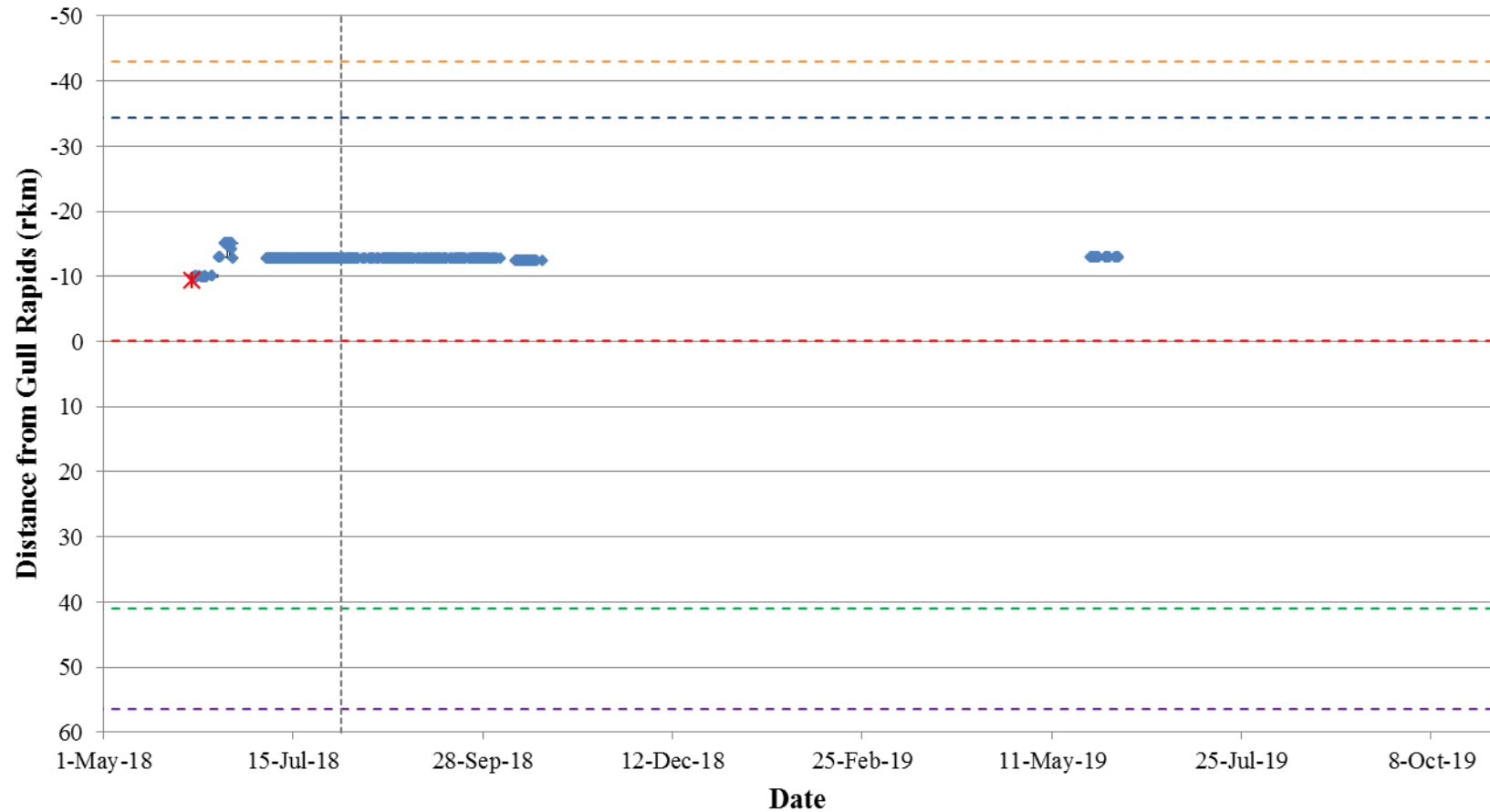


Figure A2-51: Position of a Walleye tagged with an acoustic transmitter (code #25742) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2018, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

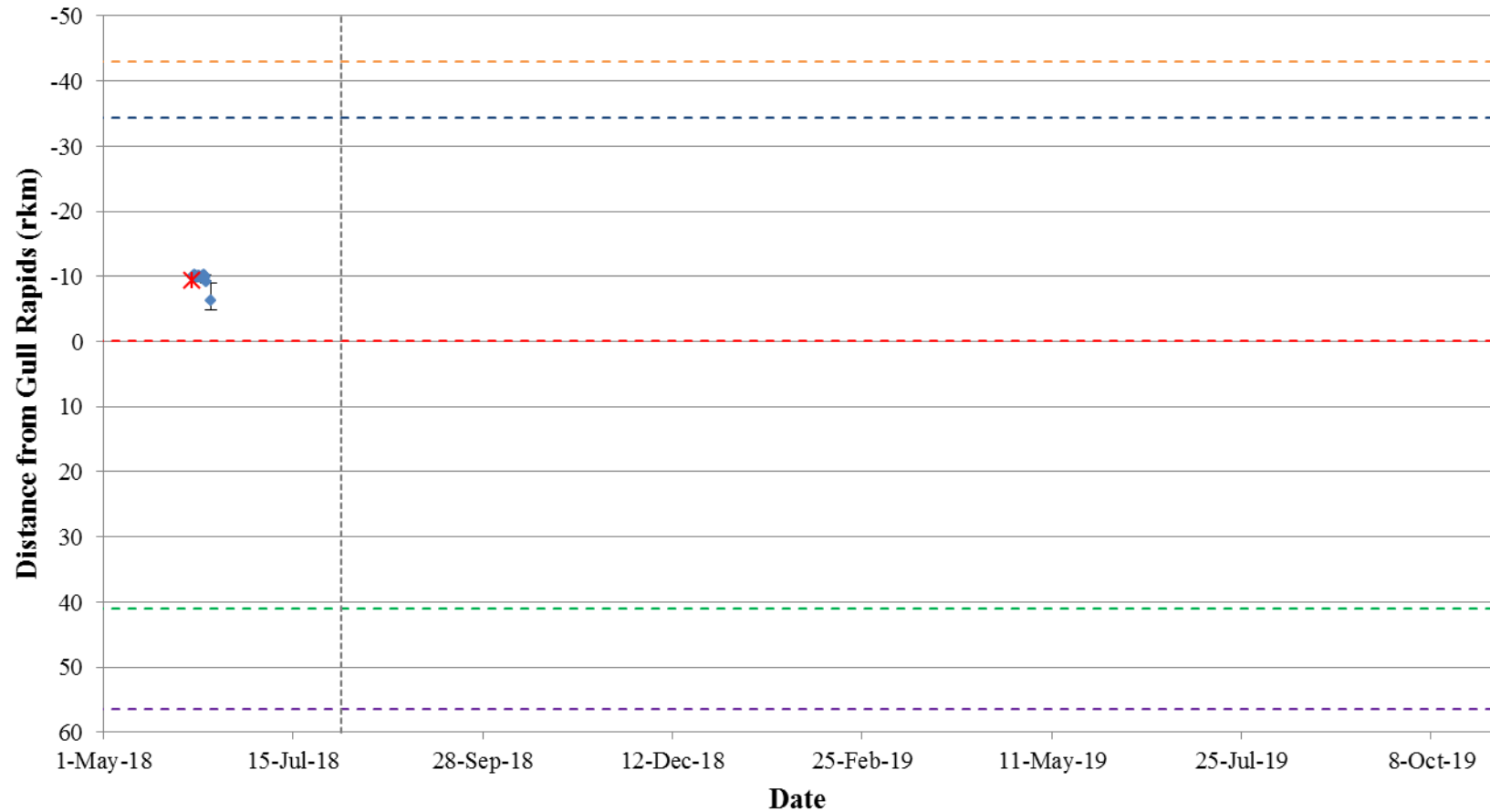


Figure A2-52: Position of a Walleye tagged with an acoustic transmitter (code #25743) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2018, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

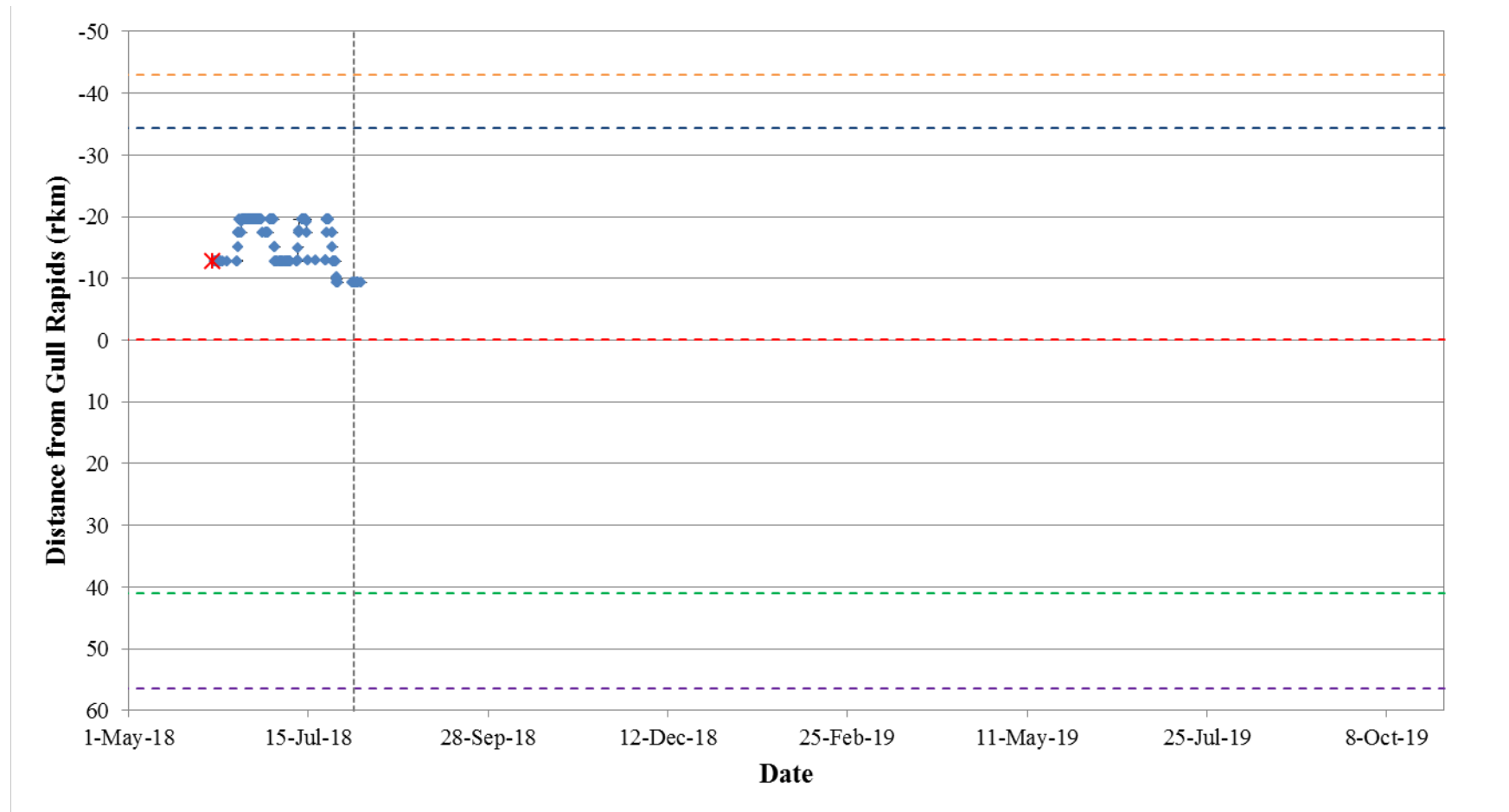


Figure A2-53: Position of a Walleye tagged with an acoustic transmitter (code #25744) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2018, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

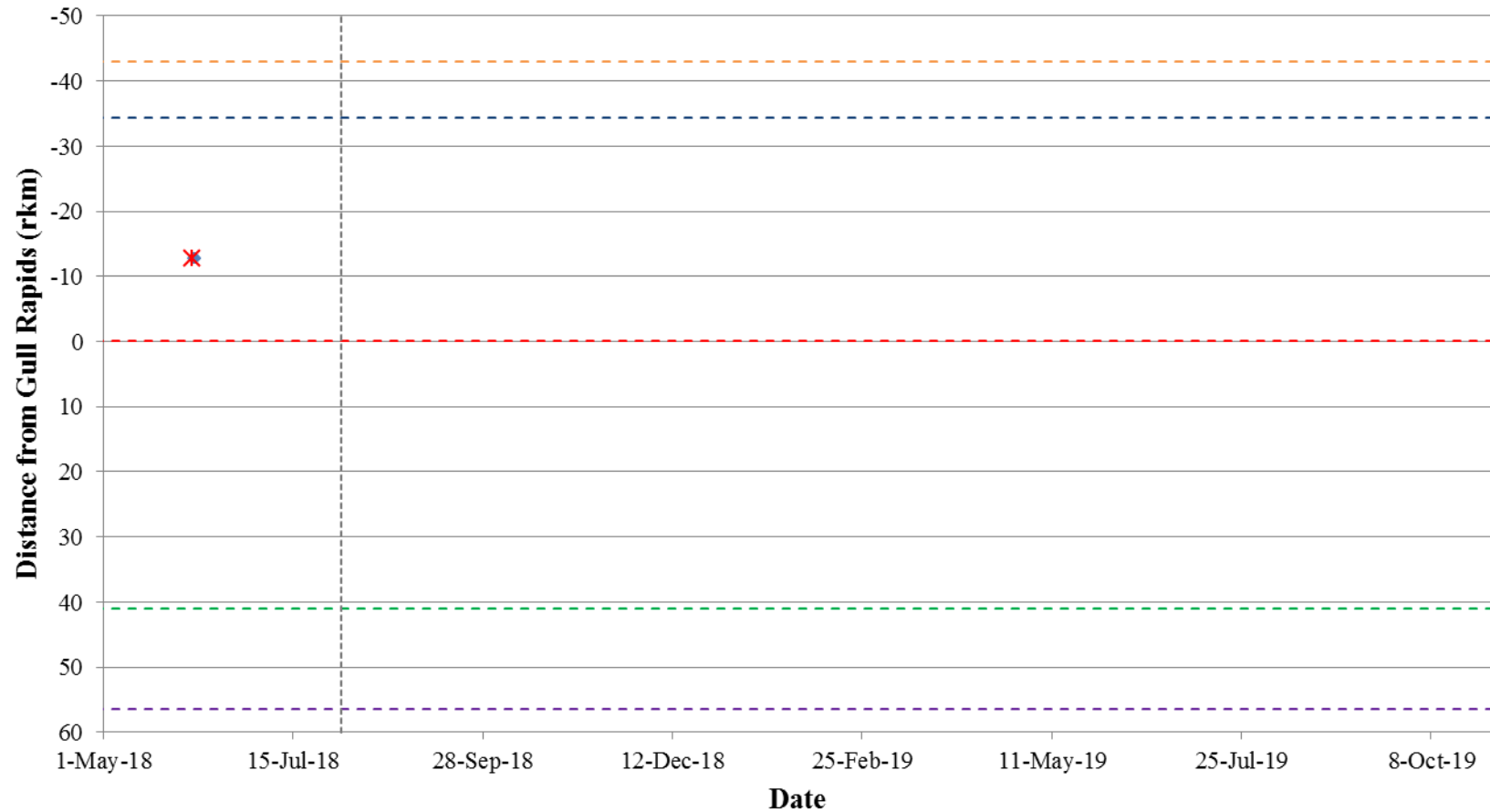


Figure A2-54: Position of a Walleye tagged with an acoustic transmitter (code #25745) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2018, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

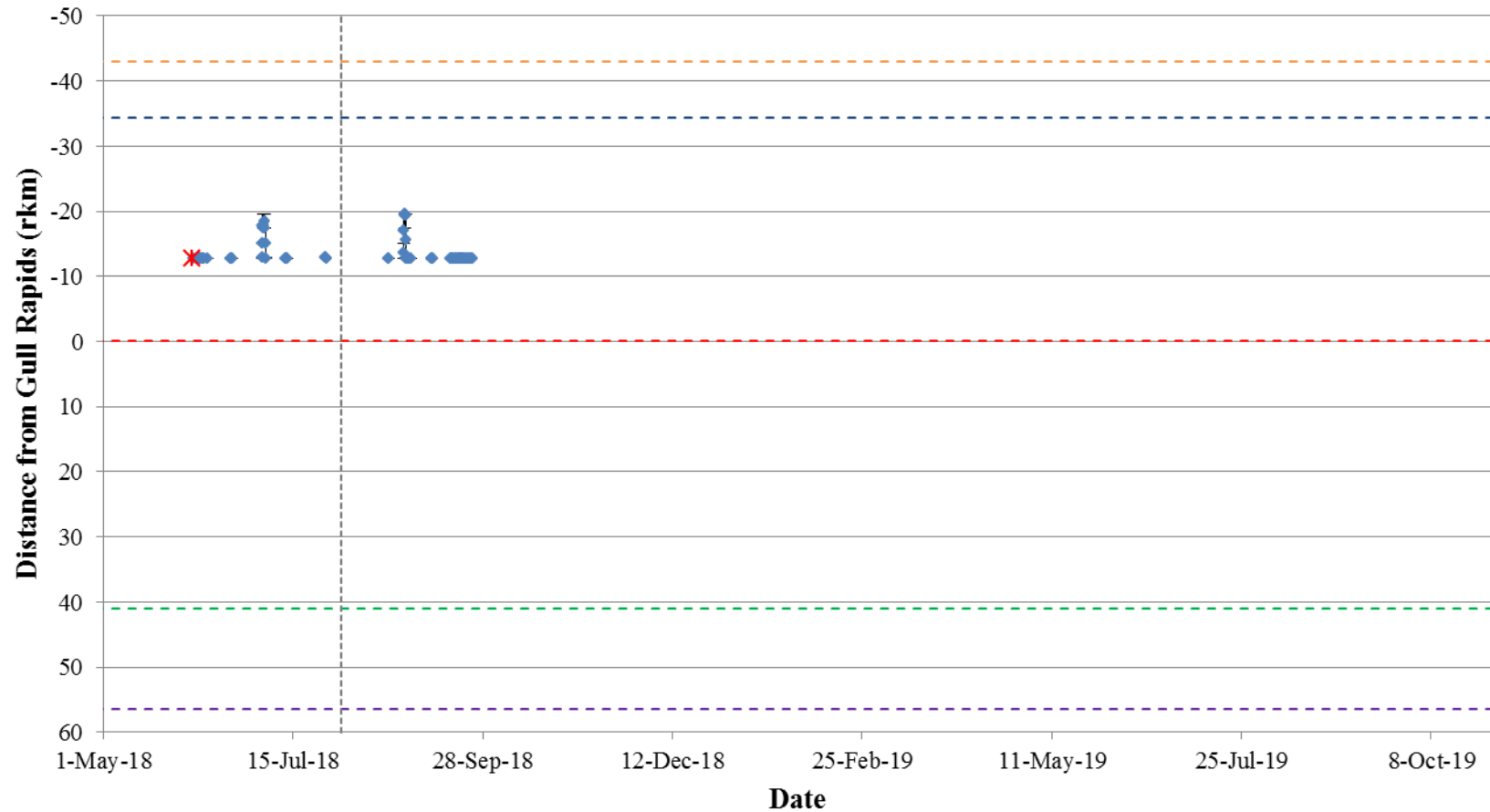


Figure A2-55: Position of a Walleye tagged with an acoustic transmitter (code #25746) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2018, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

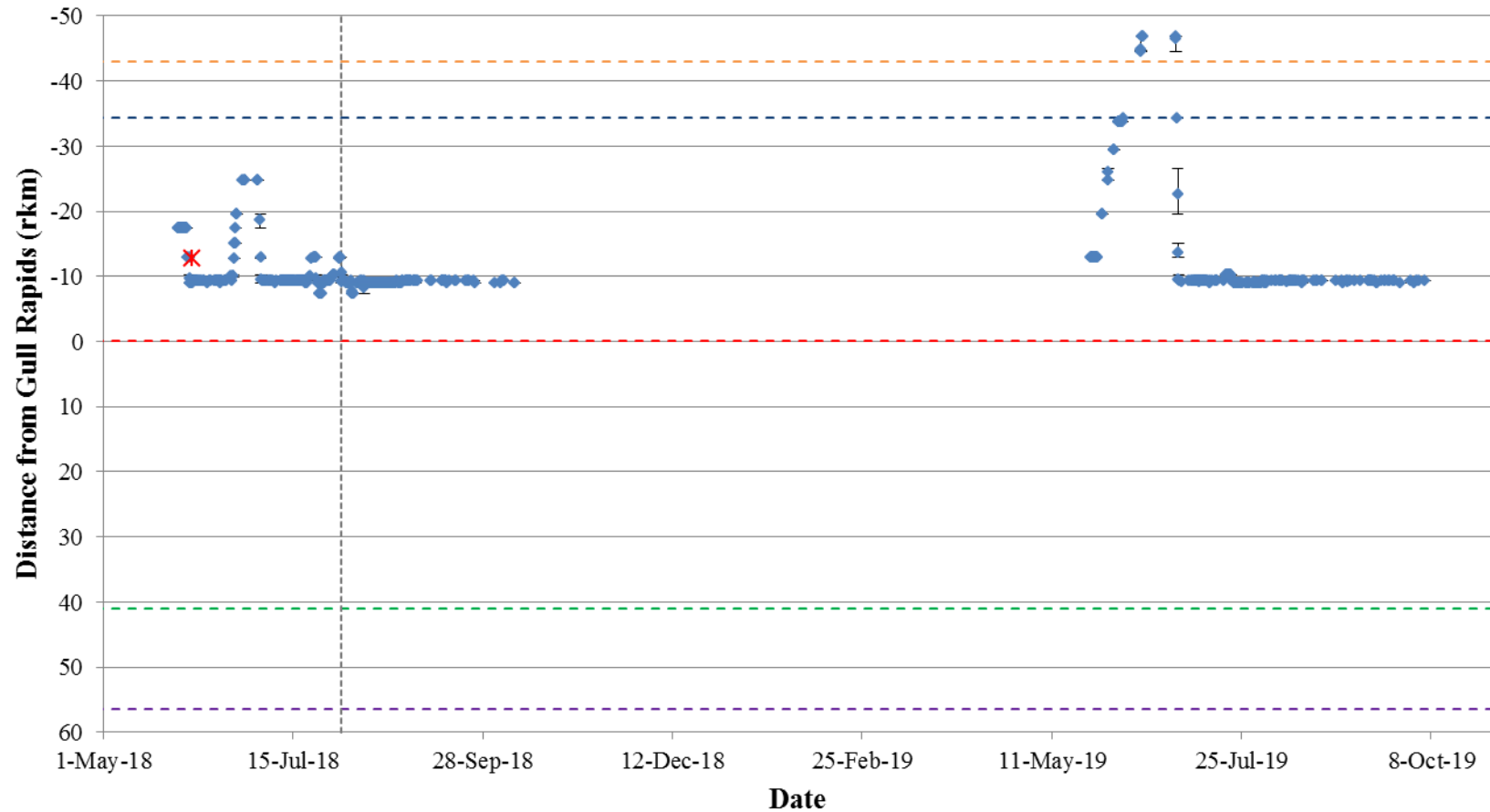


Figure A2-56: Position of a Walleye tagged with an acoustic transmitter (code #25747) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2018, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

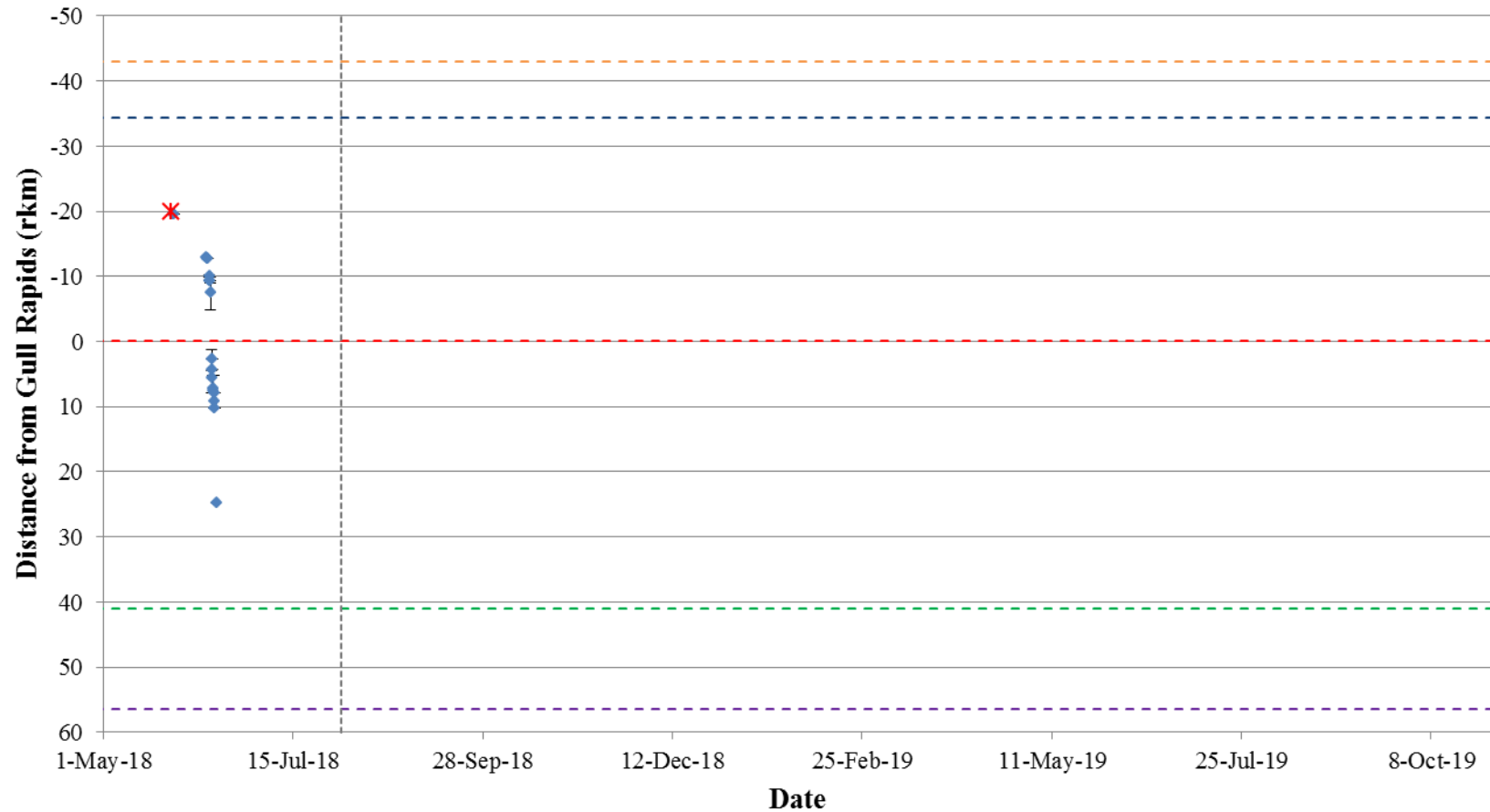


Figure A2-57: Position of a Walleye tagged with an acoustic transmitter (code #25748) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2018, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

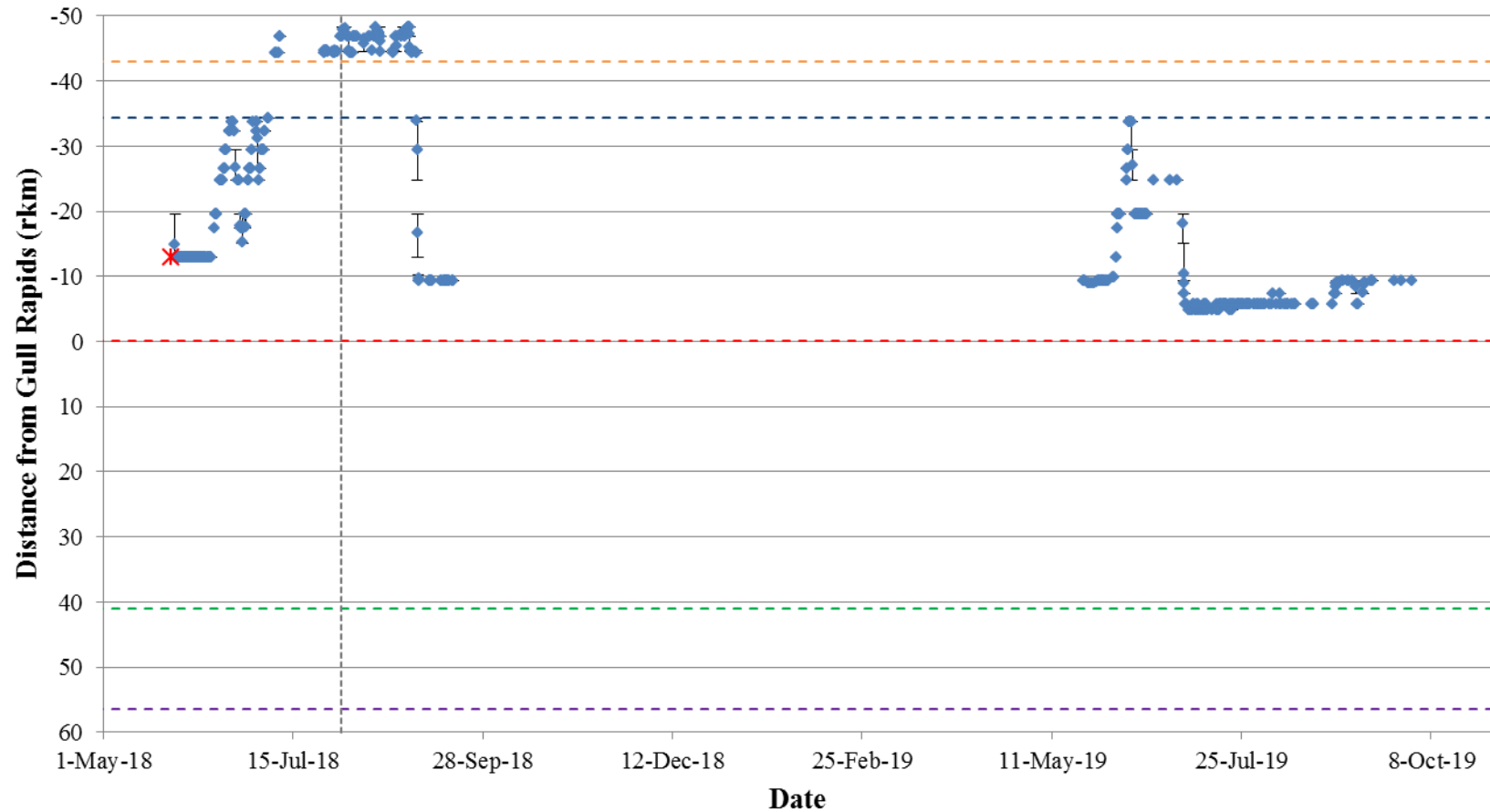


Figure A2-58: Position of a Walleye tagged with an acoustic transmitter (code #25749) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2018, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

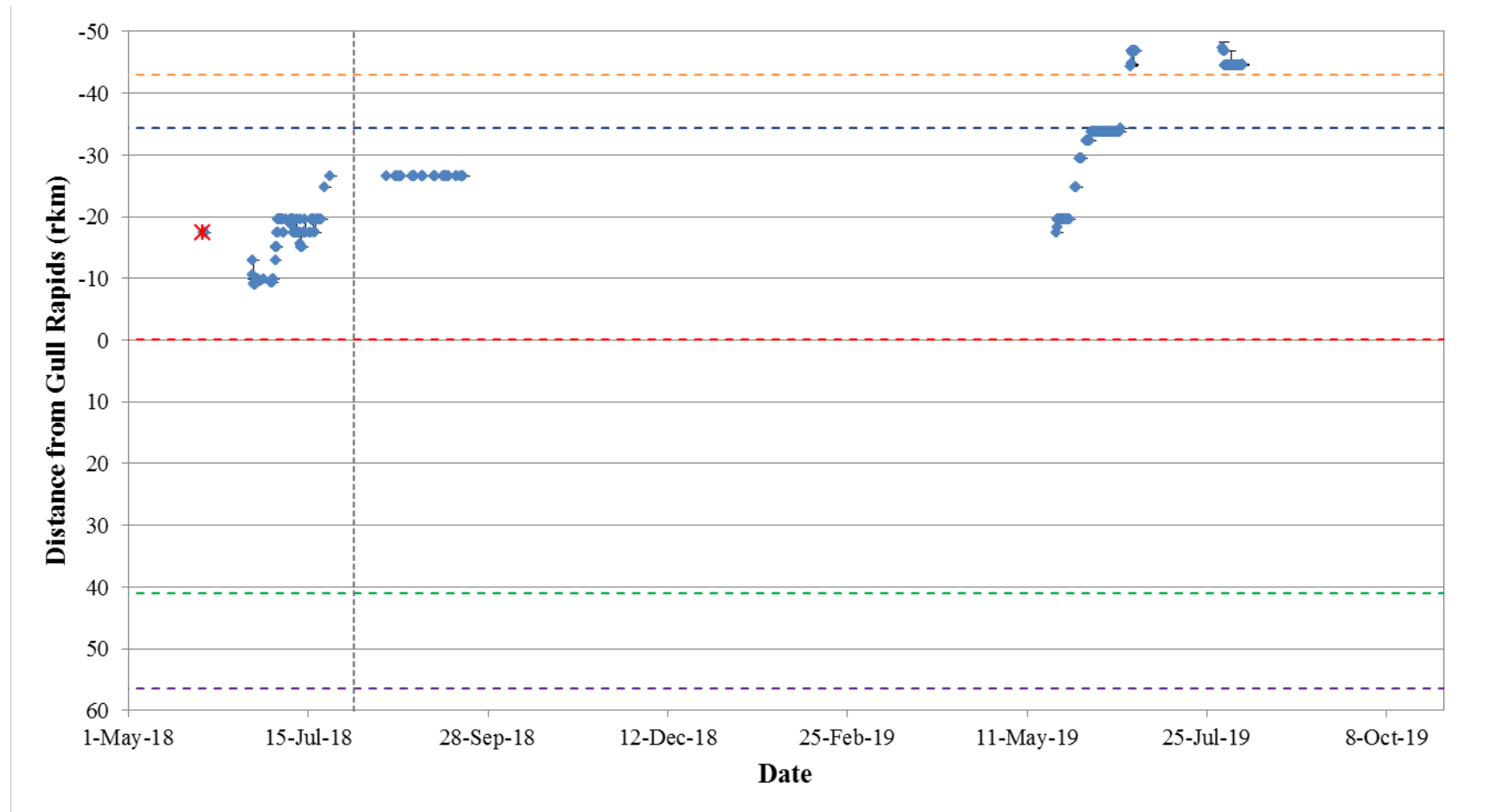


Figure A2-59: Position of a Walleye tagged with an acoustic transmitter (code #25750) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2018, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

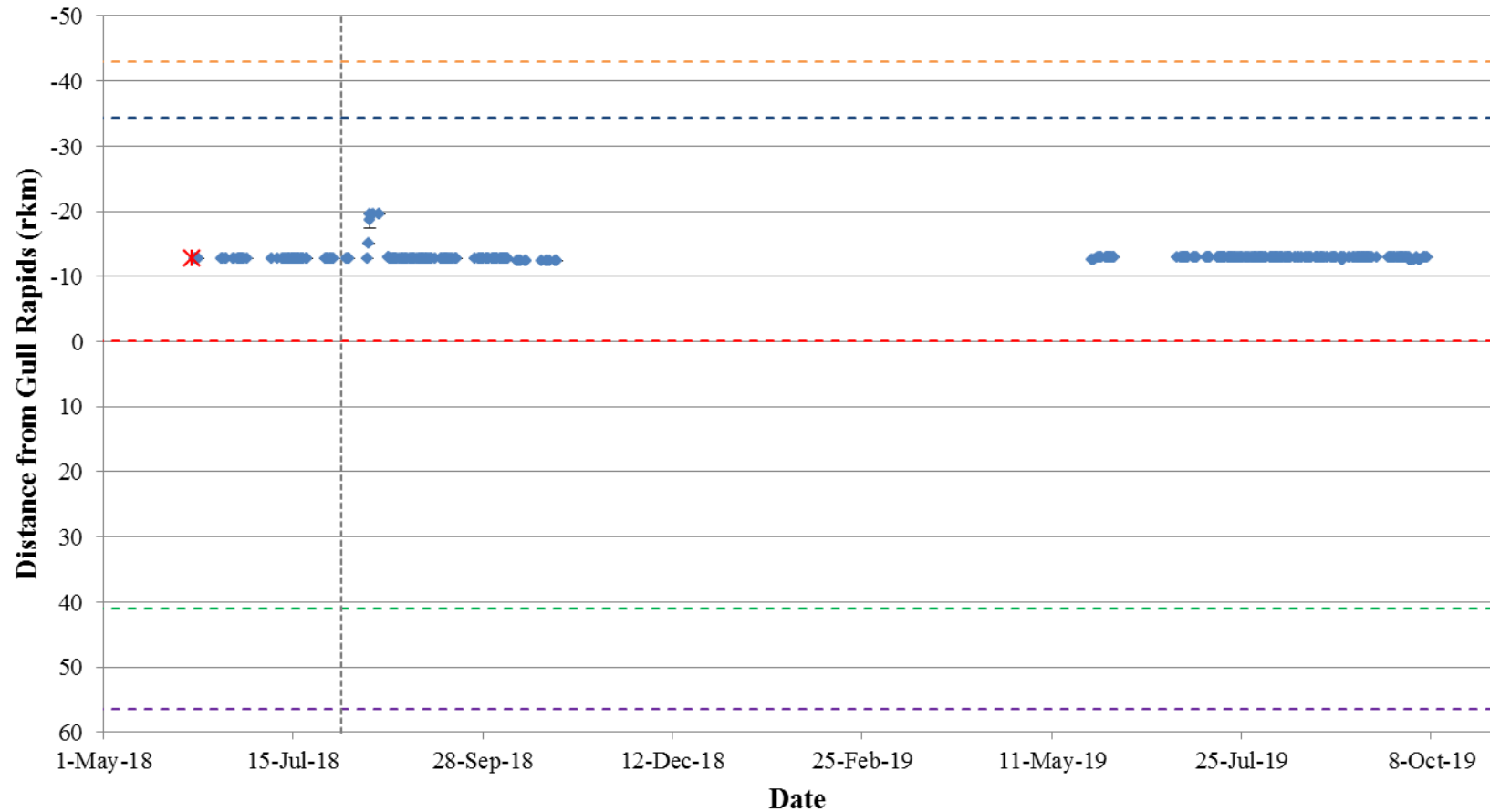


Figure A2-60: Position of a Walleye tagged with an acoustic transmitter (code #25751) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2018, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

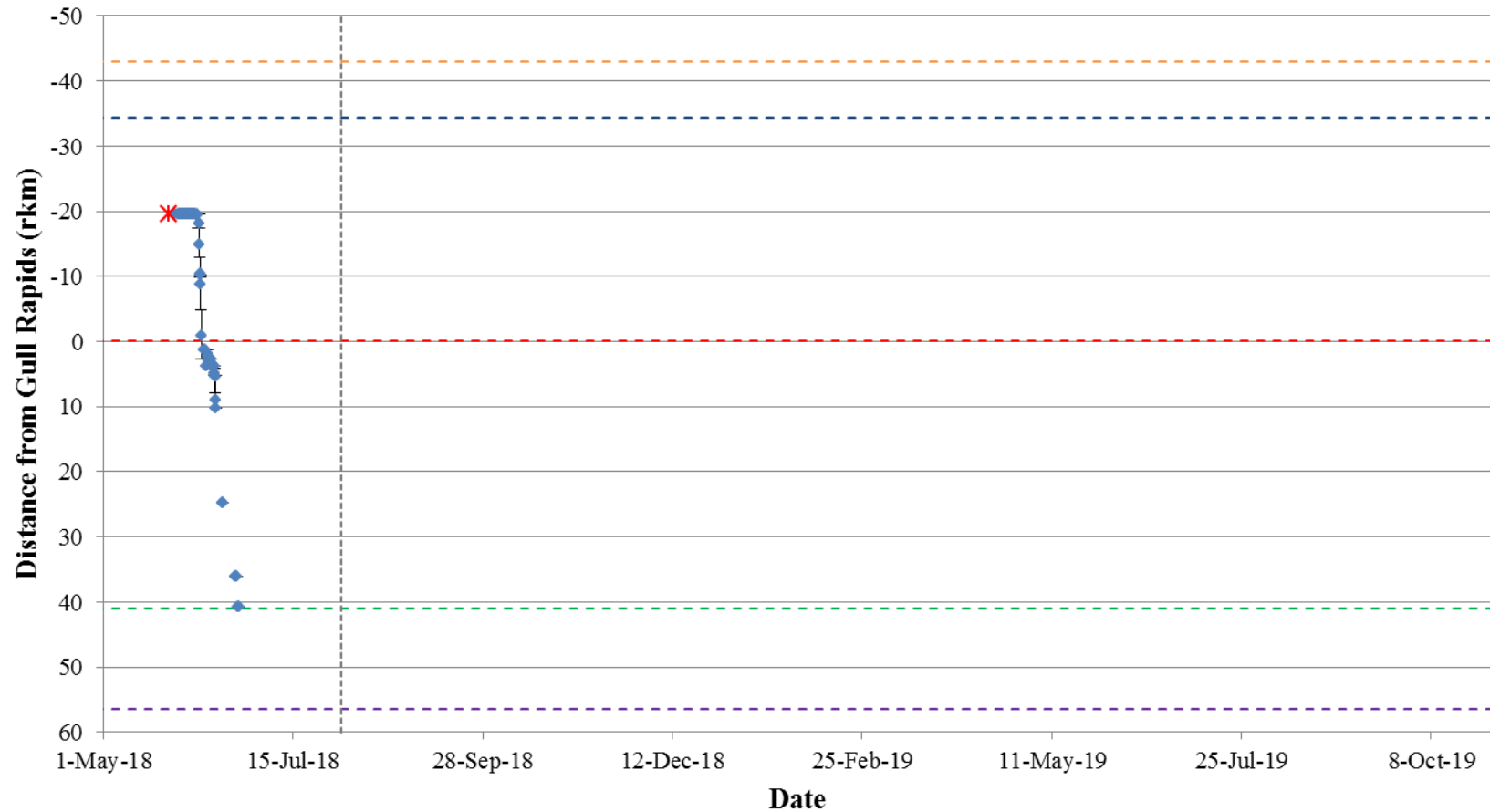


Figure A2-61: Position of a Walleye tagged with an acoustic transmitter (code #25752) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2018, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

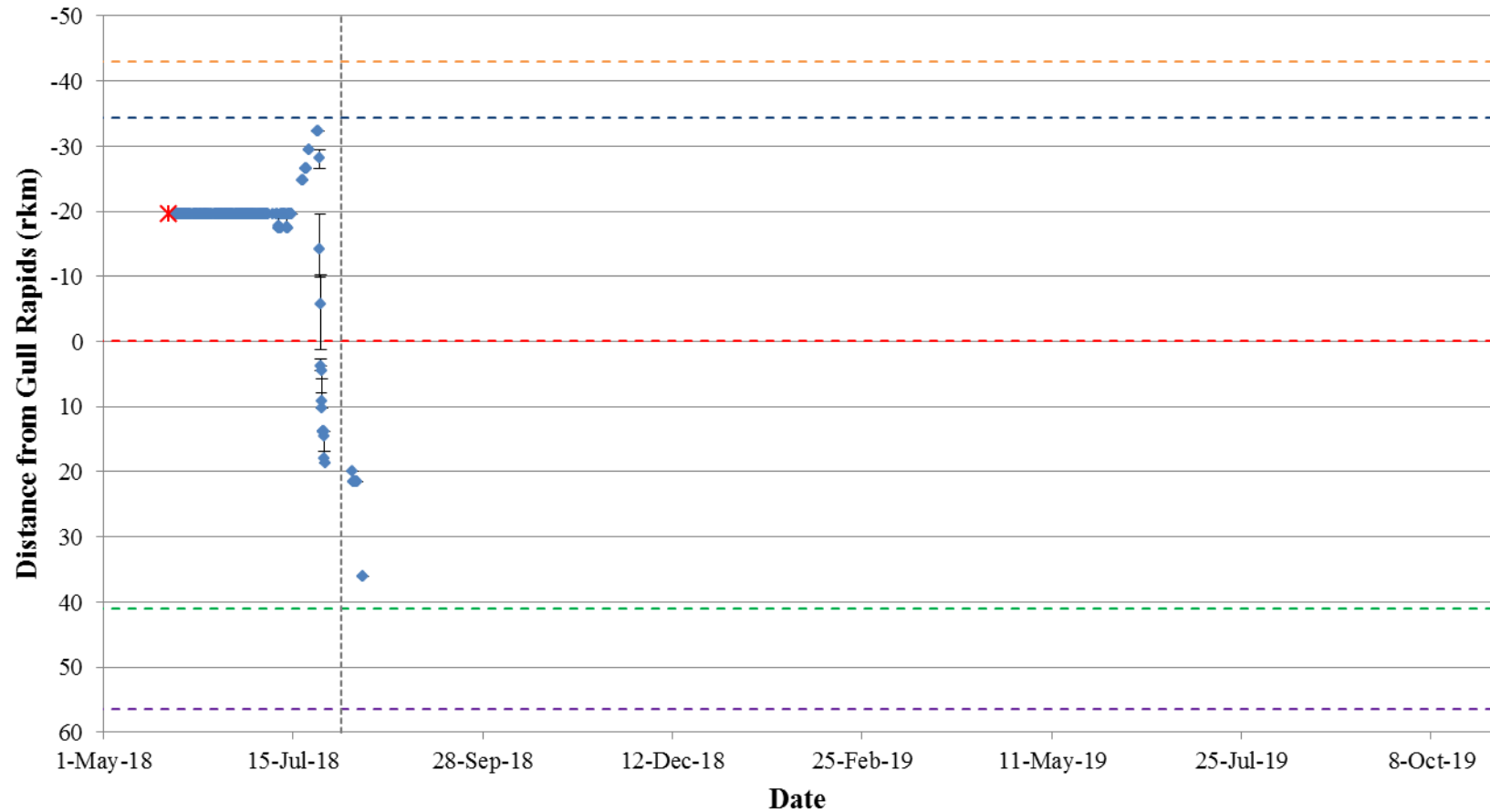


Figure A2-62: Position of a Walleye tagged with an acoustic transmitter (code #25753) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2018, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

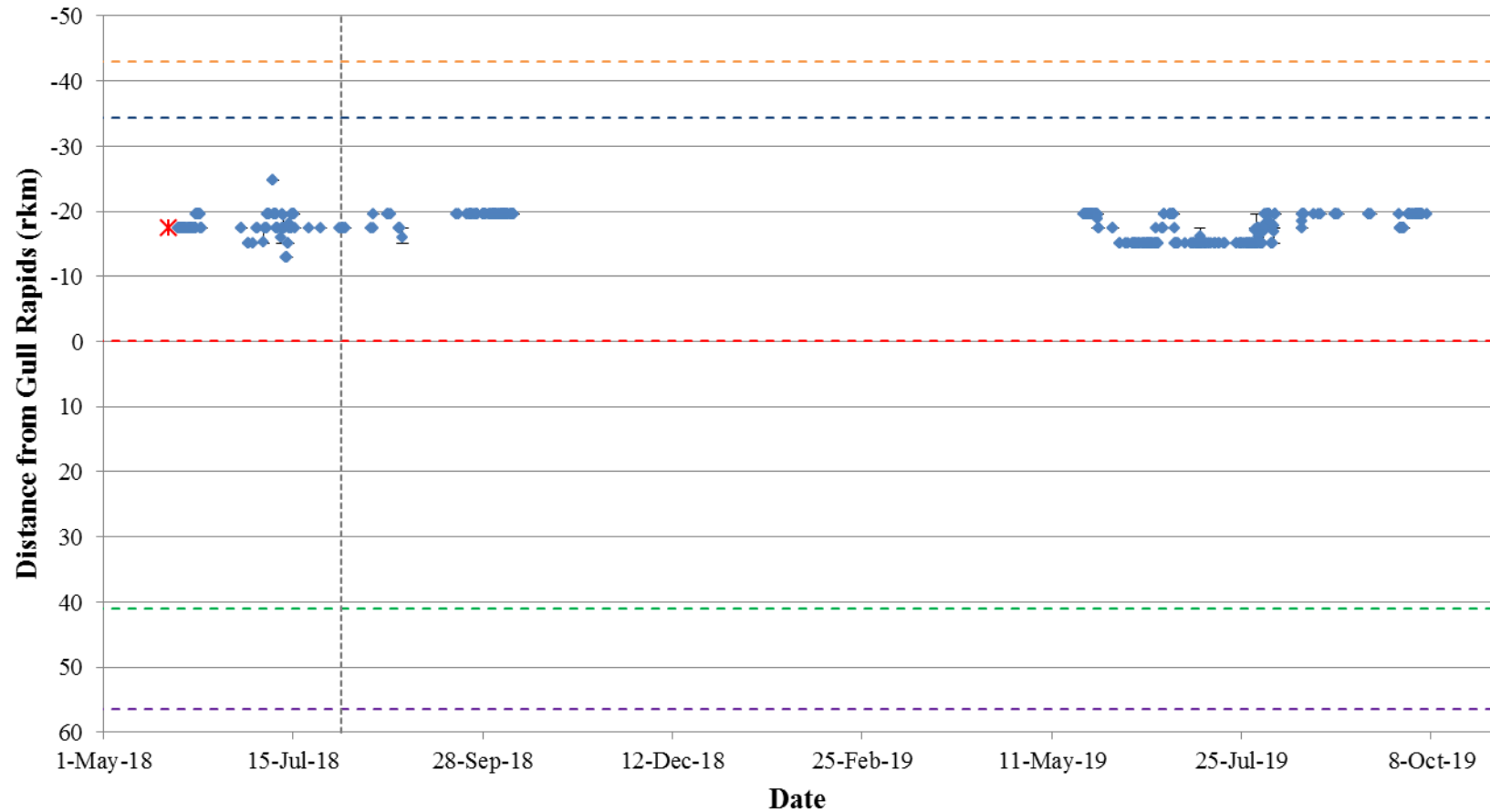


Figure A2-63: Position of a Walleye tagged with an acoustic transmitter (code #25754) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2018, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

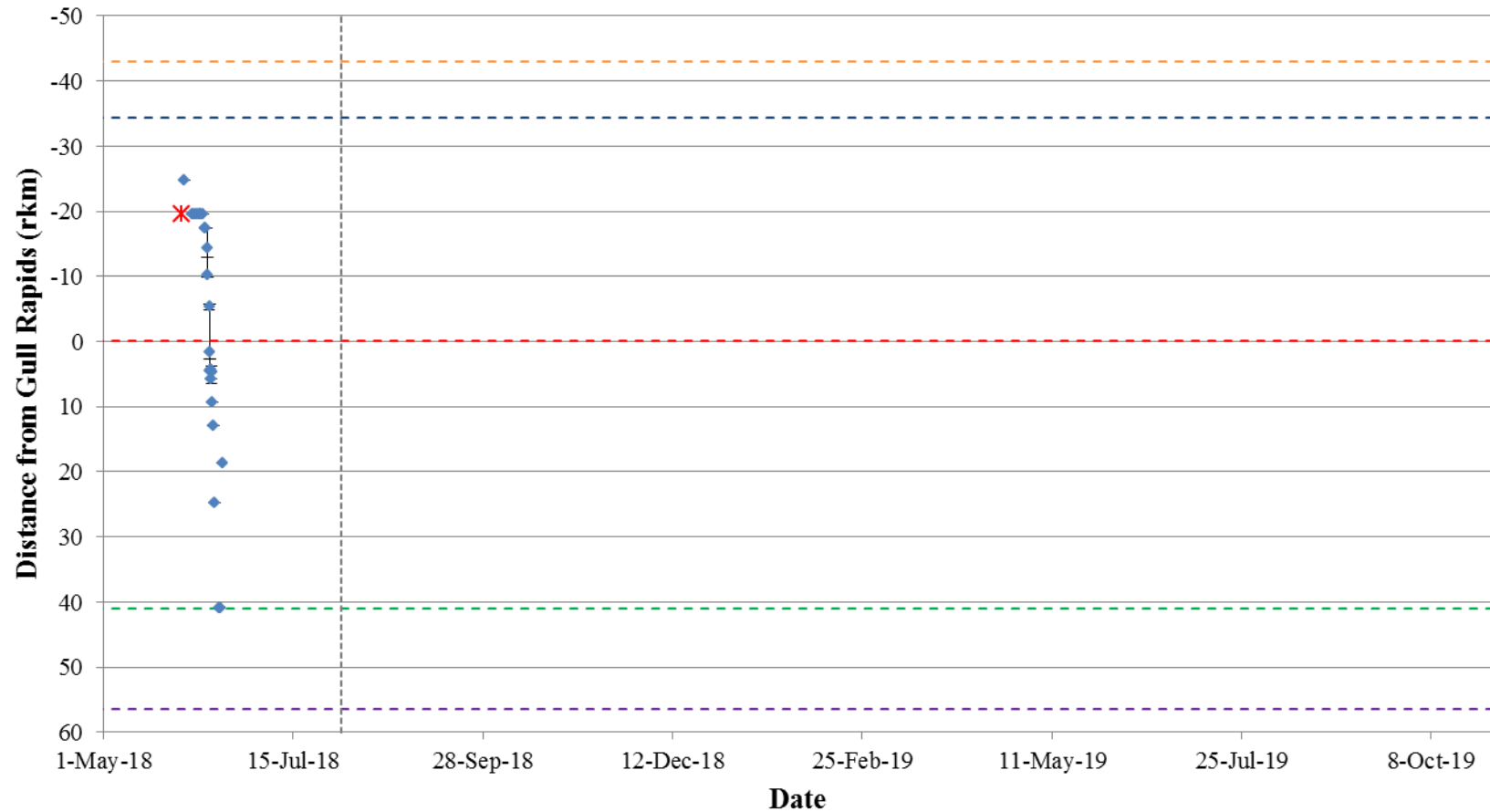


Figure A2-64: Position of a Walleye tagged with an acoustic transmitter (code #25755) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2018, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

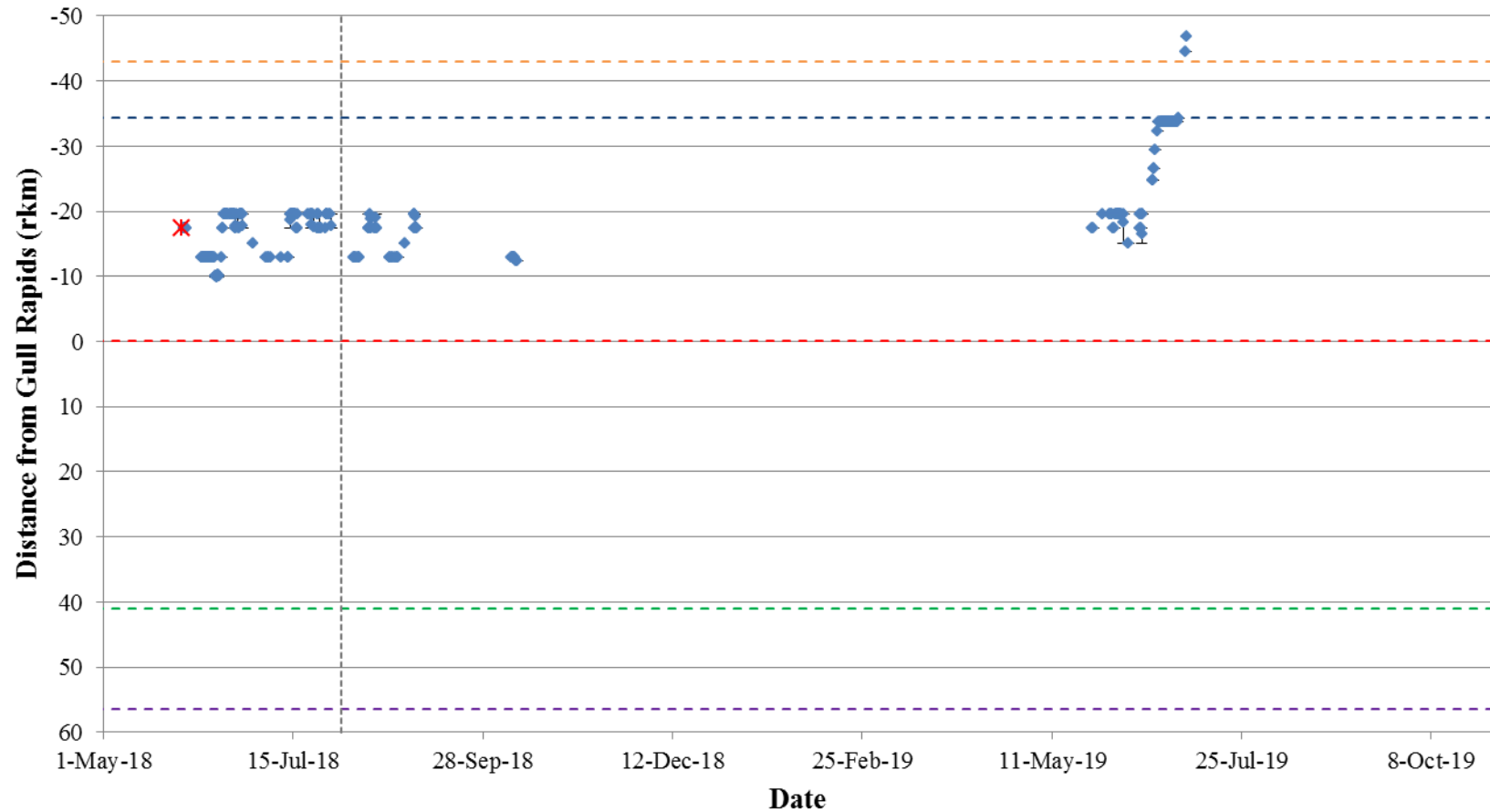


Figure A2-65: Position of a Walleye tagged with an acoustic transmitter (code #25756) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1, 2018, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

APPENDIX 3:

LOCATION SUMMARY FOR INDIVIDUAL ACOUSTIC TAGGED WALLEYE IN STEPHENS LAKE JUNE 2016 TO OCTOBER 2019

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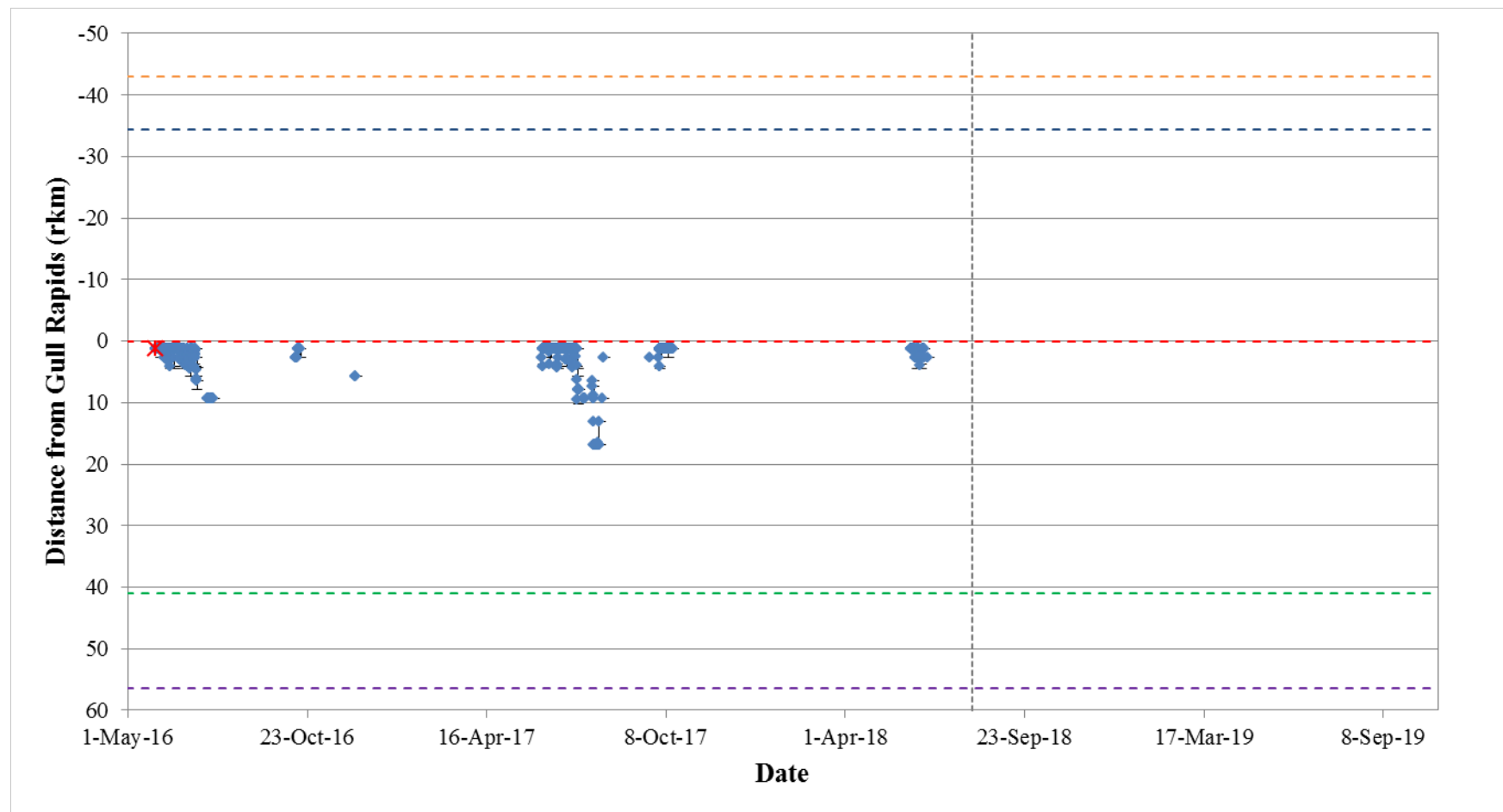


Figure A3-1: Position of a Walleye tagged with an acoustic transmitter (code #53723) in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

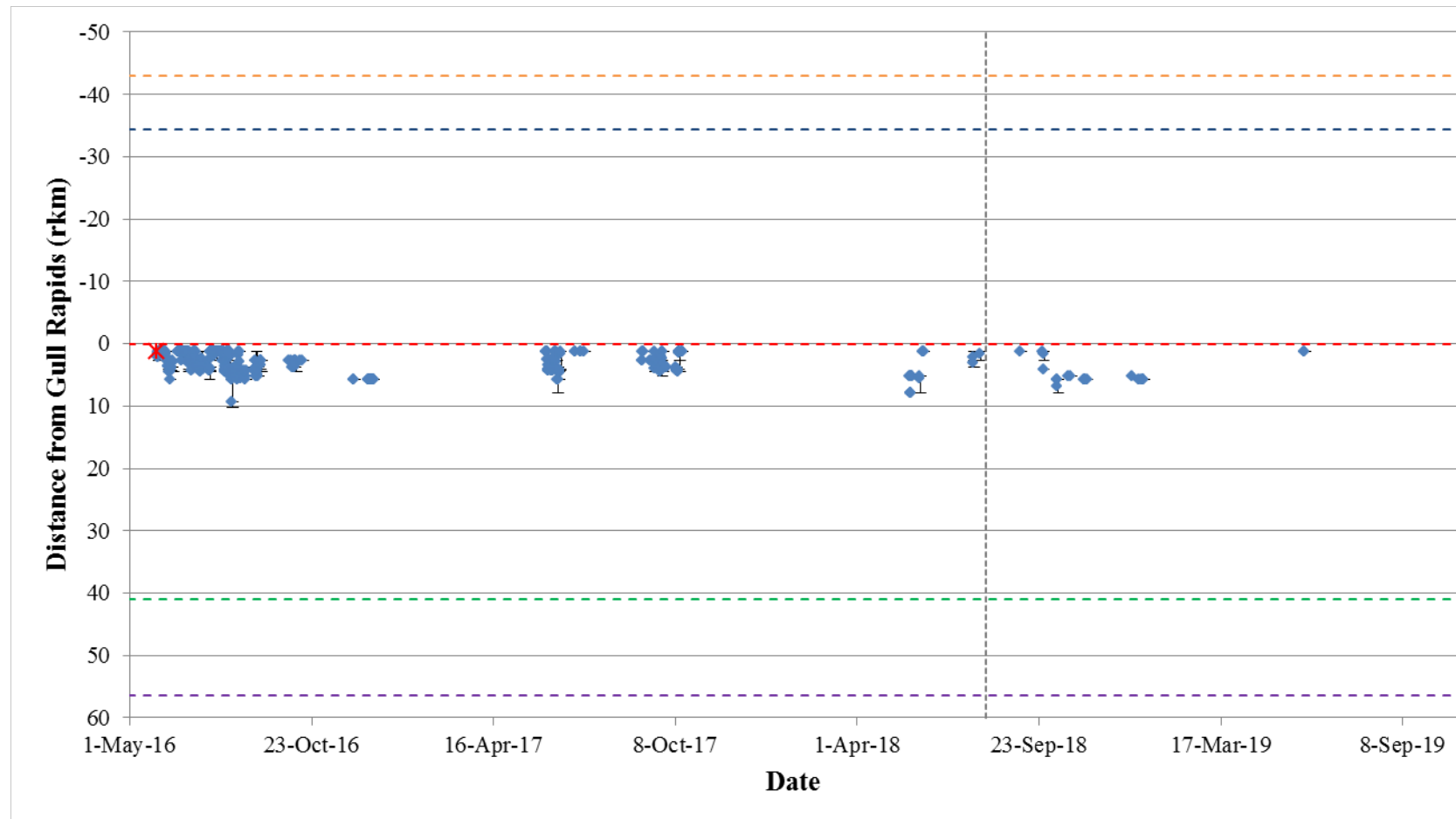


Figure A3-2: Position of a Walleye tagged with an acoustic transmitter (code #53724) in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

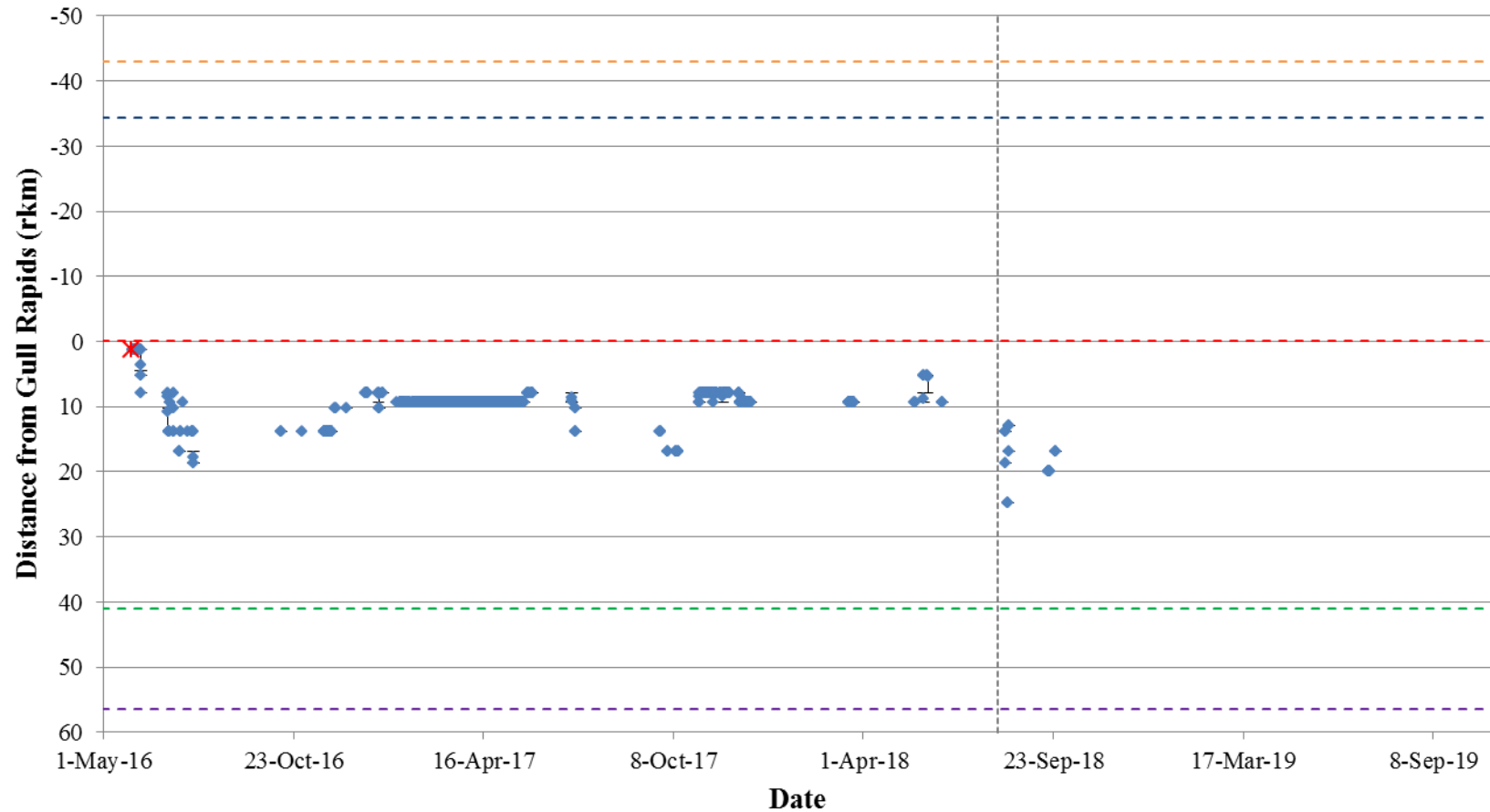


Figure A3-3: Position of a Walleye tagged with an acoustic transmitter (code #53725) in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

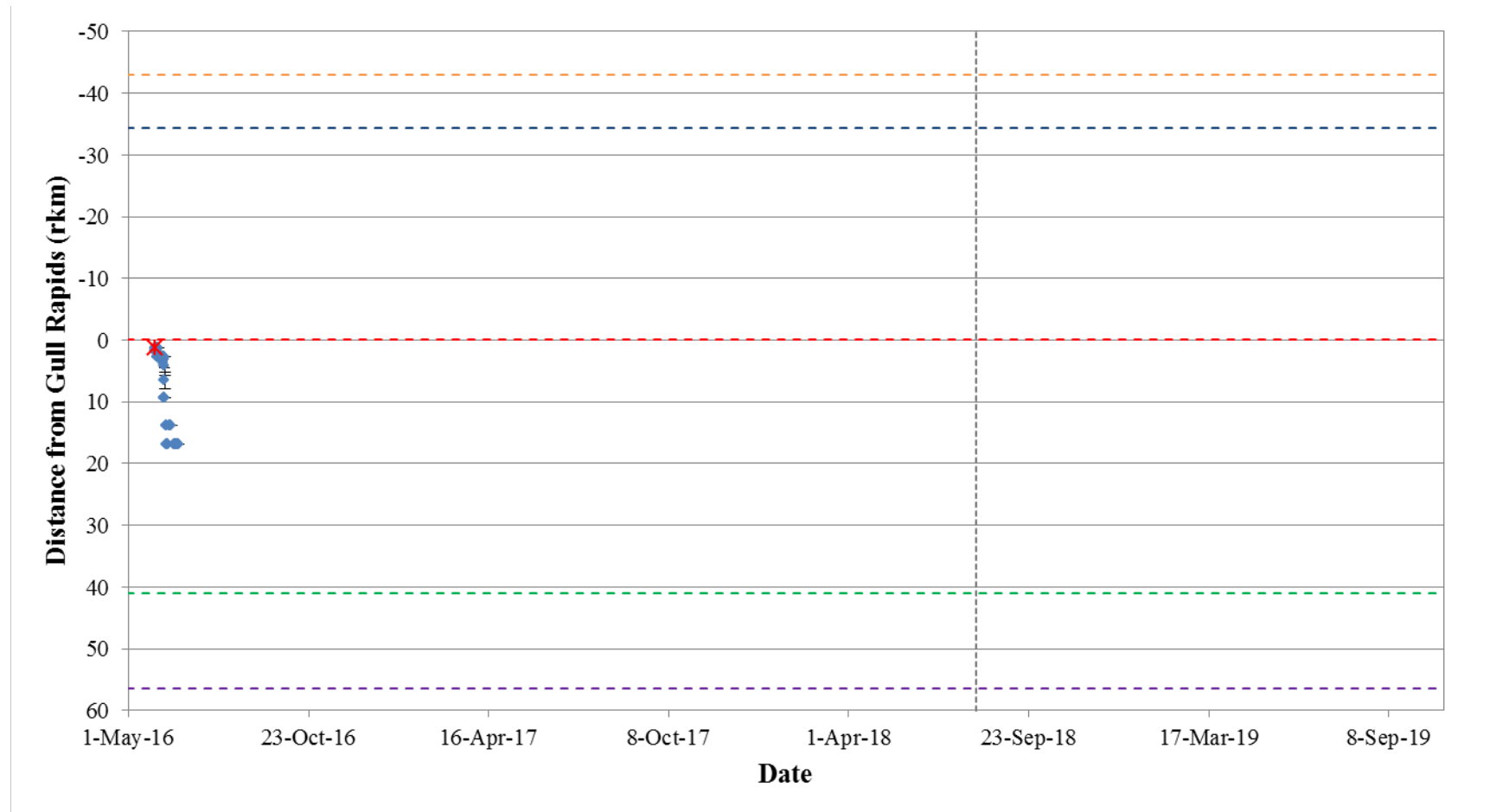


Figure A3-4: Position of a Walleye tagged with an acoustic transmitter (code #53726) in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

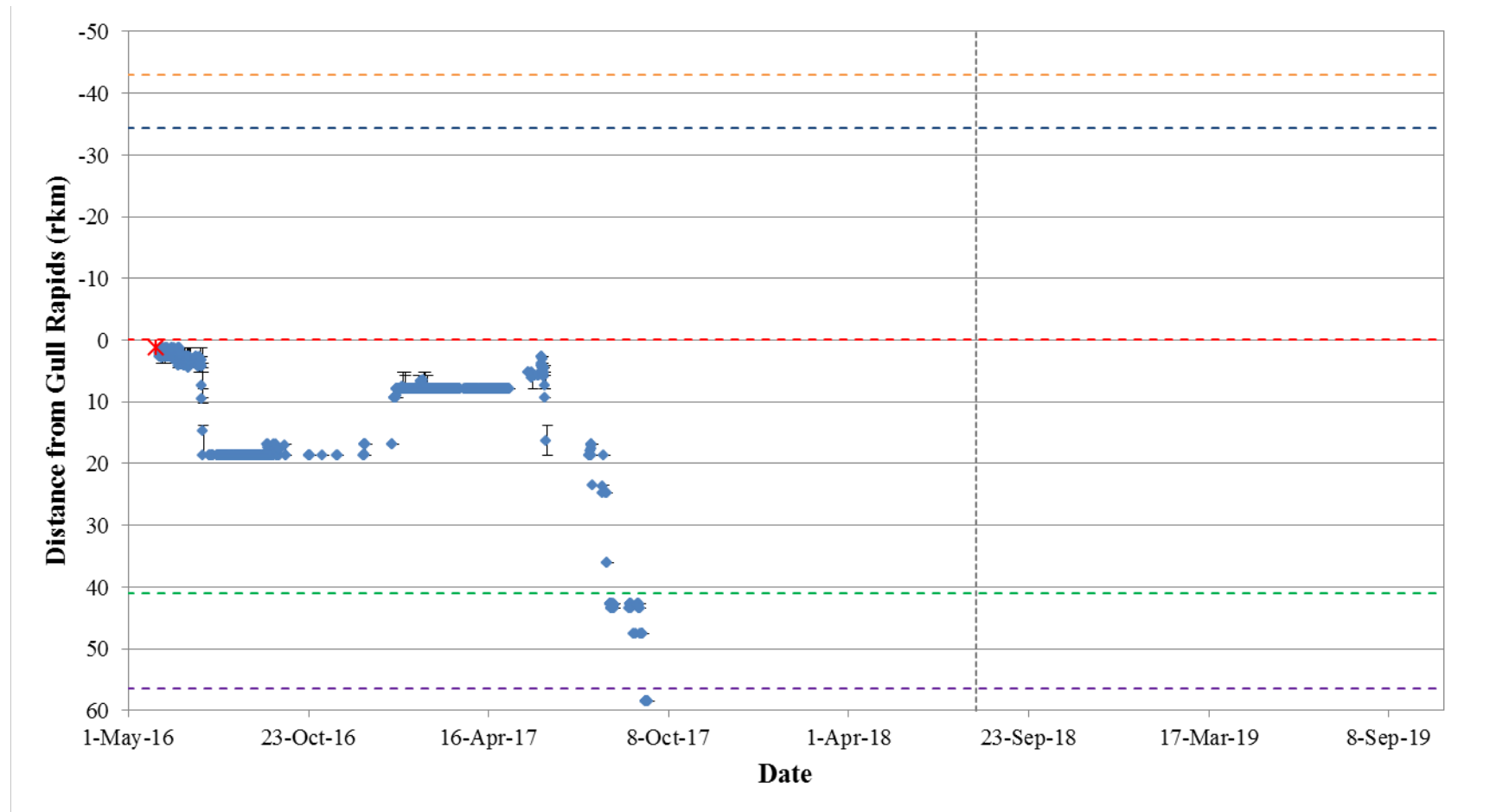


Figure A3-5: Position of a Walleye tagged with an acoustic transmitter (code #53728) in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

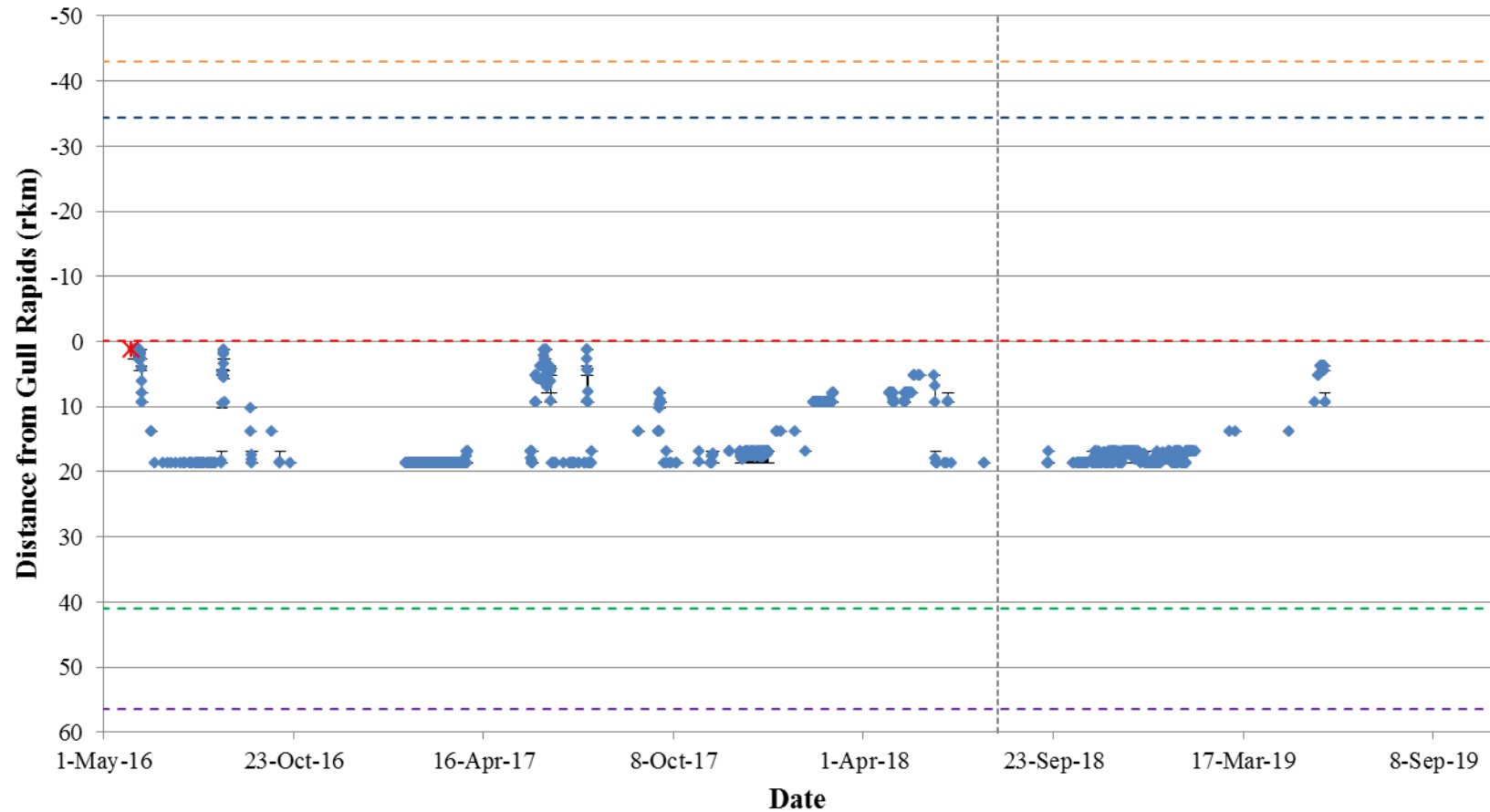


Figure A3-6: Position of a Walleye tagged with an acoustic transmitter (code #53729) in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

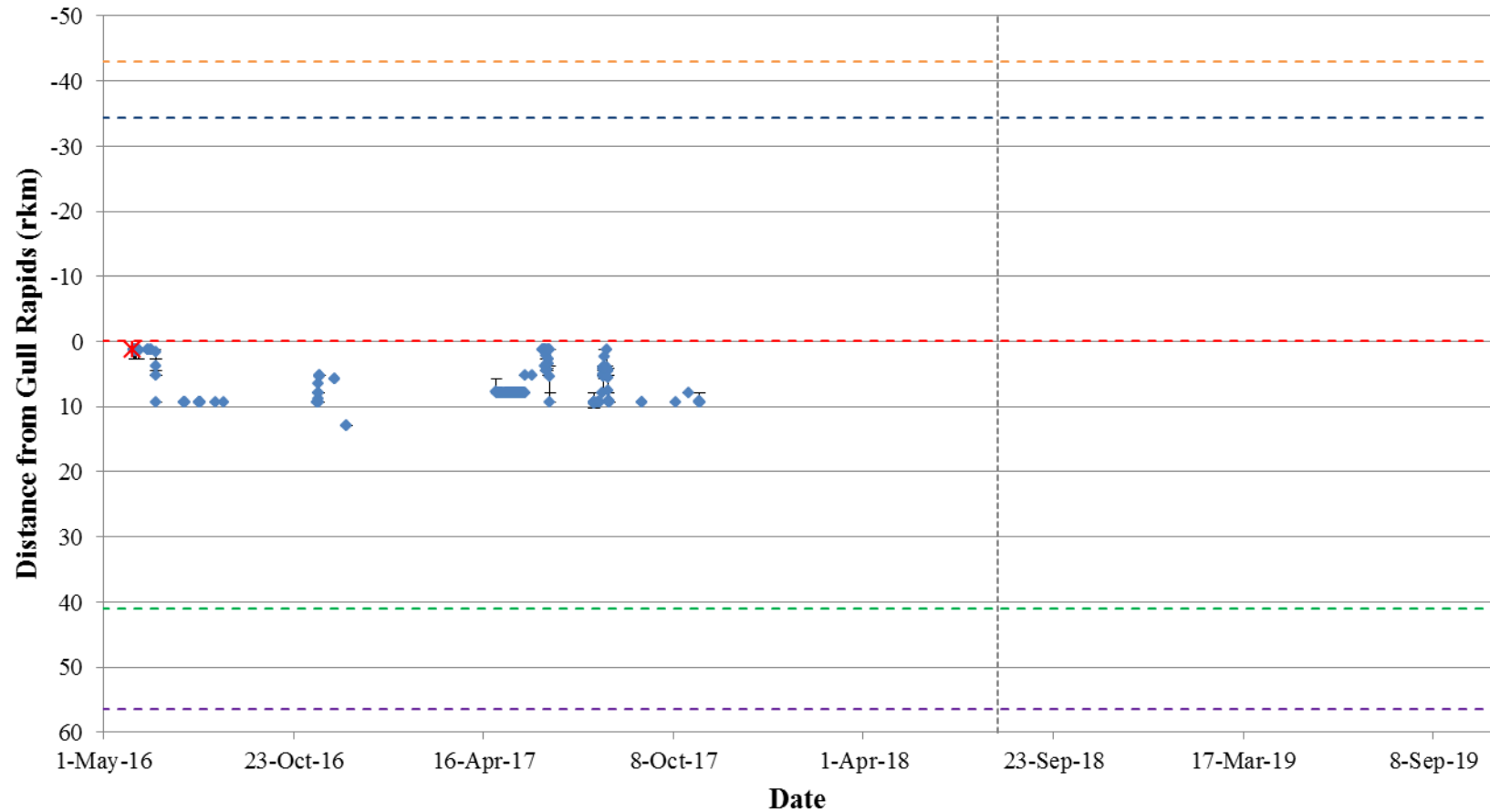


Figure A3-7: Position of a Walleye tagged with an acoustic transmitter (code #53730) in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

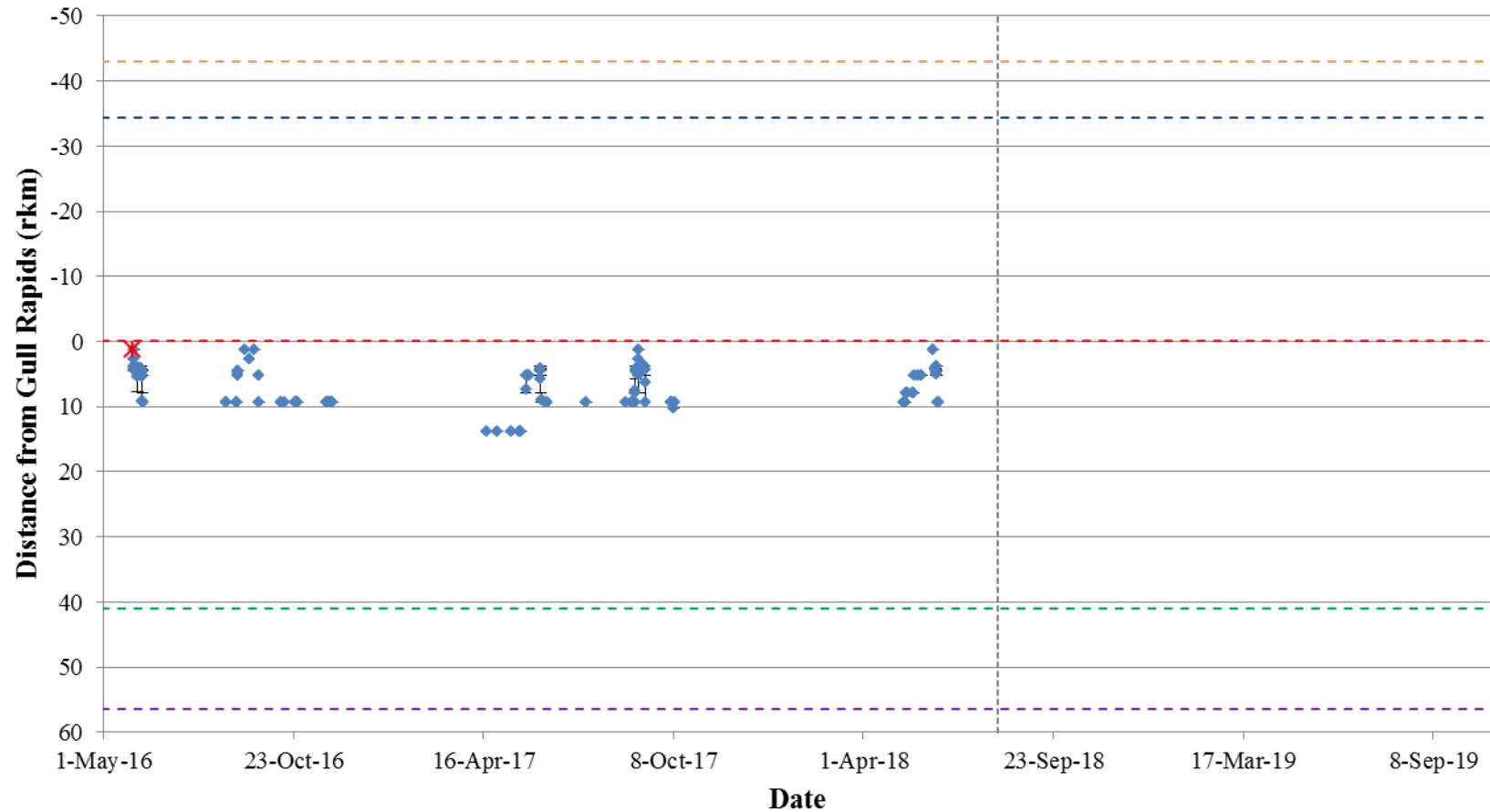


Figure A3-8: Position of a Walleye tagged with an acoustic transmitter (code #53731) in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

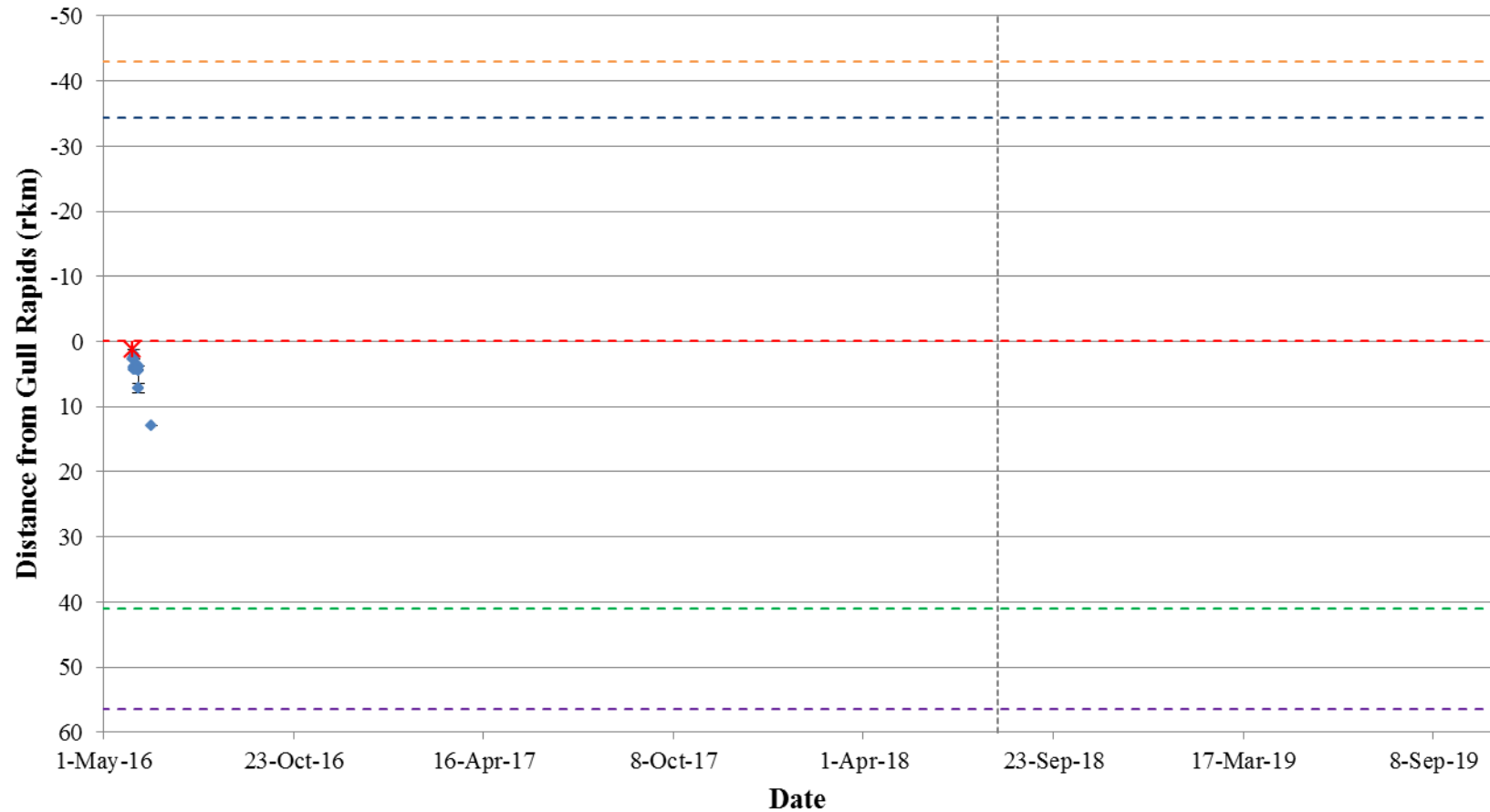


Figure A3-9: Position of a Walleye tagged with an acoustic transmitter (code #53732) in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

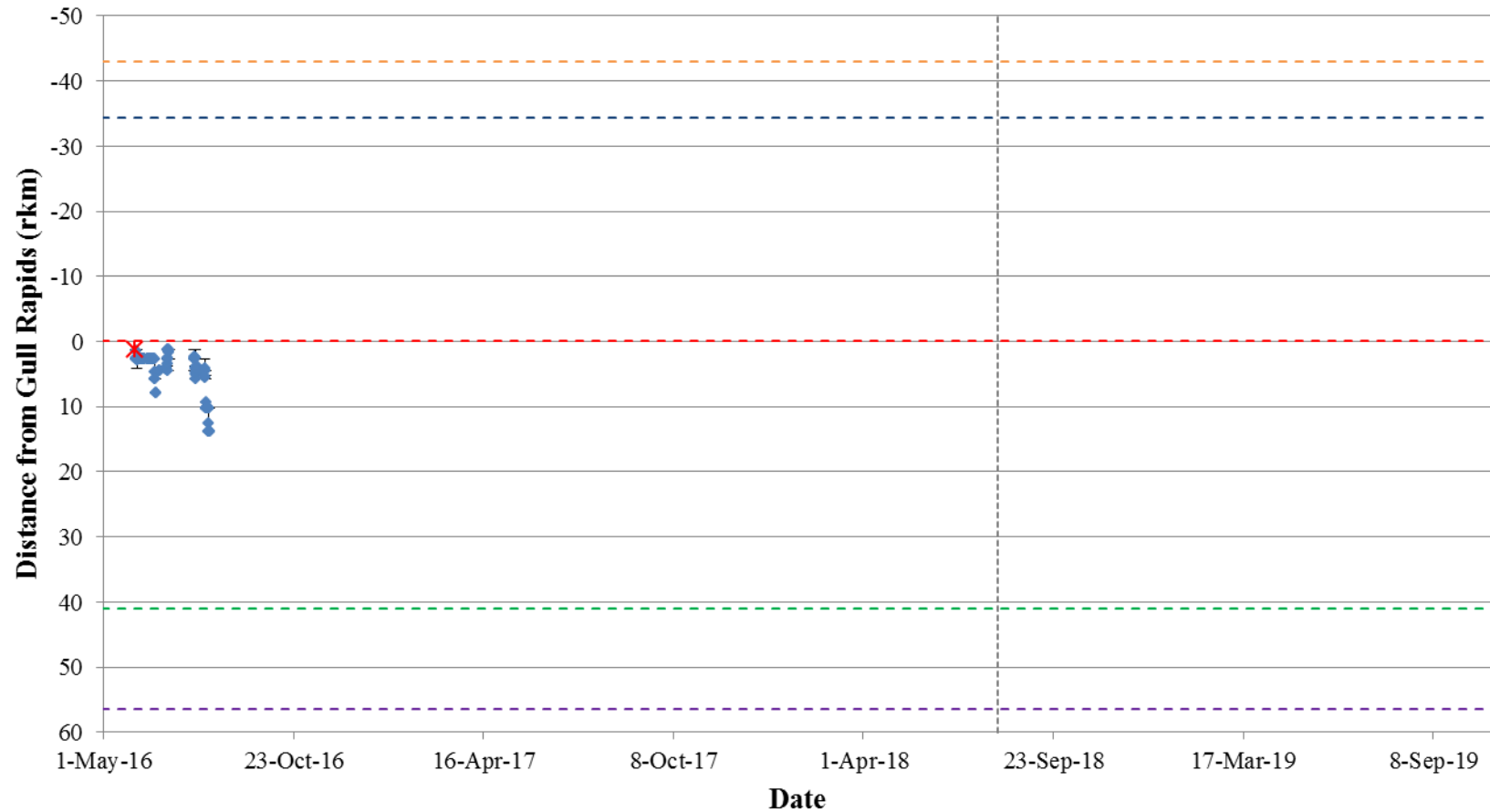


Figure A3-10: Position of a Walleye tagged with an acoustic transmitter (code #53733) in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

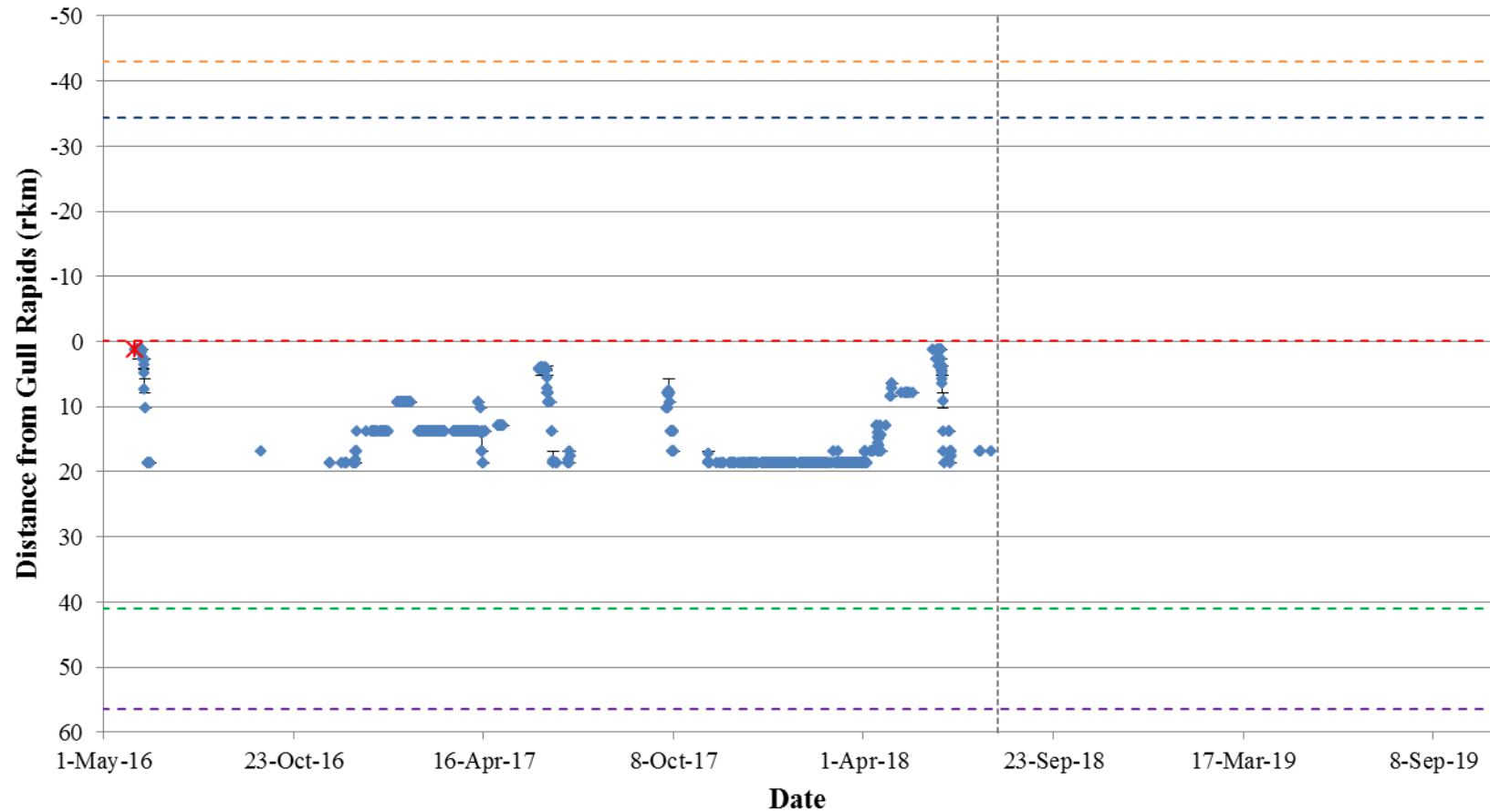


Figure A3-11: Position of a Walleye tagged with an acoustic transmitter (code #53734) in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

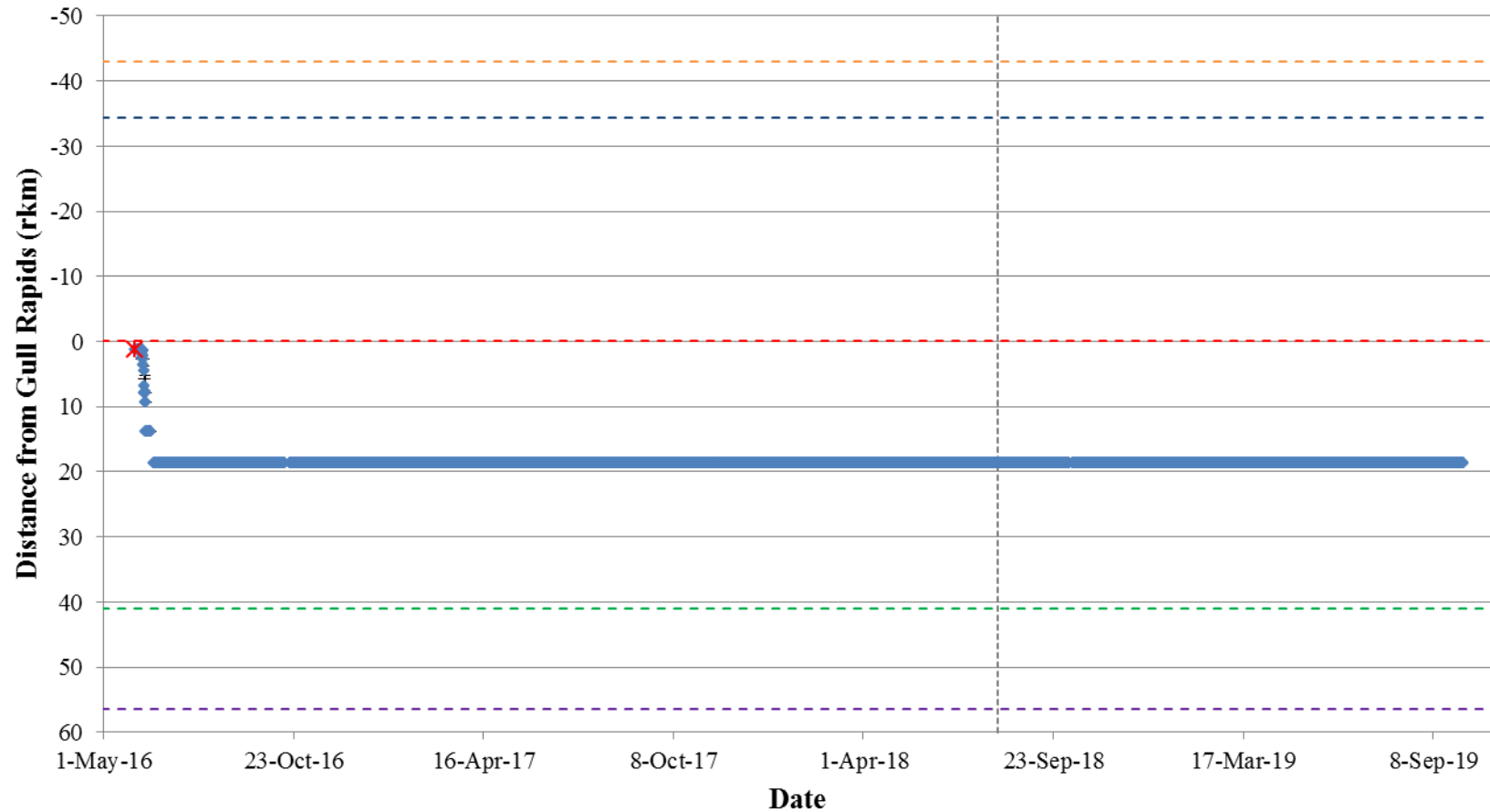


Figure A3-12: Position of a Walleye tagged with an acoustic transmitter (code #53735) in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

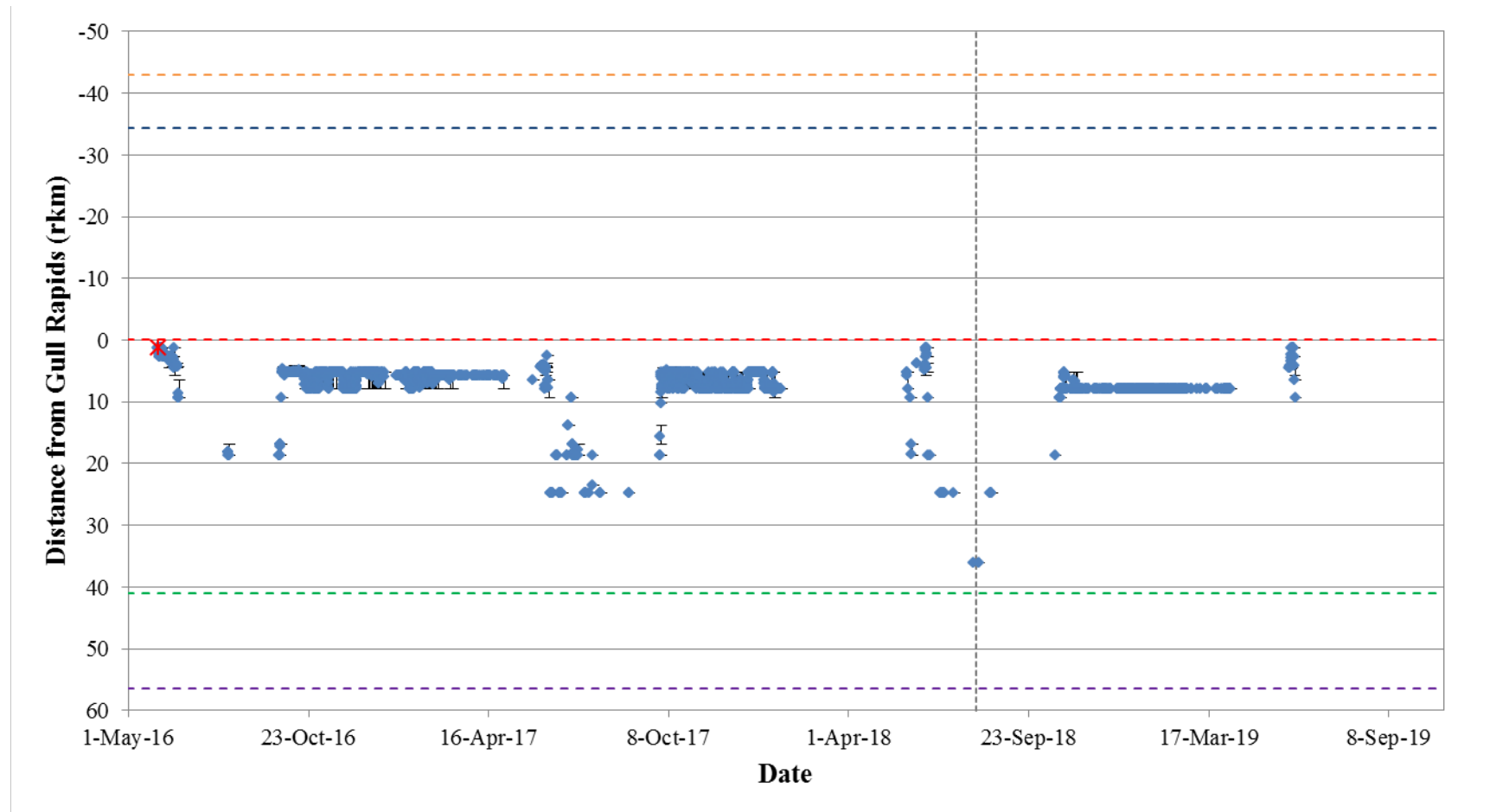


Figure A3-13: Position of a Walleye tagged with an acoustic transmitter (code #53736) in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

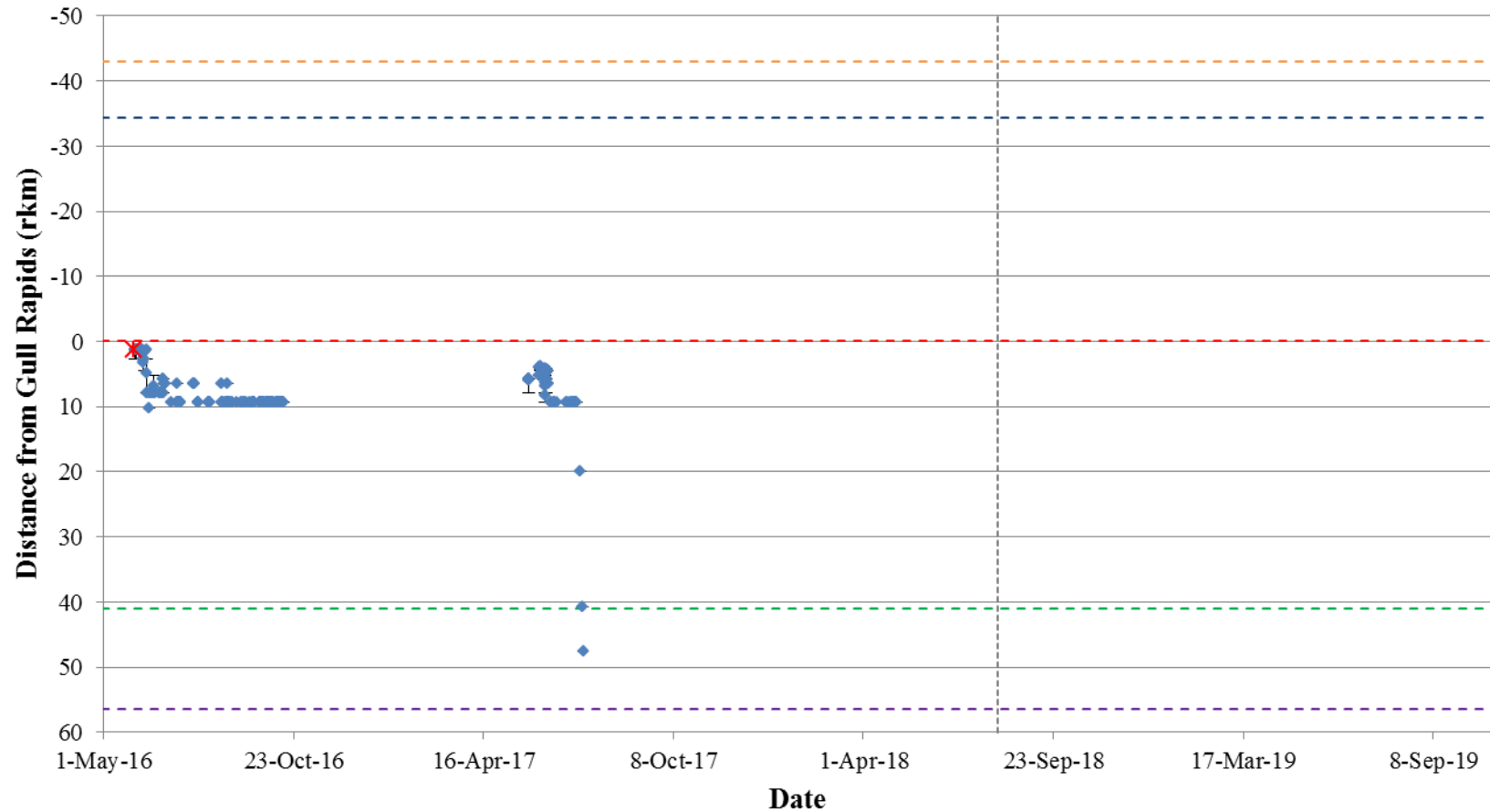


Figure A3-14: Position of a Walleye tagged with an acoustic transmitter (code #53737) in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

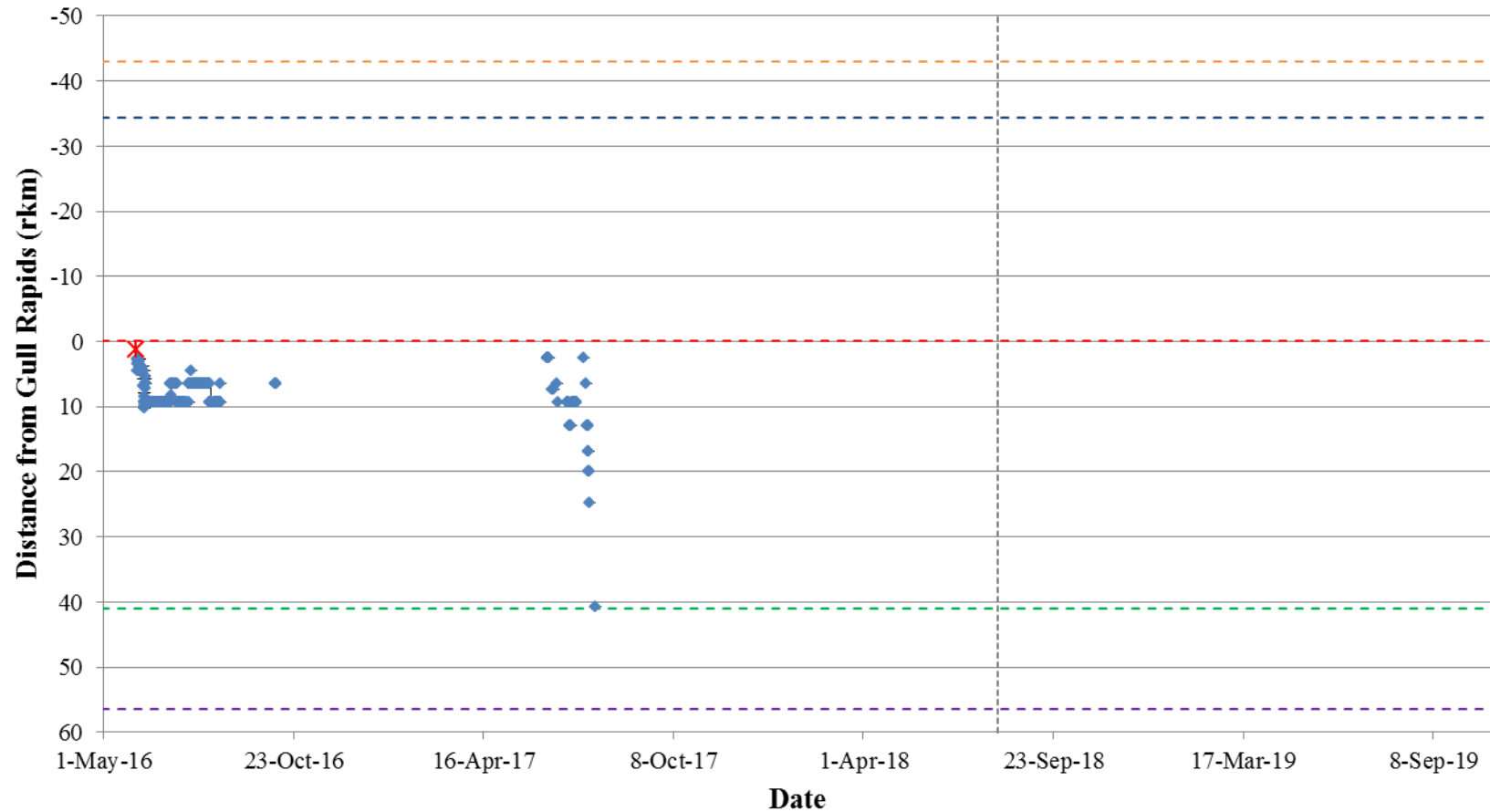


Figure A3-15: Position of a Walleye tagged with an acoustic transmitter (code #53738) in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

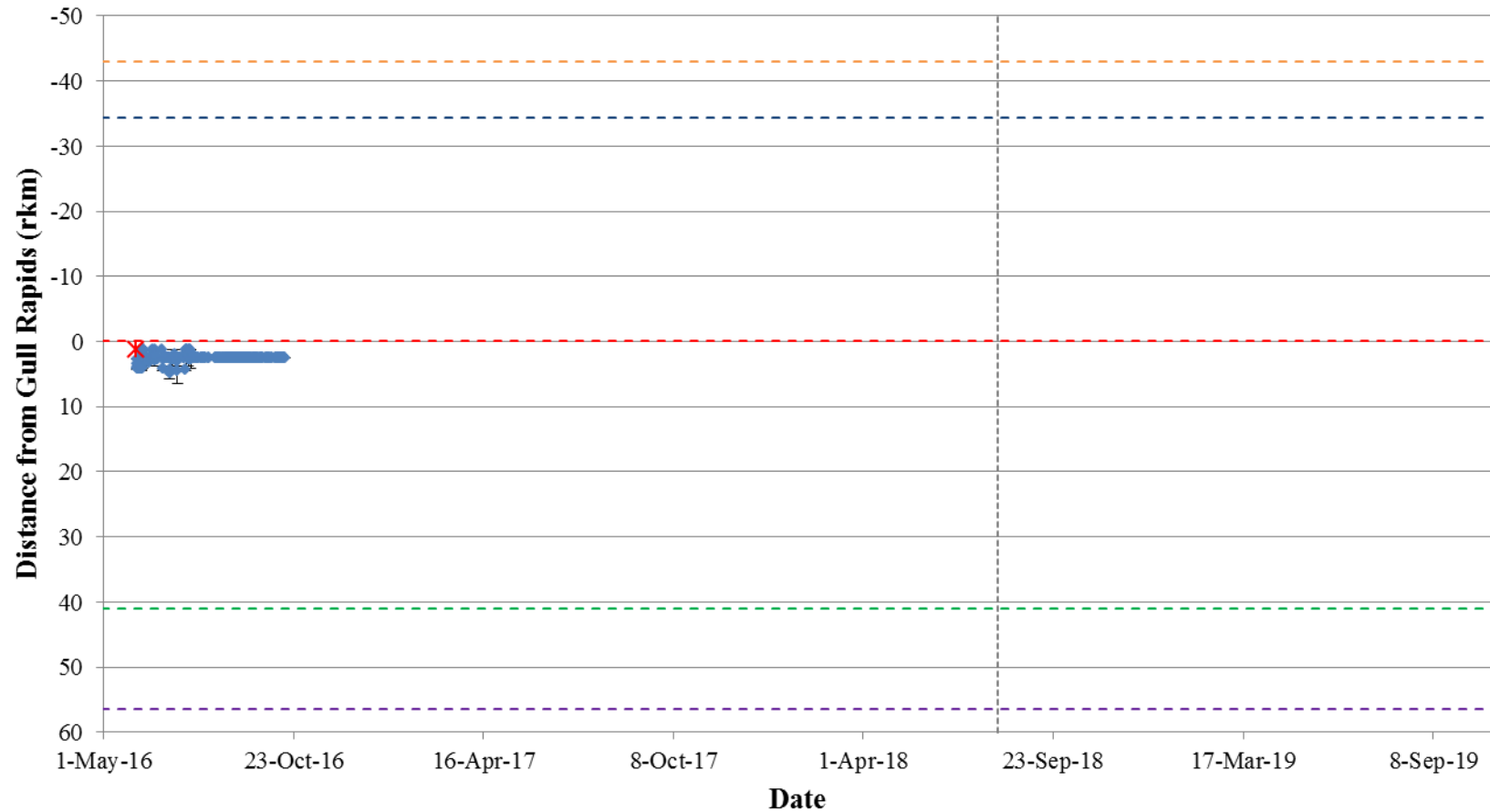


Figure A3-16: Position of a Walleye tagged with an acoustic transmitter (code #53739) in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

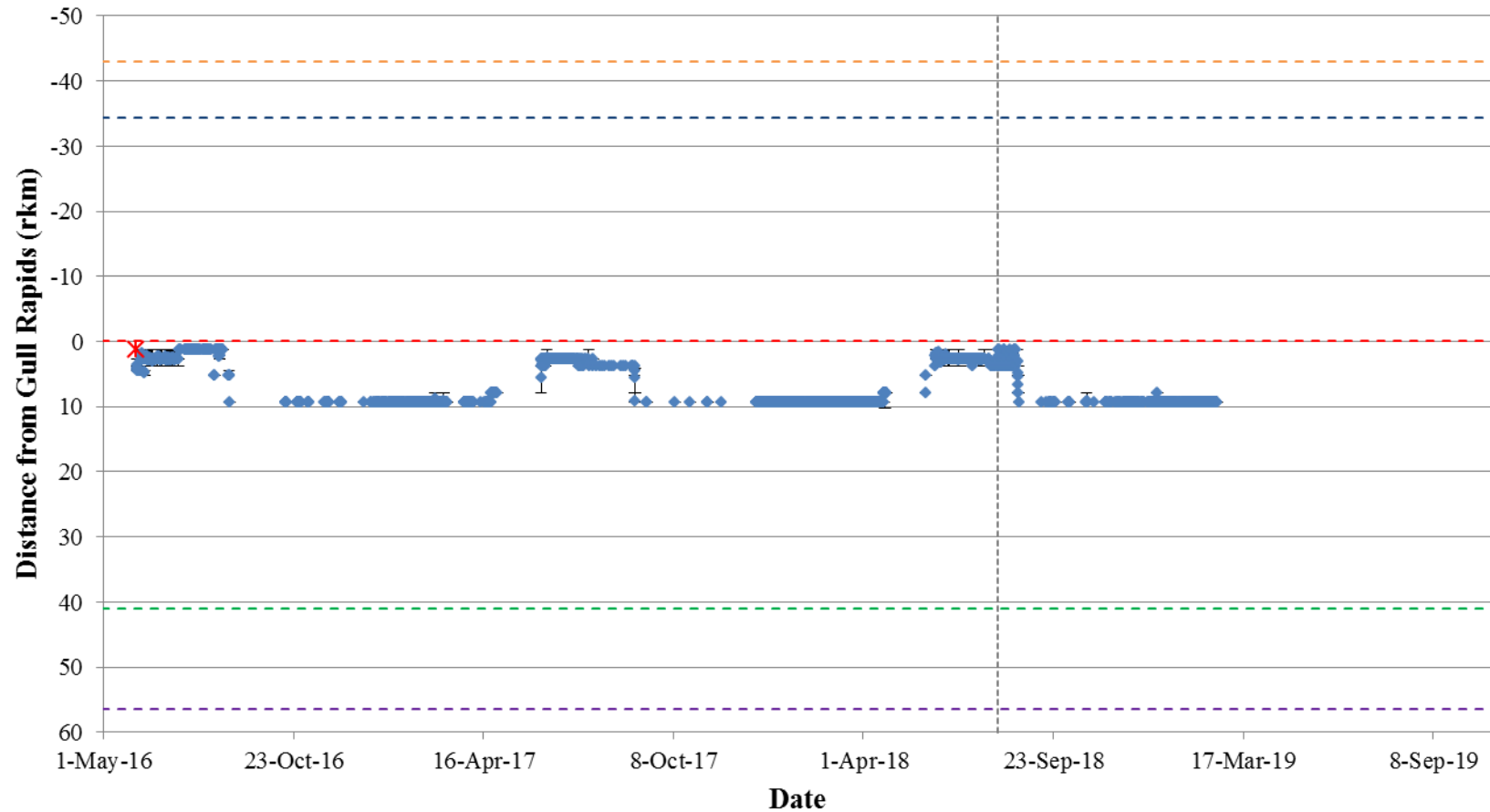


Figure A3-17: Position of a Walleye tagged with an acoustic transmitter (code #53740) in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

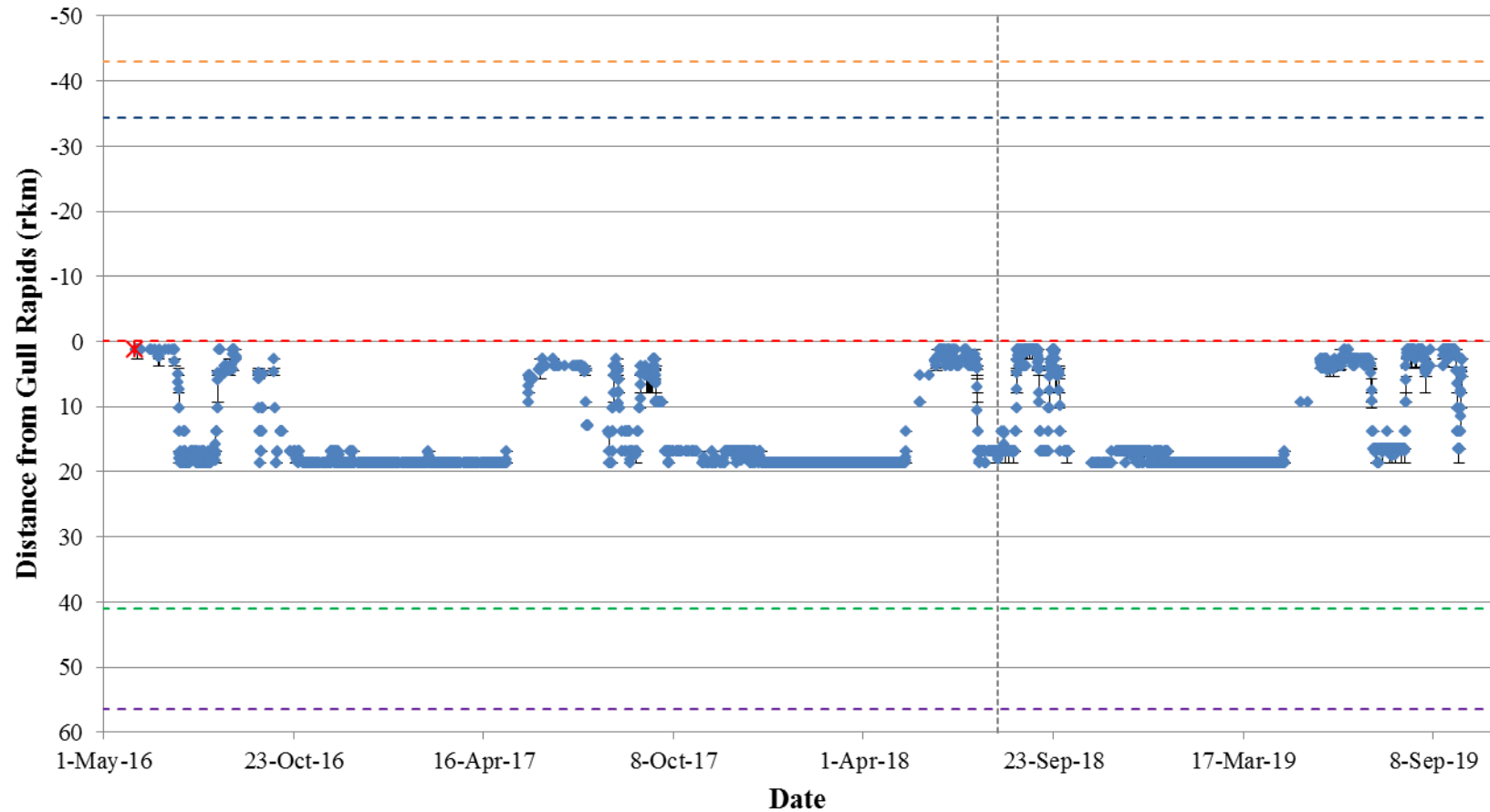


Figure A3-18: Position of a Walleye tagged with an acoustic transmitter (code #53741) in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

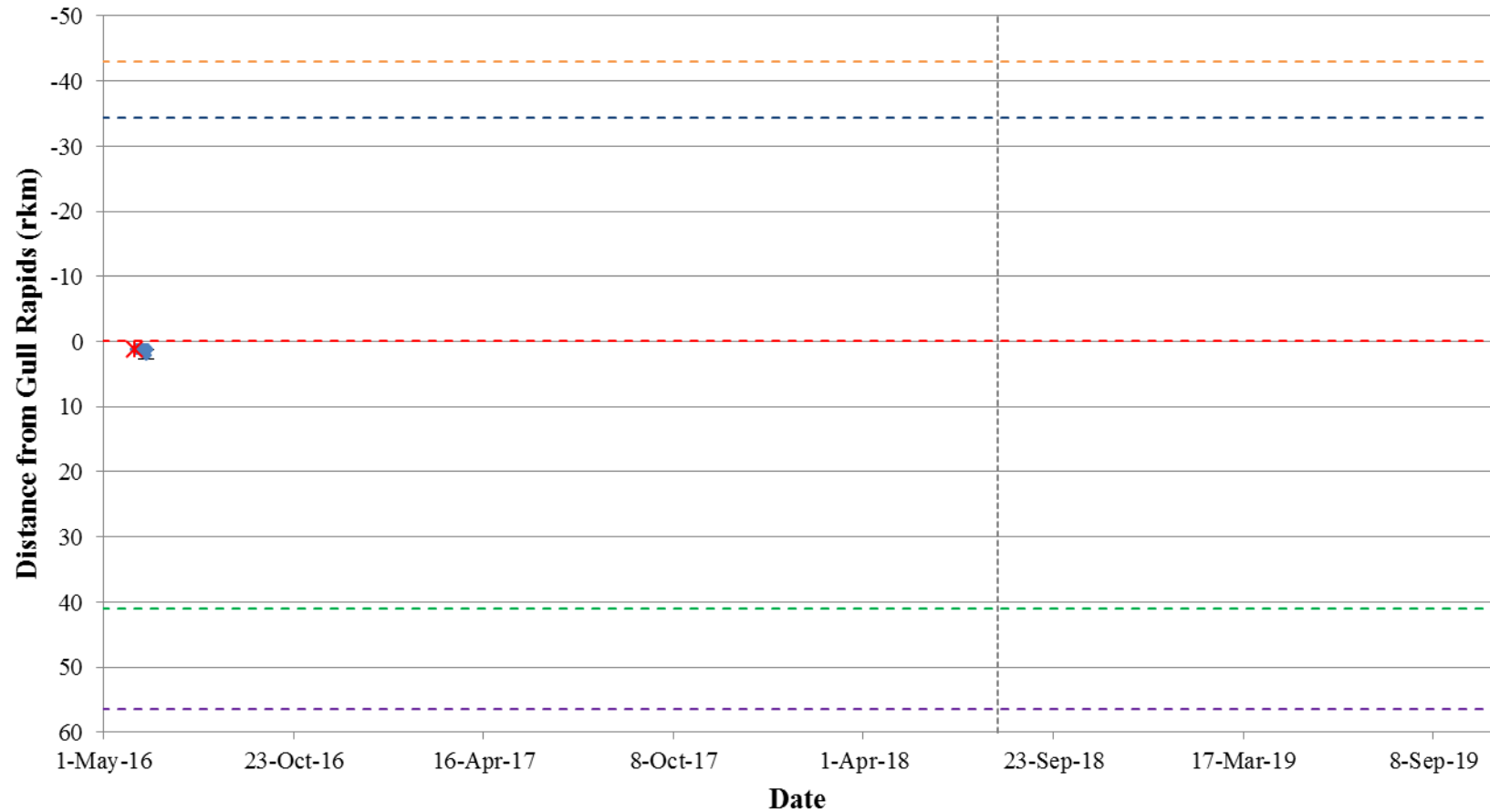


Figure A3-19: Position of a Walleye tagged with an acoustic transmitter (code #53742) in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

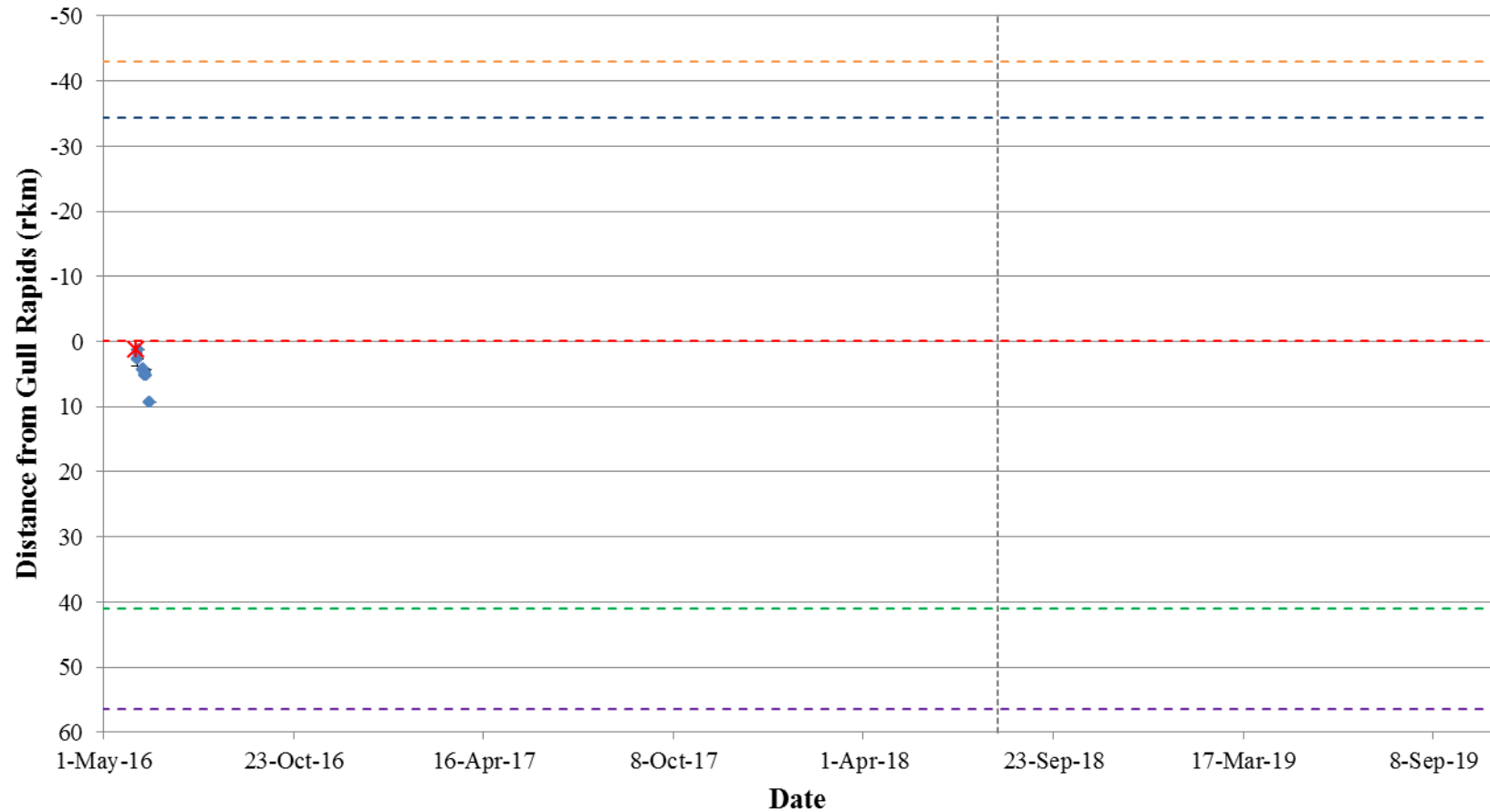


Figure A3-20: Position of a Walleye tagged with an acoustic transmitter (code #53743) in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

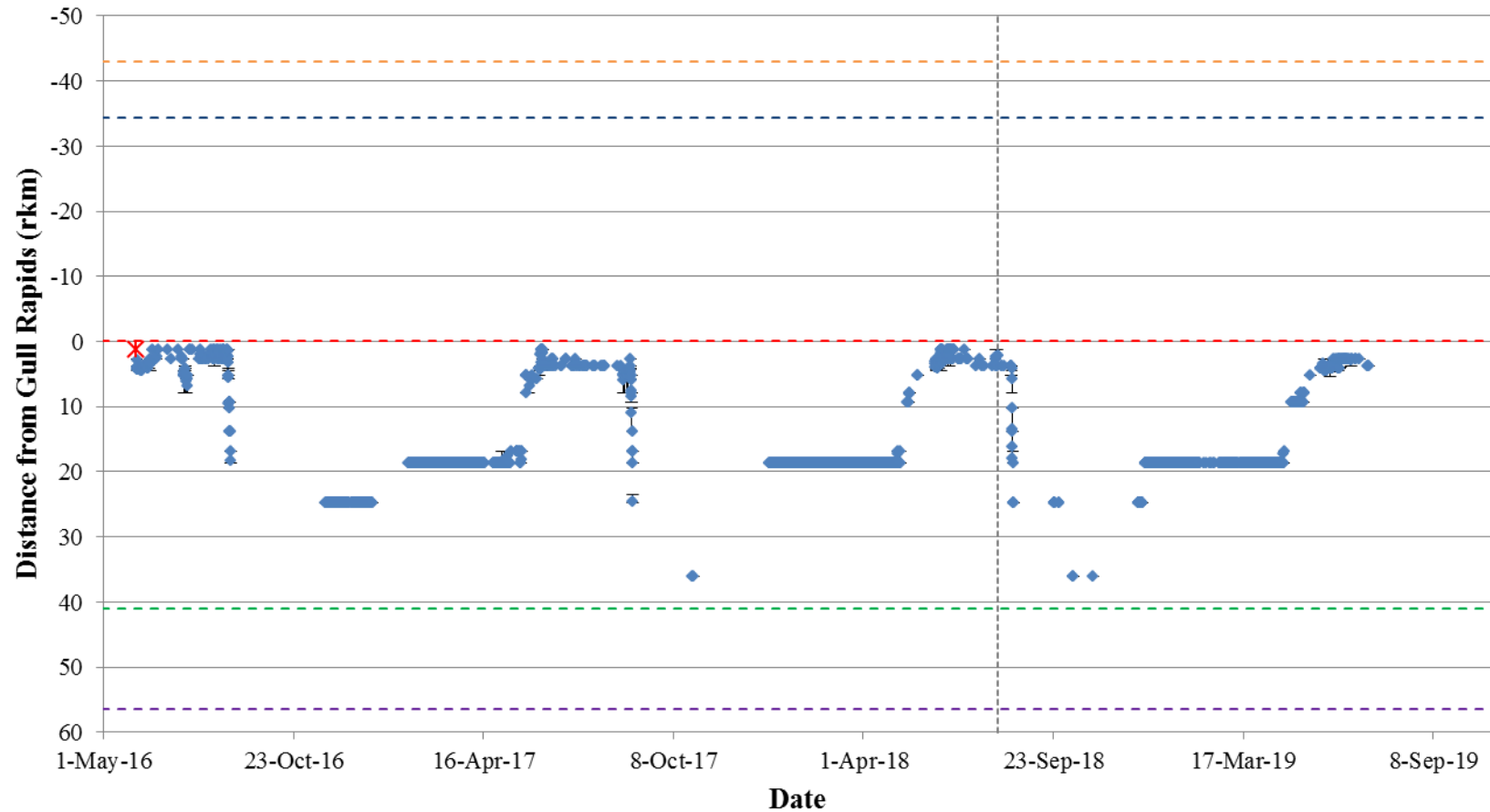


Figure A3-21: Position of a Walleye tagged with an acoustic transmitter (code #53744) in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

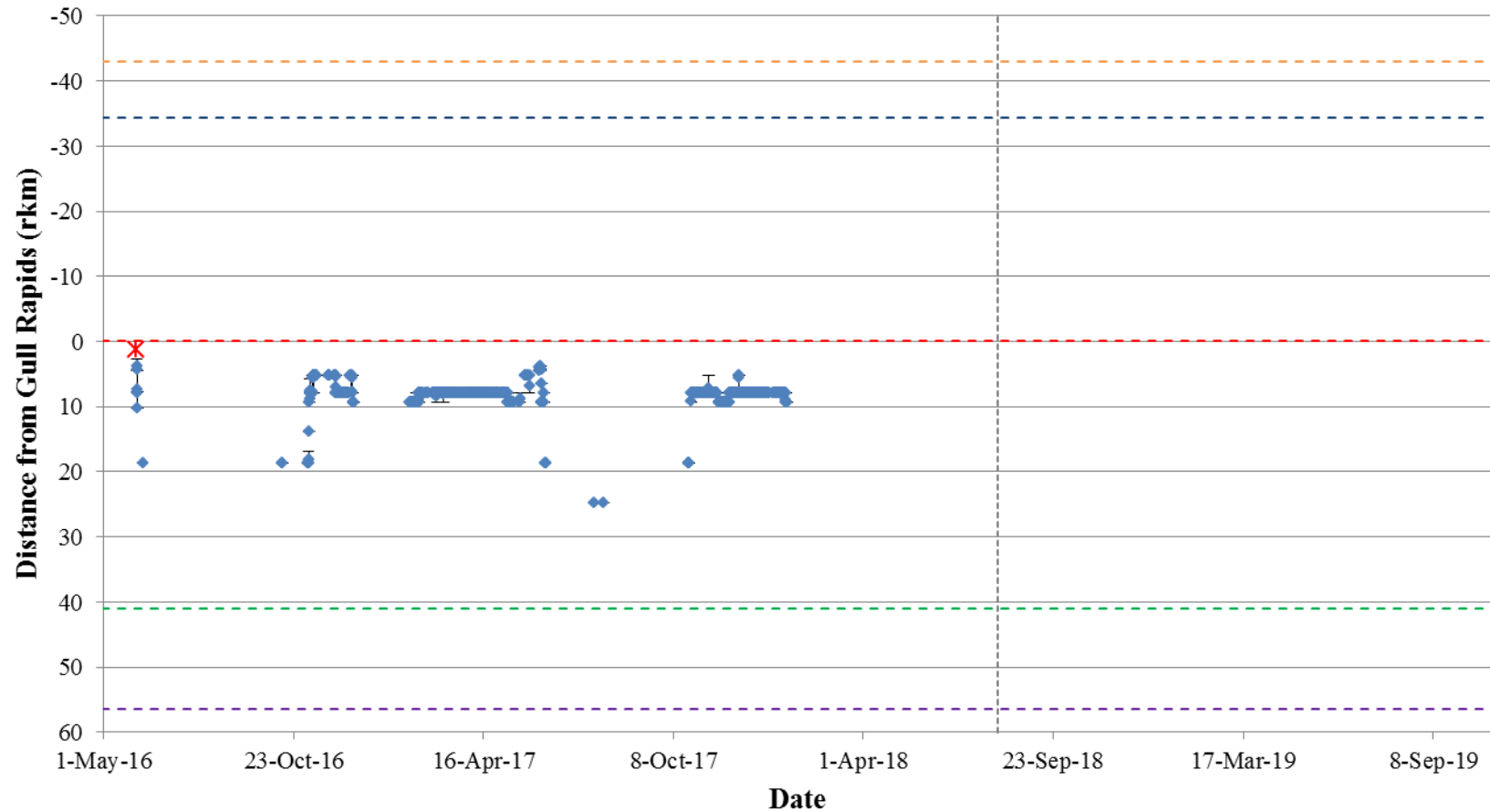


Figure A3-22: Position of a Walleye tagged with an acoustic transmitter (code #53745) in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

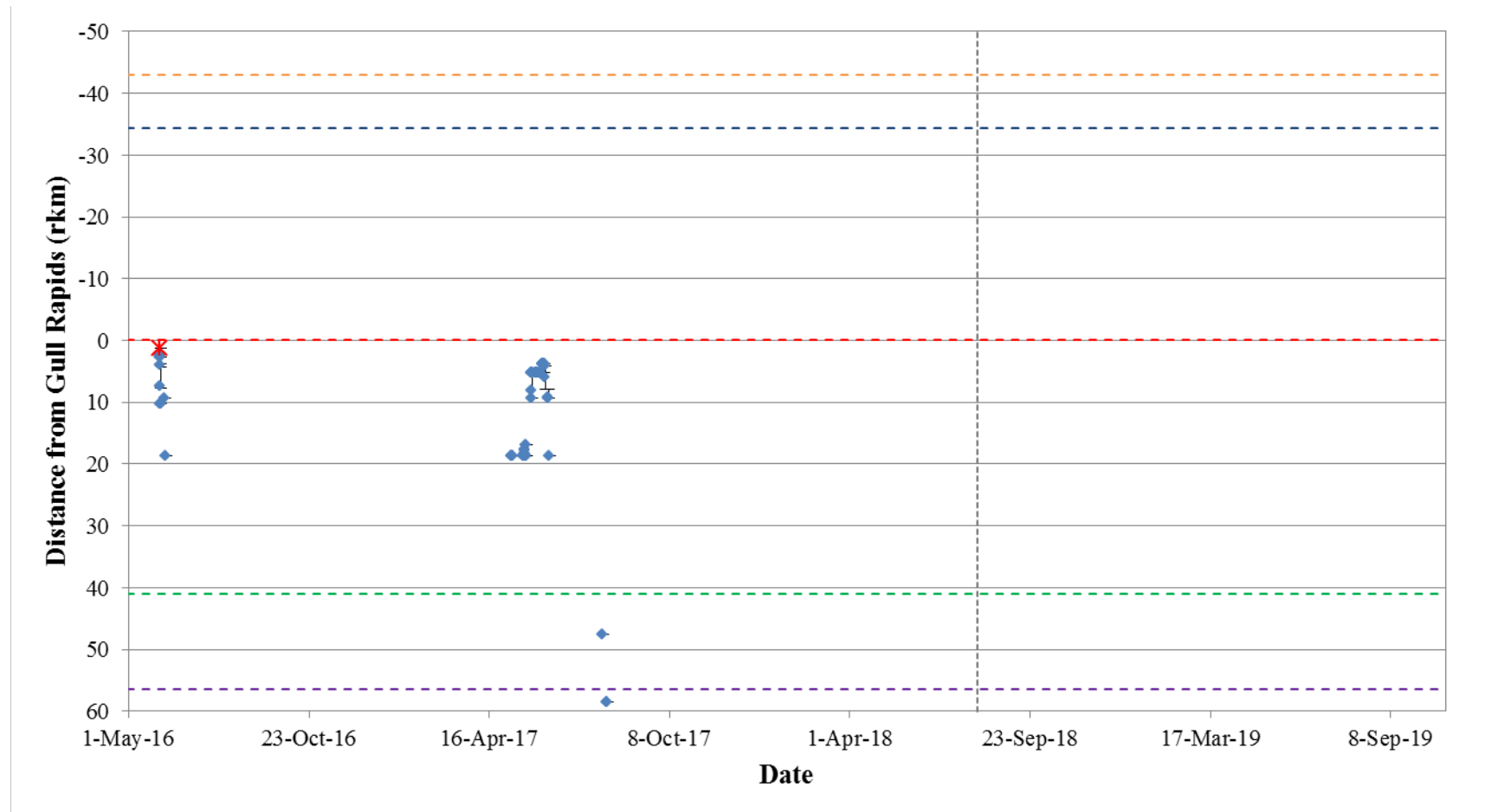


Figure A3-23: Position of a Walleye tagged with an acoustic transmitter (code #53746) in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

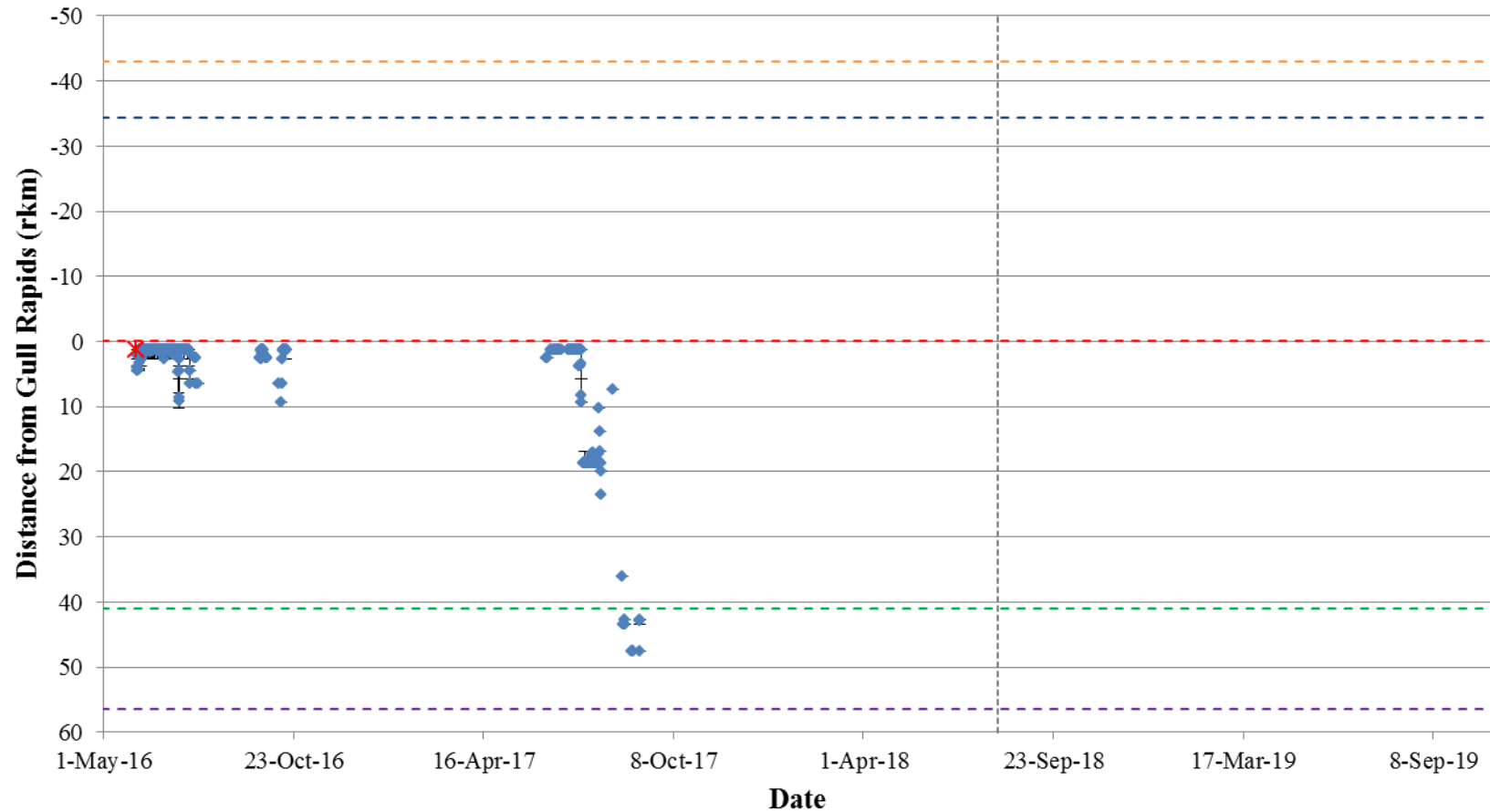


Figure A3-24: Position of a Walleye tagged with an acoustic transmitter (code #53747) in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

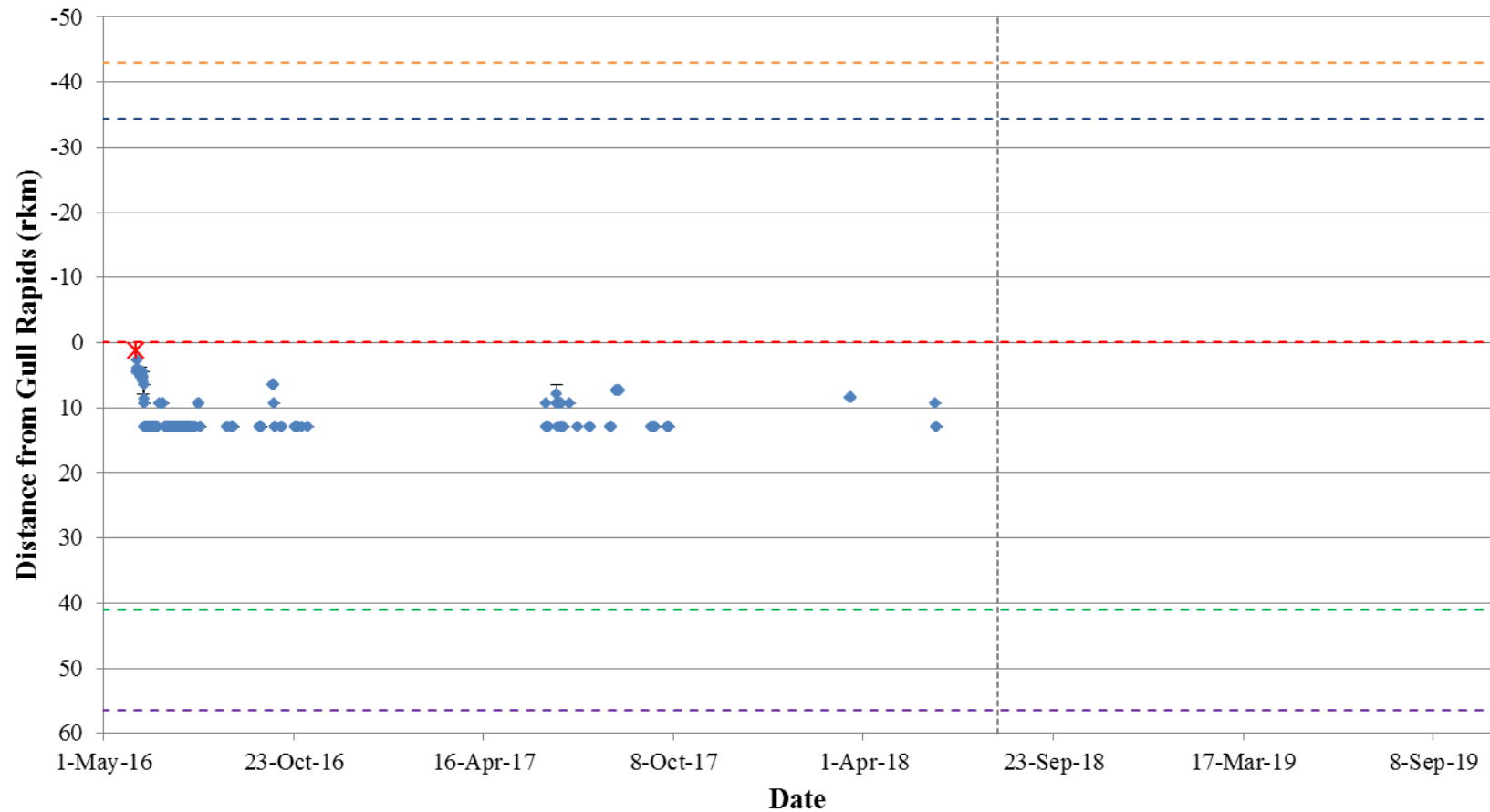


Figure A3-25: Position of a Walleye tagged with an acoustic transmitter (code #53748) in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

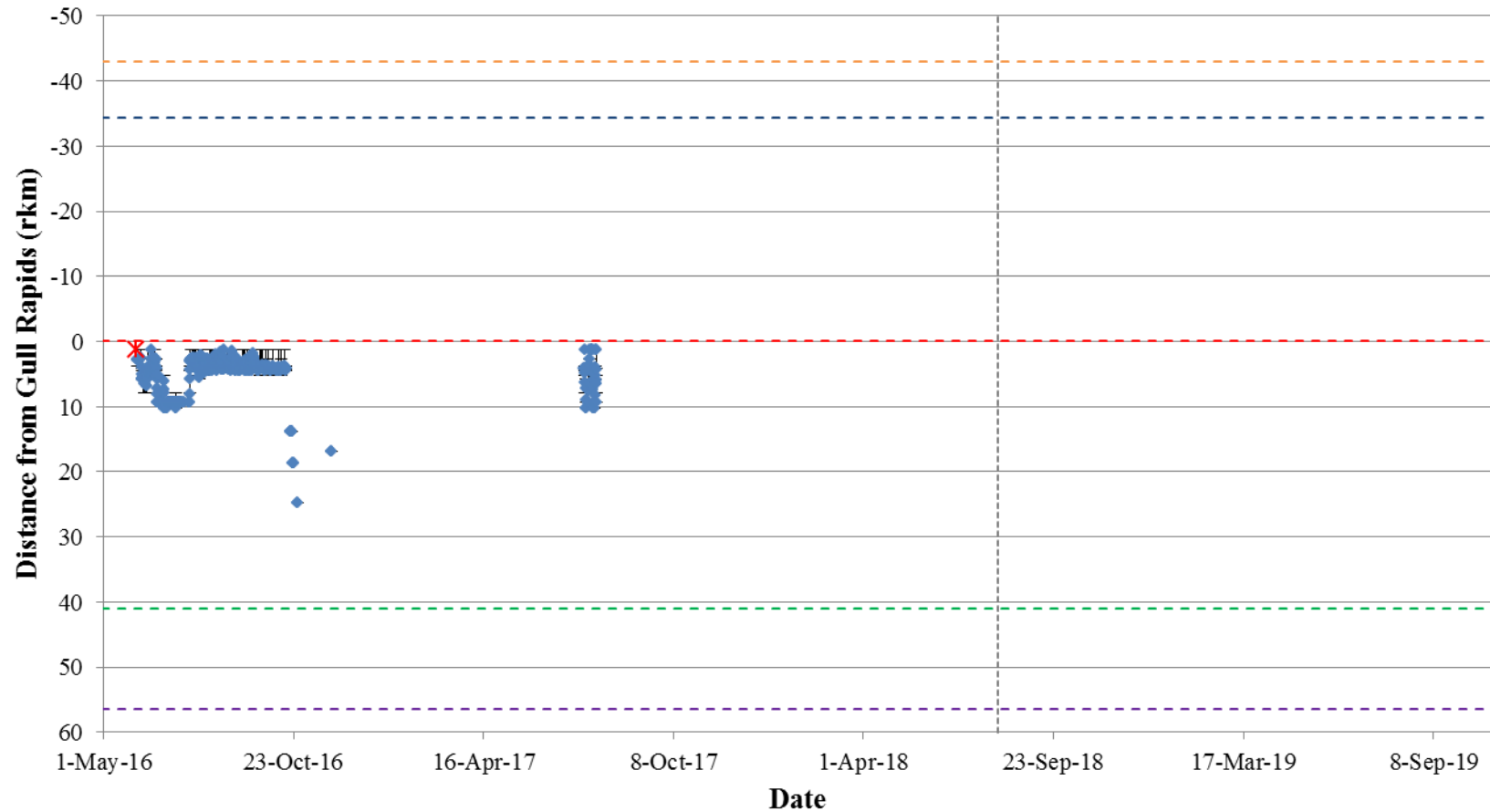


Figure A3-26: Position of a Walleye tagged with an acoustic transmitter (code #53749) in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

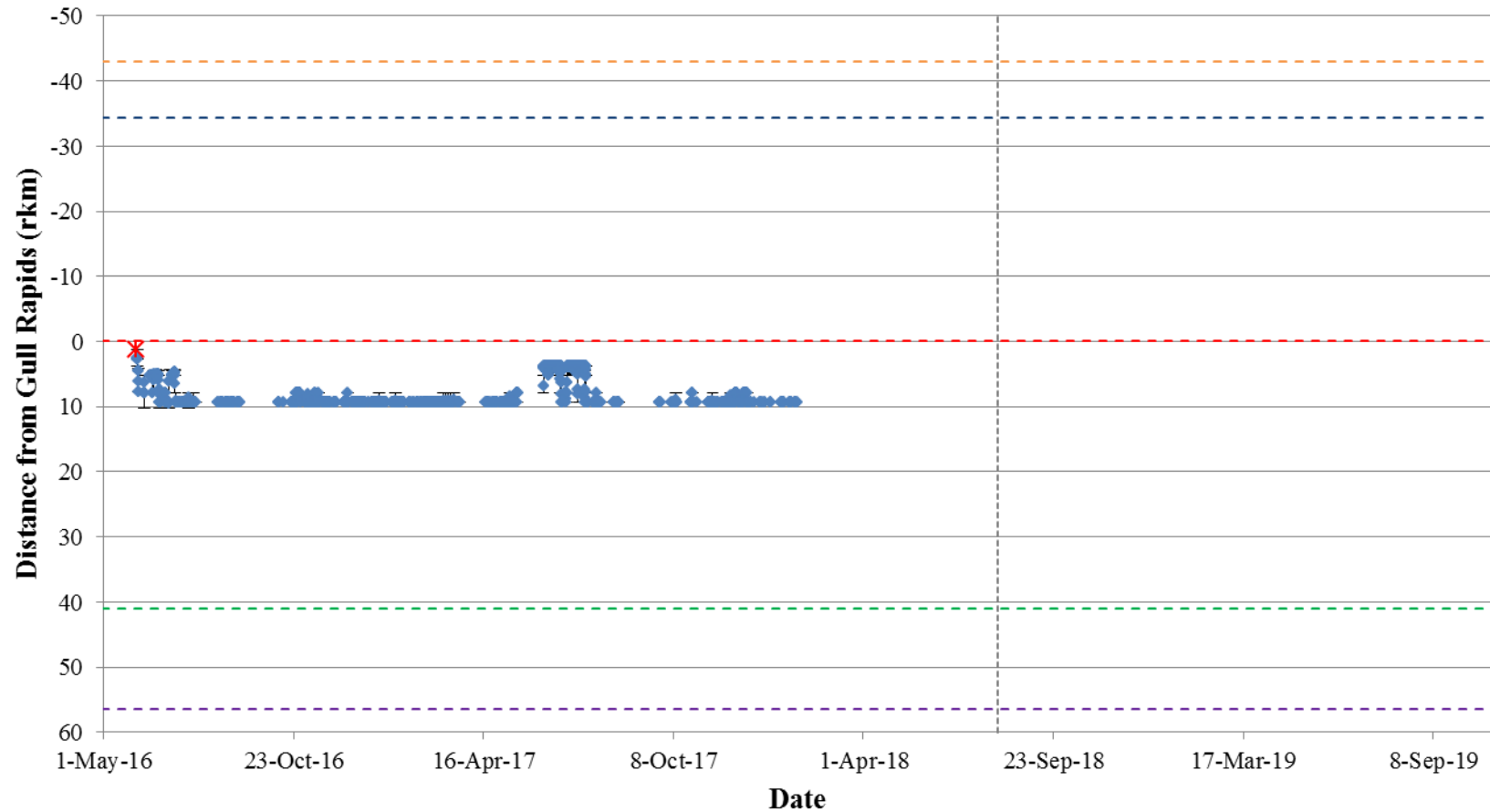


Figure A3-27: Position of a Walleye tagged with an acoustic transmitter (code #53750) in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

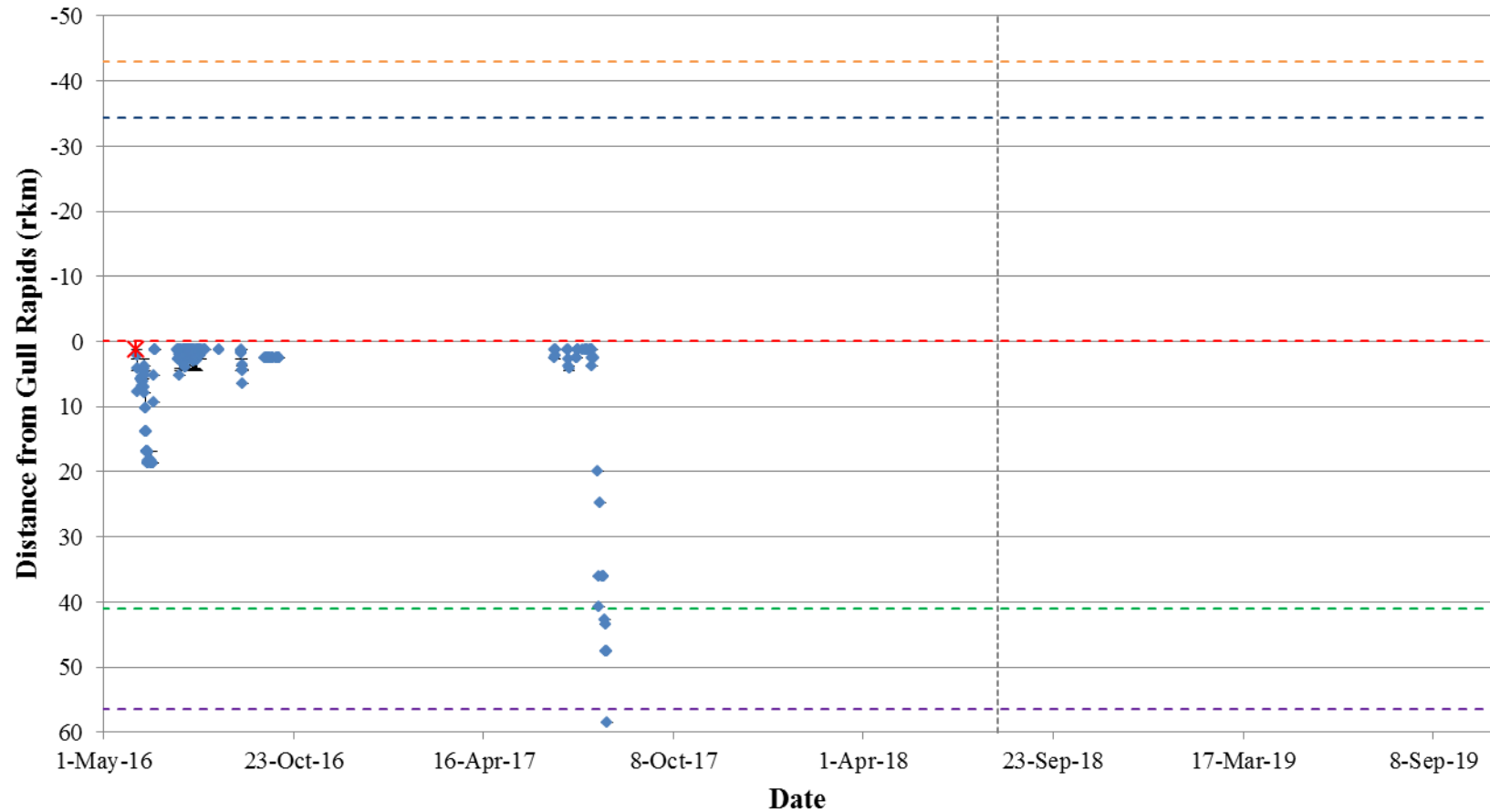


Figure A3-28: Position of a Walleye tagged with an acoustic transmitter (code #53751) in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

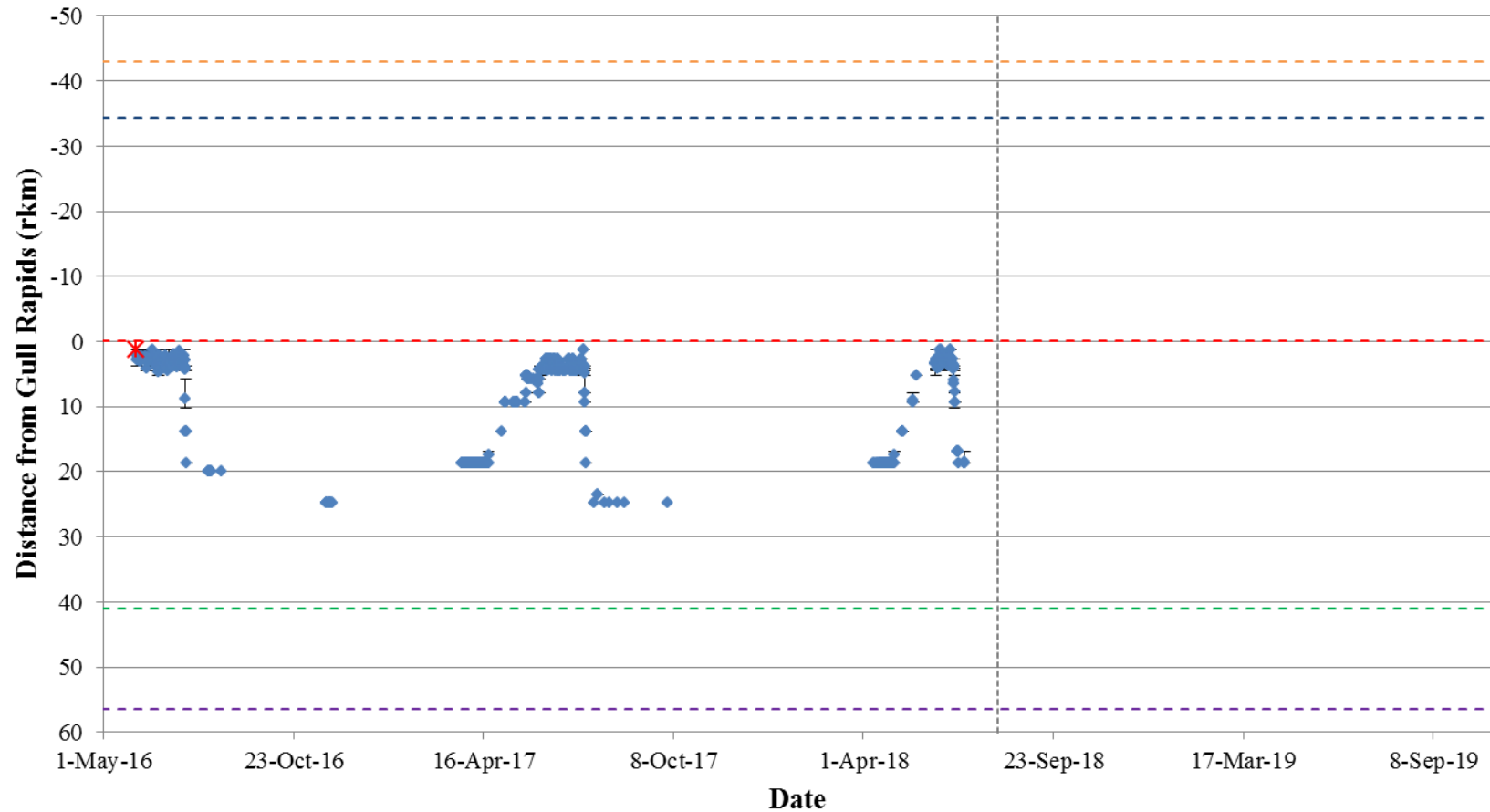


Figure A3-29: Position of a Walleye tagged with an acoustic transmitter (code #53752) in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

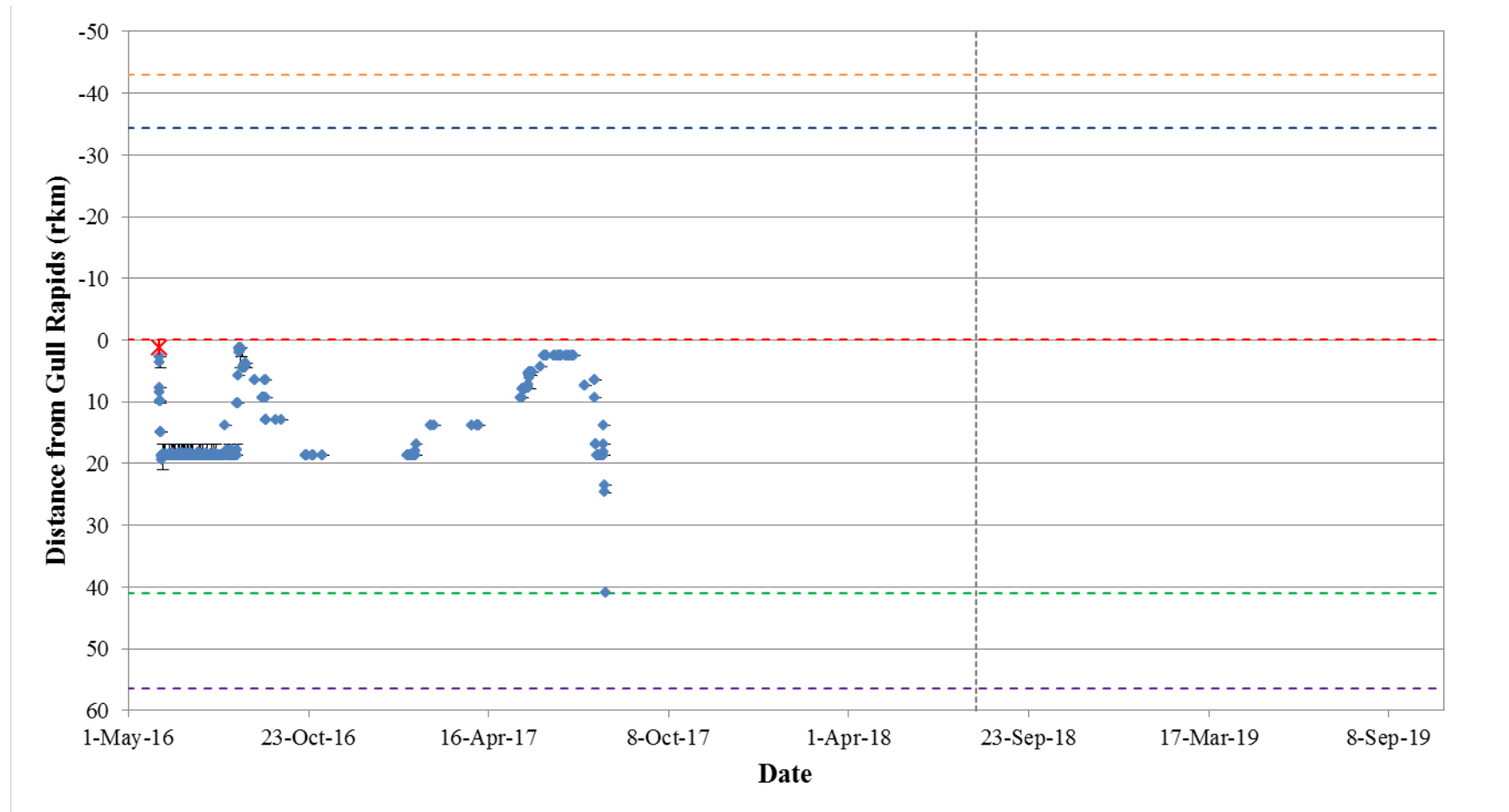


Figure A3-30: Position of a Walleye tagged with an acoustic transmitter (code #53753) in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

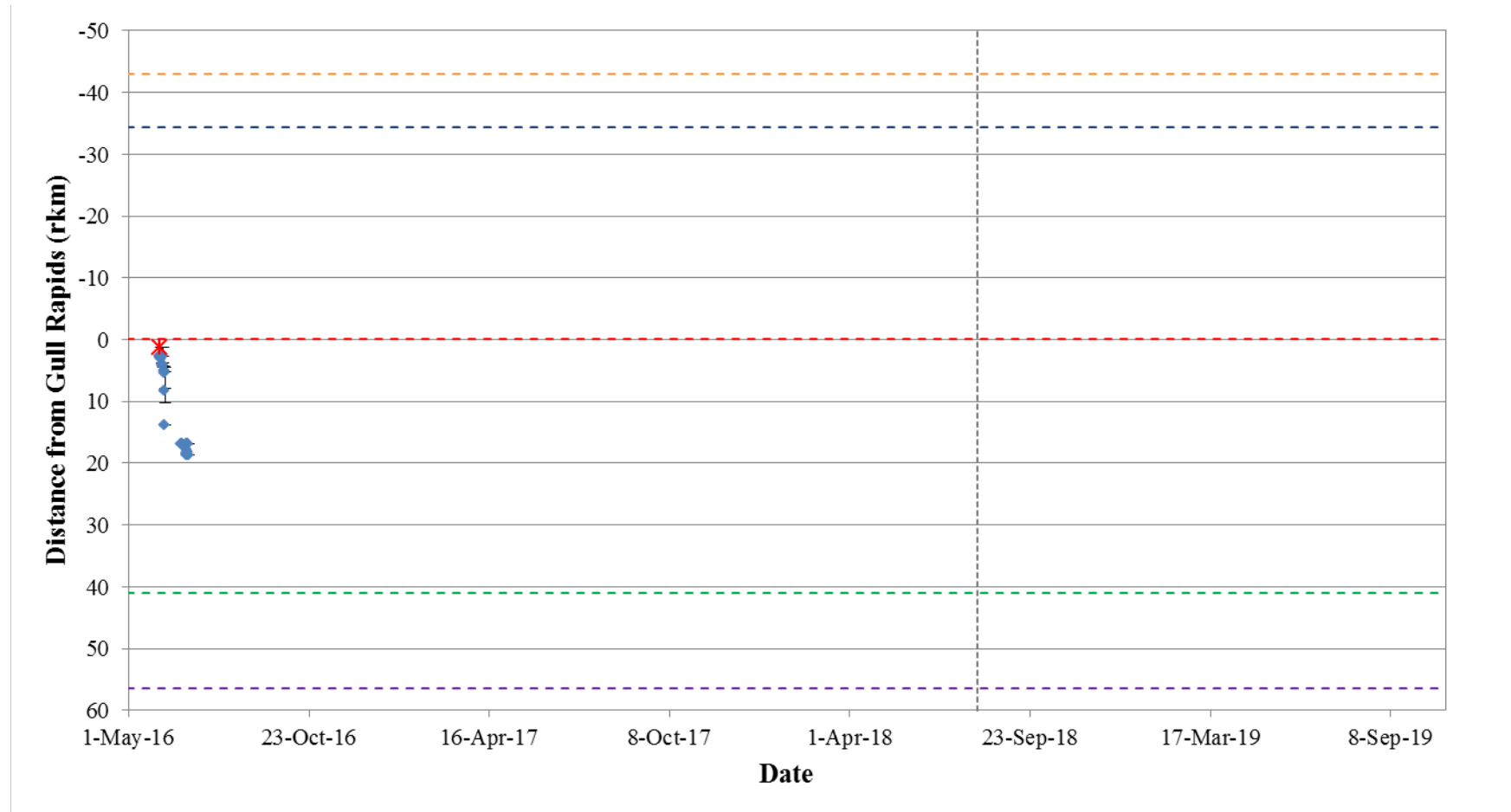


Figure A3-31: Position of a Walleye tagged with an acoustic transmitter (code #53754) in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

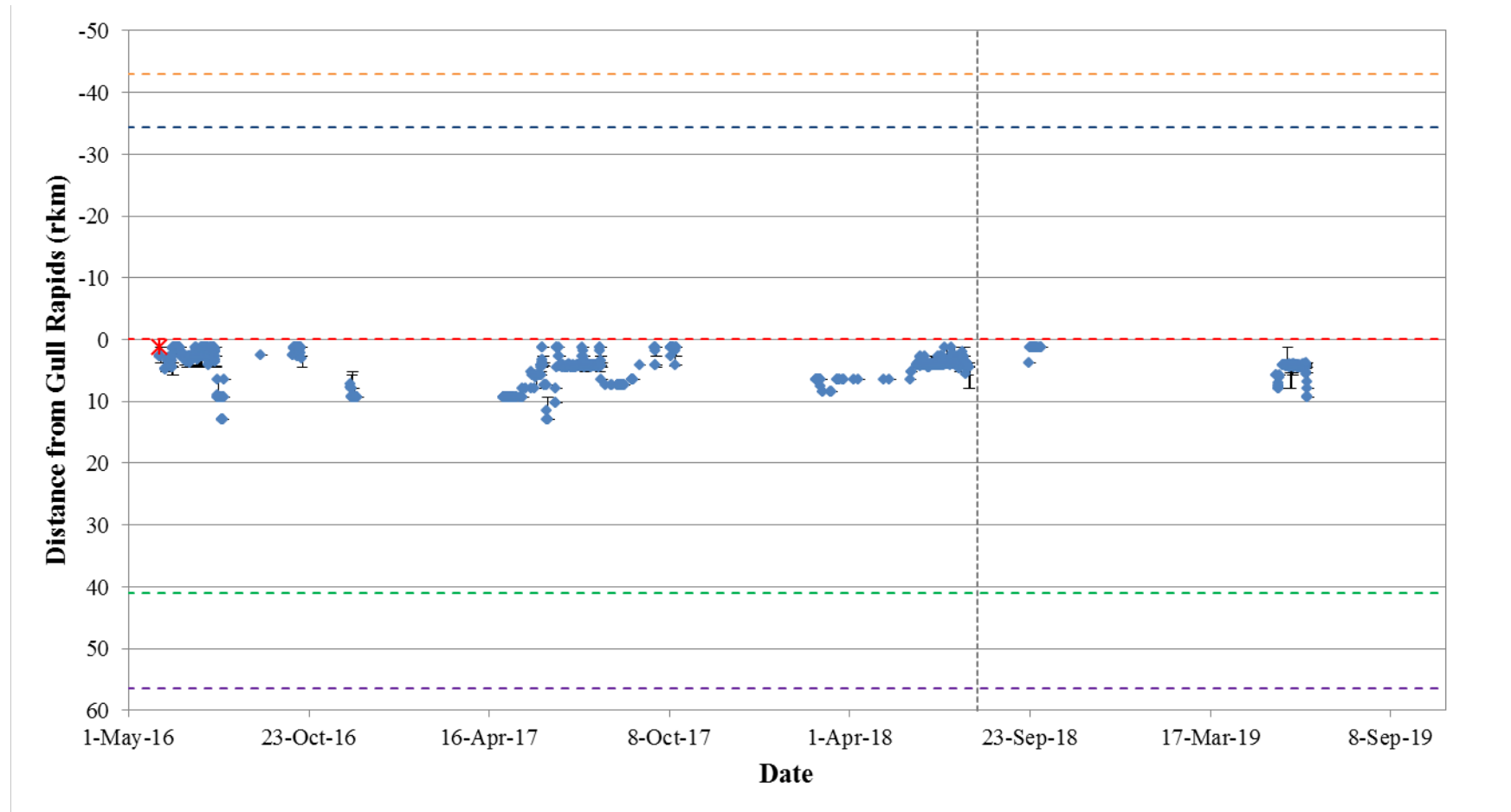


Figure A3-32: Position of a Walleye tagged with an acoustic transmitter (code #53755) in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

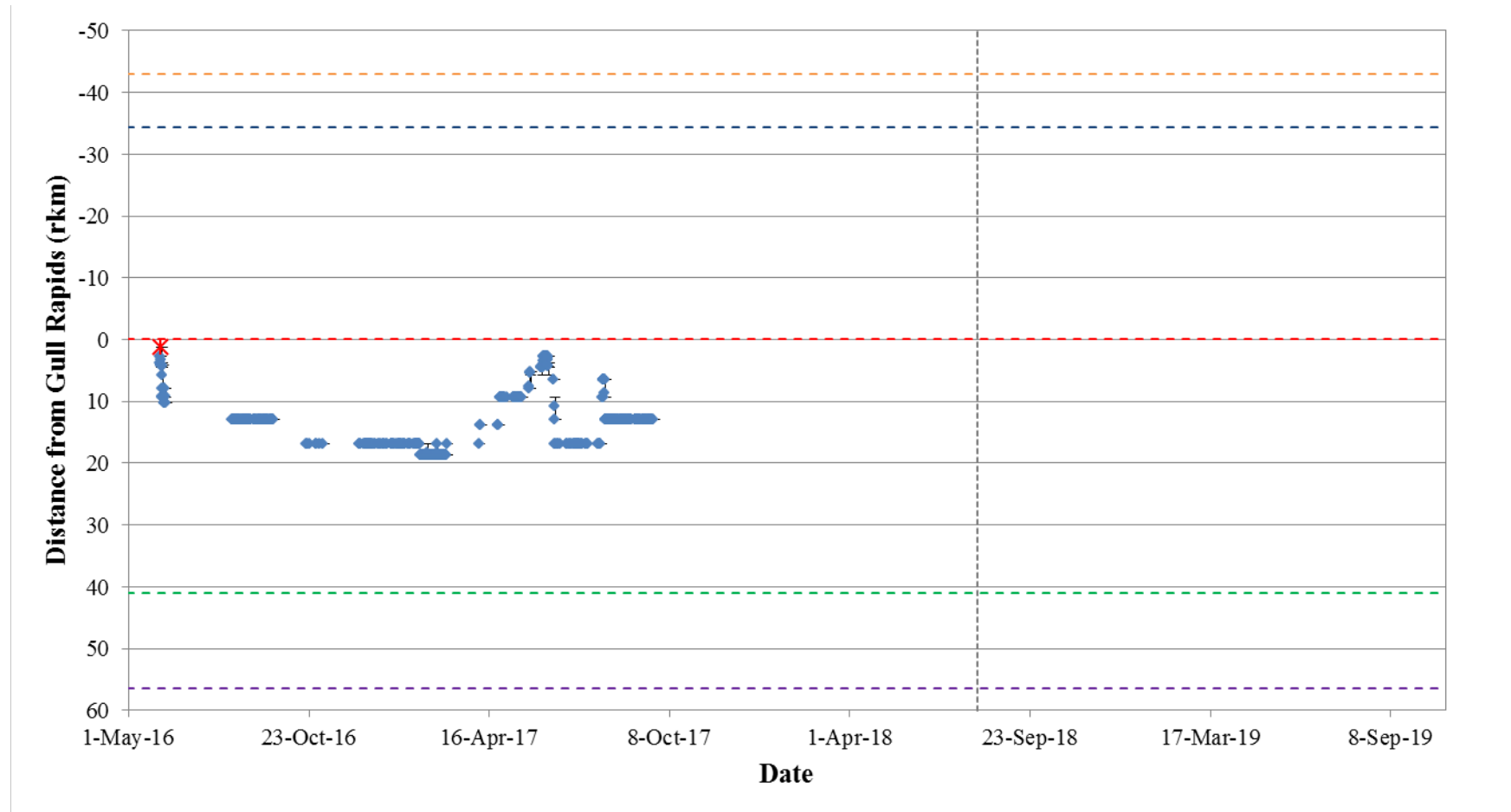


Figure A3-33: Position of a Walleye tagged with an acoustic transmitter (code #53756) in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

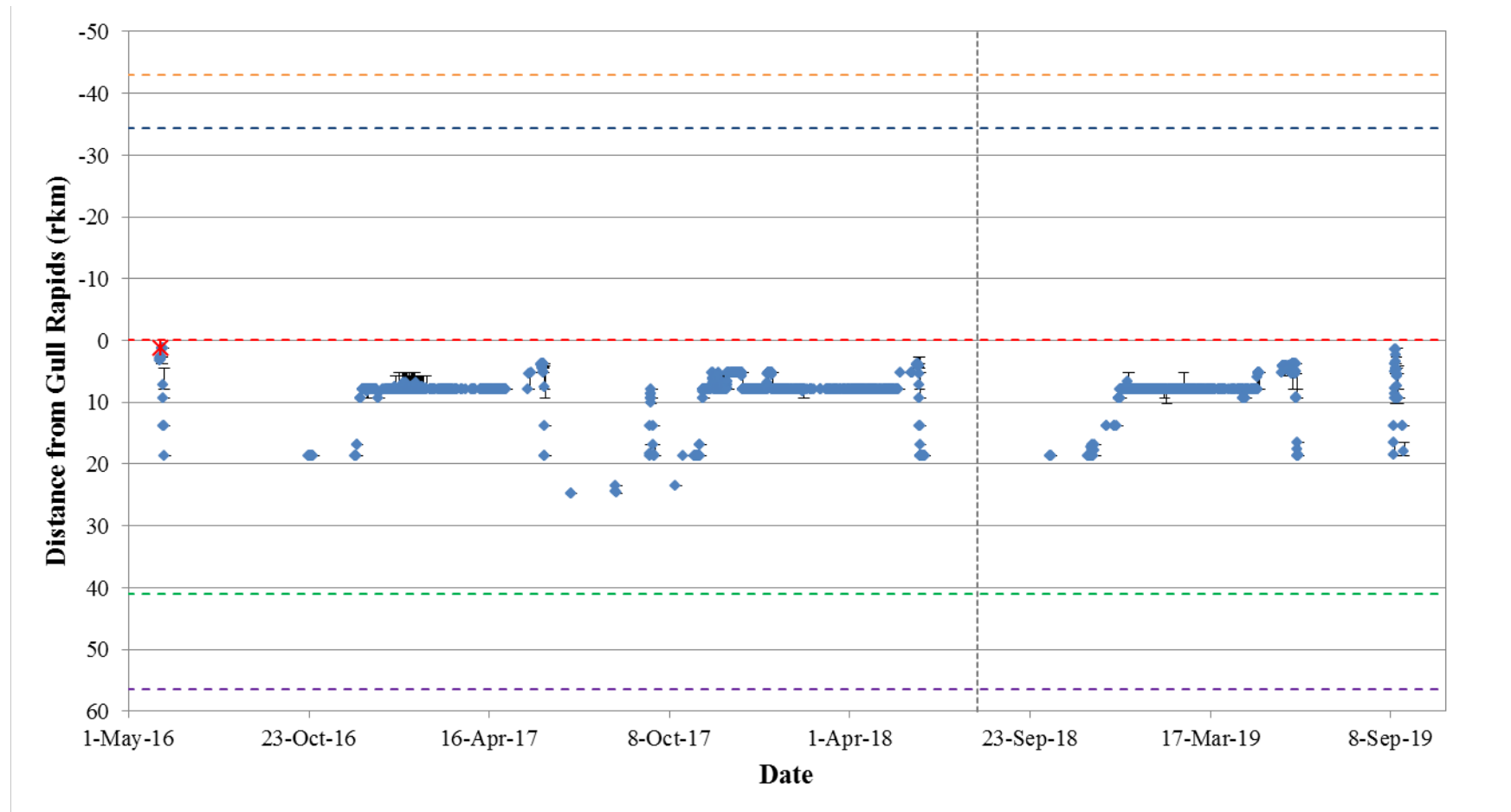


Figure A3-34: Position of a Walleye tagged with an acoustic transmitter (code #53757) in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

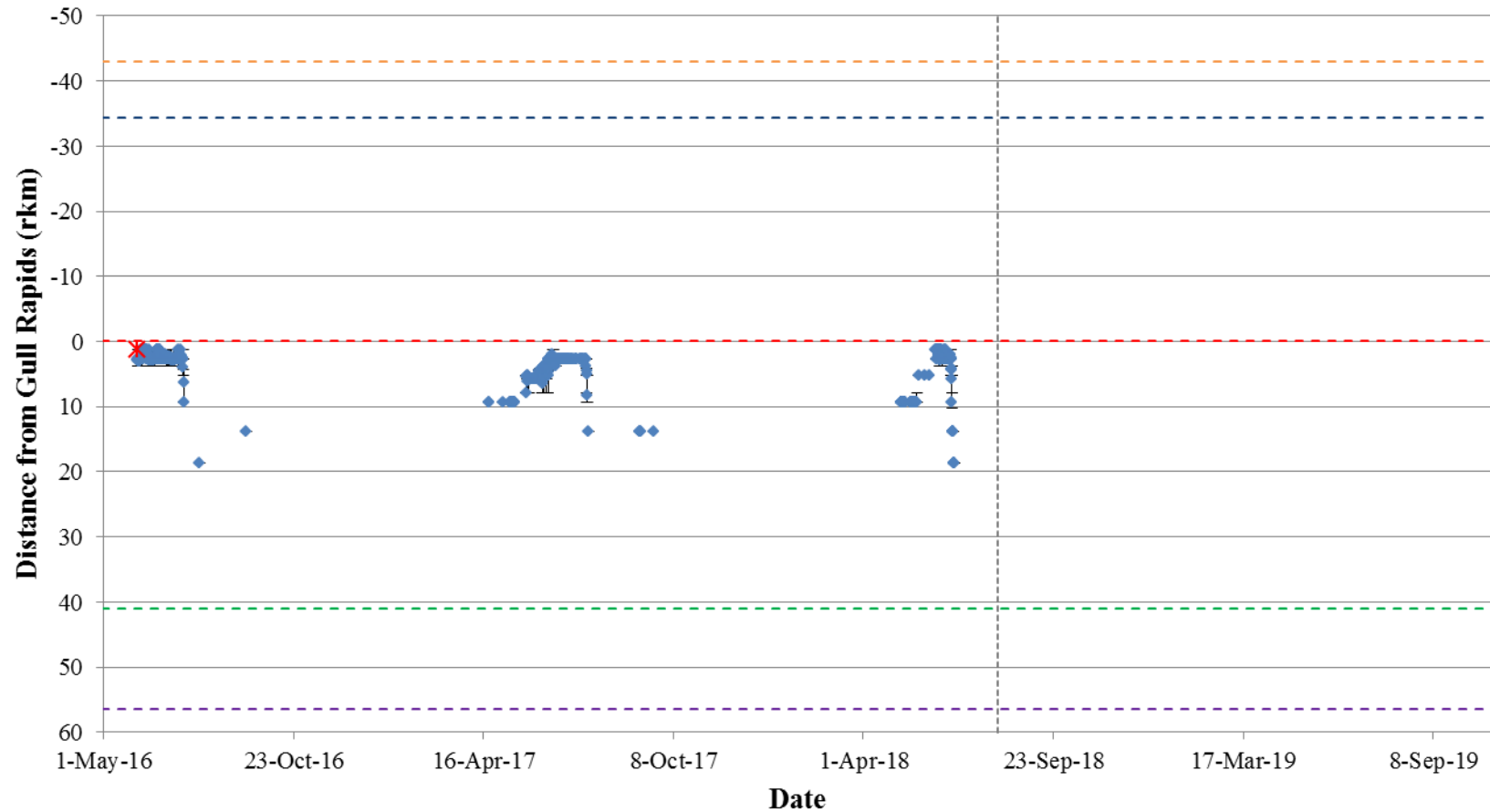


Figure A3-35: Position of a Walleye tagged with an acoustic transmitter (code #53808) in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

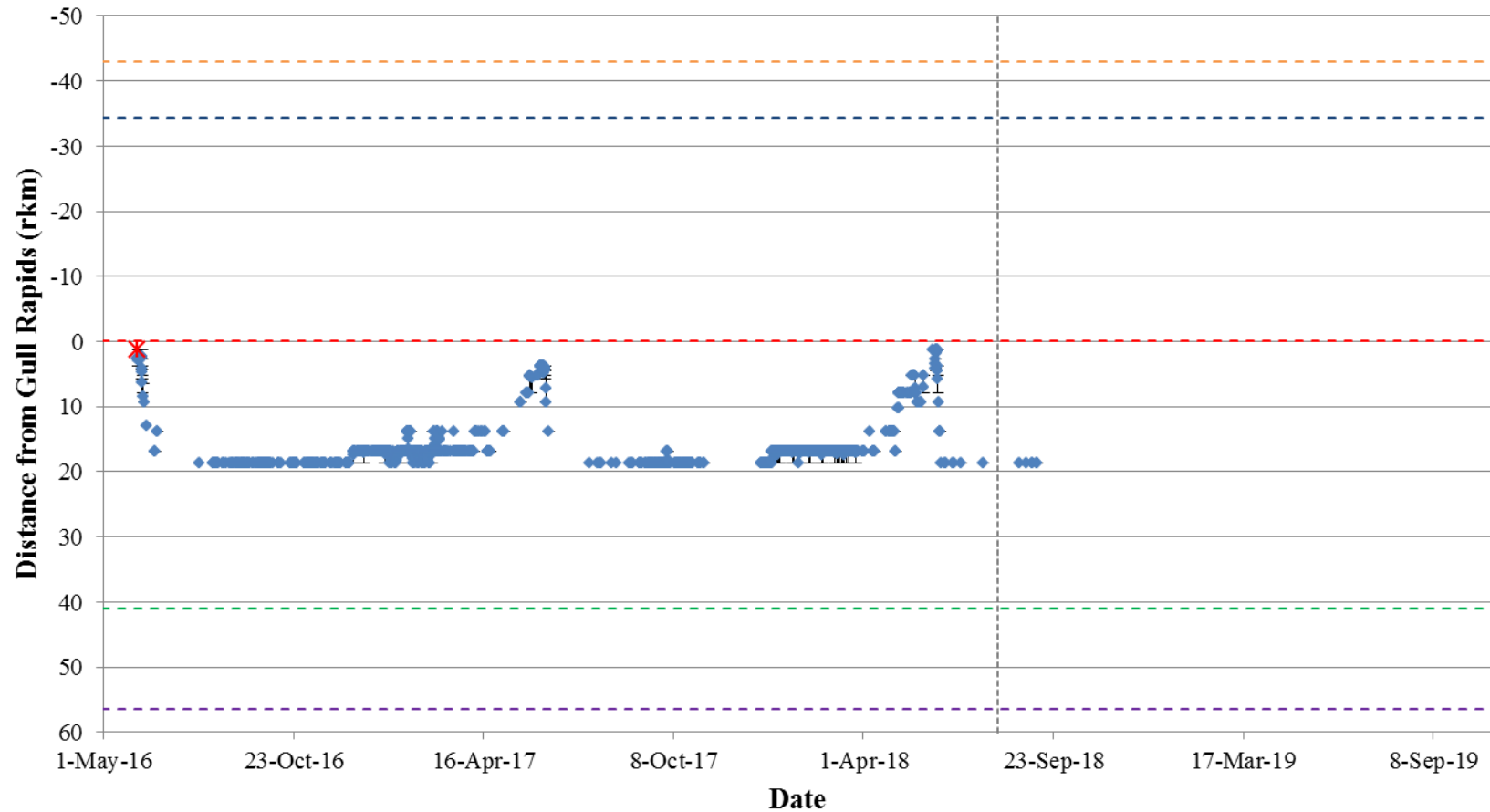


Figure A3-36: Position of a Walleye tagged with an acoustic transmitter (code #53809) in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

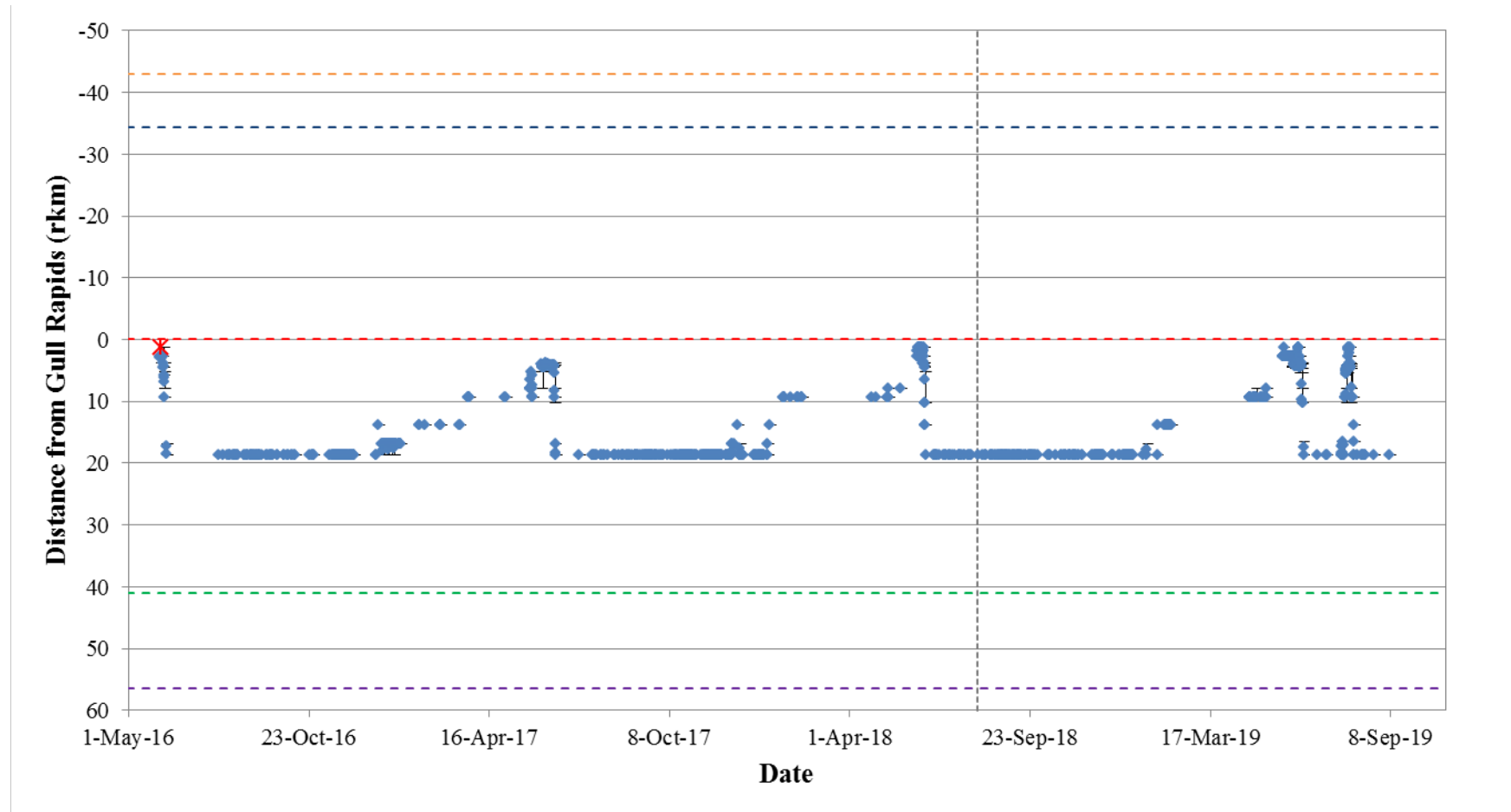


Figure A3-37: Position of a Walleye tagged with an acoustic transmitter (code #53810) in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

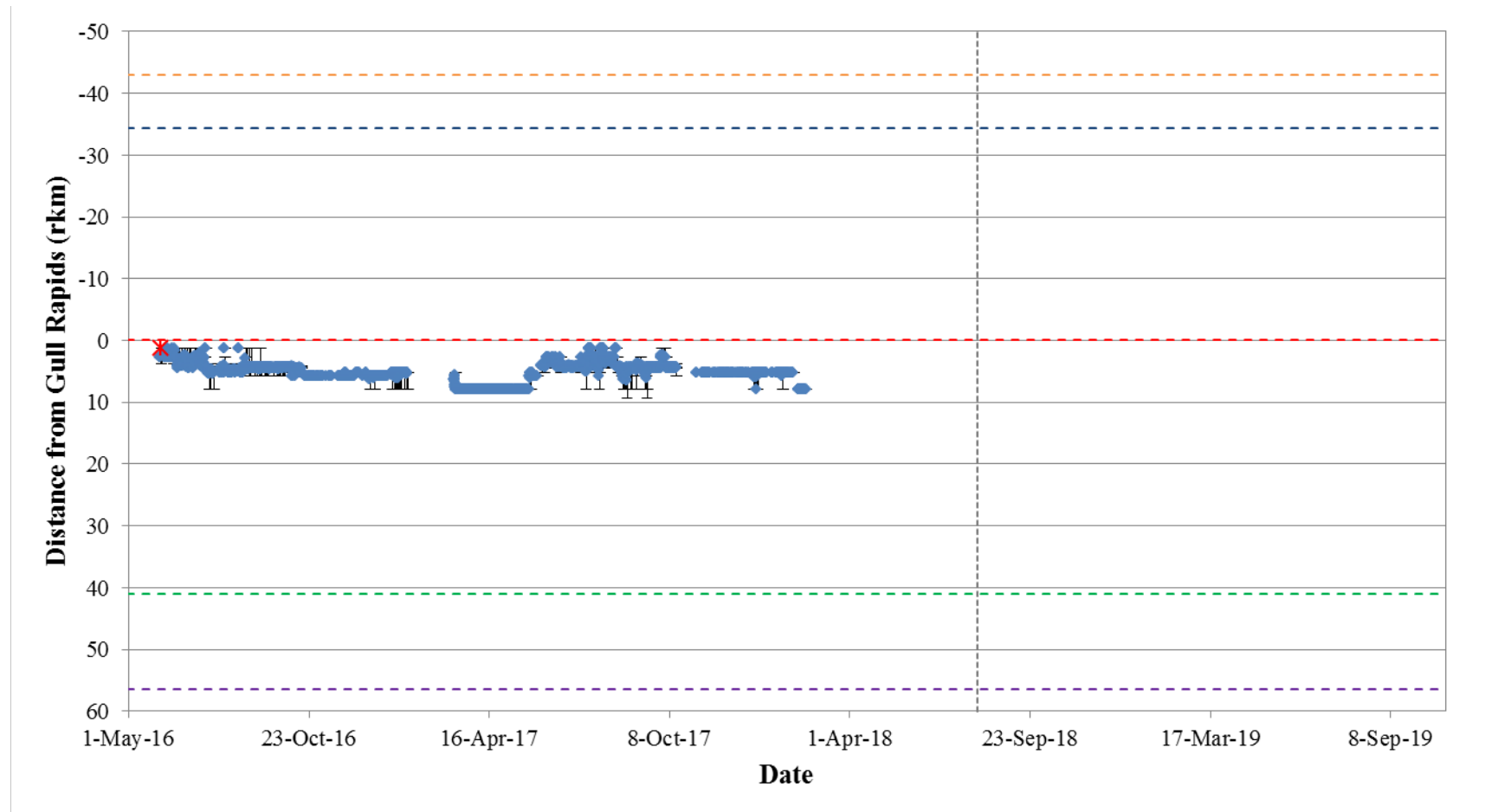
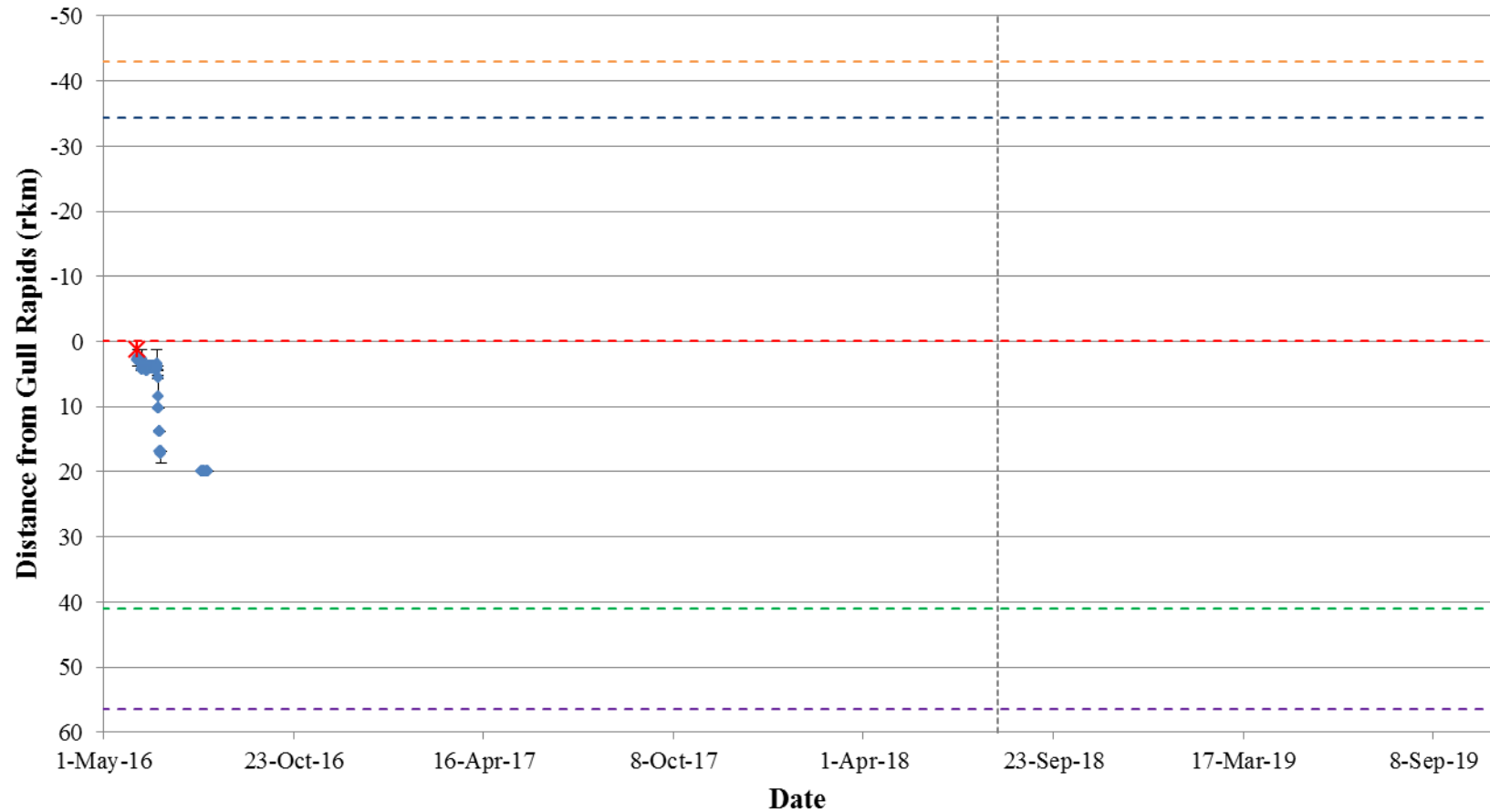


Figure A3-38: Position of a Walleye tagged with an acoustic transmitter (code #53811) in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1, 2016, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).



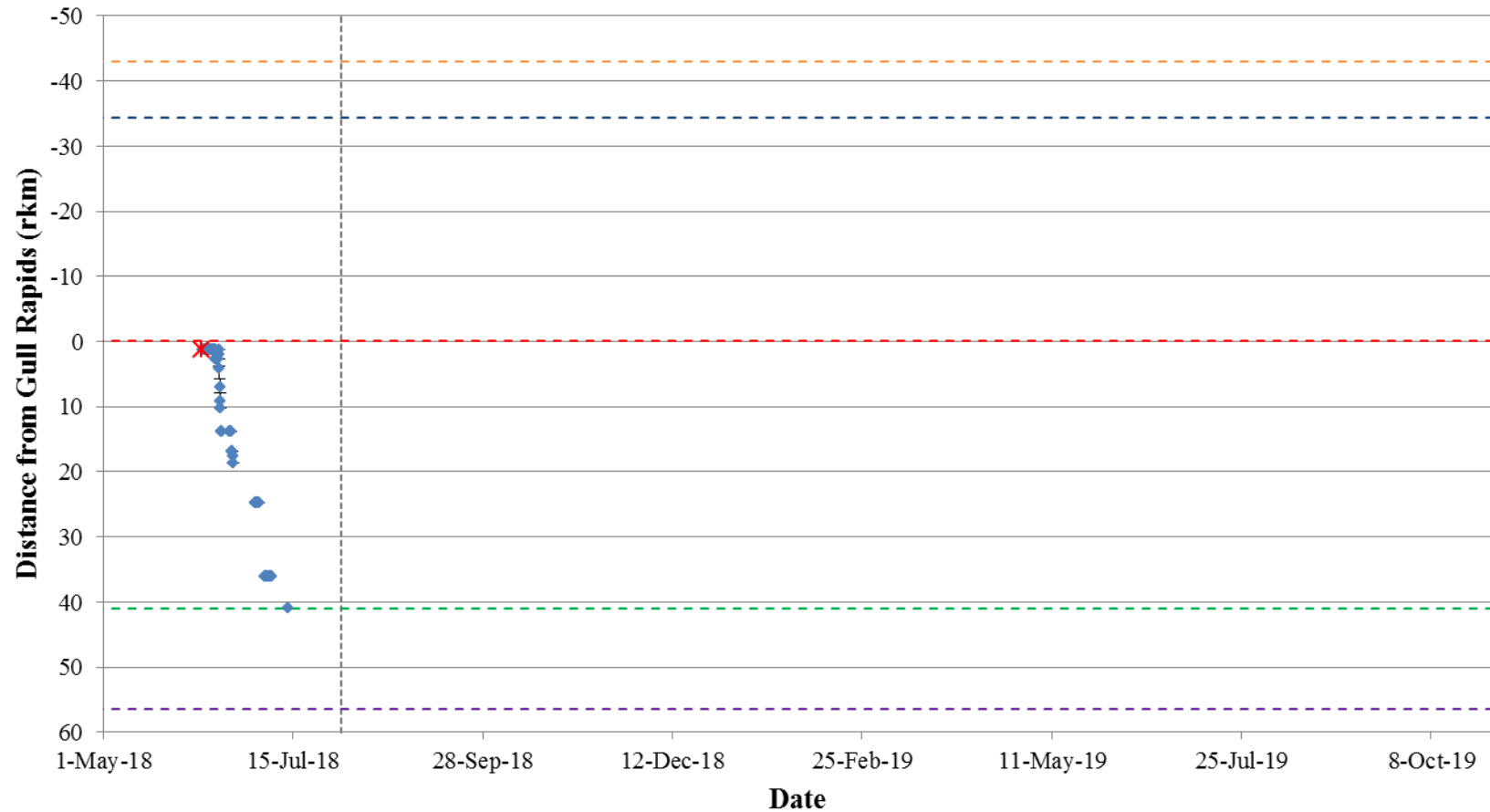


Figure A3-40: Position of a Walleye tagged with an acoustic transmitter (code #25732) in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1, 2018, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

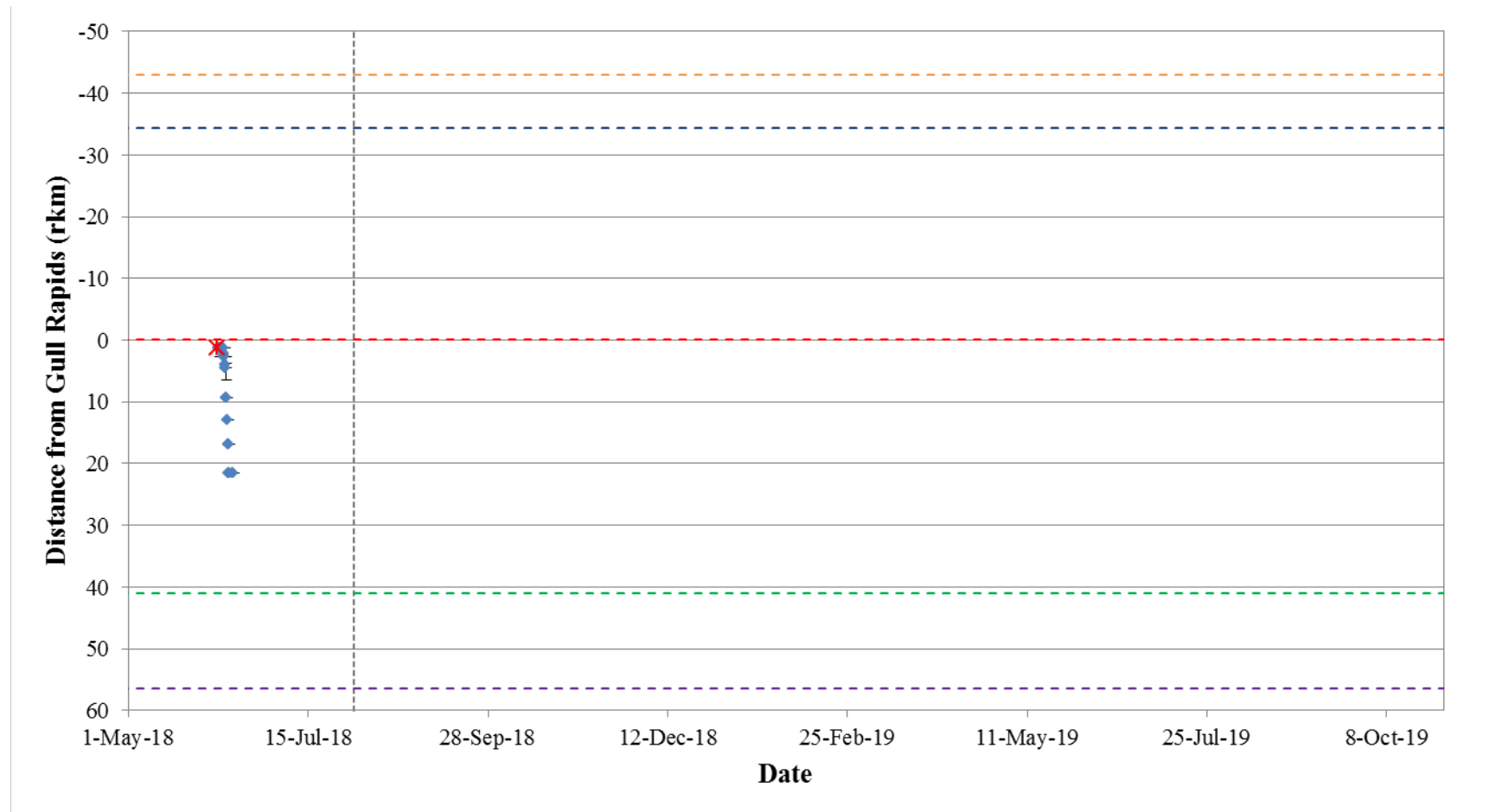


Figure A3-41: Position of a Walleye tagged with an acoustic transmitter (code #25734) in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1, 2018, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

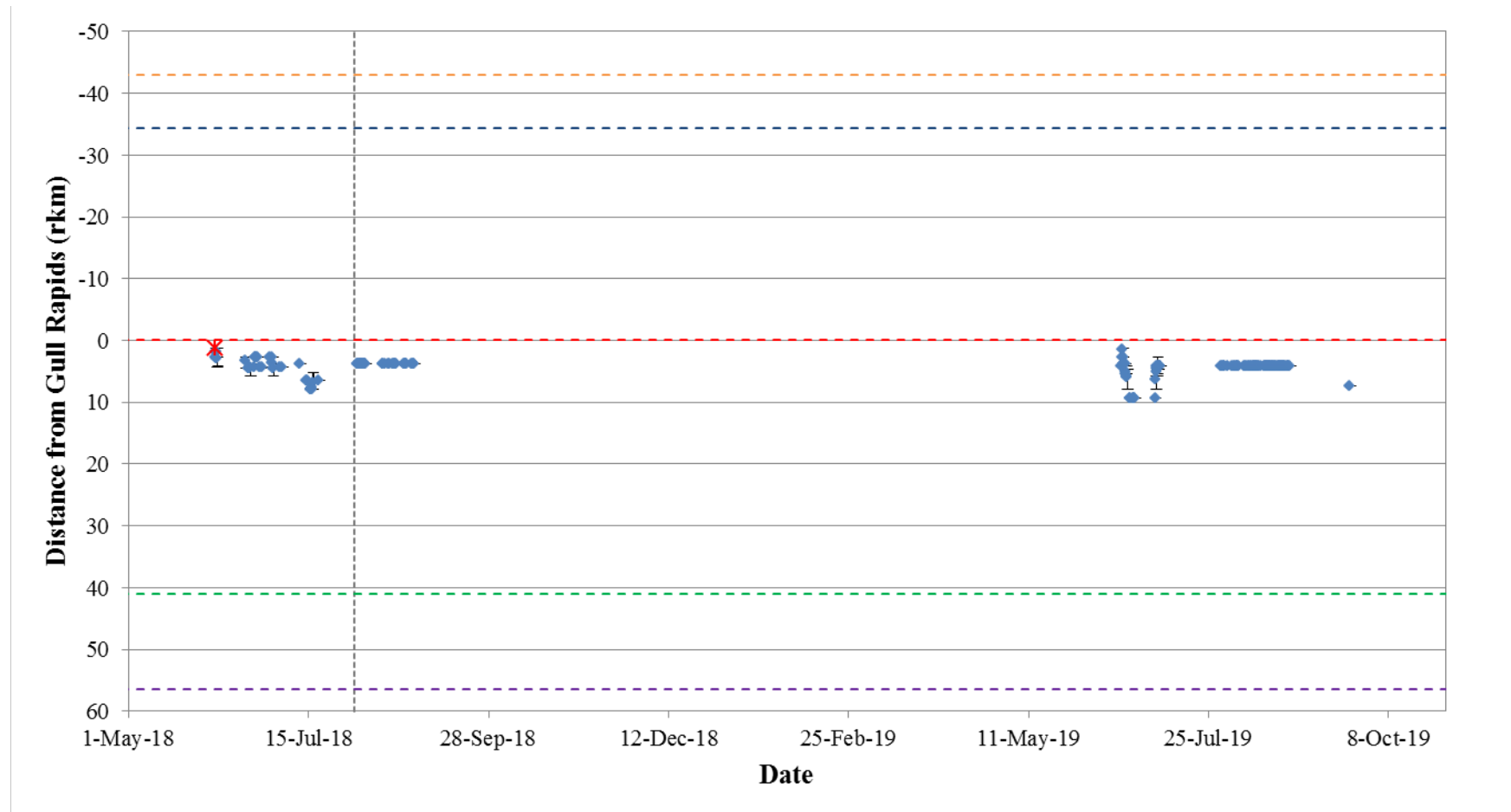


Figure A3-42: Position of a Walleye tagged with an acoustic transmitter (code #25735) in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1, 2018, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

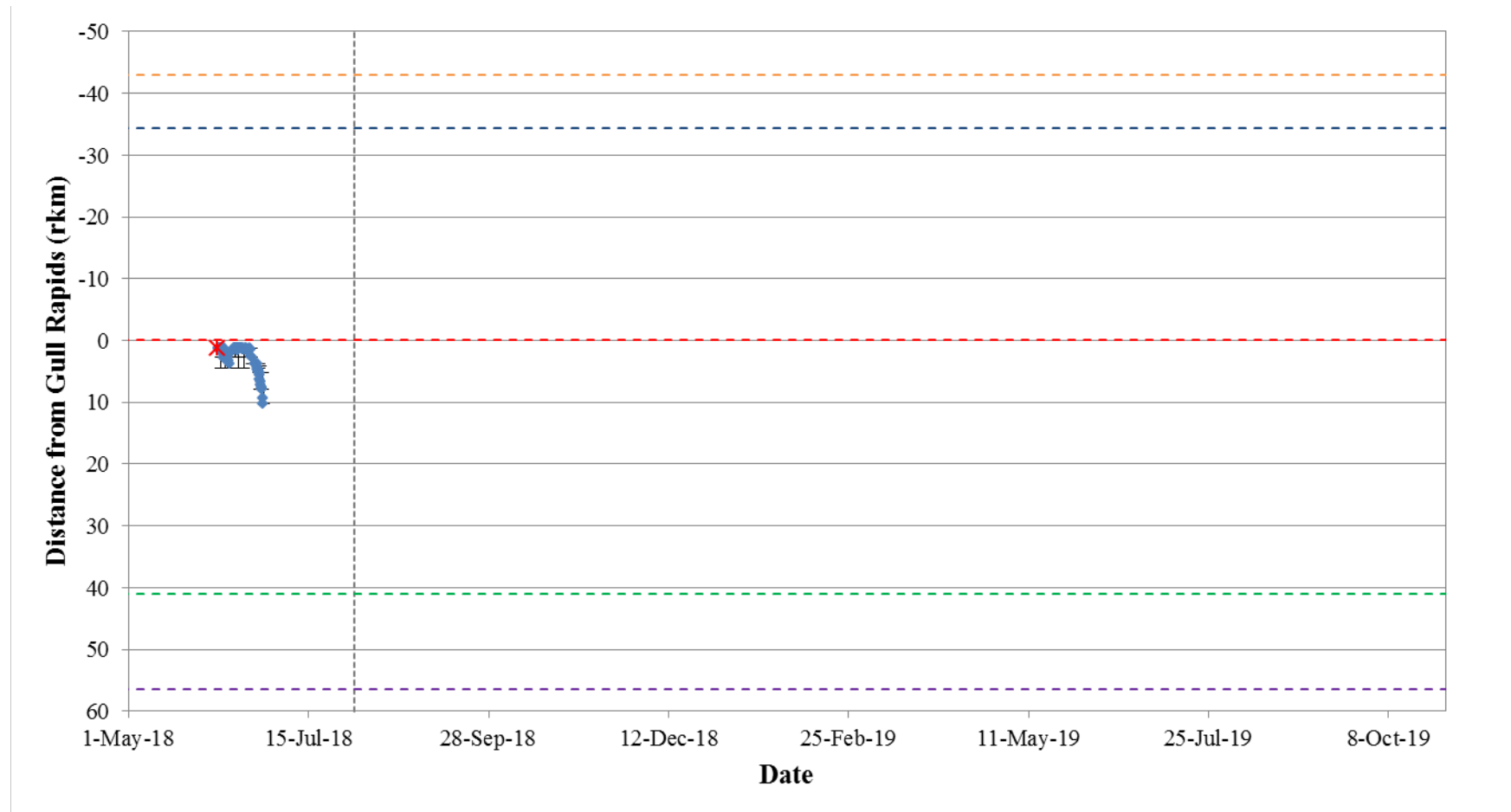


Figure A3-43: Position of a Walleye tagged with an acoustic transmitter (code #25736) in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1, 2018, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

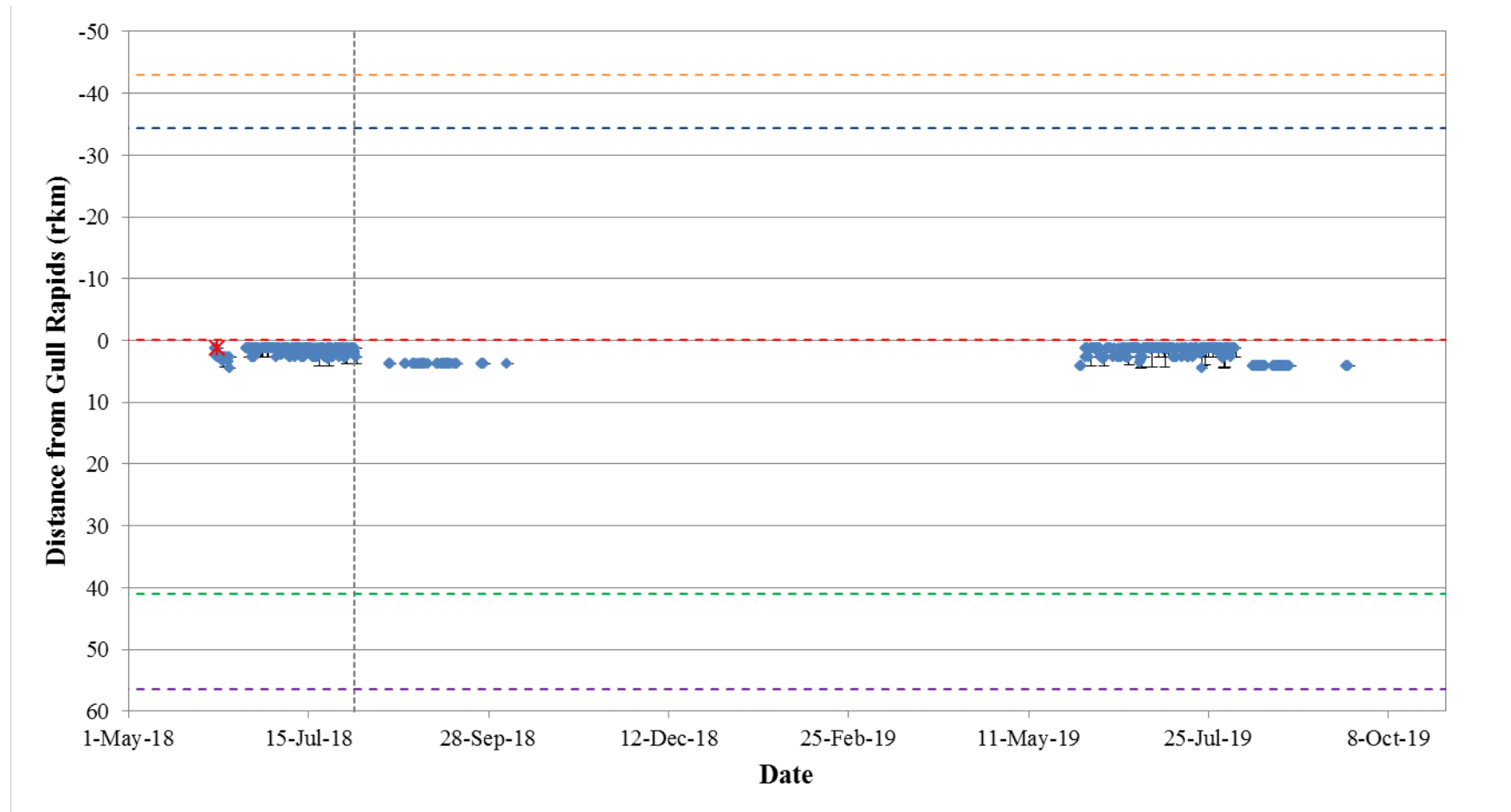


Figure A3-44: Position of a Walleye tagged with an acoustic transmitter (code #25737) in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1, 2018, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

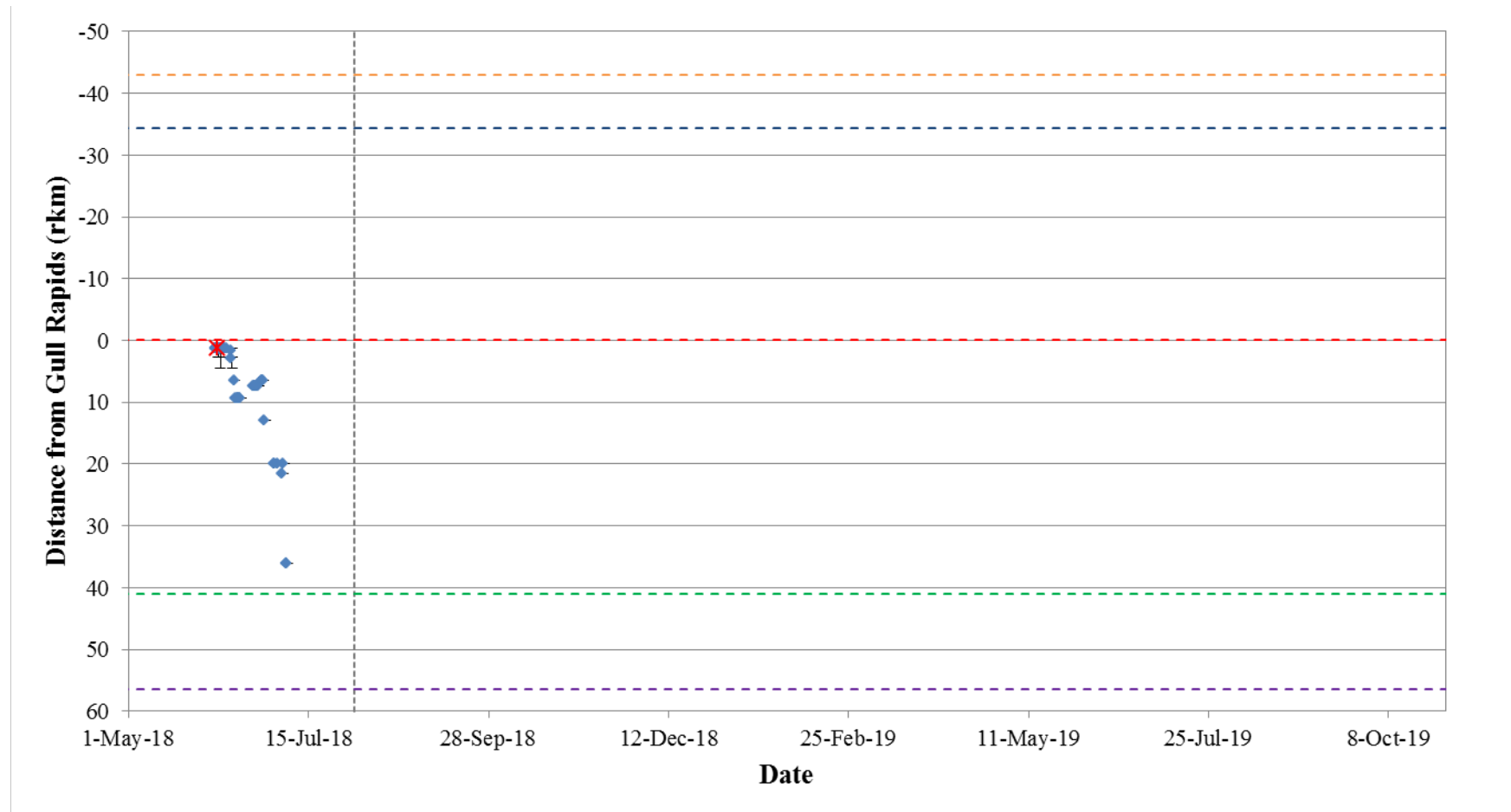


Figure A3-45: Position of a Walleye tagged with an acoustic transmitter (code #25738) in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1, 2018, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

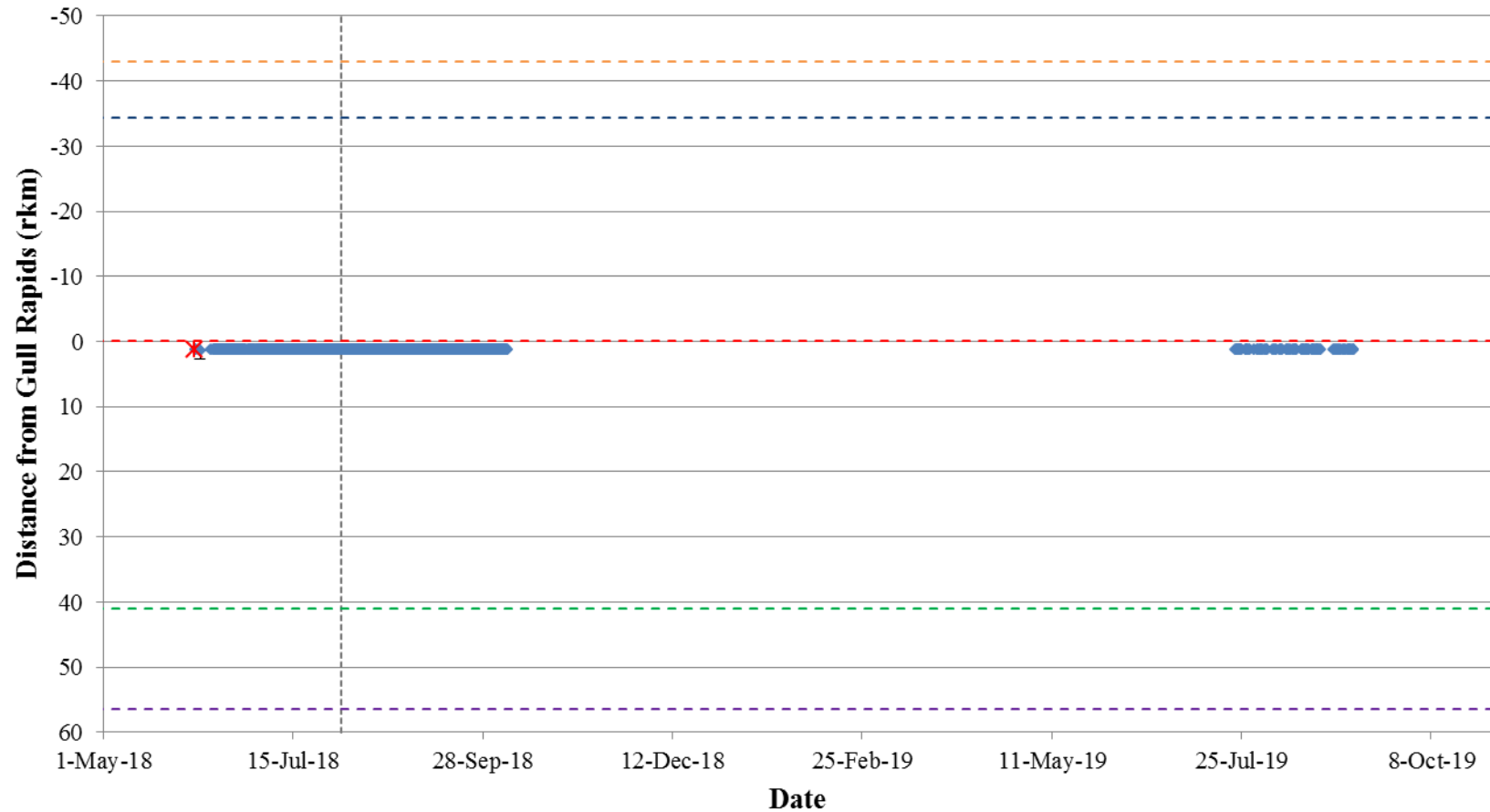


Figure A3-46: Position of a Walleye tagged with an acoustic transmitter (code #25741) in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1, 2018, to October 7, 2019. Date and location of tagging is indicated by a star. Beginning of Keeyask spillway commissioning is indicated with vertical dotted line. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

APPENDIX 4:

LOCATION SUMMARY FOR INDIVIDUAL ACOUSTIC TAGGED WALLEYE UPSTREAM OF THE KEEYASK GS, MAY TO OCTOBER 2019.

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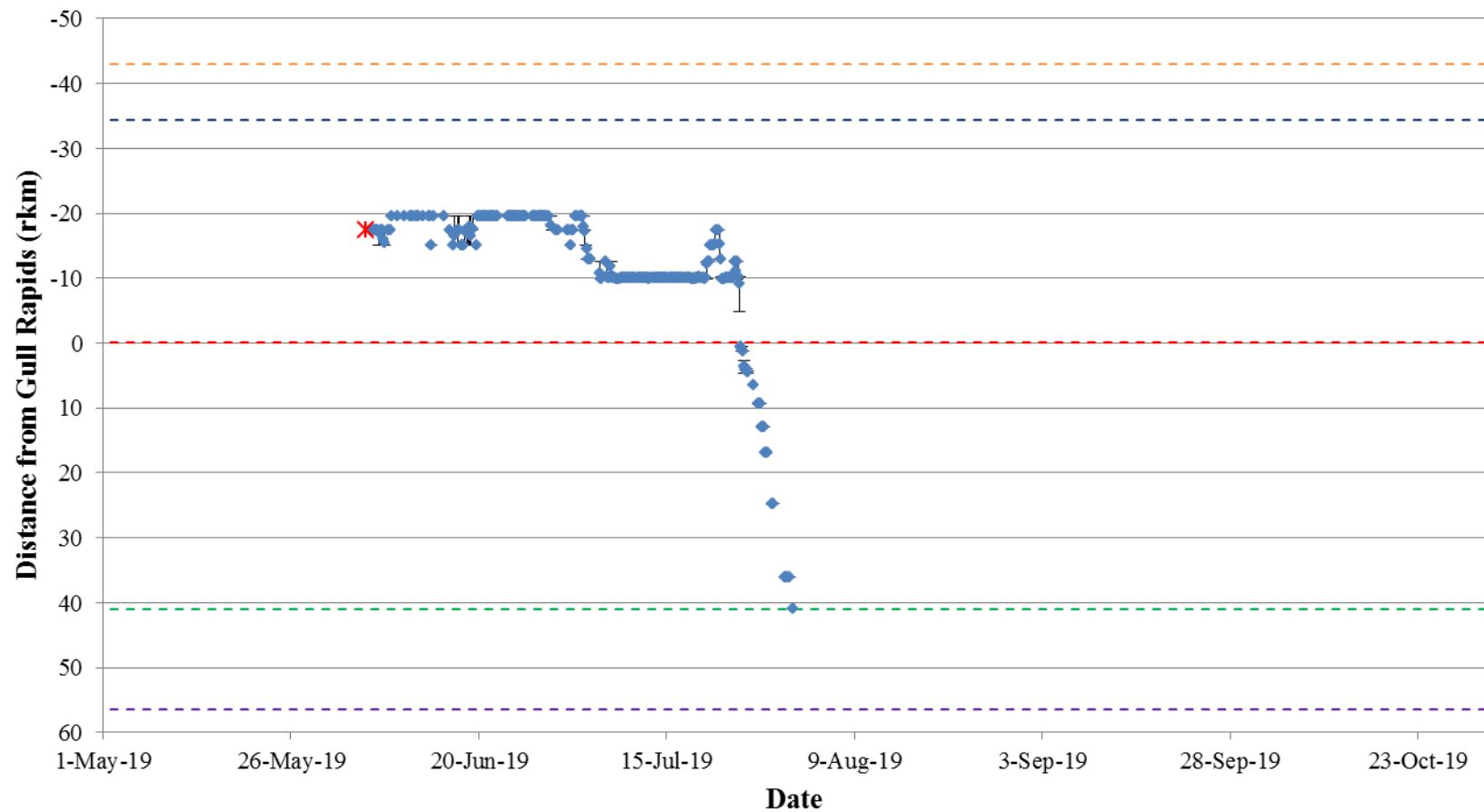


Figure A4-1: Position of a Walleye tagged with an acoustic transmitter (code #20147) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

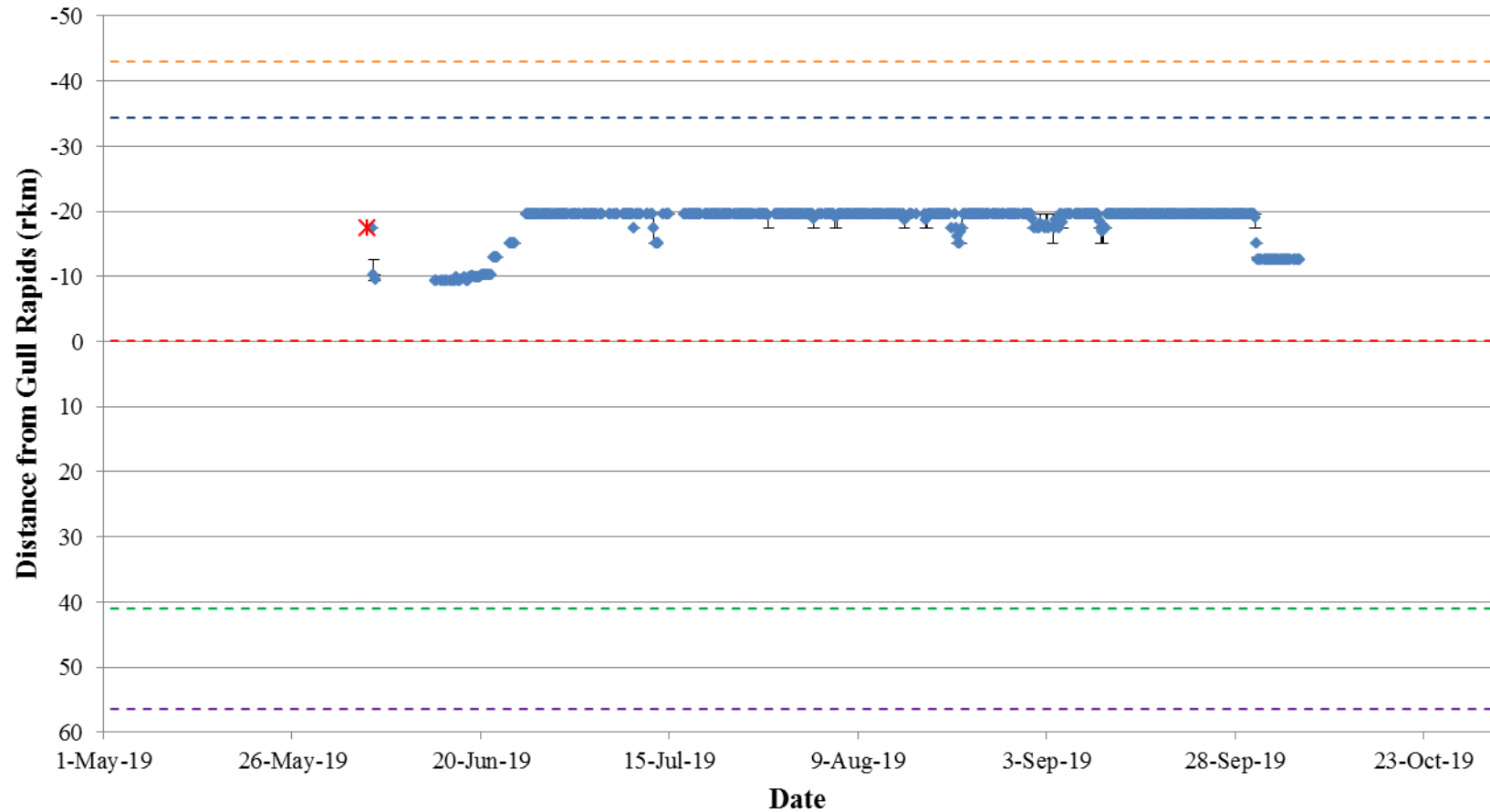


Figure A4-2: Position of a Walleye tagged with an acoustic transmitter (code #20148) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

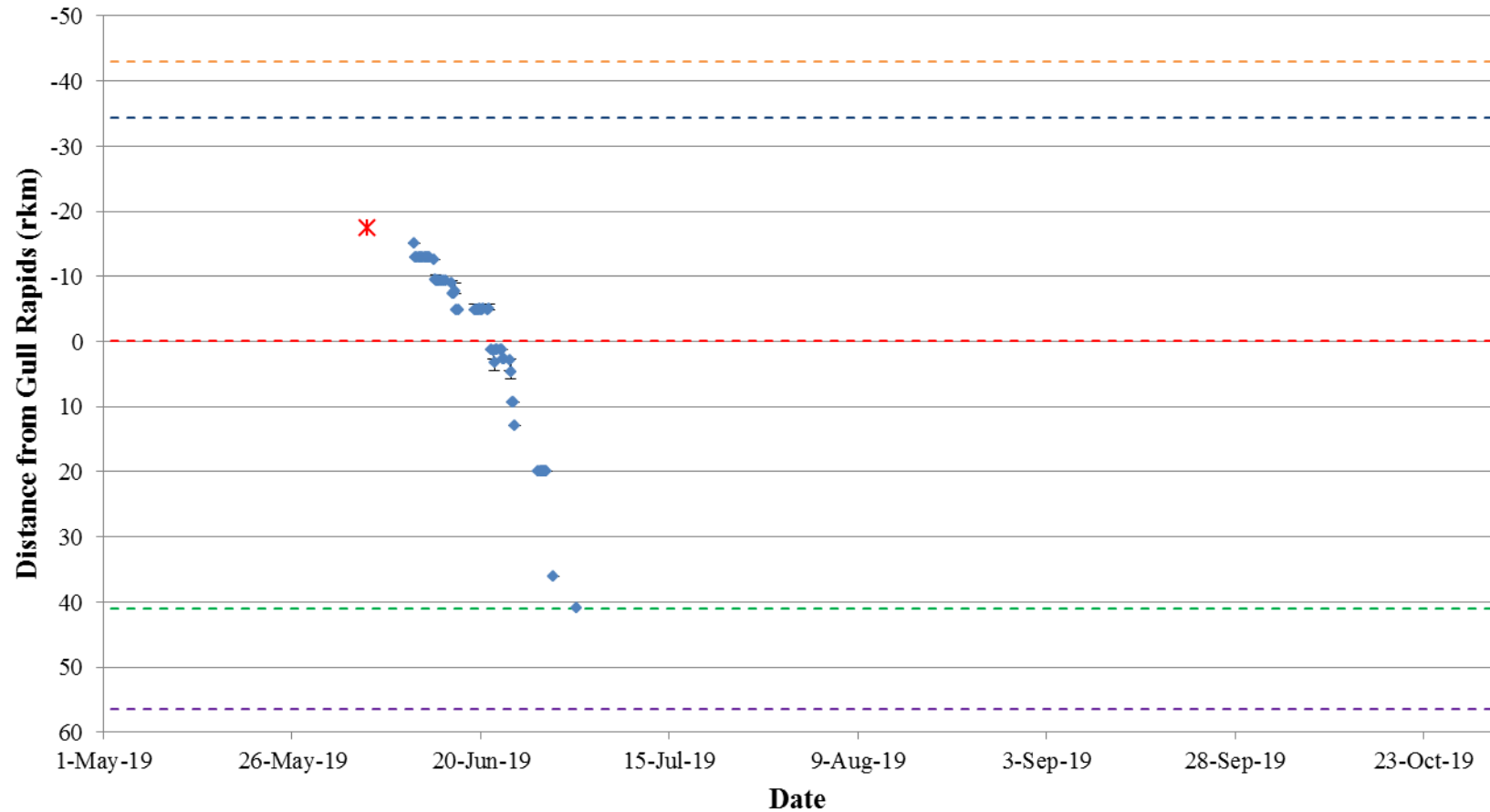


Figure A4-3: Position of a Walleye tagged with an acoustic transmitter (code #20149) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

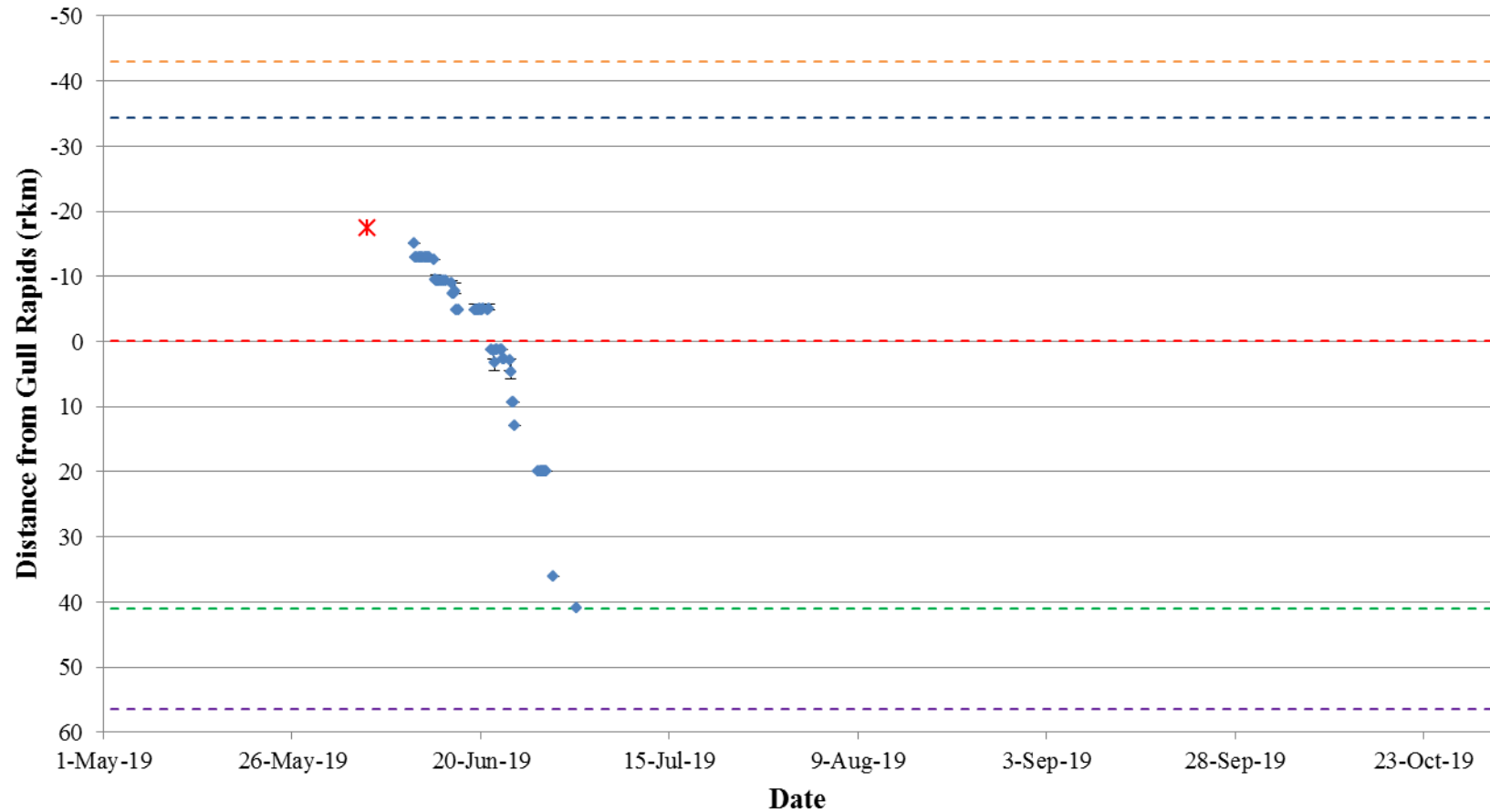


Figure A4-4: Position of a Walleye tagged with an acoustic transmitter (code #20150) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

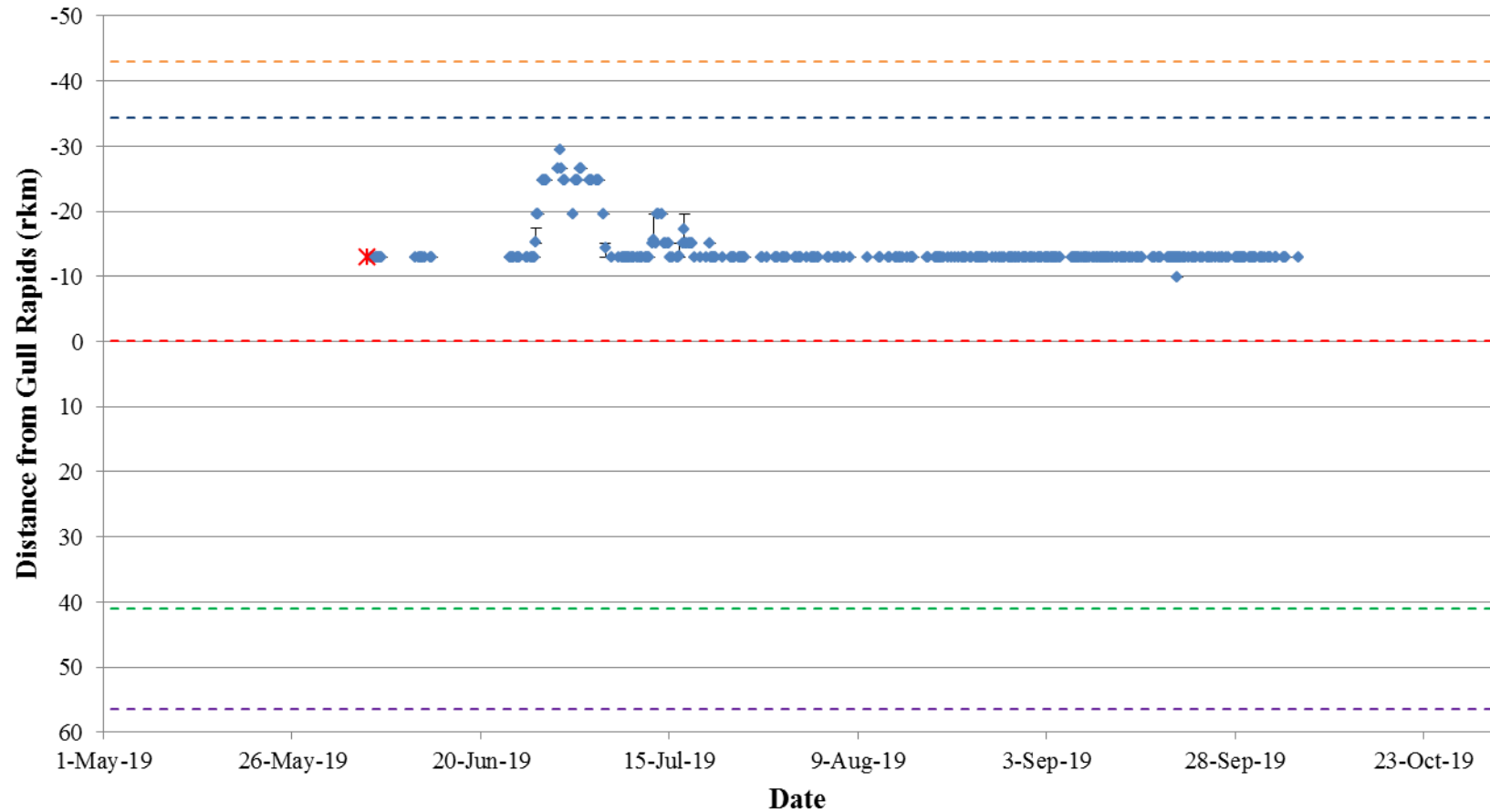


Figure A4-5: Position of a Walleye tagged with an acoustic transmitter (code #20151) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

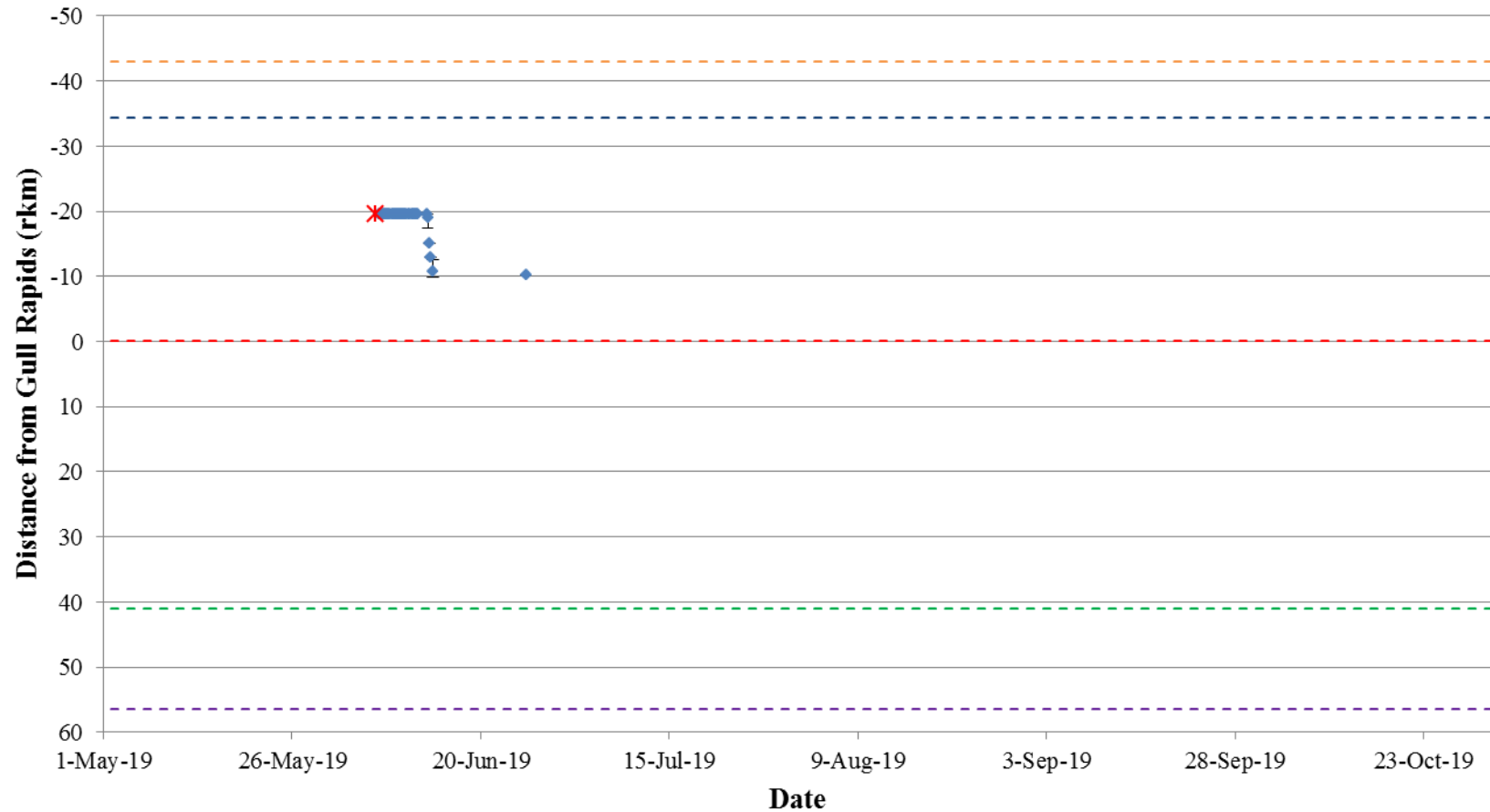


Figure A4-6: Position of a Walleye tagged with an acoustic transmitter (code #20153) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

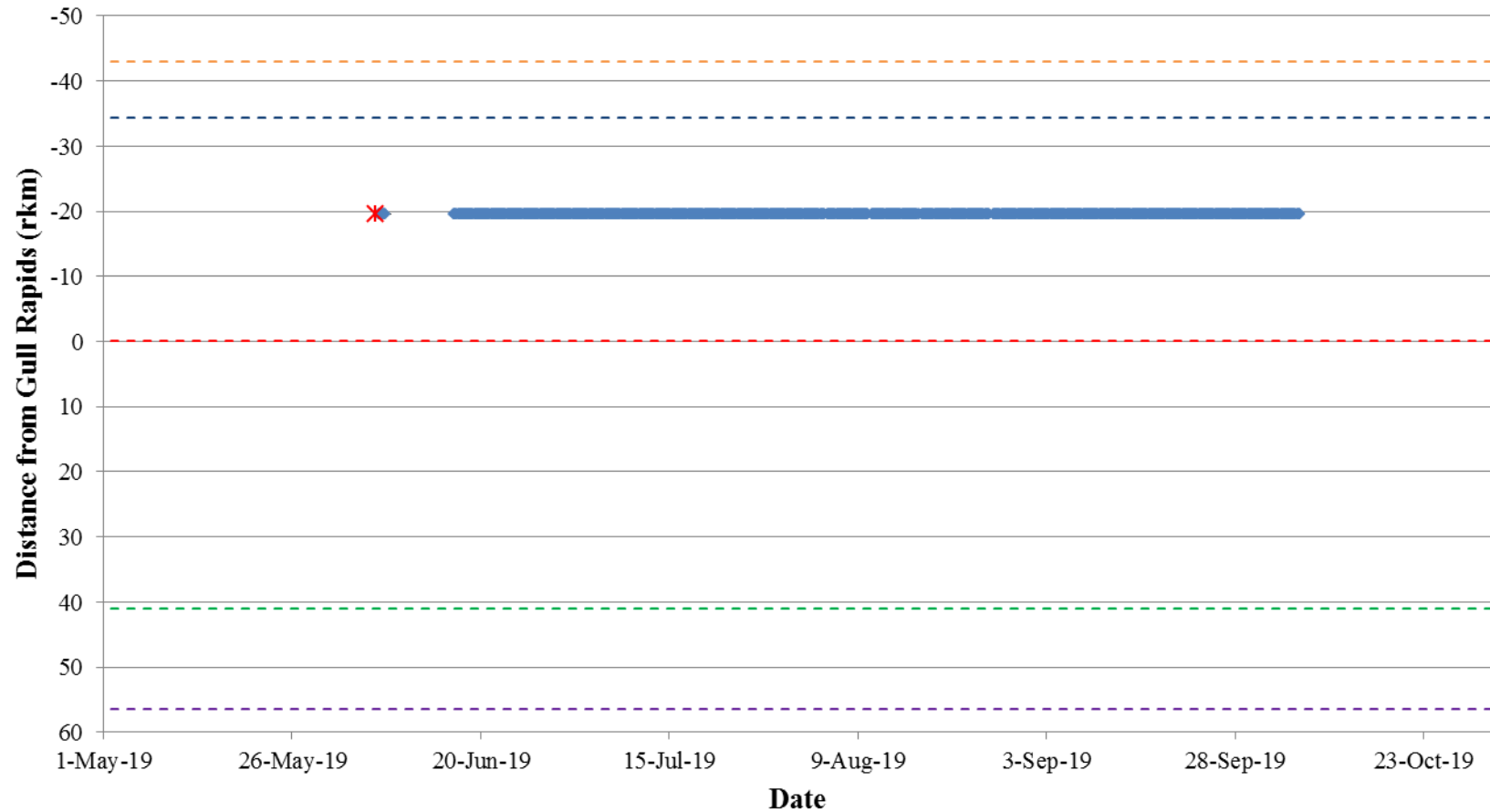


Figure A4-7: Position of a Walleye tagged with an acoustic transmitter (code #20154) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

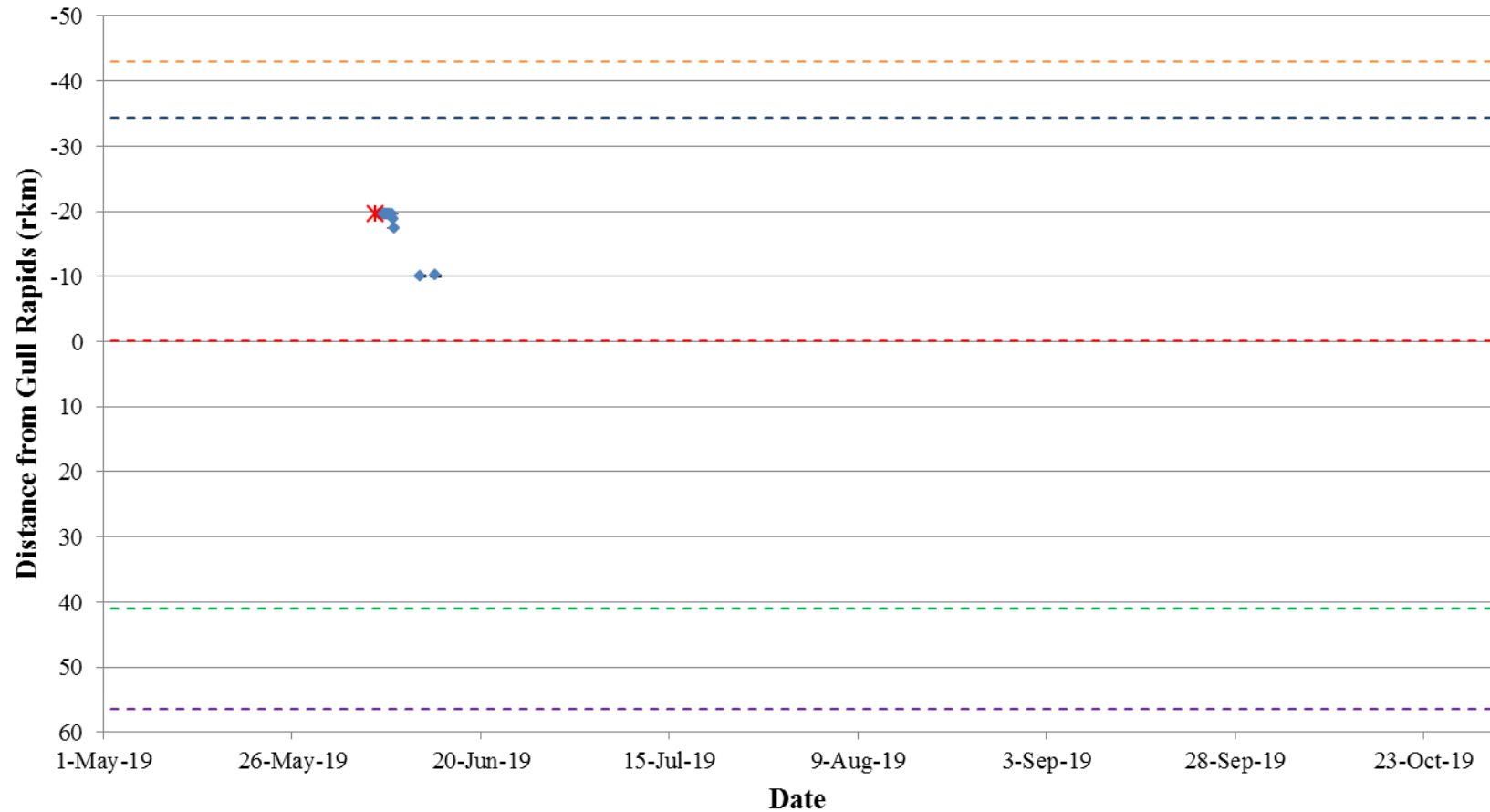


Figure A4-8: Position of a Walleye tagged with an acoustic transmitter (code #20155) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

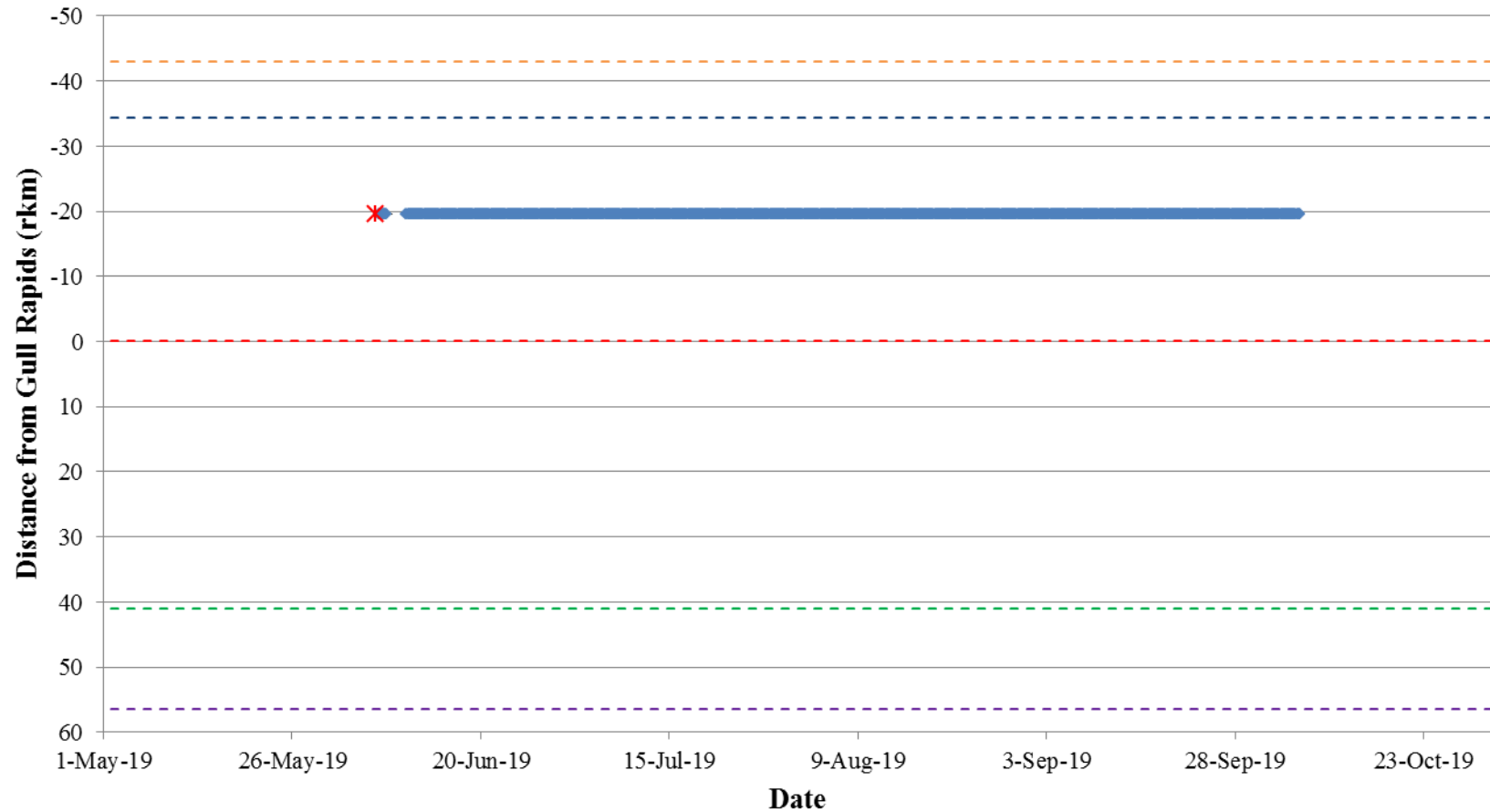


Figure A4-9: Position of a Walleye tagged with an acoustic transmitter (code #20156) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

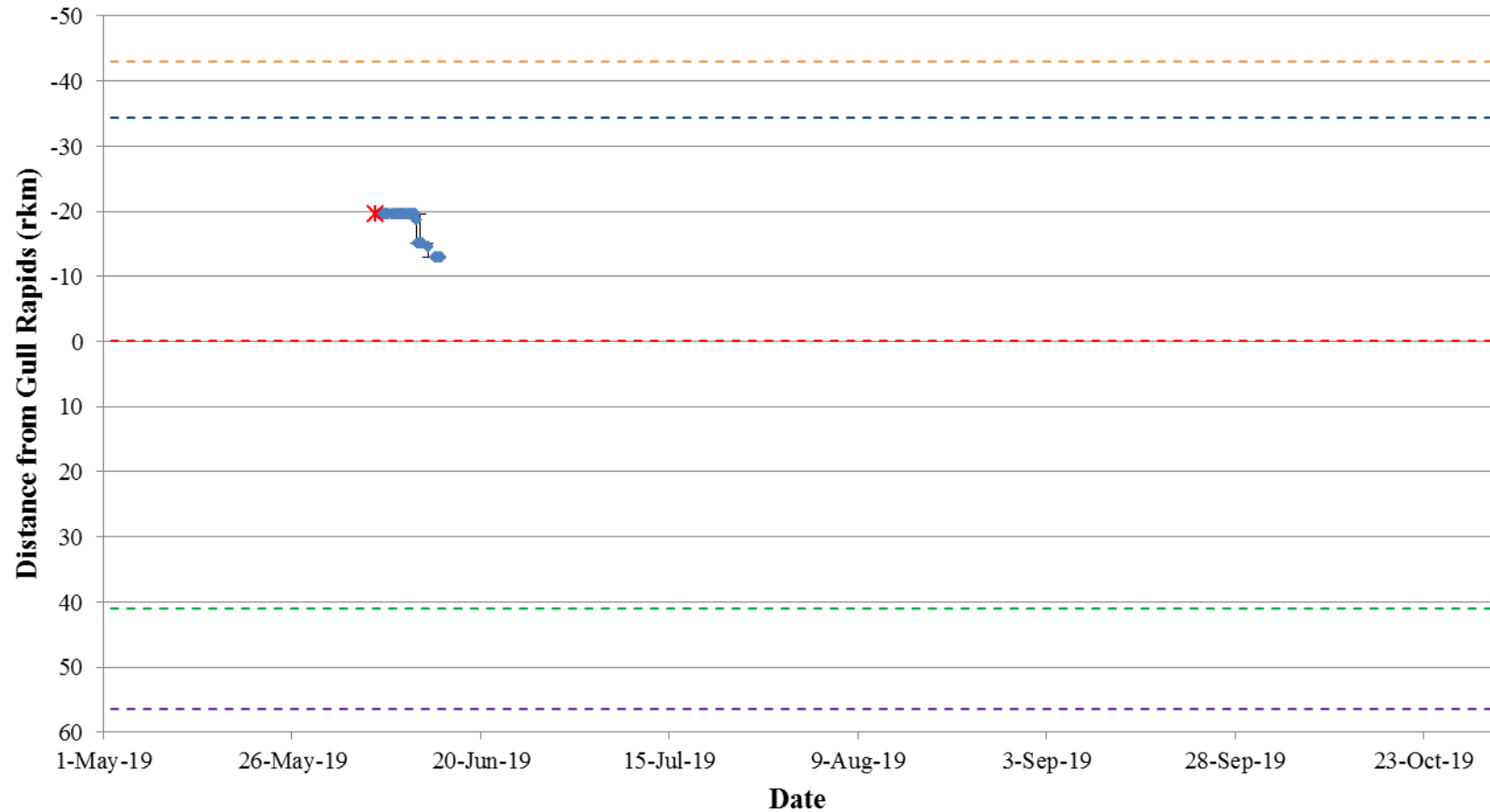


Figure A4-10: Position of a Walleye tagged with an acoustic transmitter (code #20157) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

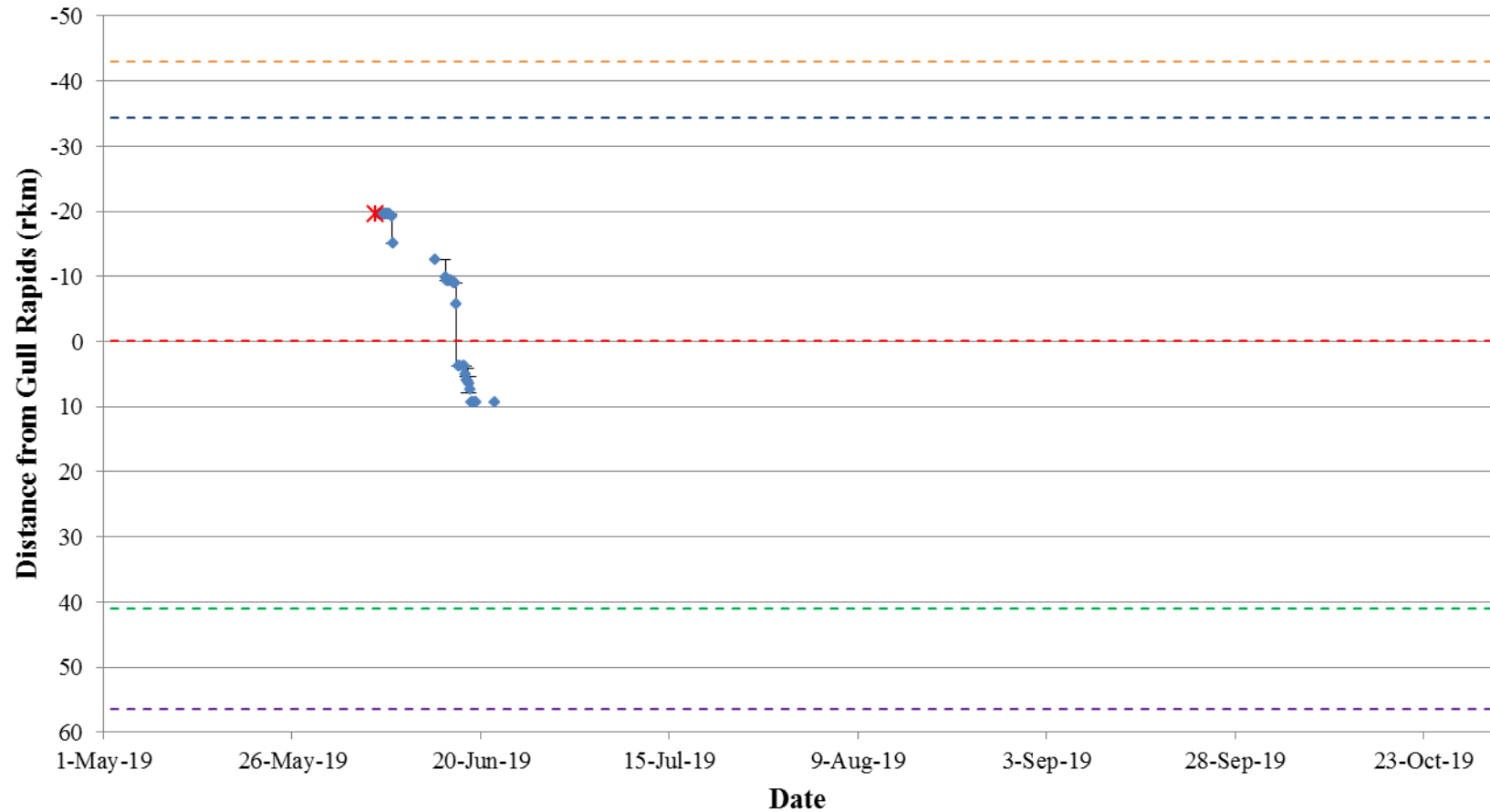


Figure A4-11: Position of a Walleye tagged with an acoustic transmitter (code #20158) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

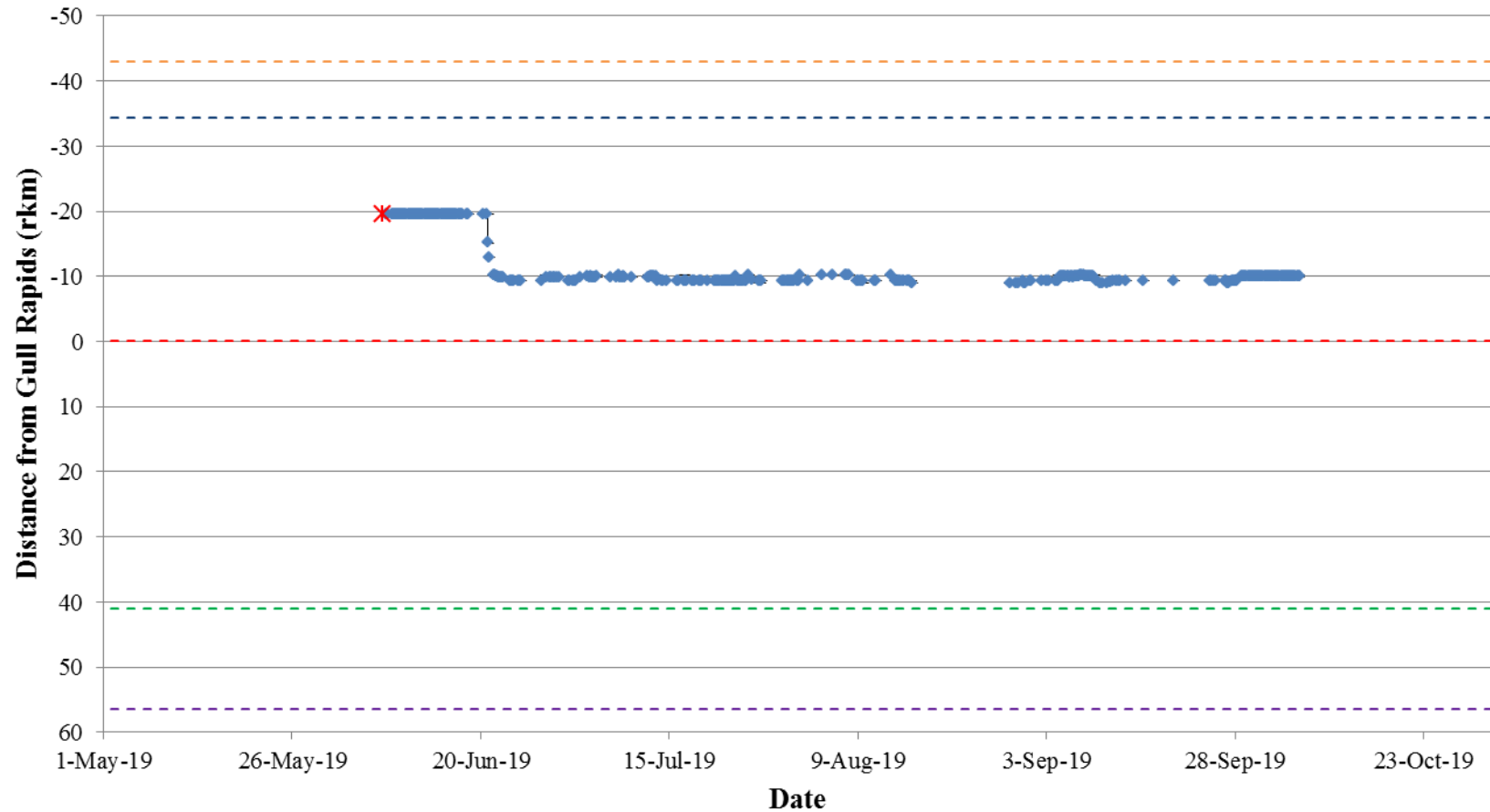


Figure A4-12: Position of a Walleye tagged with an acoustic transmitter (code #20159) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

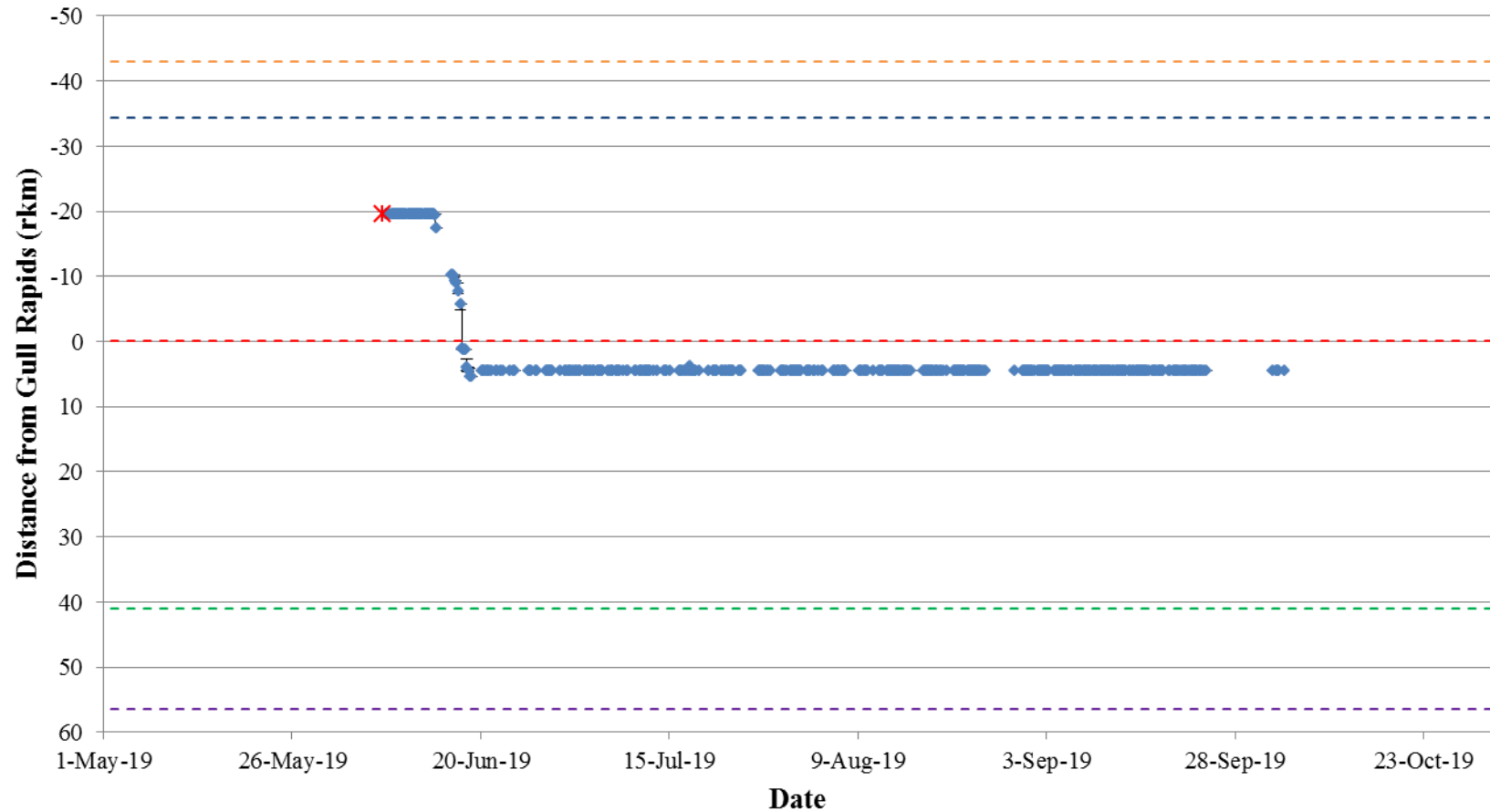


Figure A4-13: Position of a Walleye tagged with an acoustic transmitter (code #20160) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

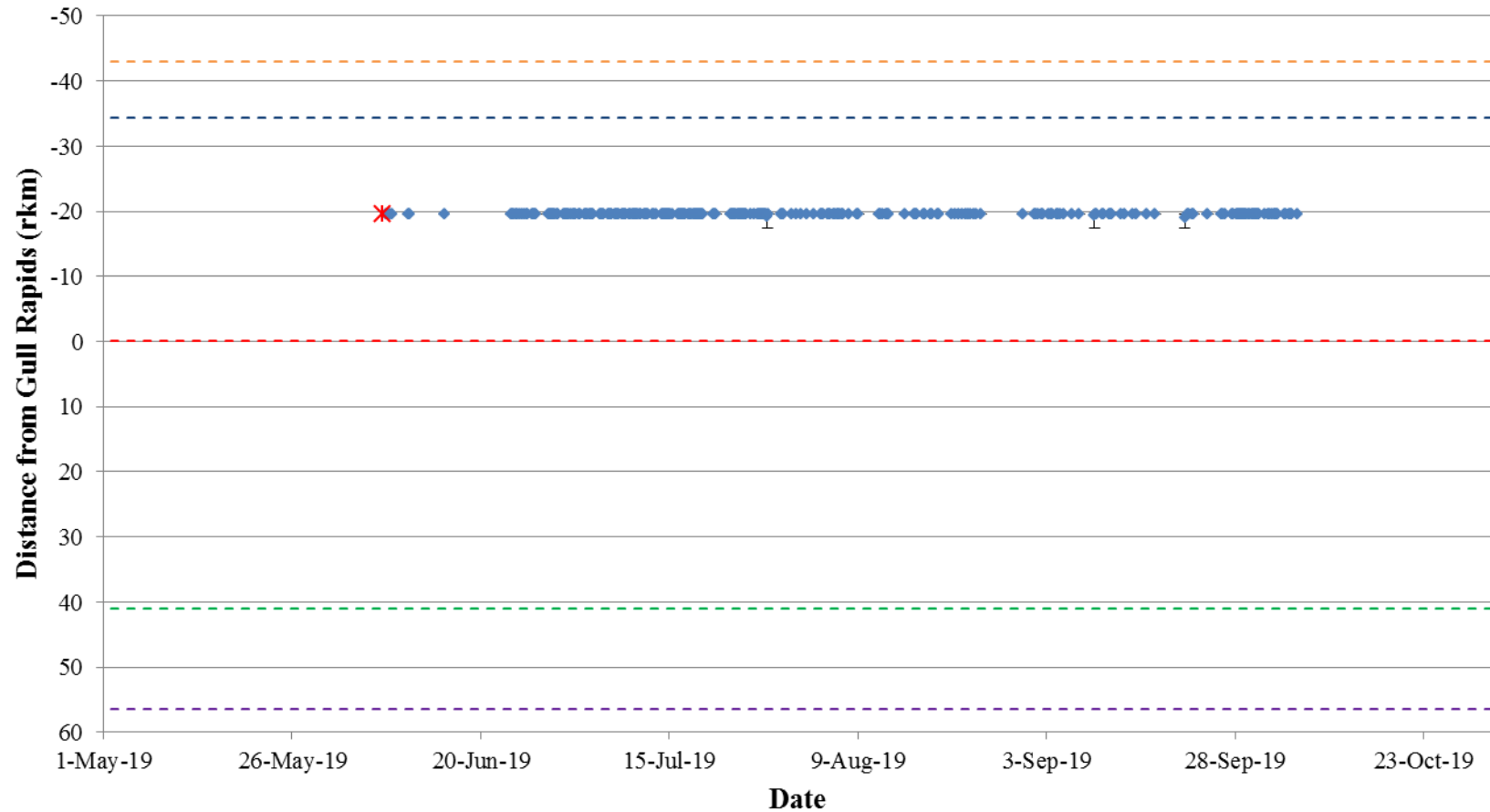


Figure A4-14: Position of a Walleye tagged with an acoustic transmitter (code #20161) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

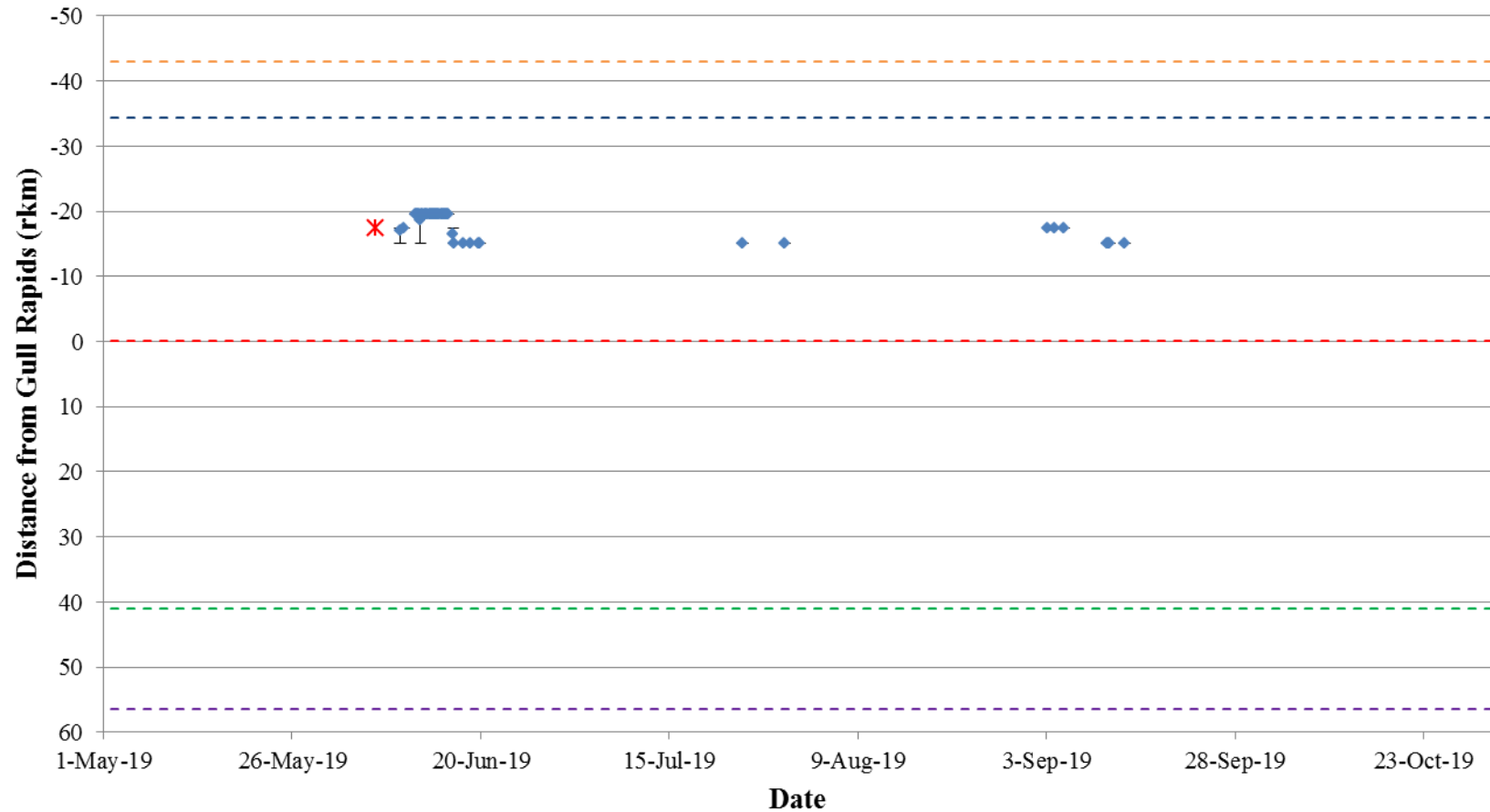


Figure A4-15: Position of a Walleye tagged with an acoustic transmitter (code #20162) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

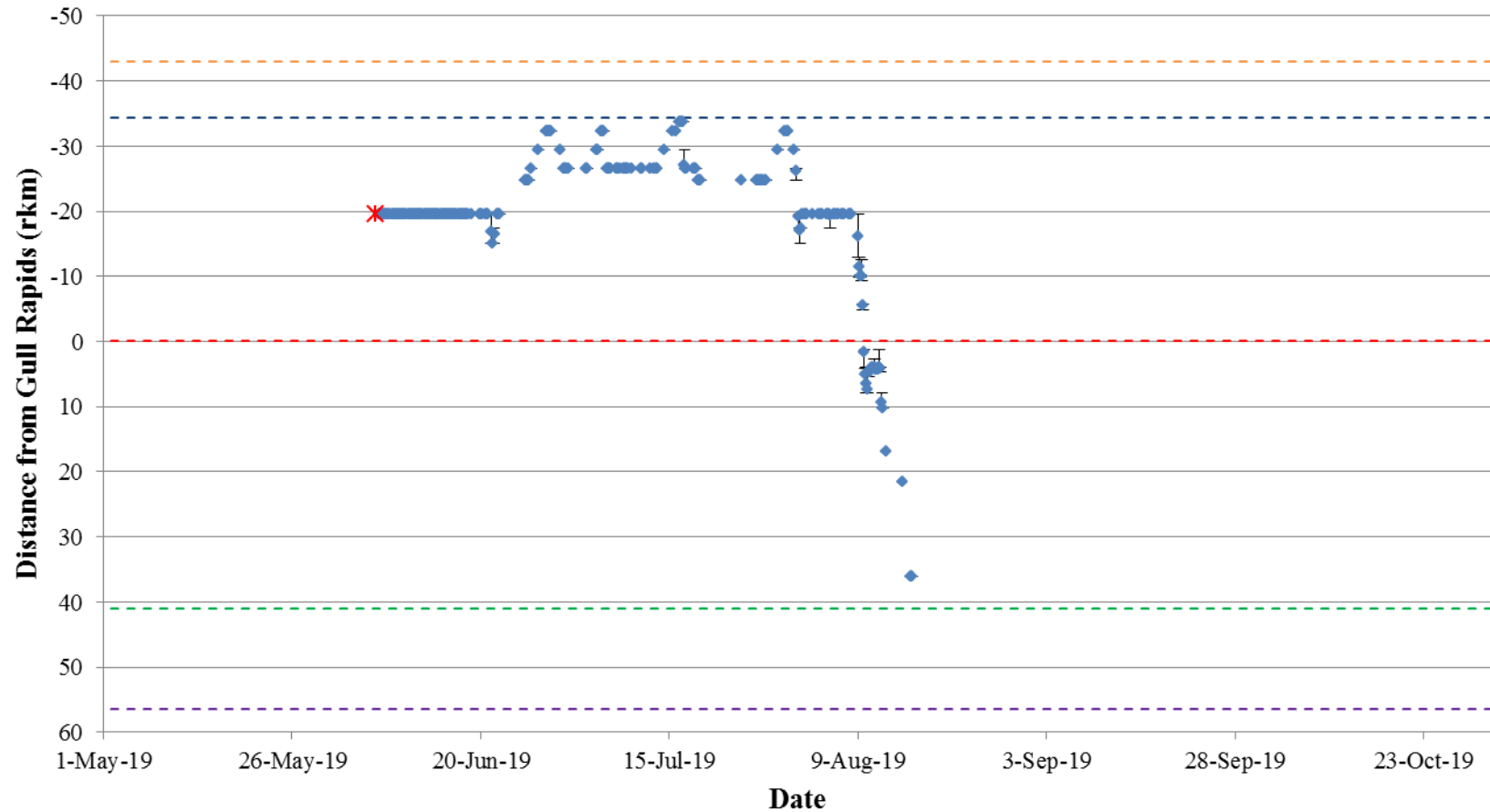


Figure A4-16: Position of a Walleye tagged with an acoustic transmitter (code #20163) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

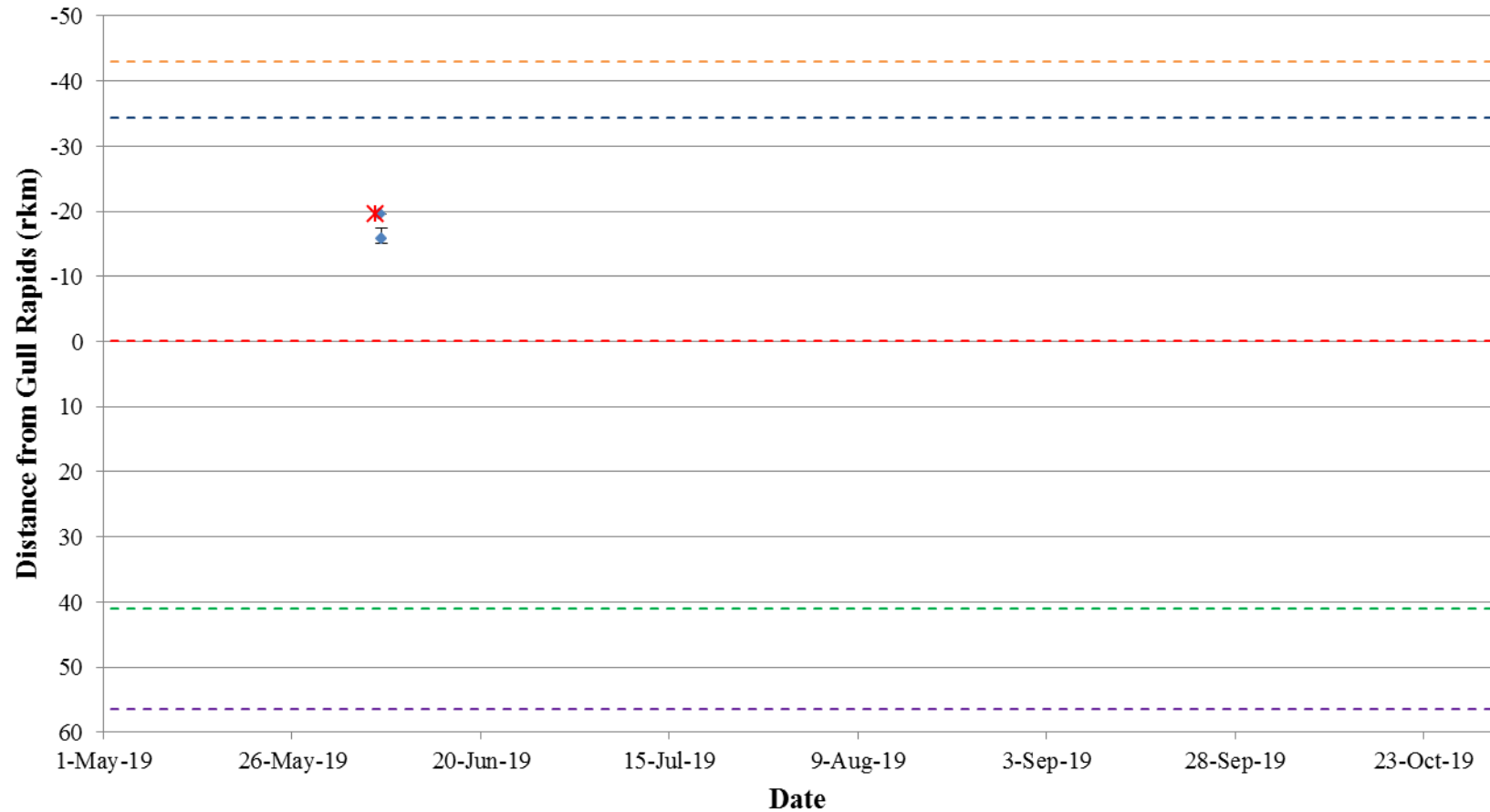


Figure A4-17: Position of a Walleye tagged with an acoustic transmitter (code #20164) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

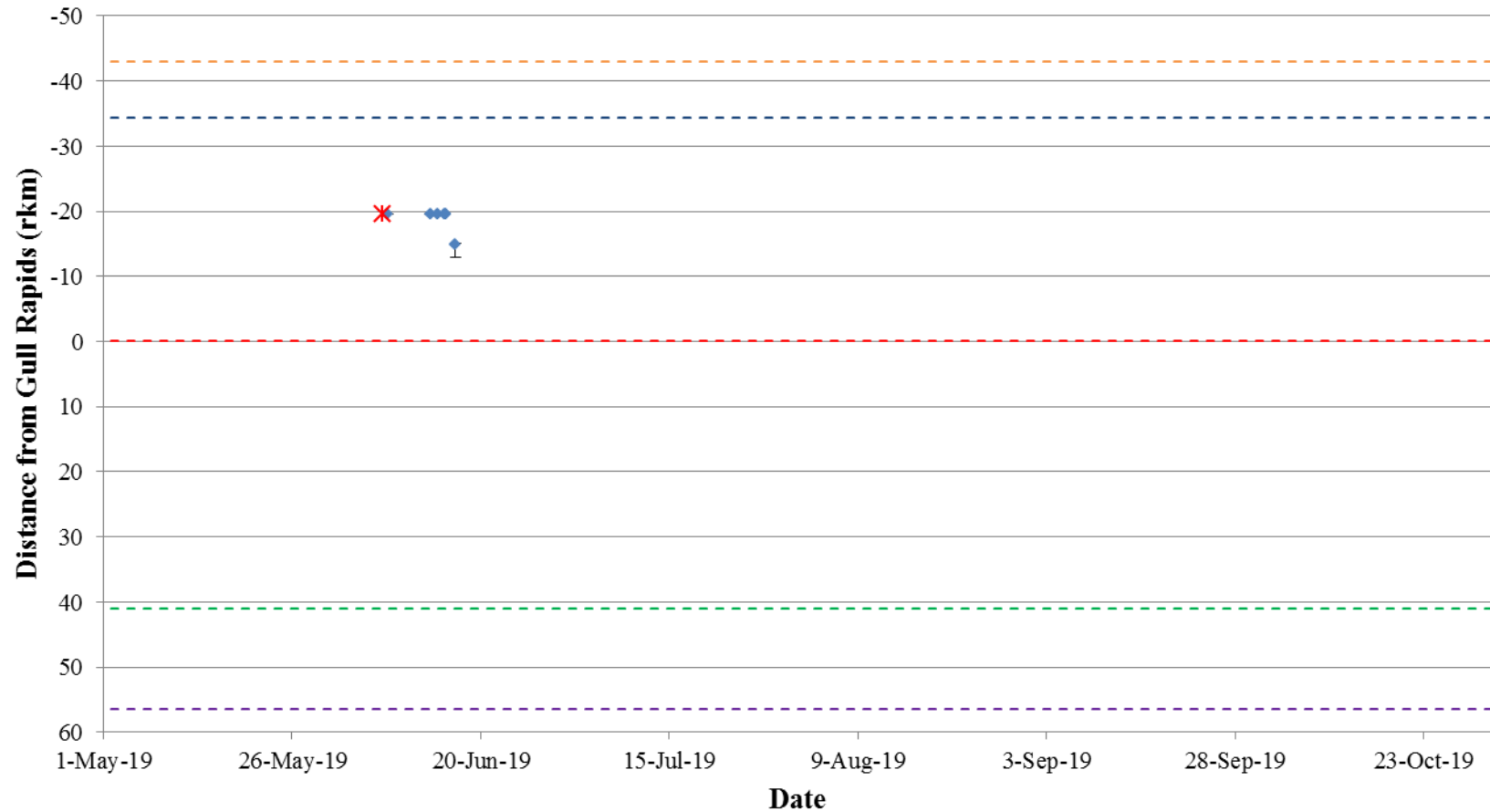


Figure A4-18: Position of a Walleye tagged with an acoustic transmitter (code #20169) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

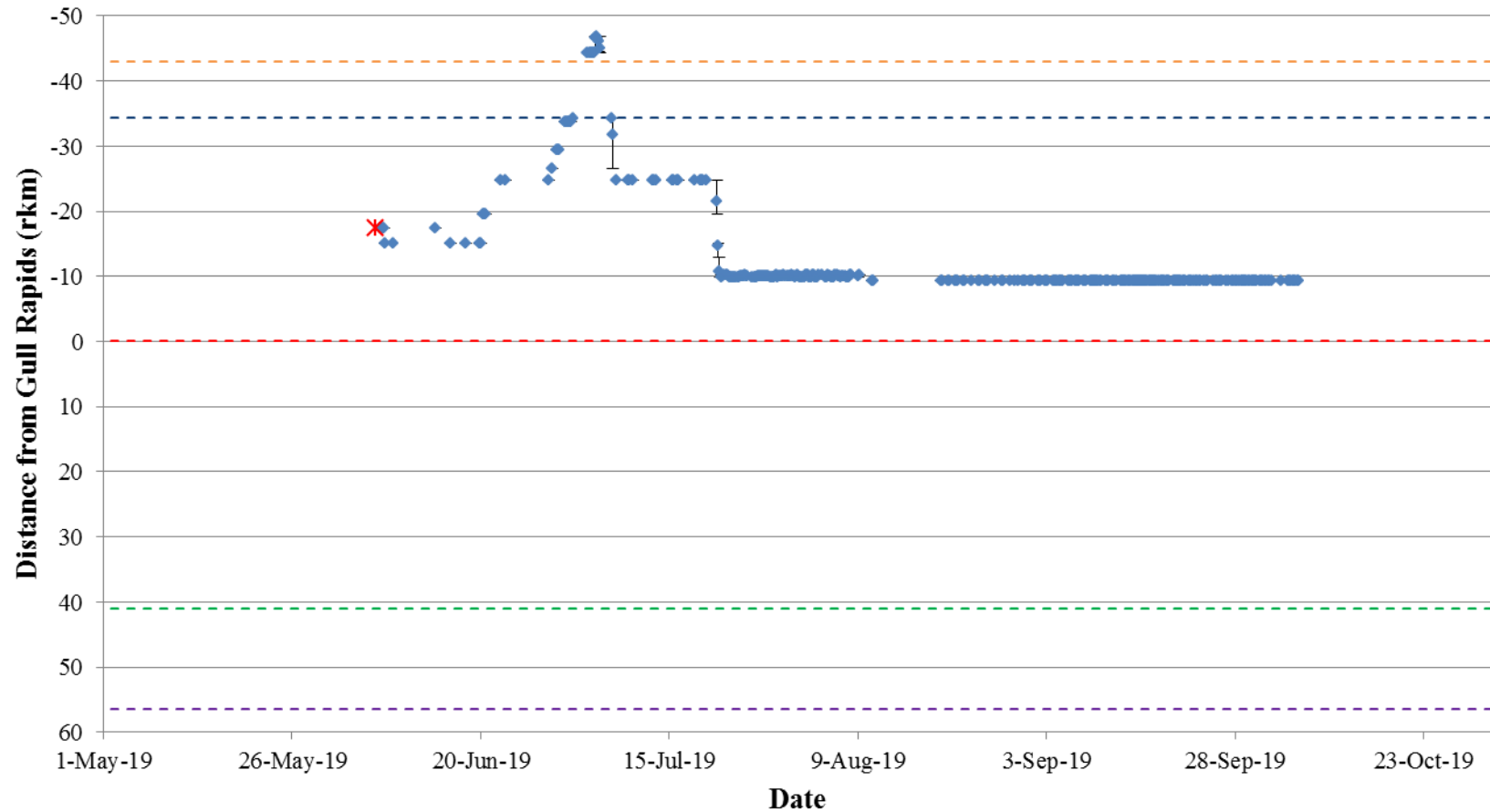


Figure A4-19: Position of a Walleye tagged with an acoustic transmitter (code #20170) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

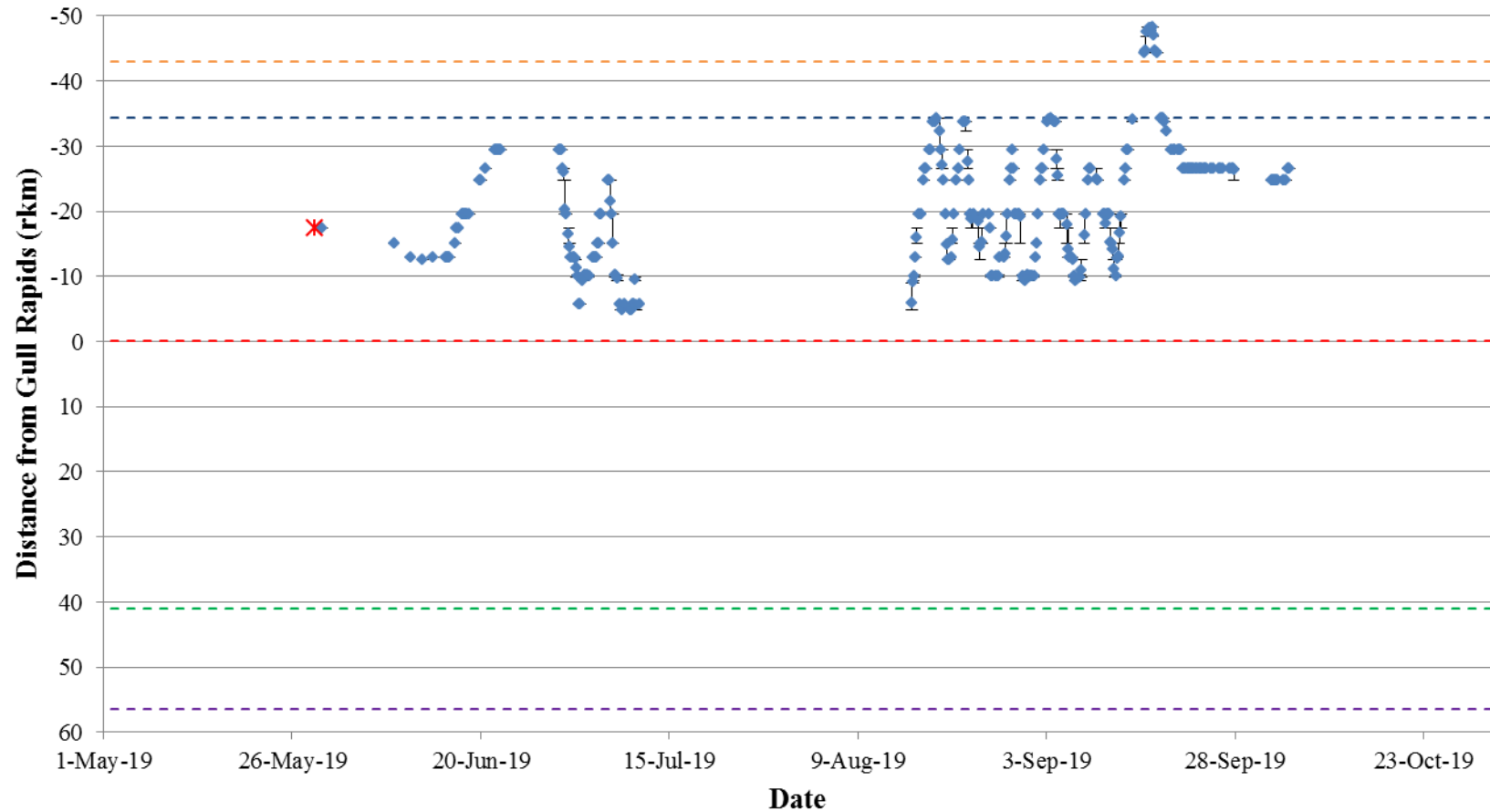


Figure A4-20: Position of a Walleye tagged with an acoustic transmitter (code #20175) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

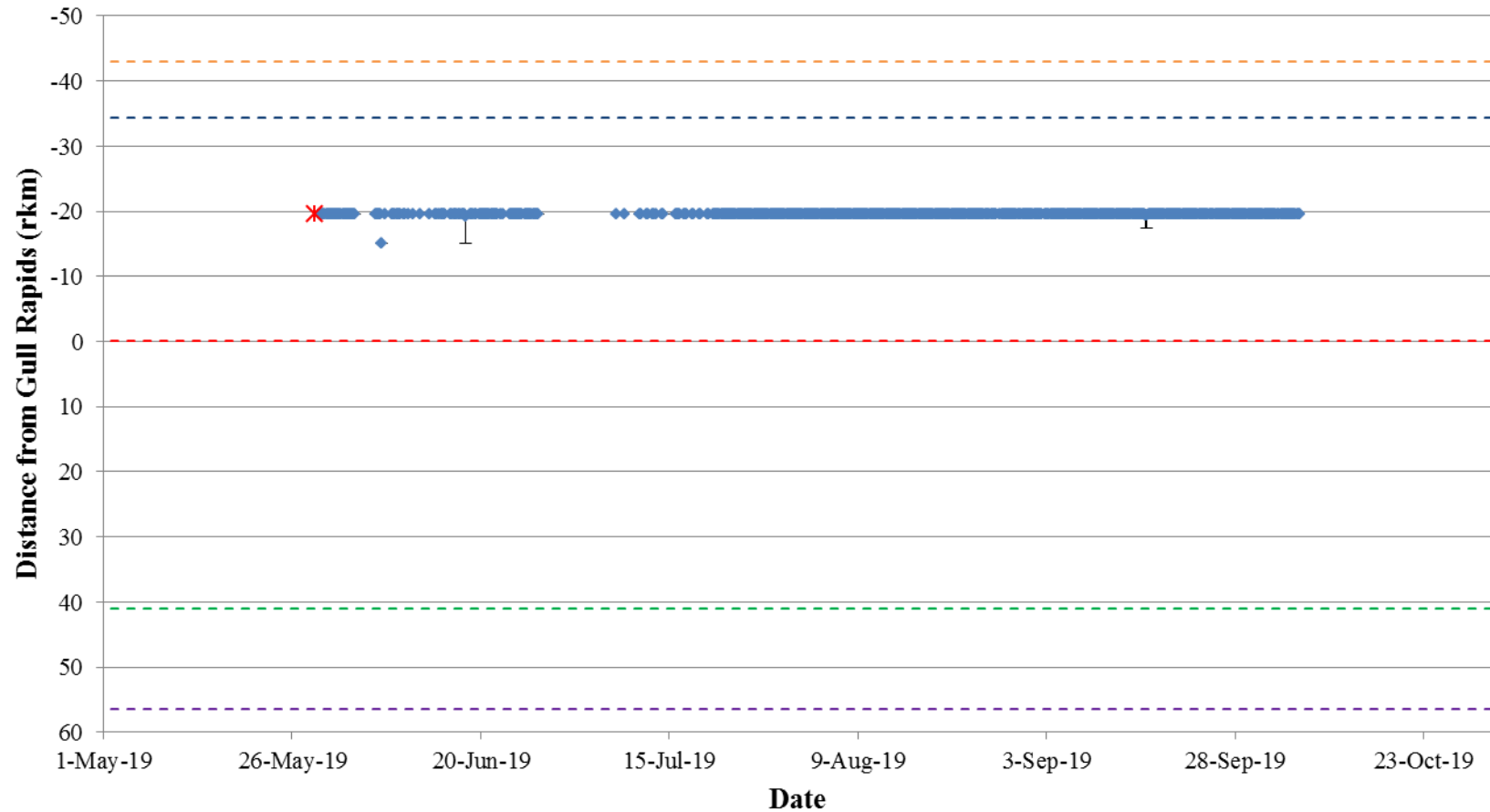


Figure A4-21: Position of a Walleye tagged with an acoustic transmitter (code #20176) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

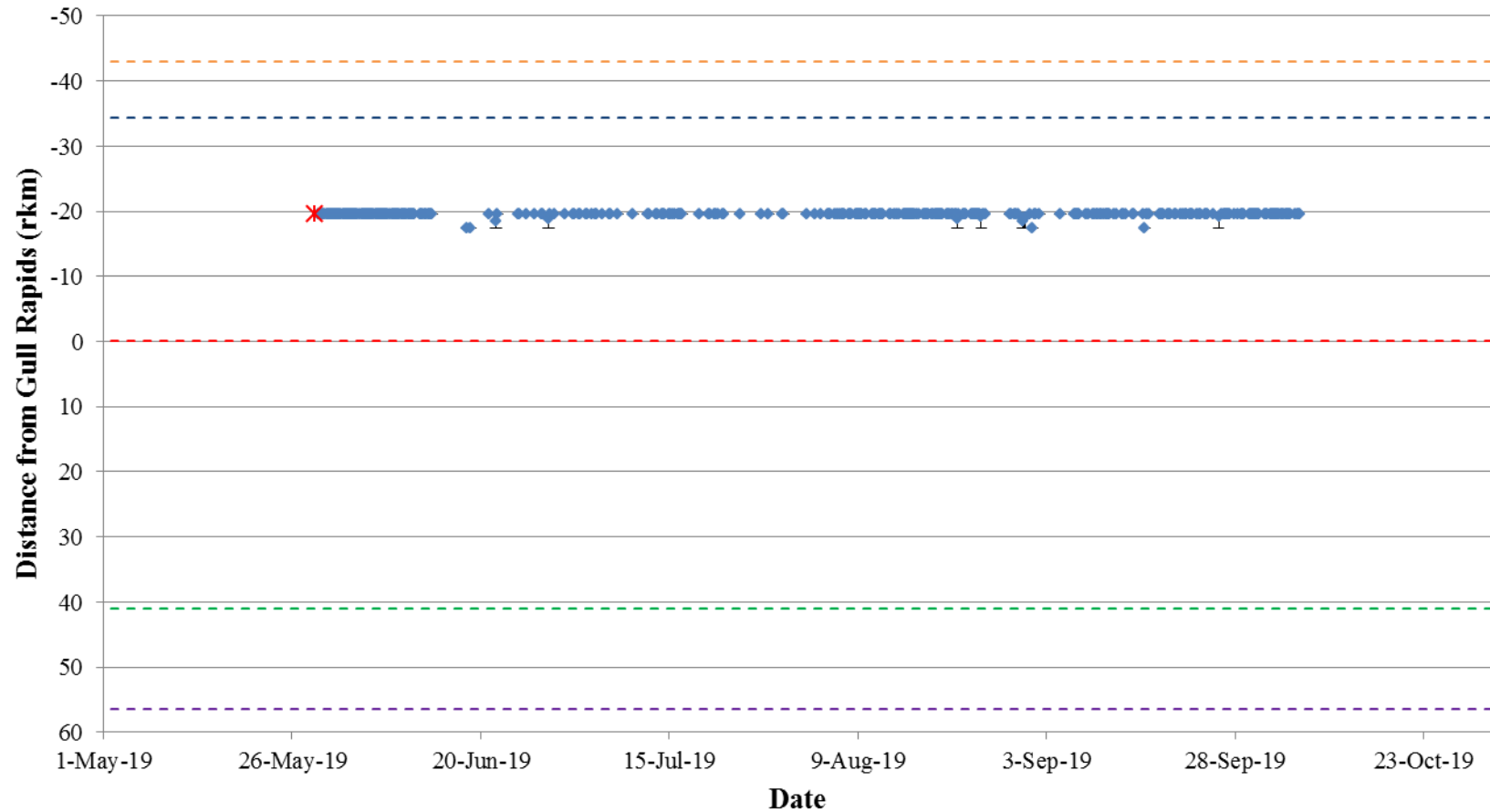


Figure A4-22: Position of a Walleye tagged with an acoustic transmitter (code #20181) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

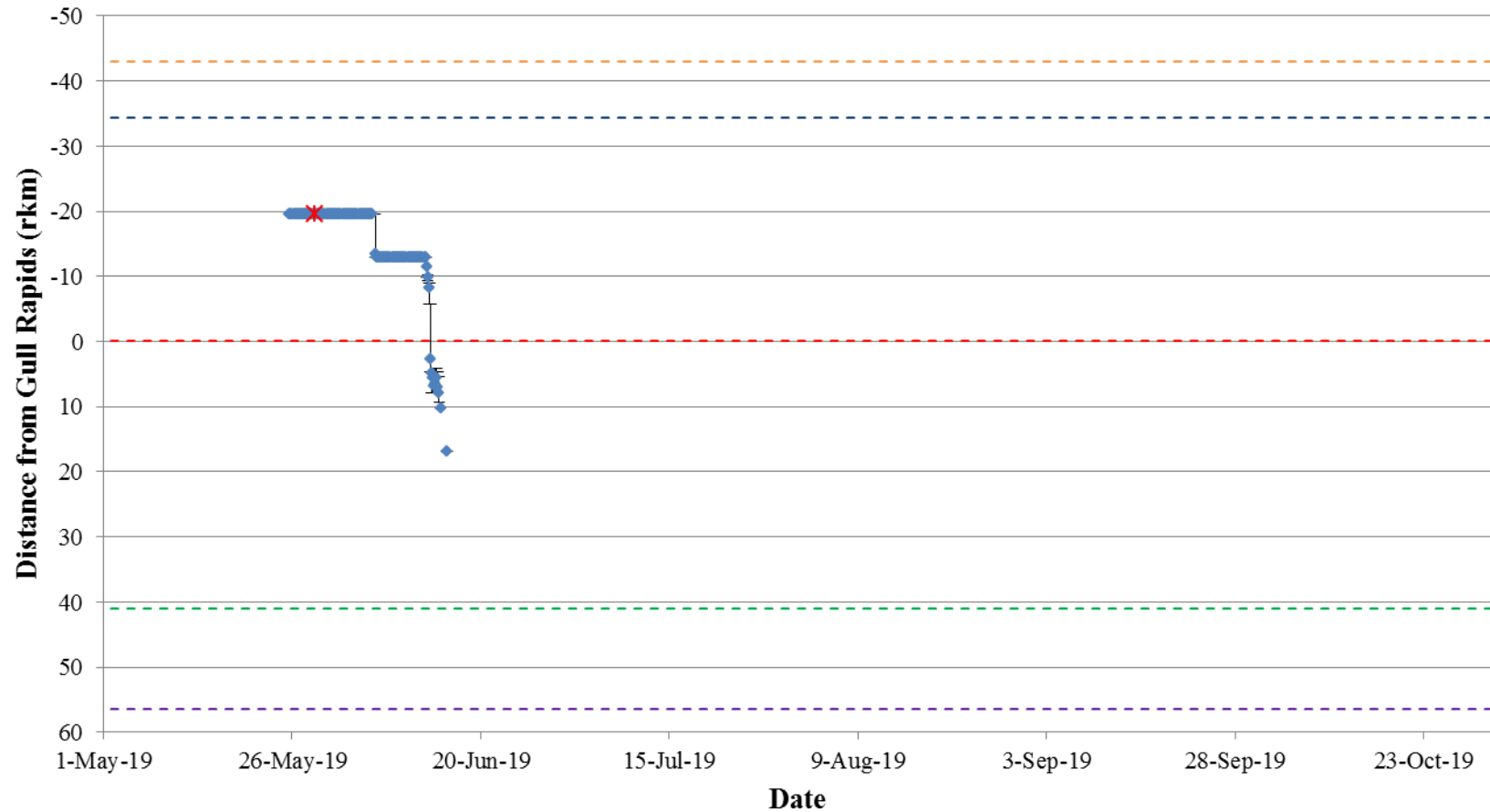


Figure A4-23: Position of a Walleye tagged with an acoustic transmitter (code #20182) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

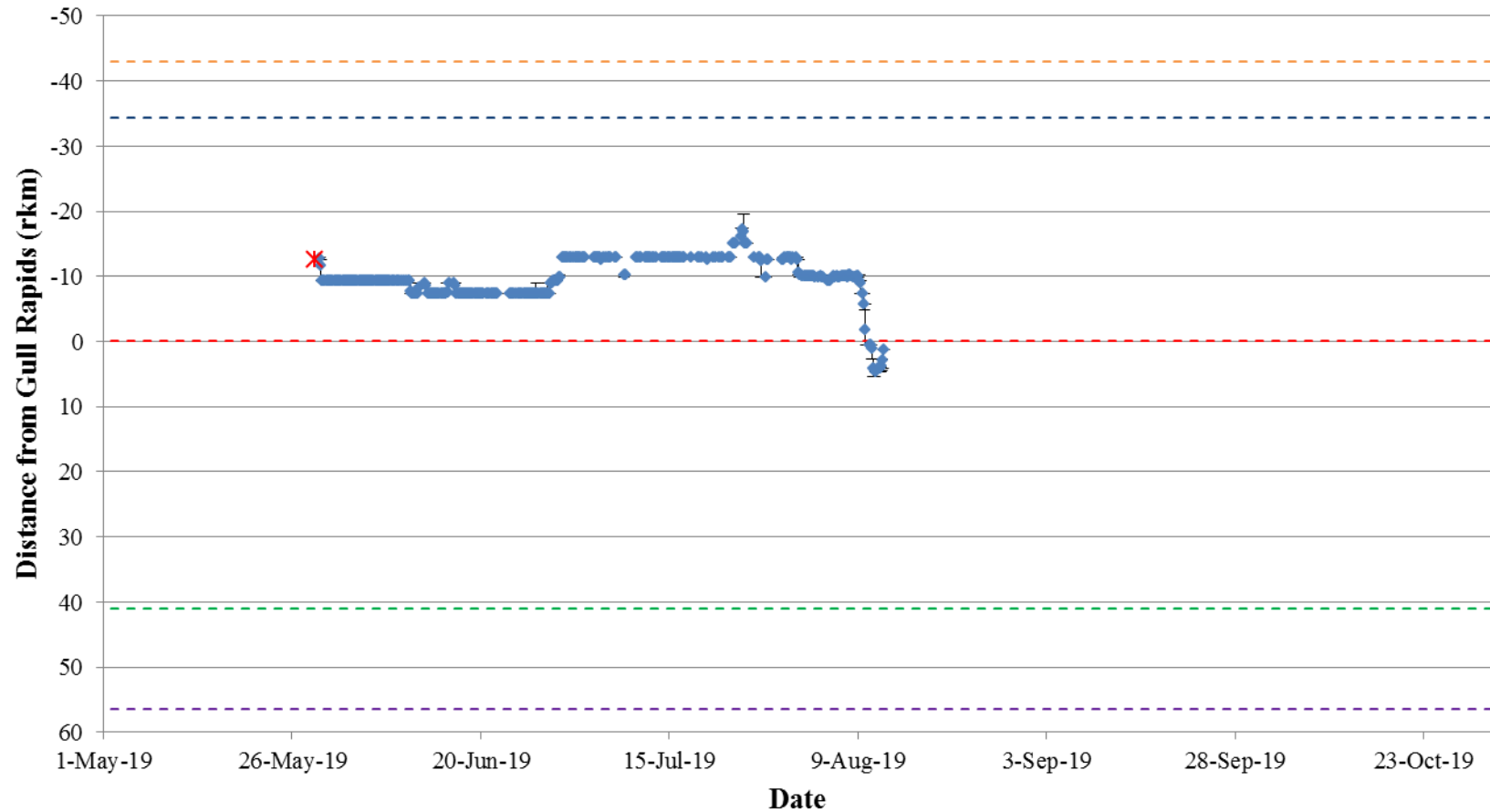


Figure A4-24: Position of a Walleye tagged with an acoustic transmitter (code #20186) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

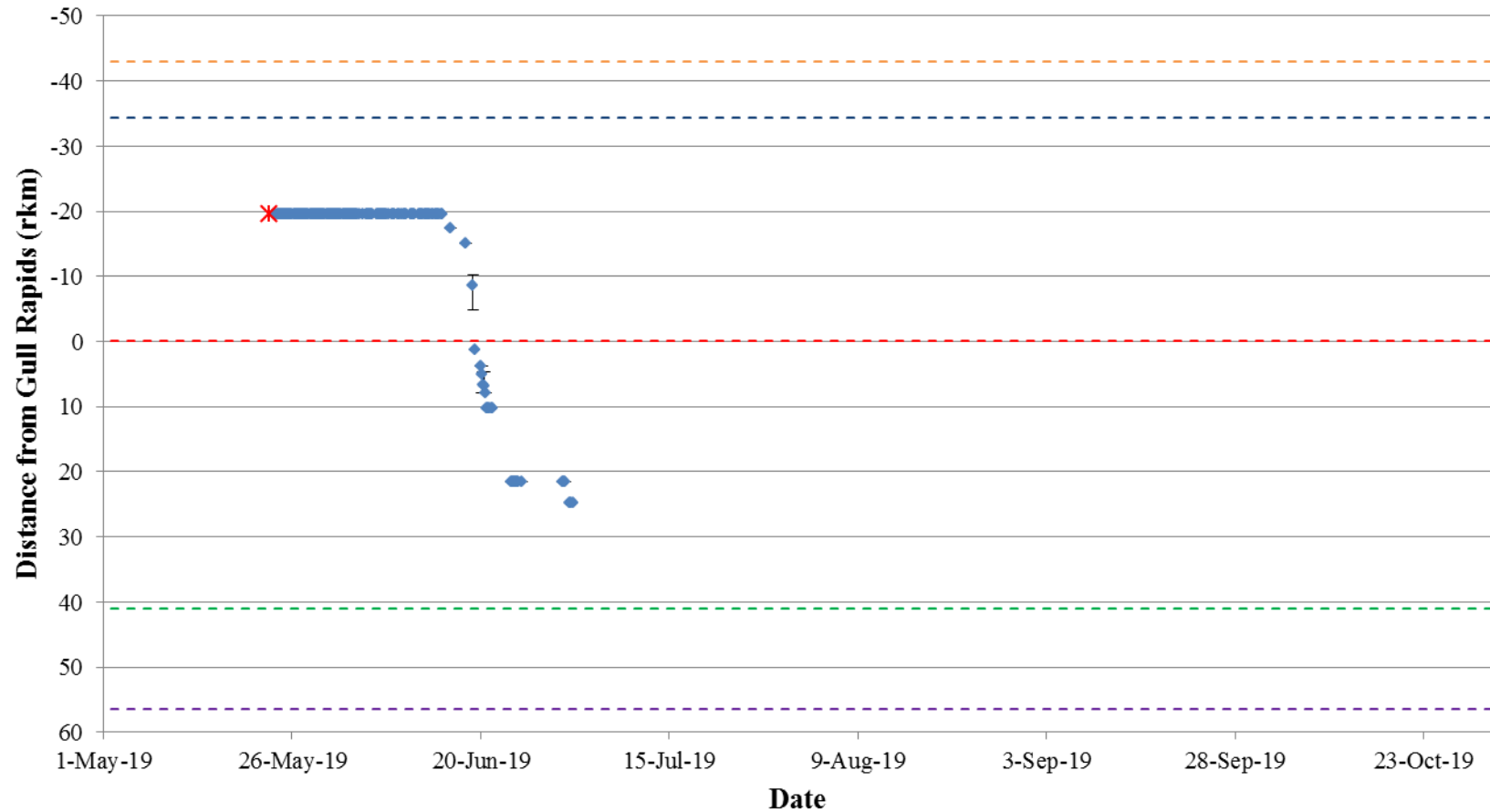


Figure A4-25: Position of a Walleye tagged with an acoustic transmitter (code #20187) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

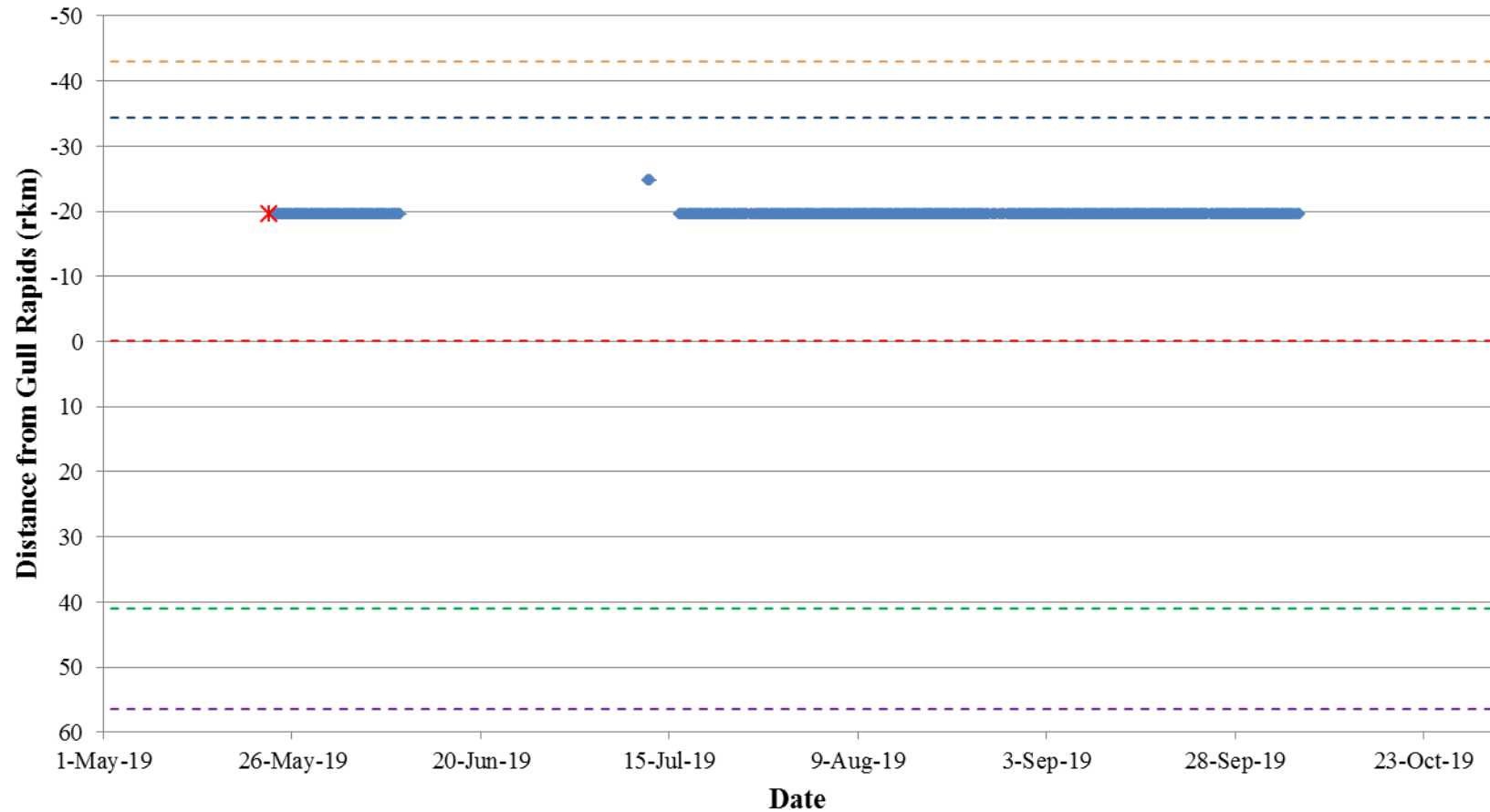


Figure A4-26: Position of a Walleye tagged with an acoustic transmitter (code #20188) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

APPENDIX 5:

LOCATION SUMMARY FOR INDIVIDUAL ACOUSTIC TAGGED WALLEYE IN STEPHENS LAKE JUNE 2016 TO OCTOBER 2019

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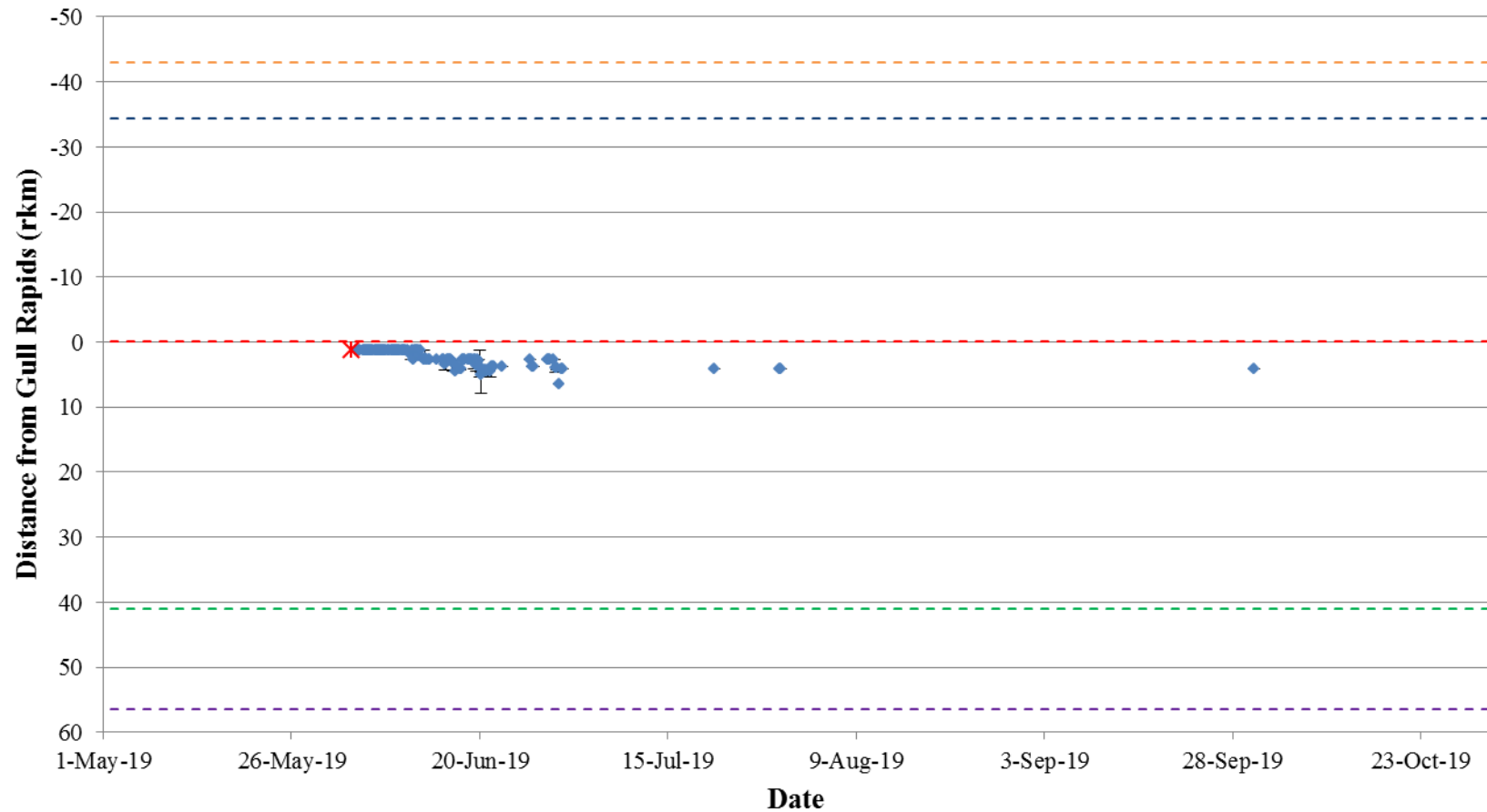


Figure A5-1: Position of a Walleye tagged with an acoustic transmitter (code #20129) in the Nelson River in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

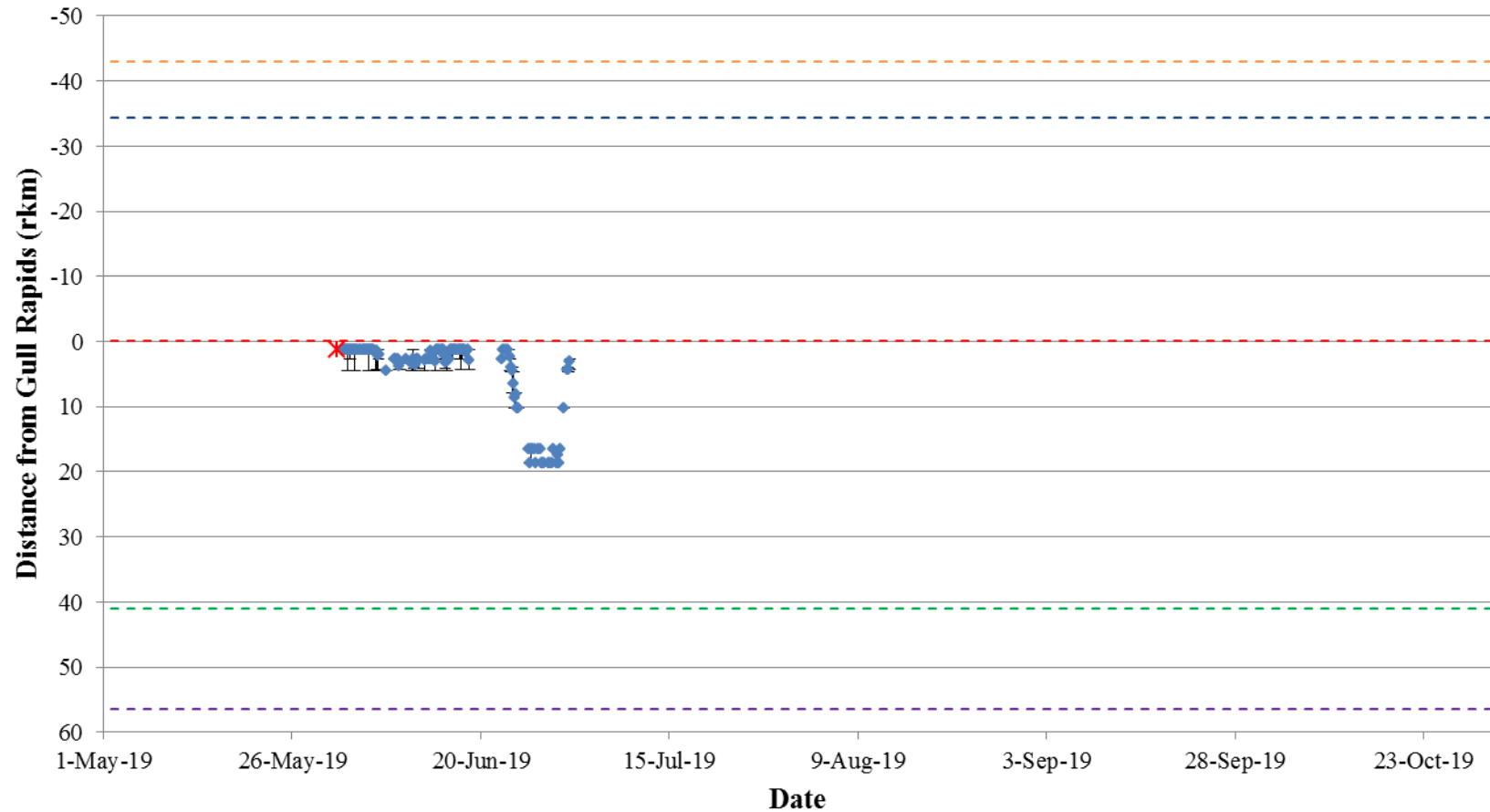


Figure A5-2: Position of a Walleye tagged with an acoustic transmitter (code #20130) in the Nelson River in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

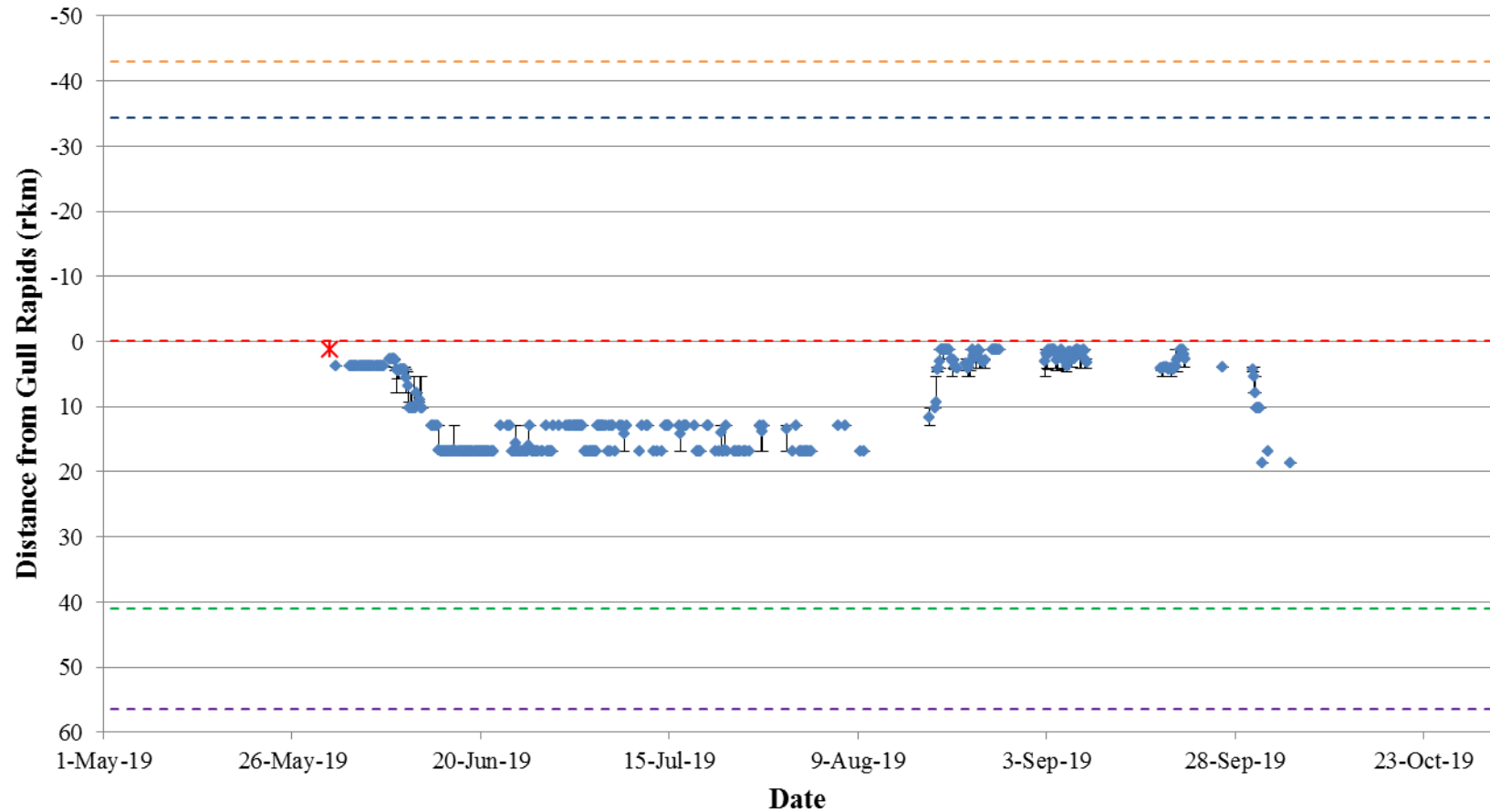


Figure A5-3: Position of a Walleye tagged with an acoustic transmitter (code #20131) in the Nelson River in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

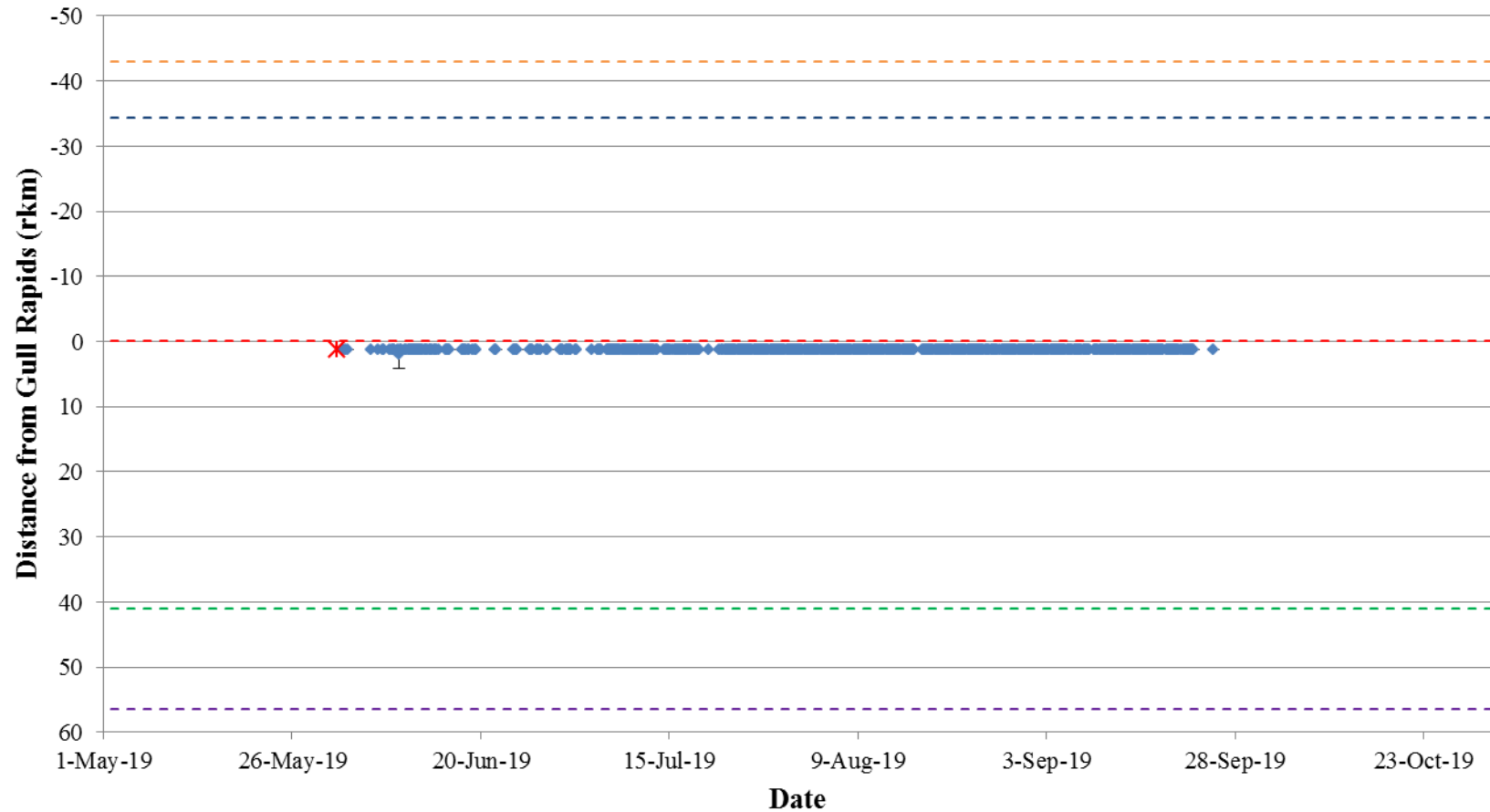


Figure A5-4: Position of a Walleye tagged with an acoustic transmitter (code #20132) in the Nelson River in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

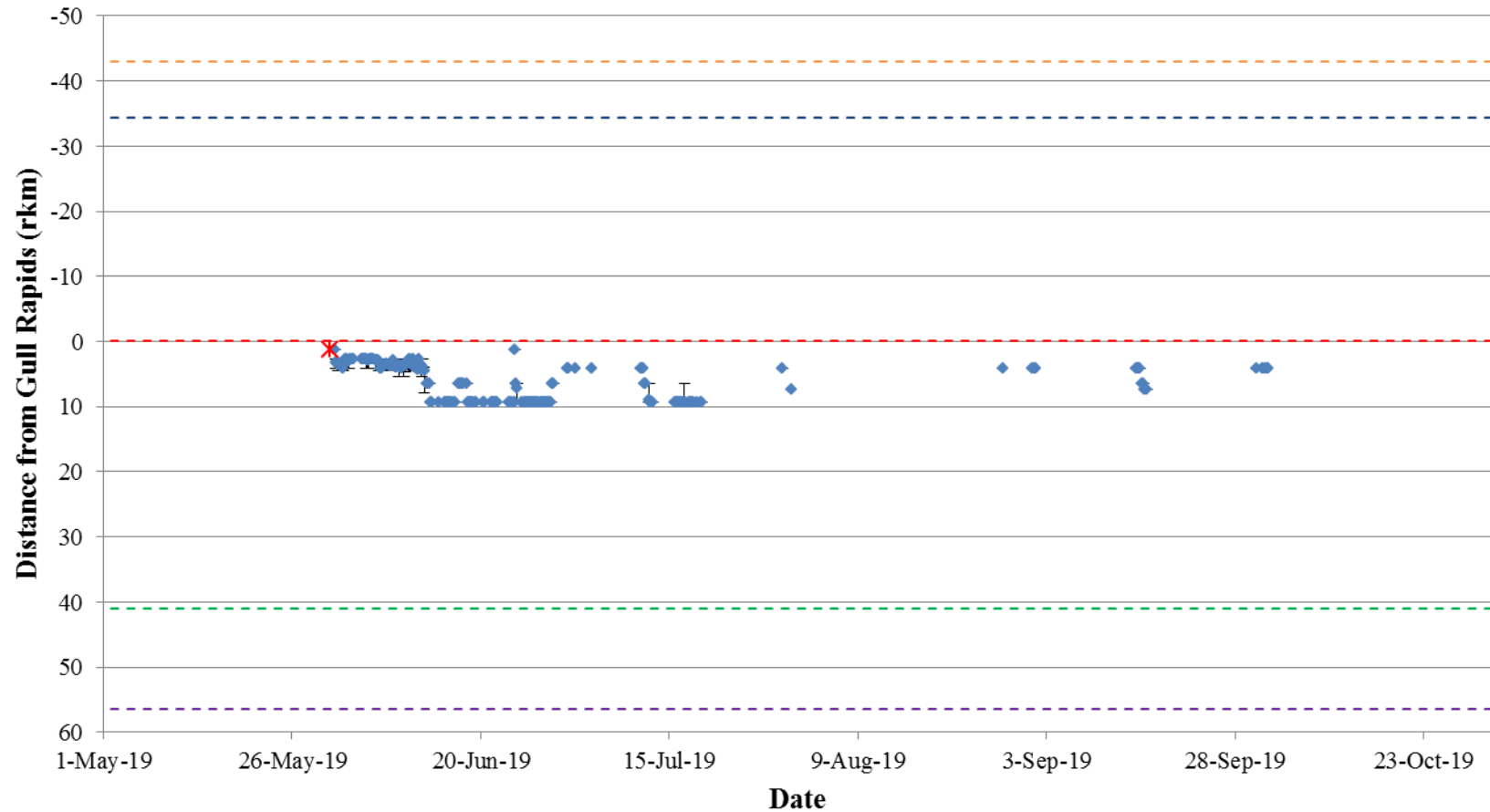


Figure A5-5: Position of a Walleye tagged with an acoustic transmitter (code #20133) in the Nelson River in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

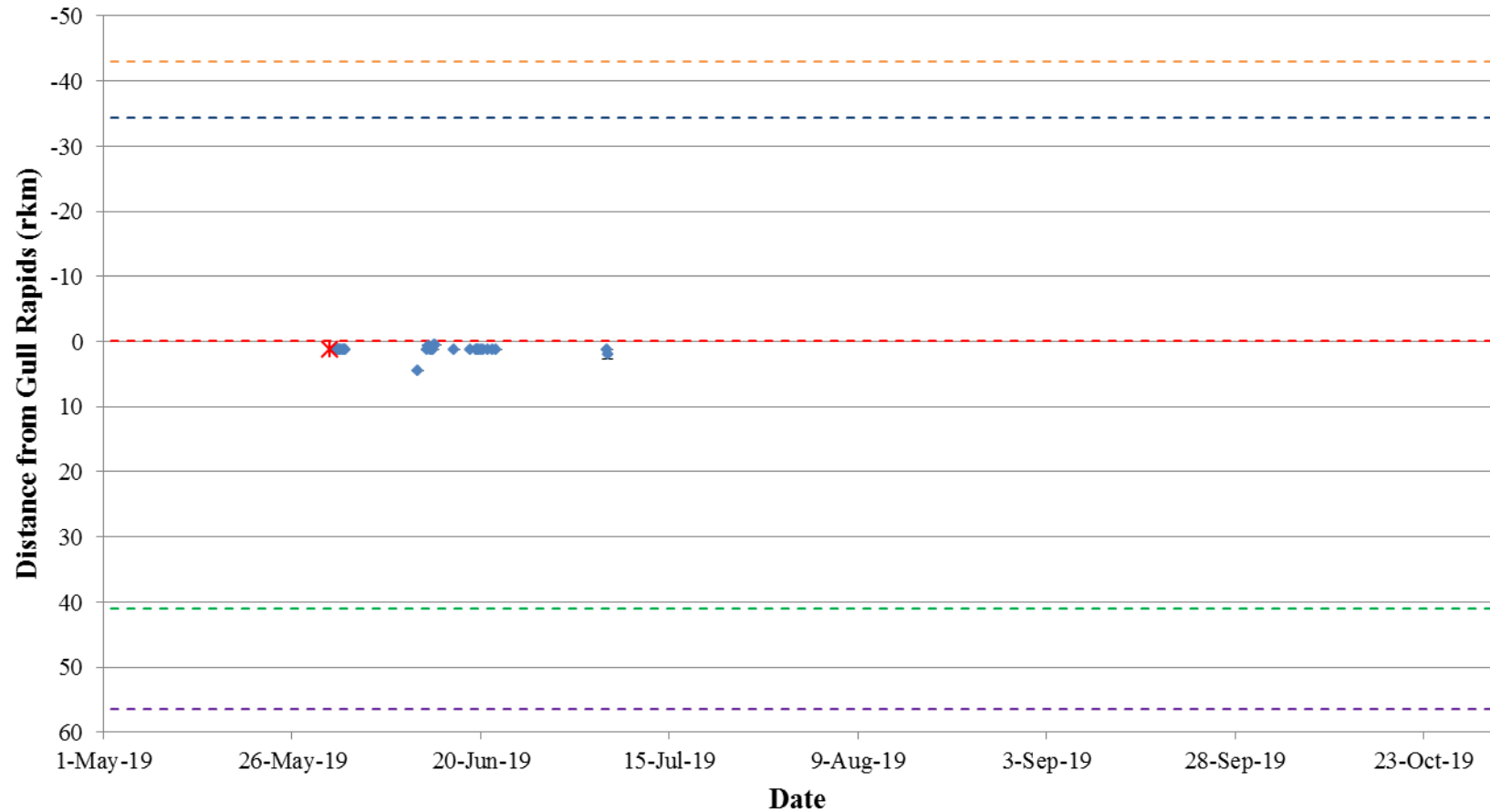


Figure A5-6: Position of a Walleye tagged with an acoustic transmitter (code #20134) in the Nelson River in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

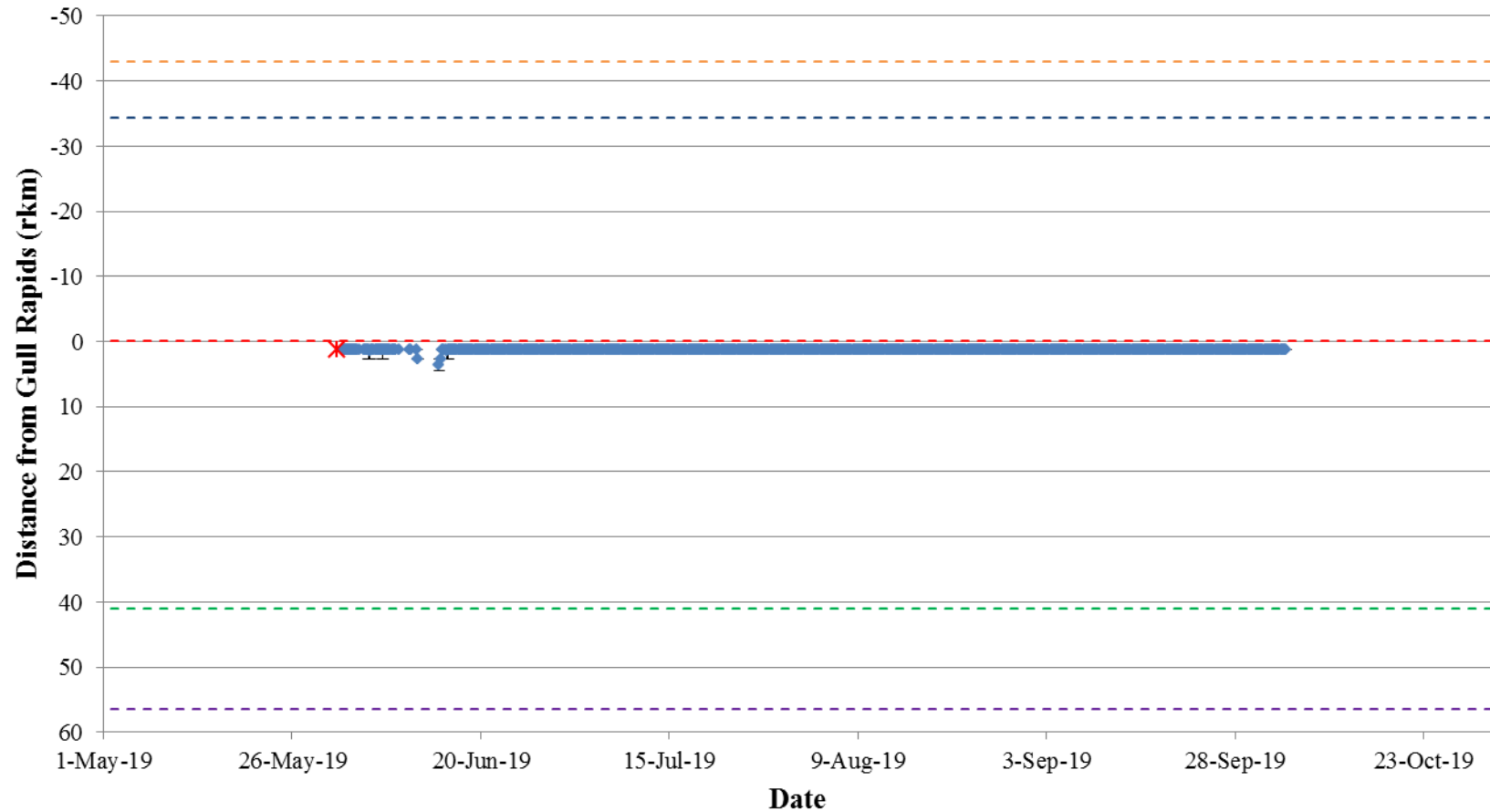


Figure A5-7: Position of a Walleye tagged with an acoustic transmitter (code #20135) in the Nelson River in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

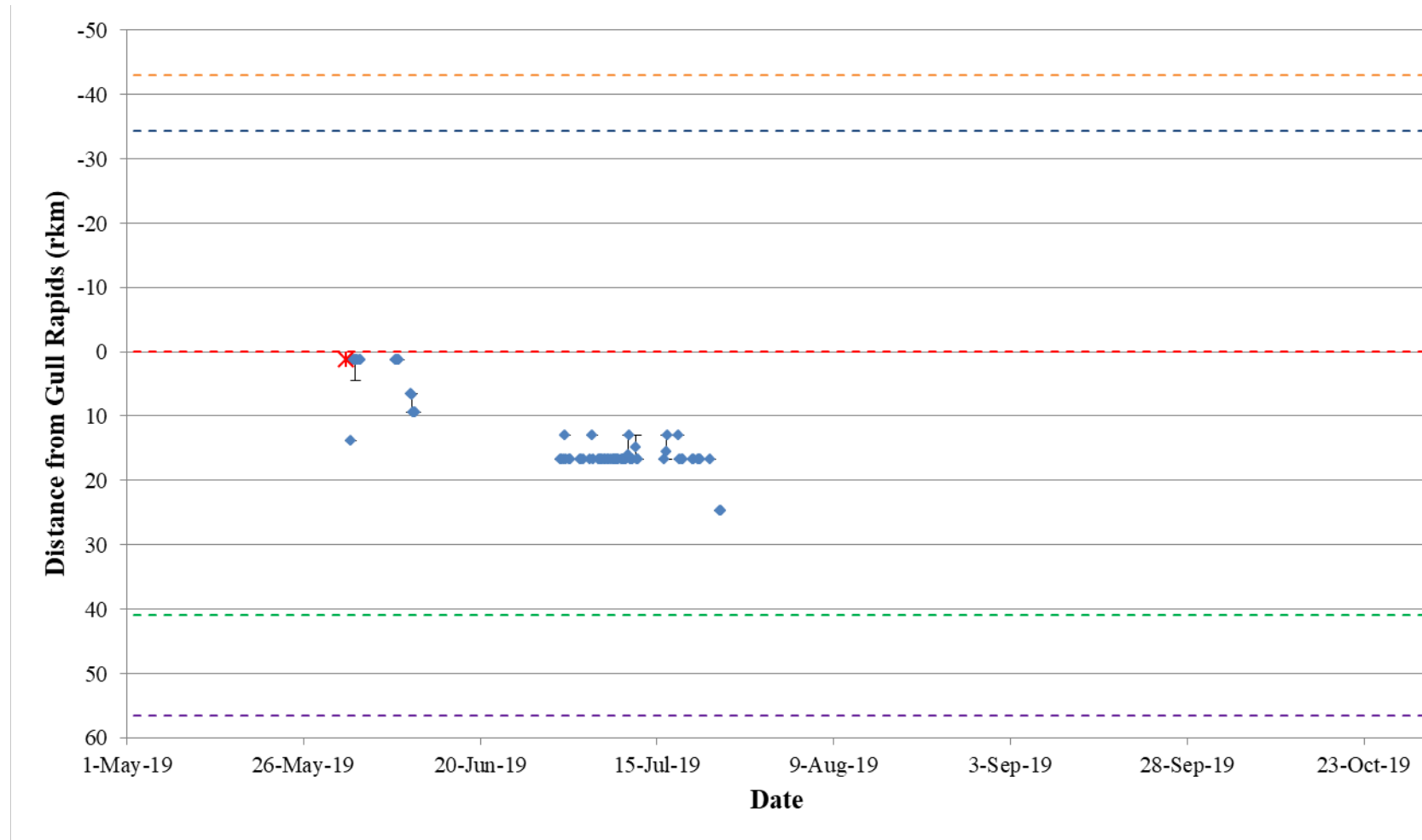


Figure A5-8: Position of a Walleye tagged with an acoustic transmitter (code #20136) in the Nelson River in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

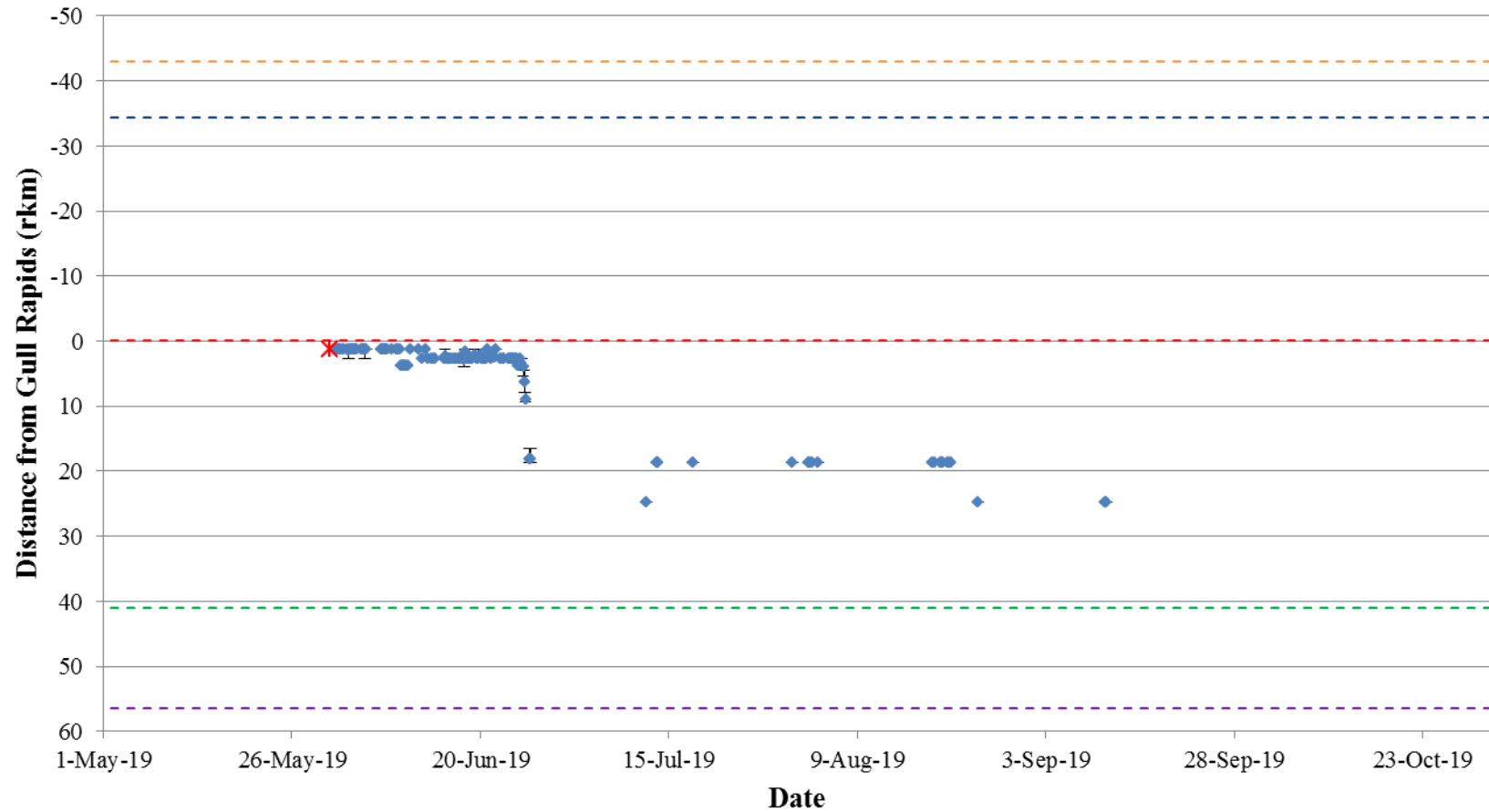


Figure A5-9: Position of a Walleye tagged with an acoustic transmitter (code #20137) in the Nelson River in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

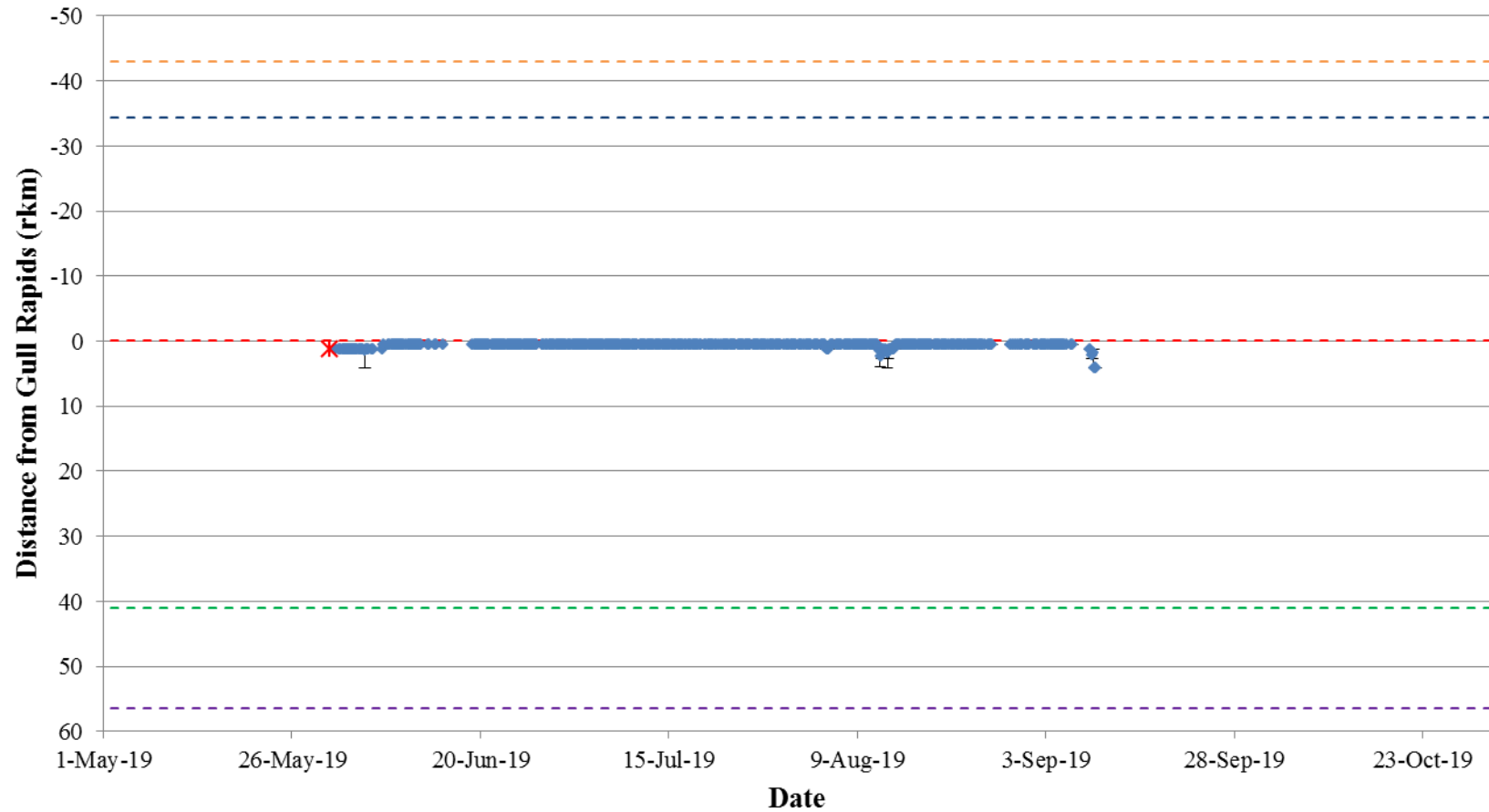


Figure A5-10: Position of a Walleye tagged with an acoustic transmitter (code #20138) in the Nelson River in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

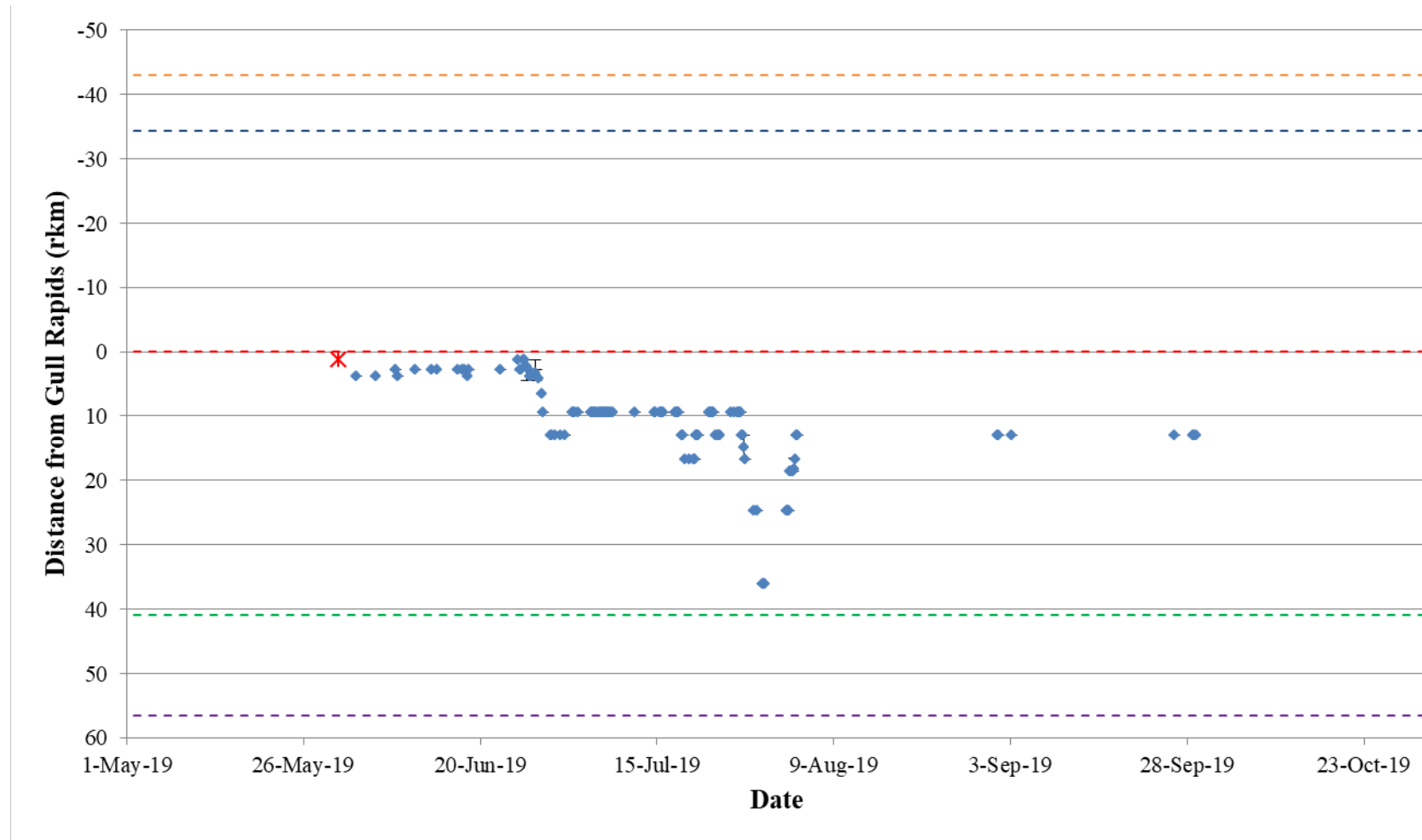


Figure A5-11: Position of a Walleye tagged with an acoustic transmitter (code #20139) in the Nelson River in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

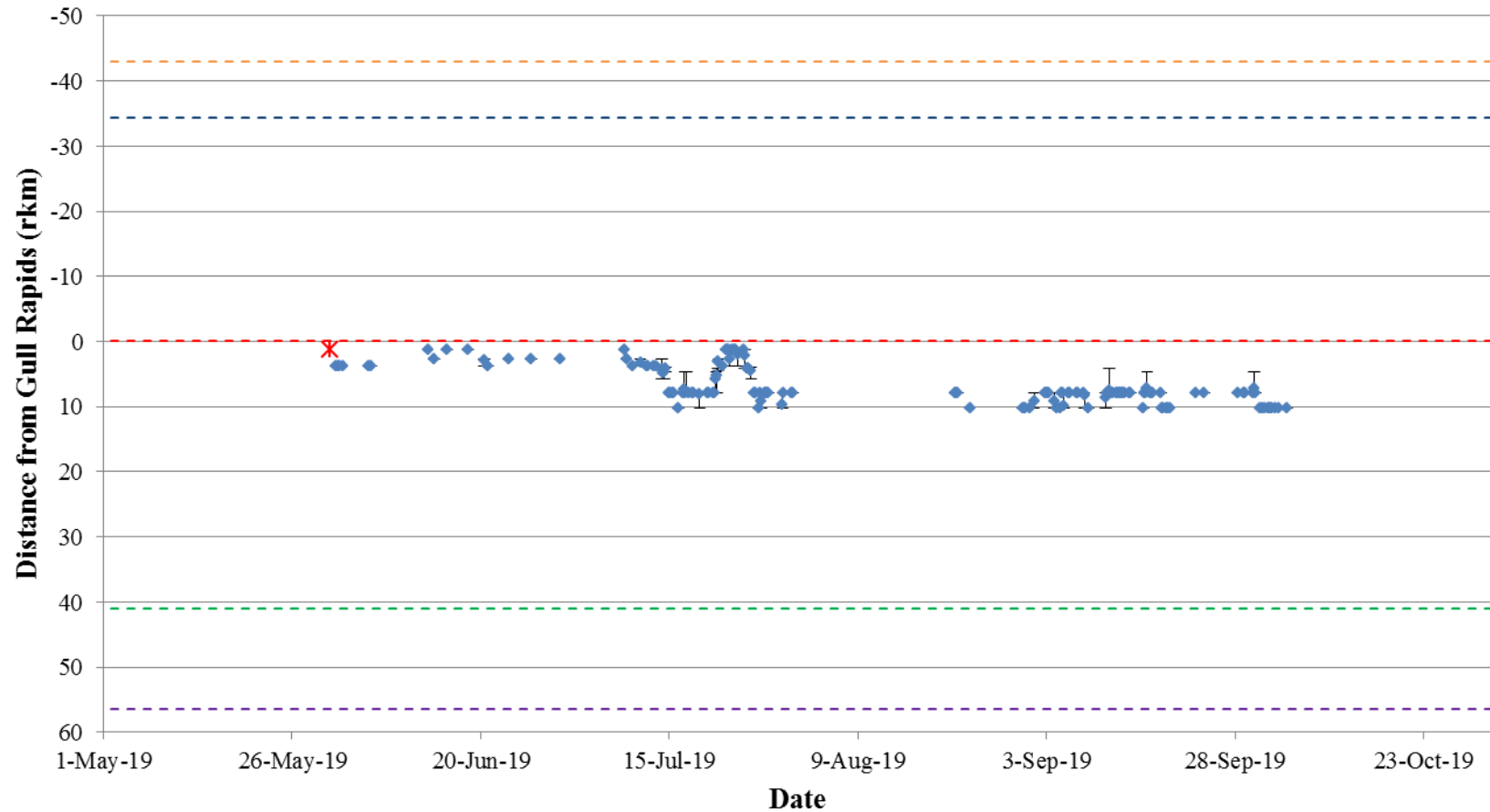


Figure A5-12: Position of a Walleye tagged with an acoustic transmitter (code #20140) in the Nelson River in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

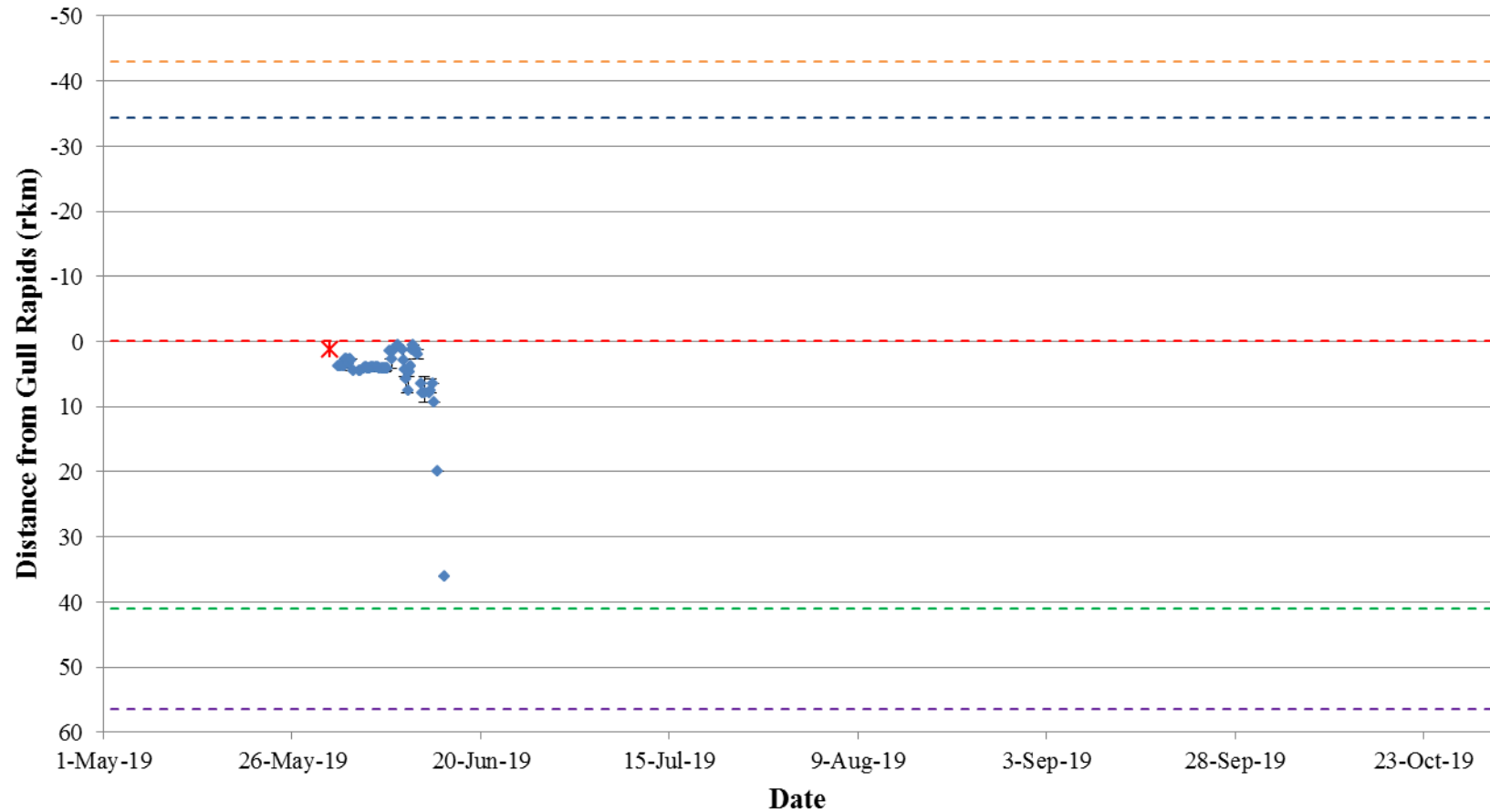


Figure A5-13: Position of a Walleye tagged with an acoustic transmitter (code #20141) in the Nelson River in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

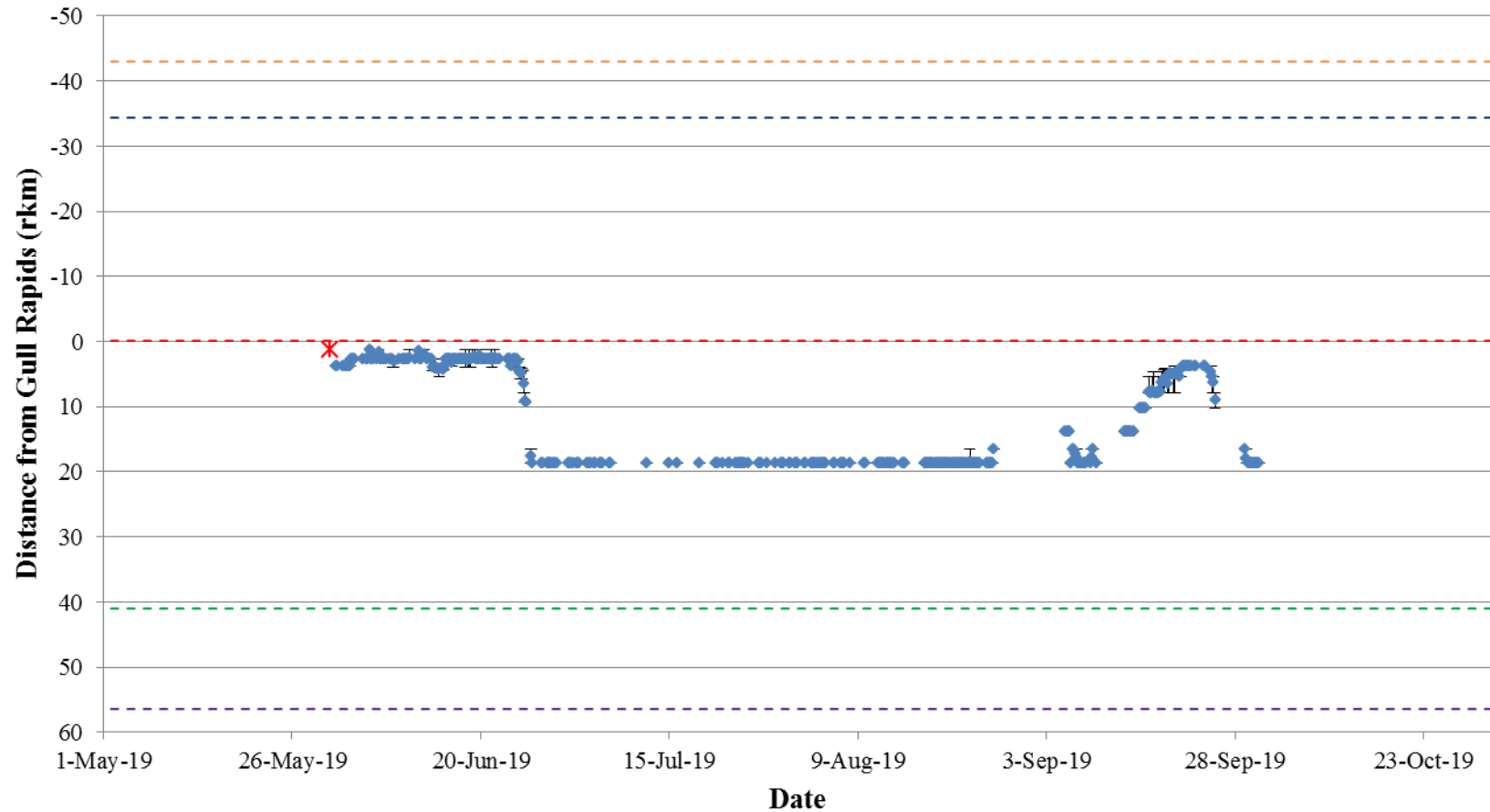


Figure A5-14: Position of a Walleye tagged with an acoustic transmitter (code #20142) in the Nelson River in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

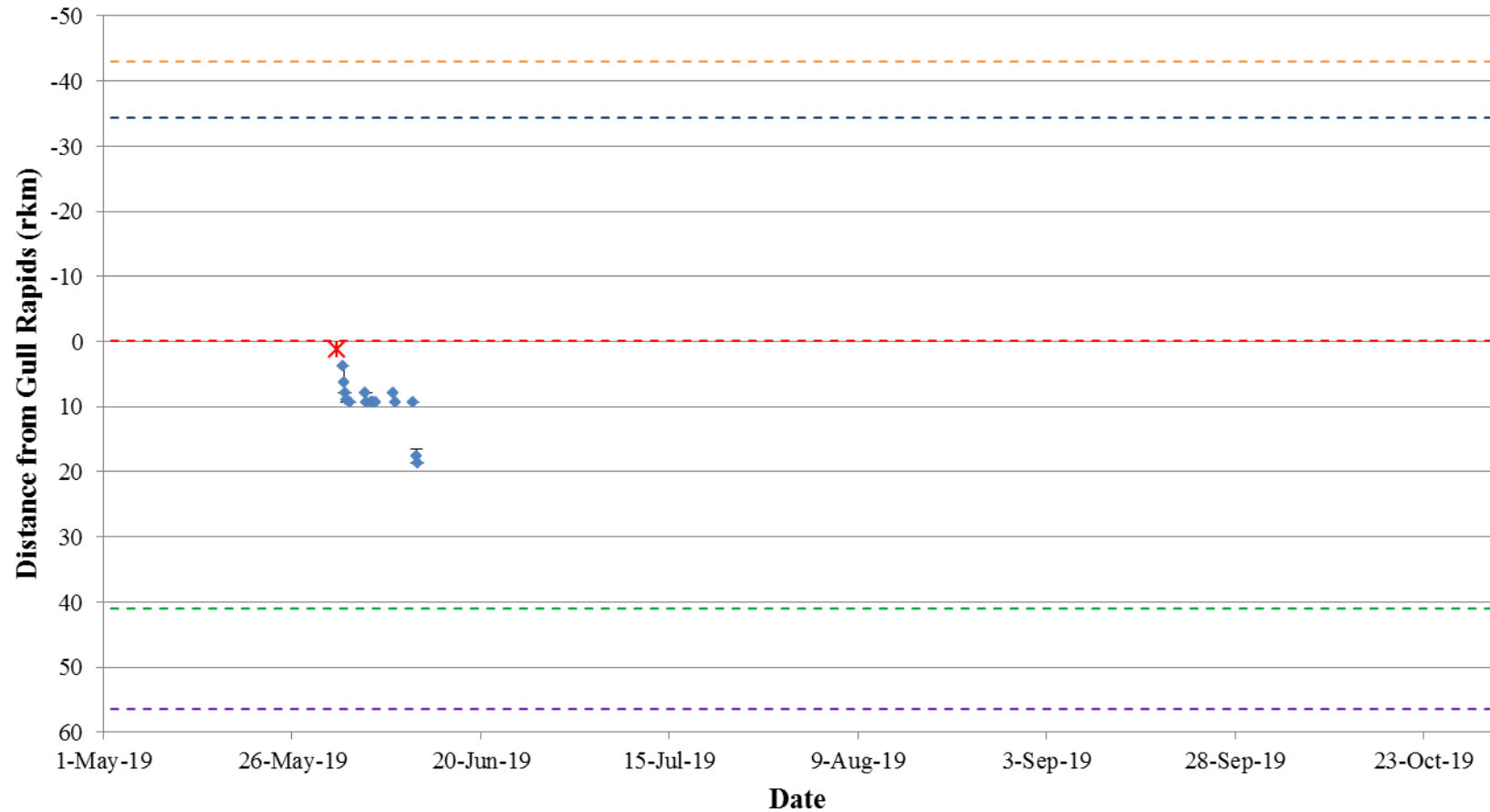


Figure A5-15: Position of a Walleye tagged with an acoustic transmitter (code #20143) in the Nelson River in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

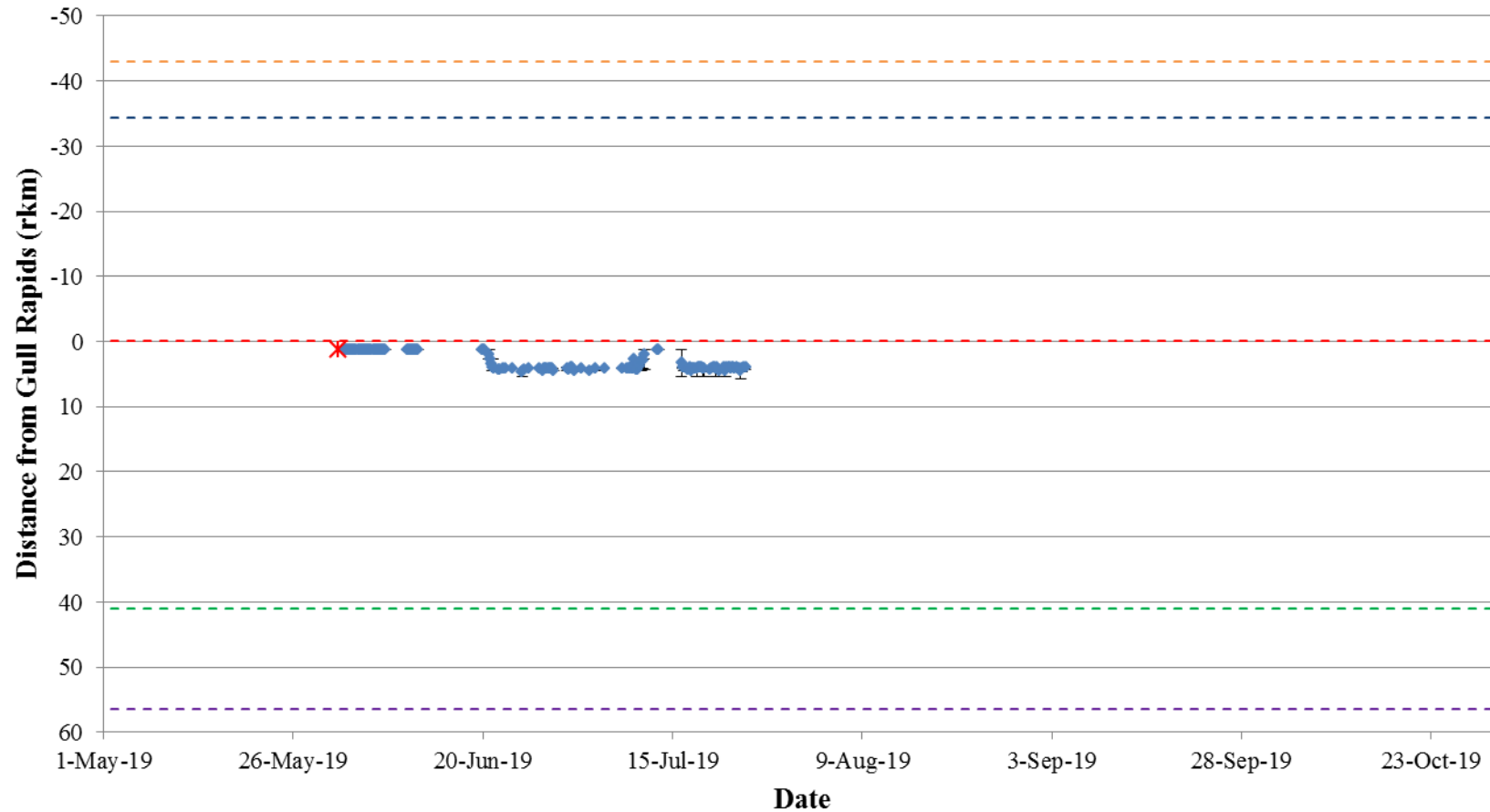


Figure A5-16: Position of a Walleye tagged with an acoustic transmitter (code #20144) in the Nelson River in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).



Figure A5-17: Position of a Walleye tagged with an acoustic transmitter (code #20145) in the Nelson River in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

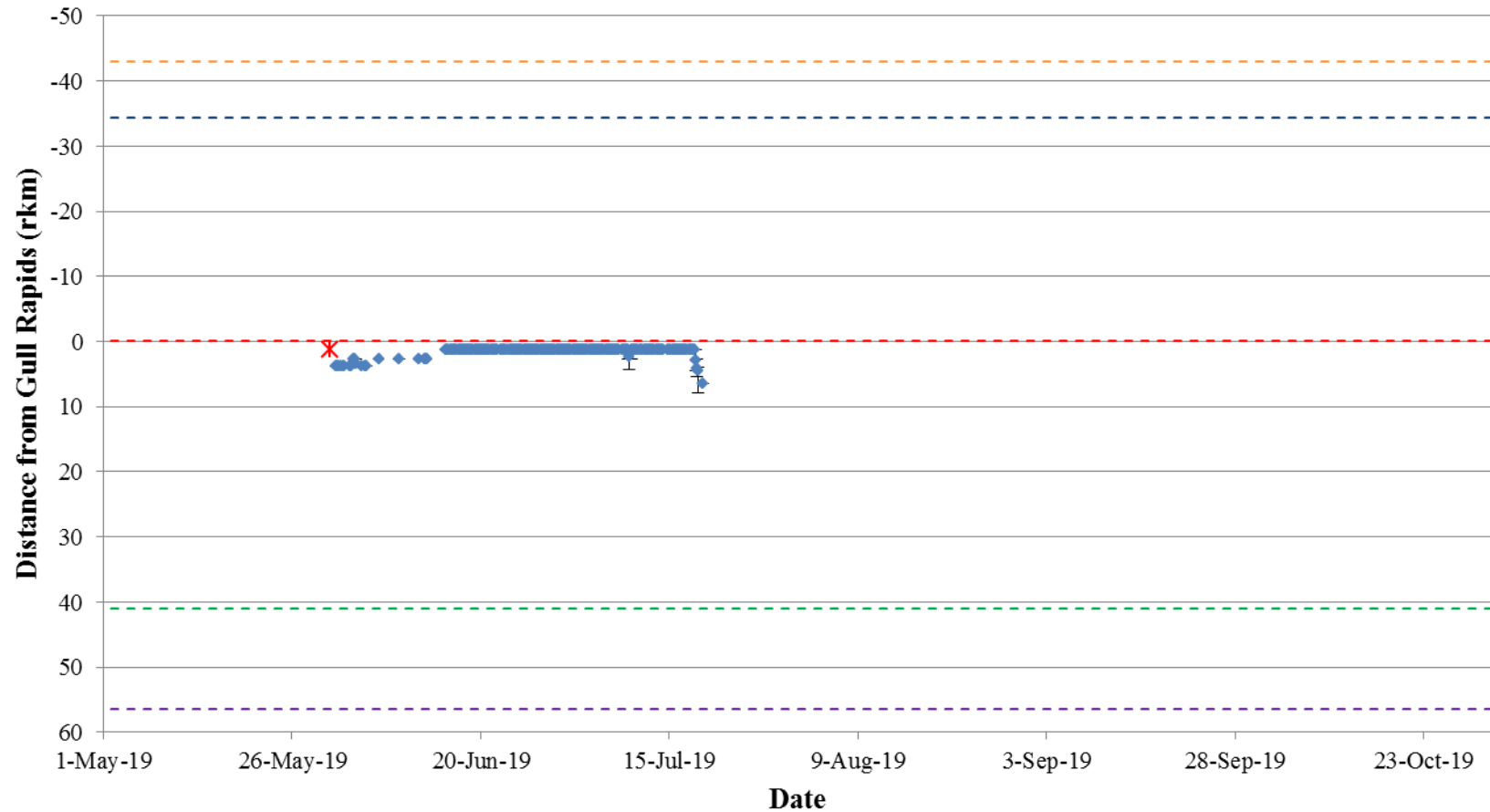


Figure A5-18: Position of a Walleye tagged with an acoustic transmitter (code #20152) in the Nelson River in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

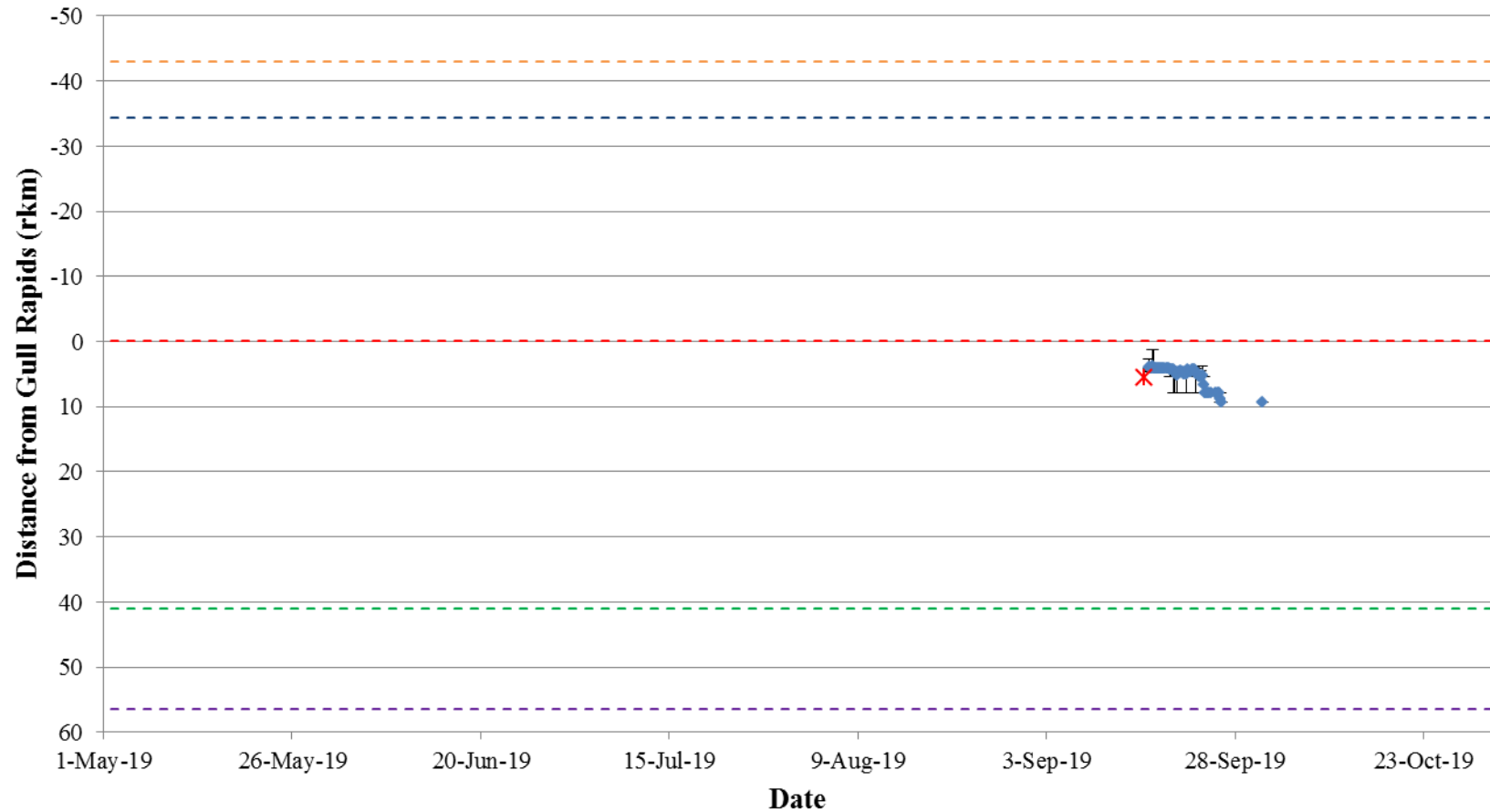


Figure A5-19: Position of a Walleye tagged with an acoustic transmitter (code #20165) in the Nelson River in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

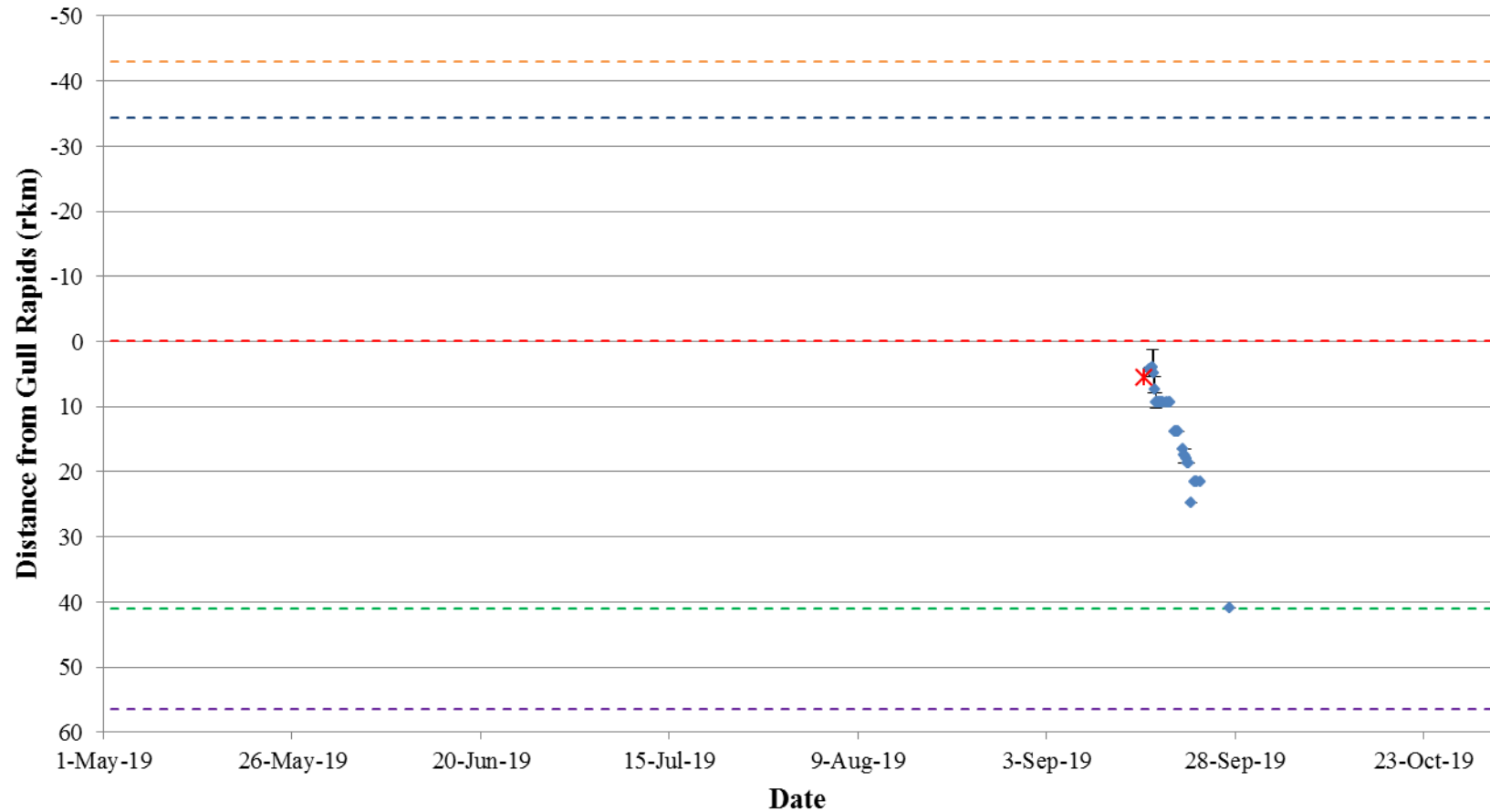


Figure A5-20: Position of a Walleye tagged with an acoustic transmitter (code #20167) in the Nelson River in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

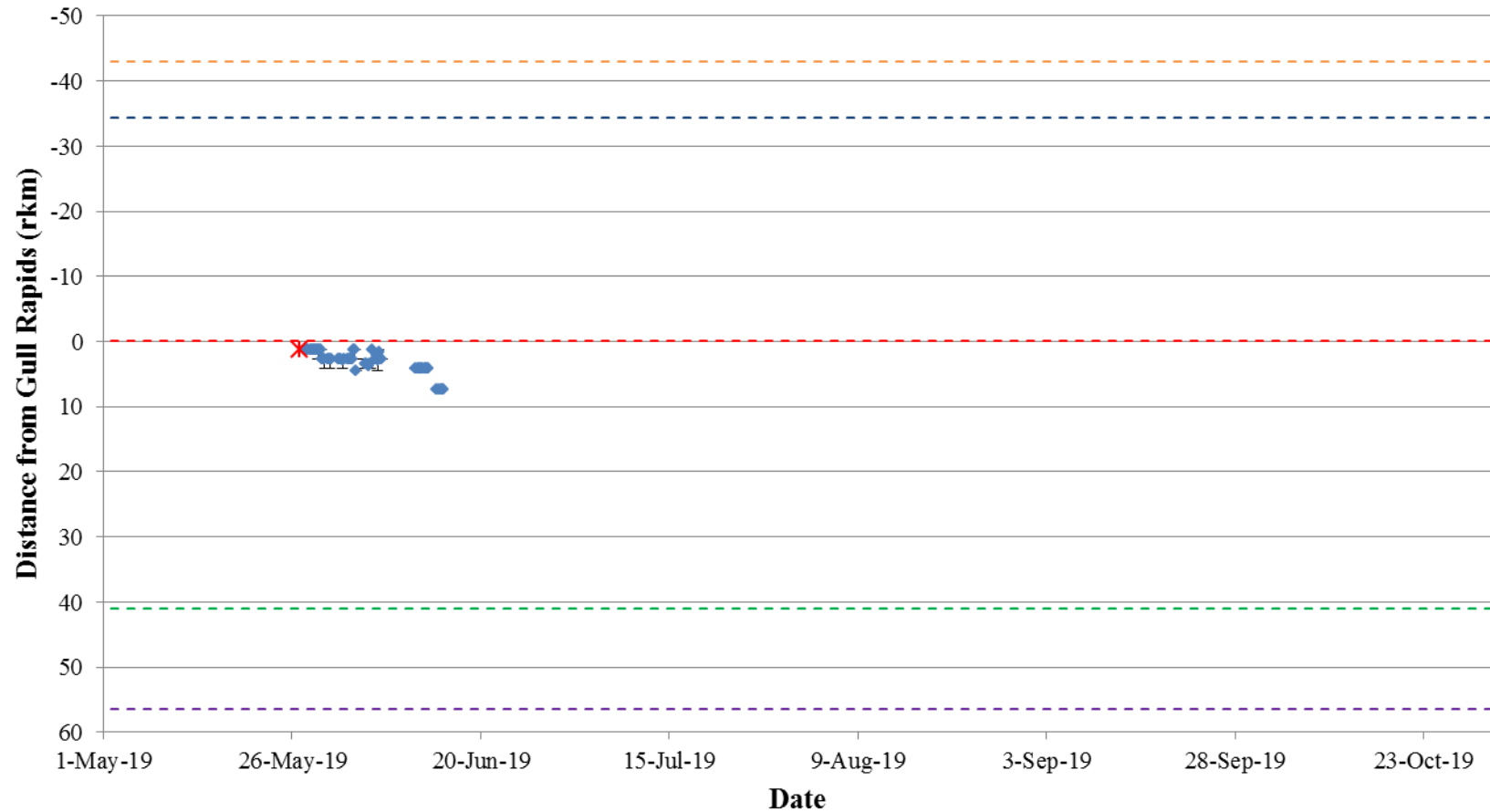


Figure A5-21: Position of a Walleye tagged with an acoustic transmitter (code #20171) in the Nelson River in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

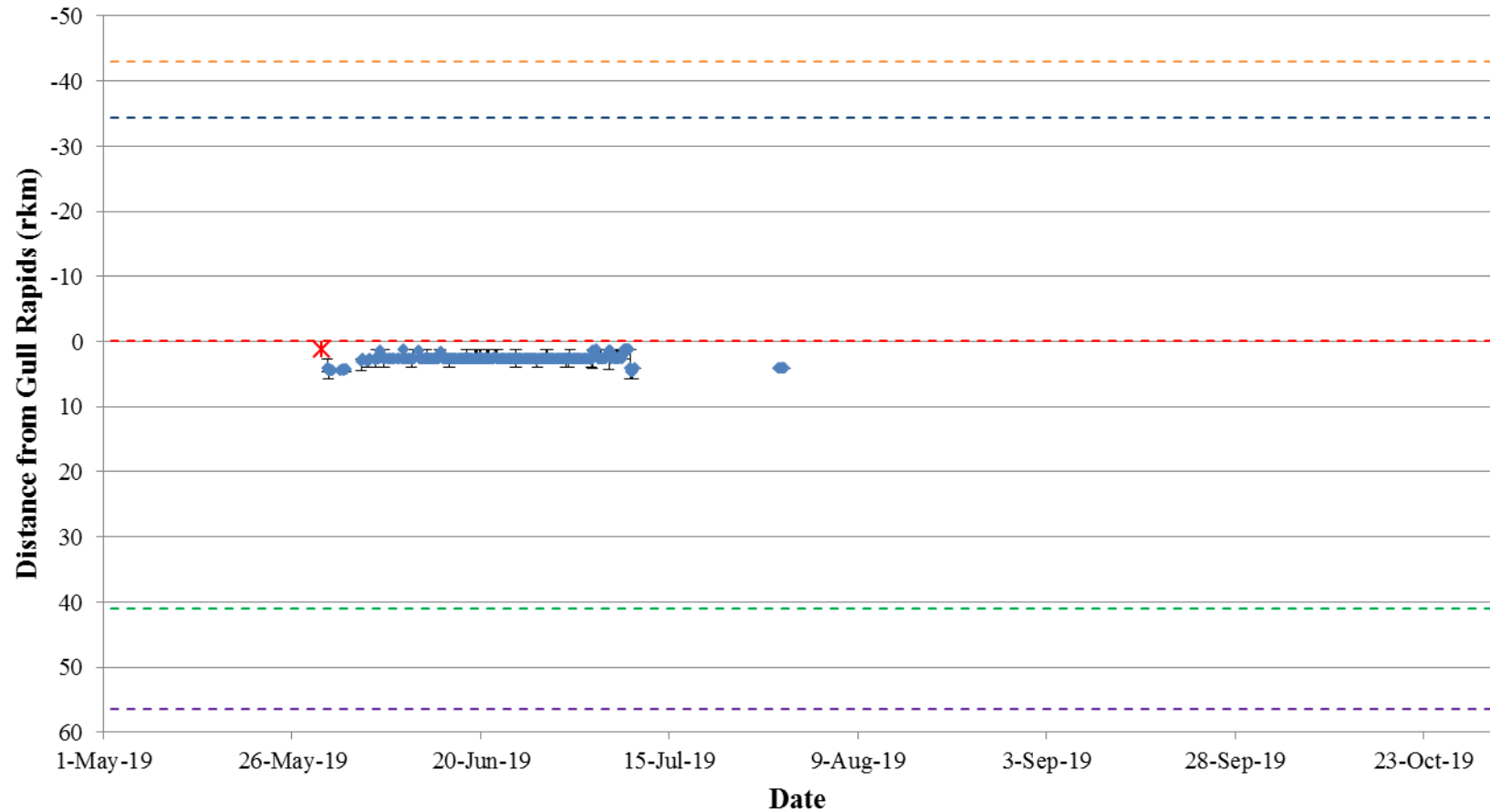


Figure A5-22: Position of a Walleye tagged with an acoustic transmitter (code #20172) in the Nelson River in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

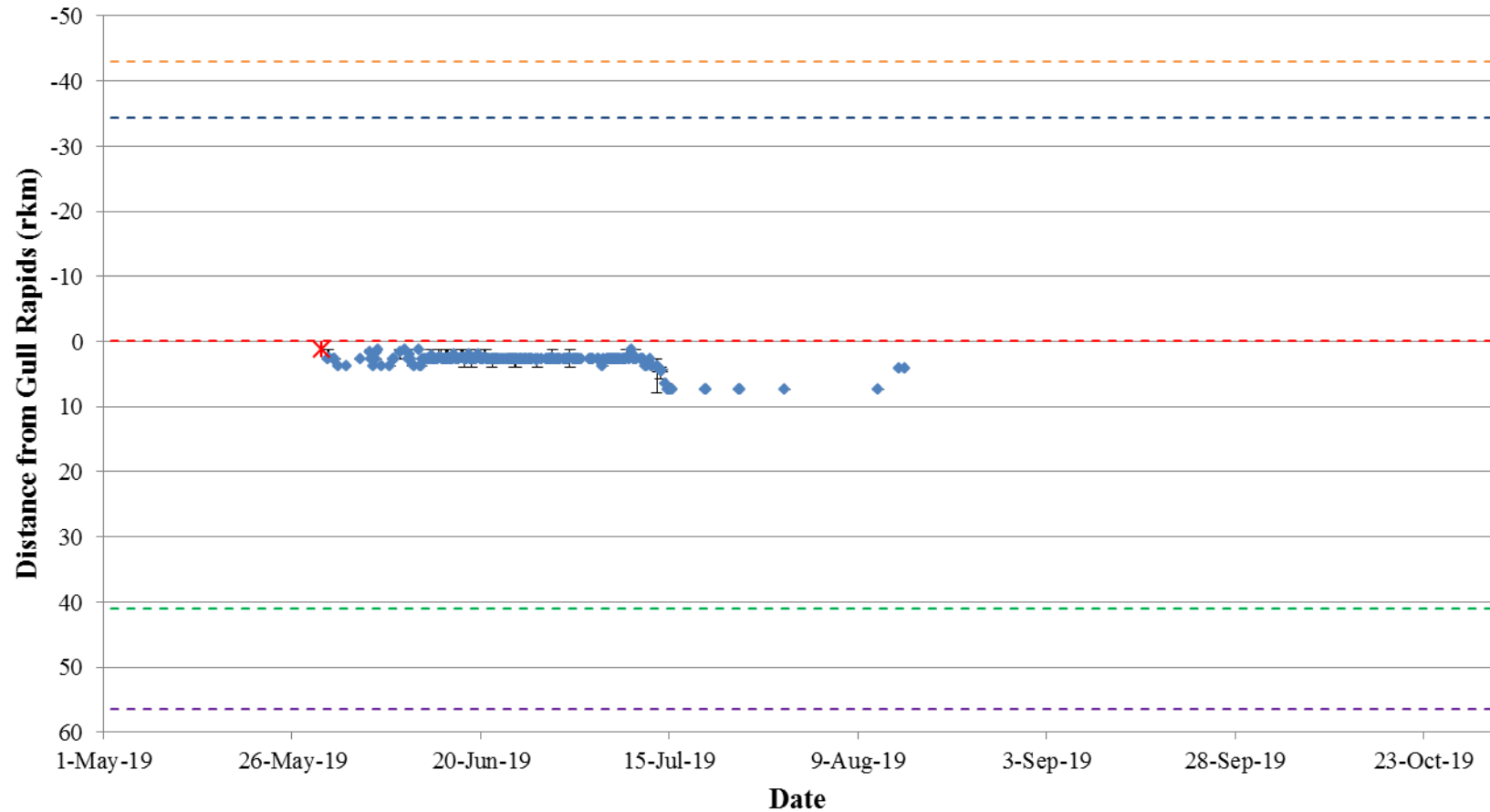


Figure A5-23: Position of a Walleye tagged with an acoustic transmitter (code #20173) in the Nelson River in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

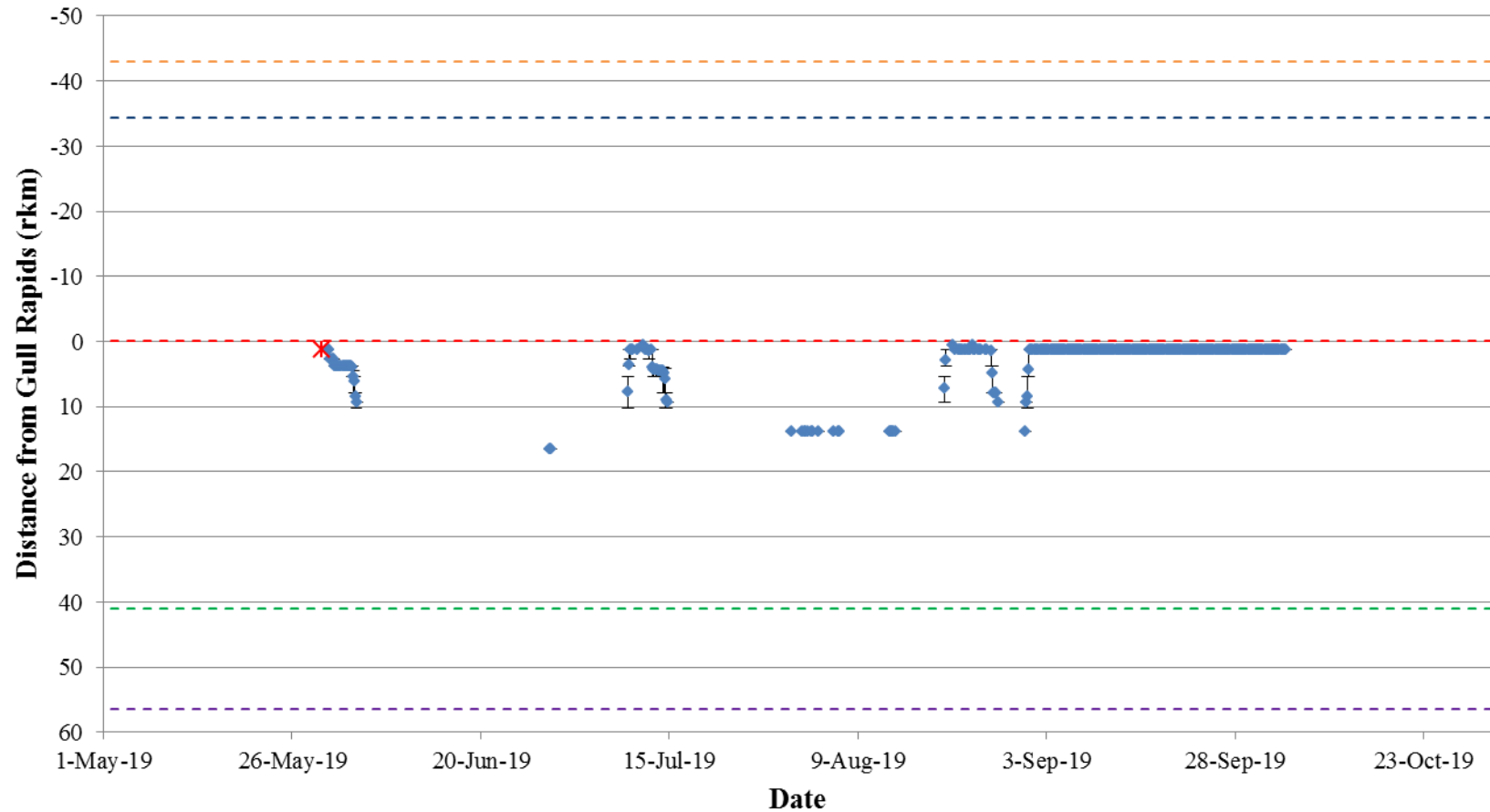


Figure A5-24: Position of a Walleye tagged with an acoustic transmitter (code #20174) in the Nelson River in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

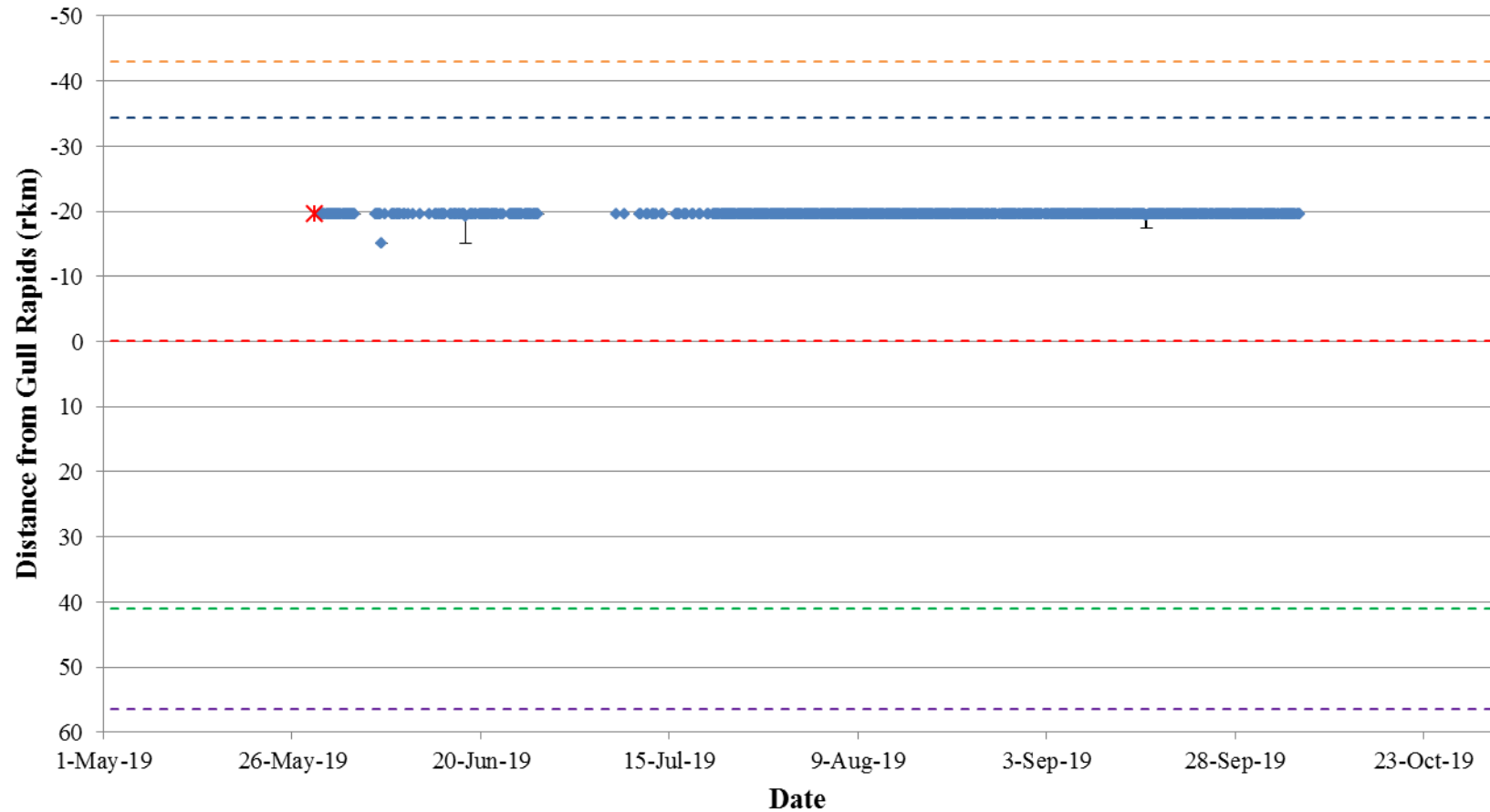


Figure A5-25: Position of a Walleye tagged with an acoustic transmitter (code #20176) in the Nelson River in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

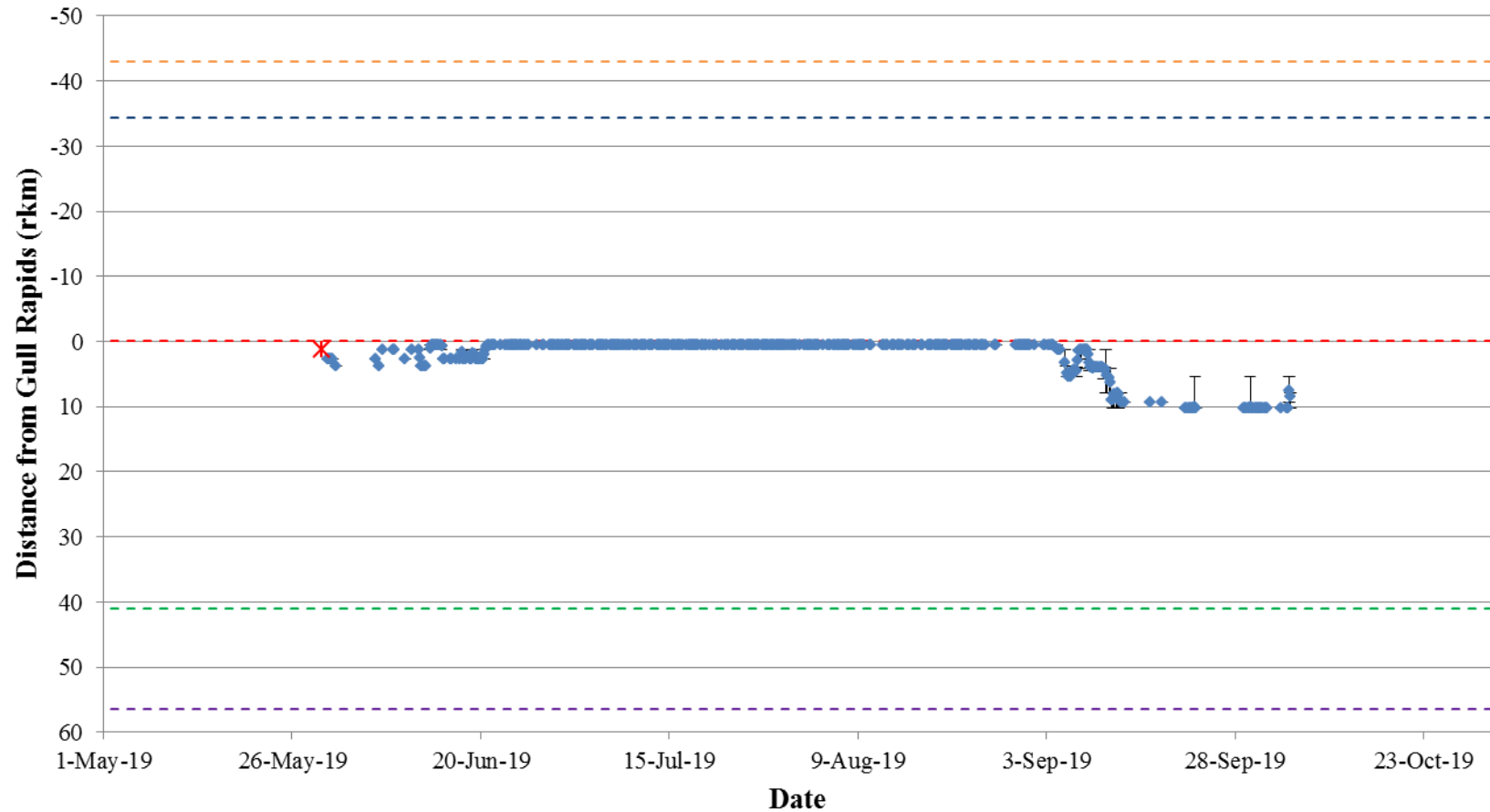


Figure A5-26: Position of a Walleye tagged with an acoustic transmitter (code #20177) in the Nelson River in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

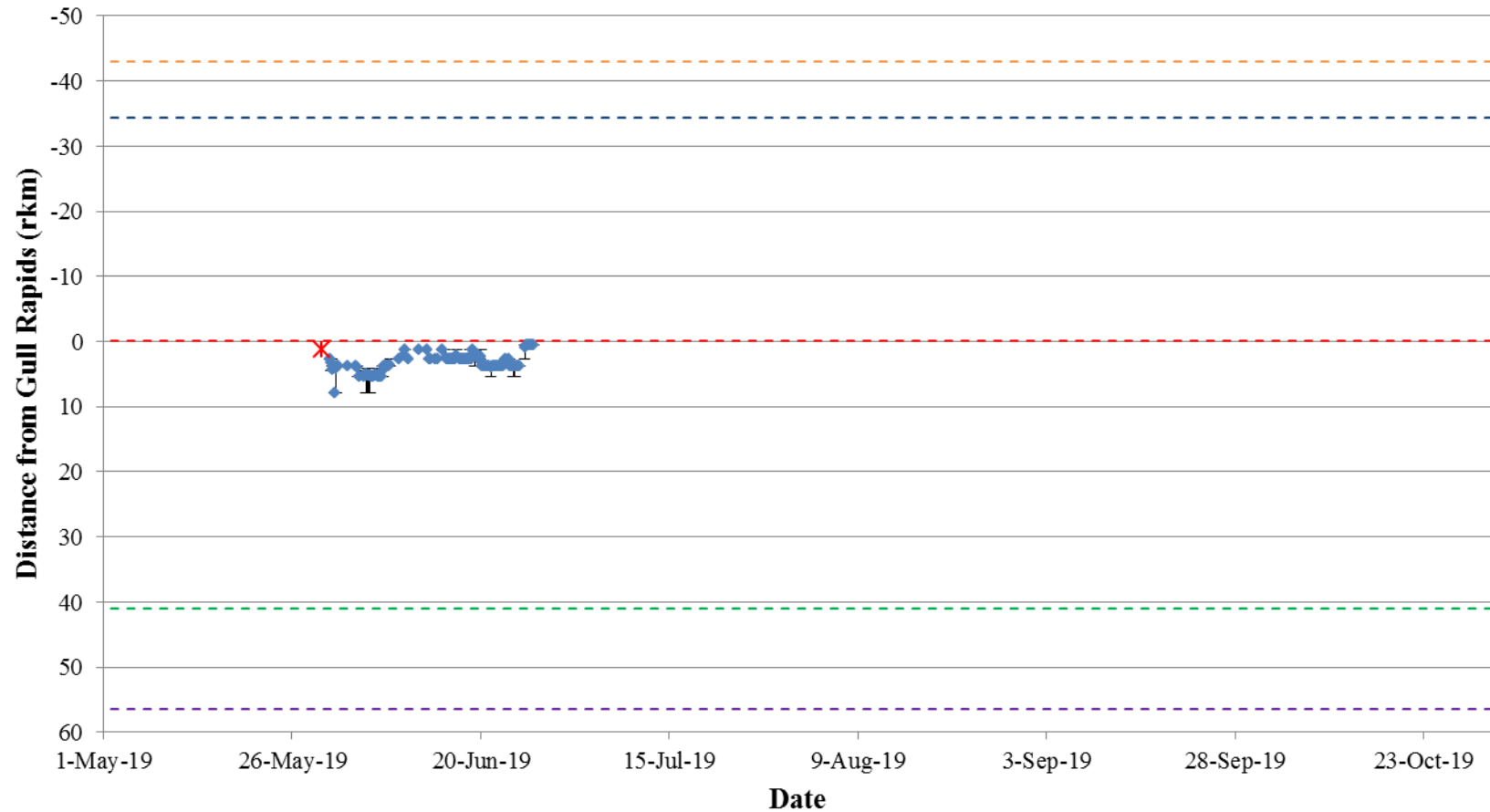


Figure A5-27: Position of a Walleye tagged with an acoustic transmitter (code #20178) in the Nelson River in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

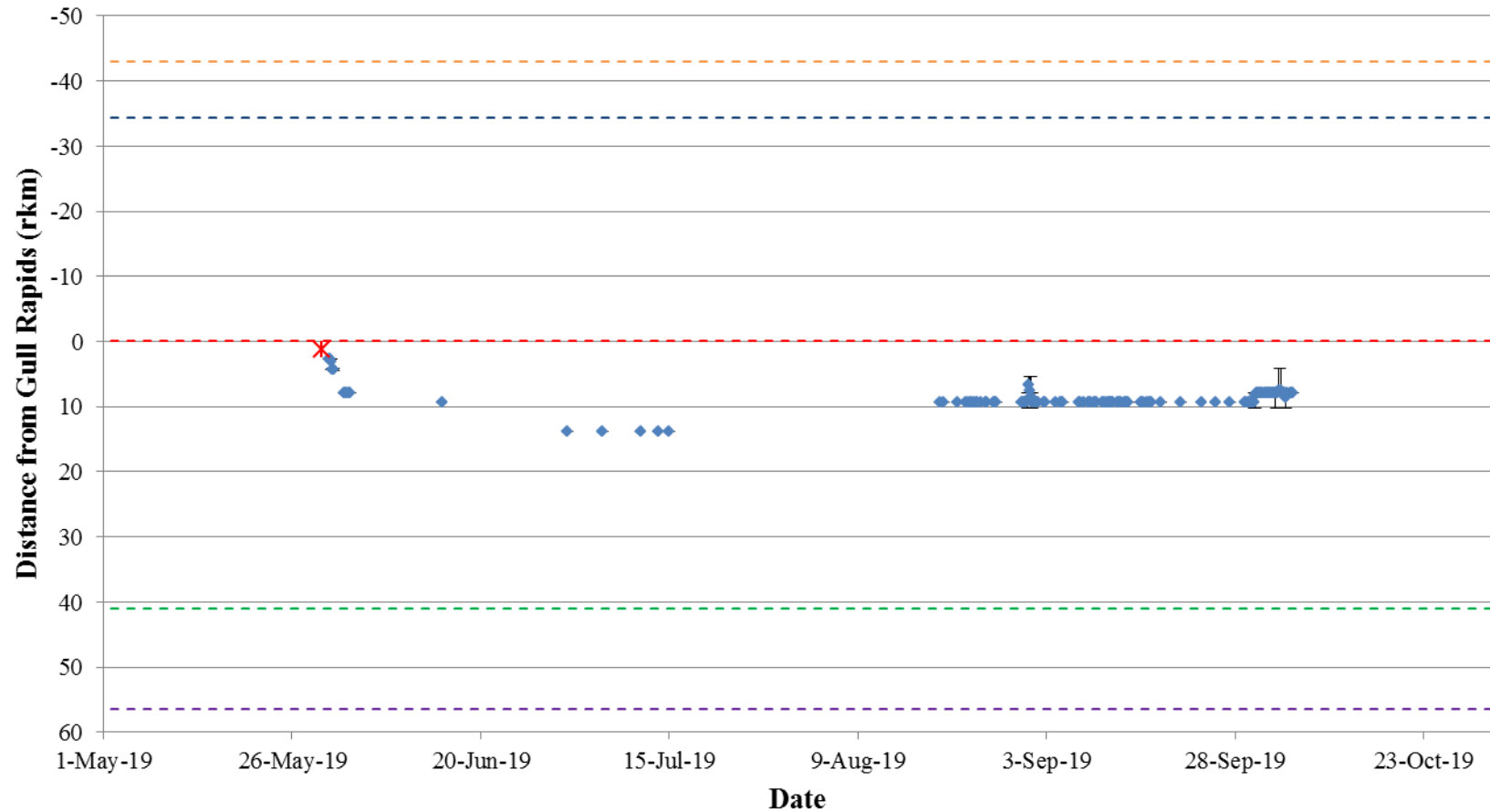


Figure A5-28: Position of a Walleye tagged with an acoustic transmitter (code #20179) in the Nelson River in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

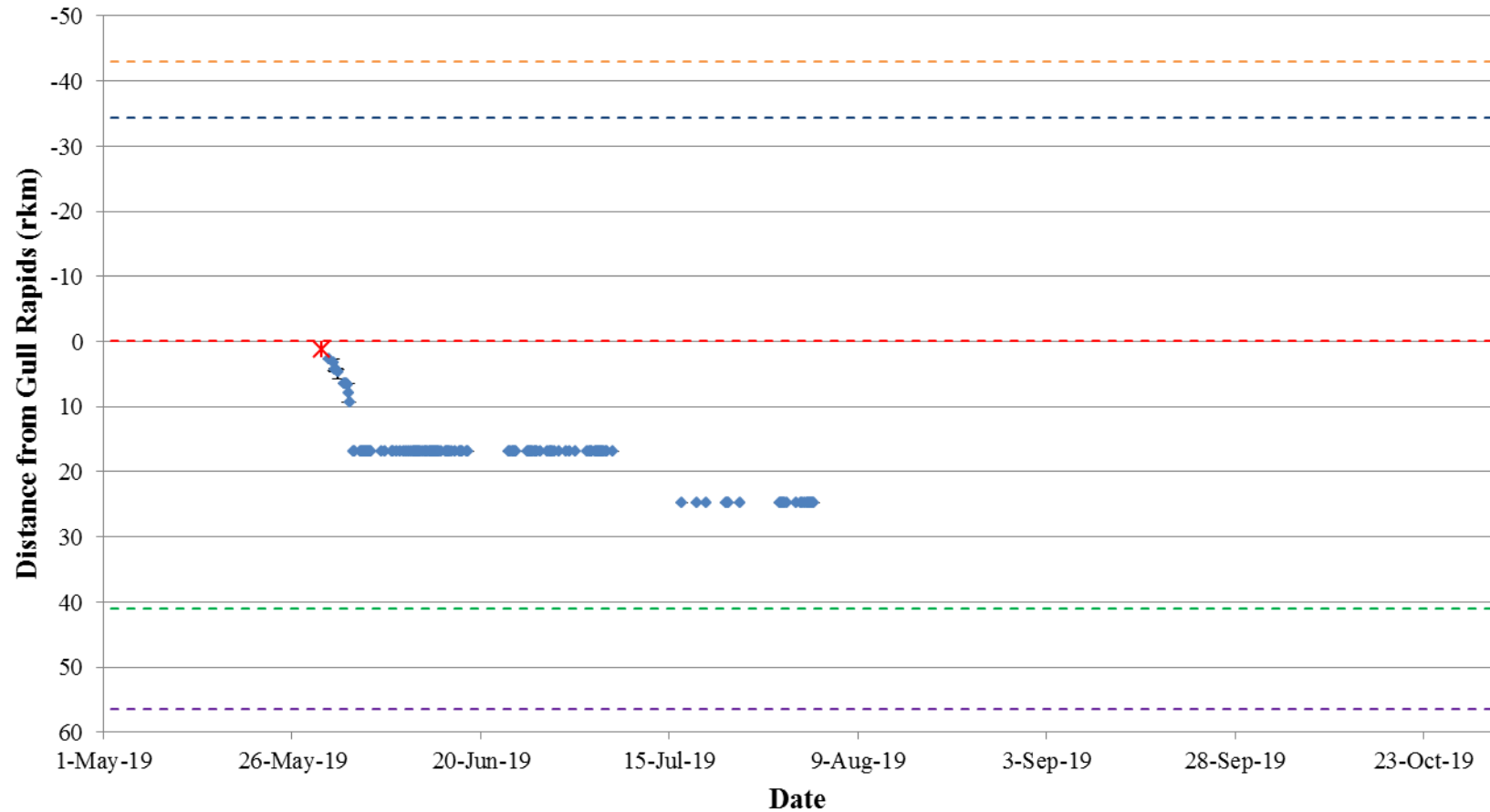


Figure A5-29: Position of a Walleye tagged with an acoustic transmitter (code #20180) in the Nelson River in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

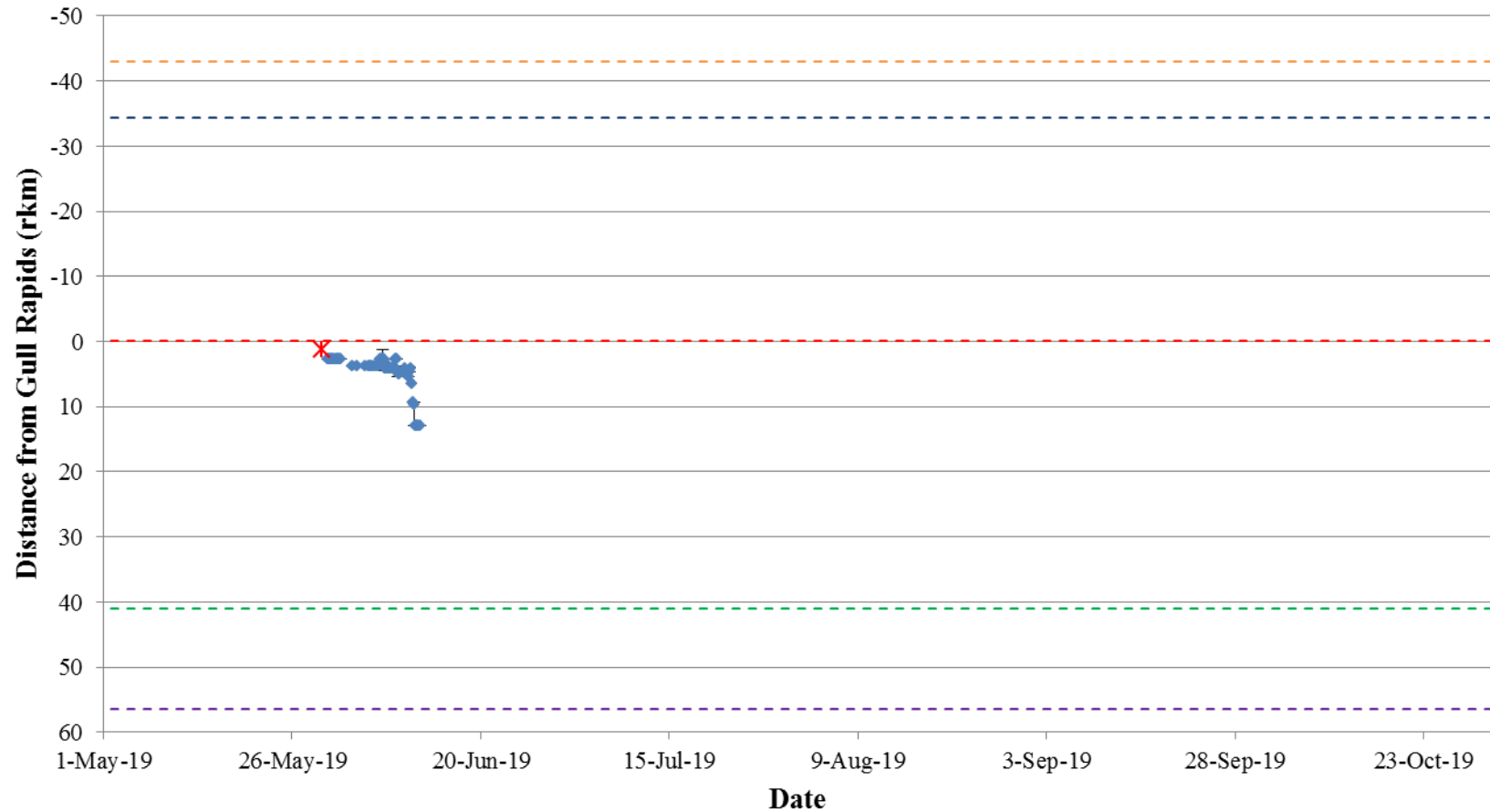


Figure A5-30: Position of a Walleye tagged with an acoustic transmitter (code #20183) in the Nelson River in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

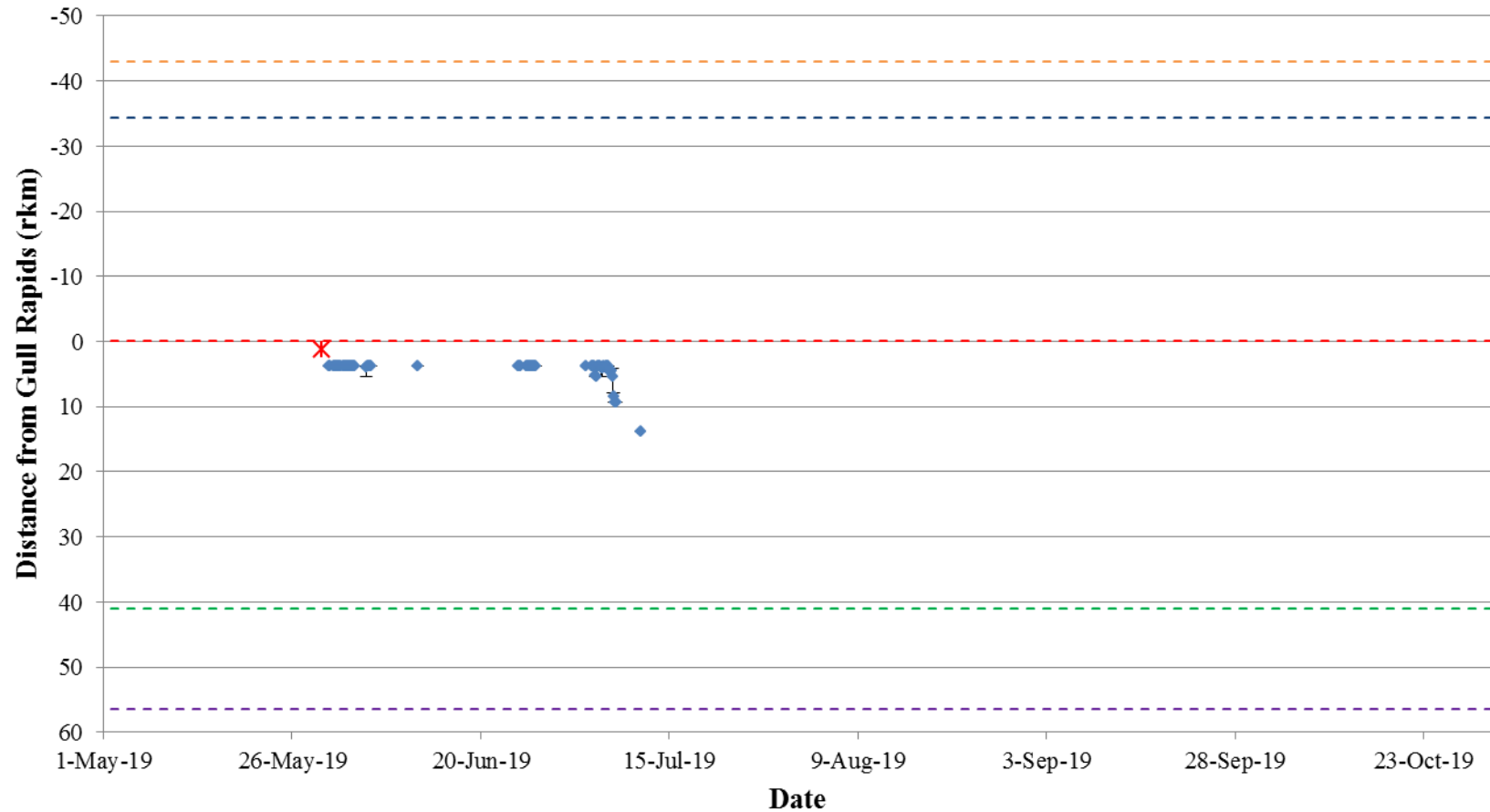


Figure A5-31: Position of a Walleye tagged with an acoustic transmitter (code #20184) in the Nelson River in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

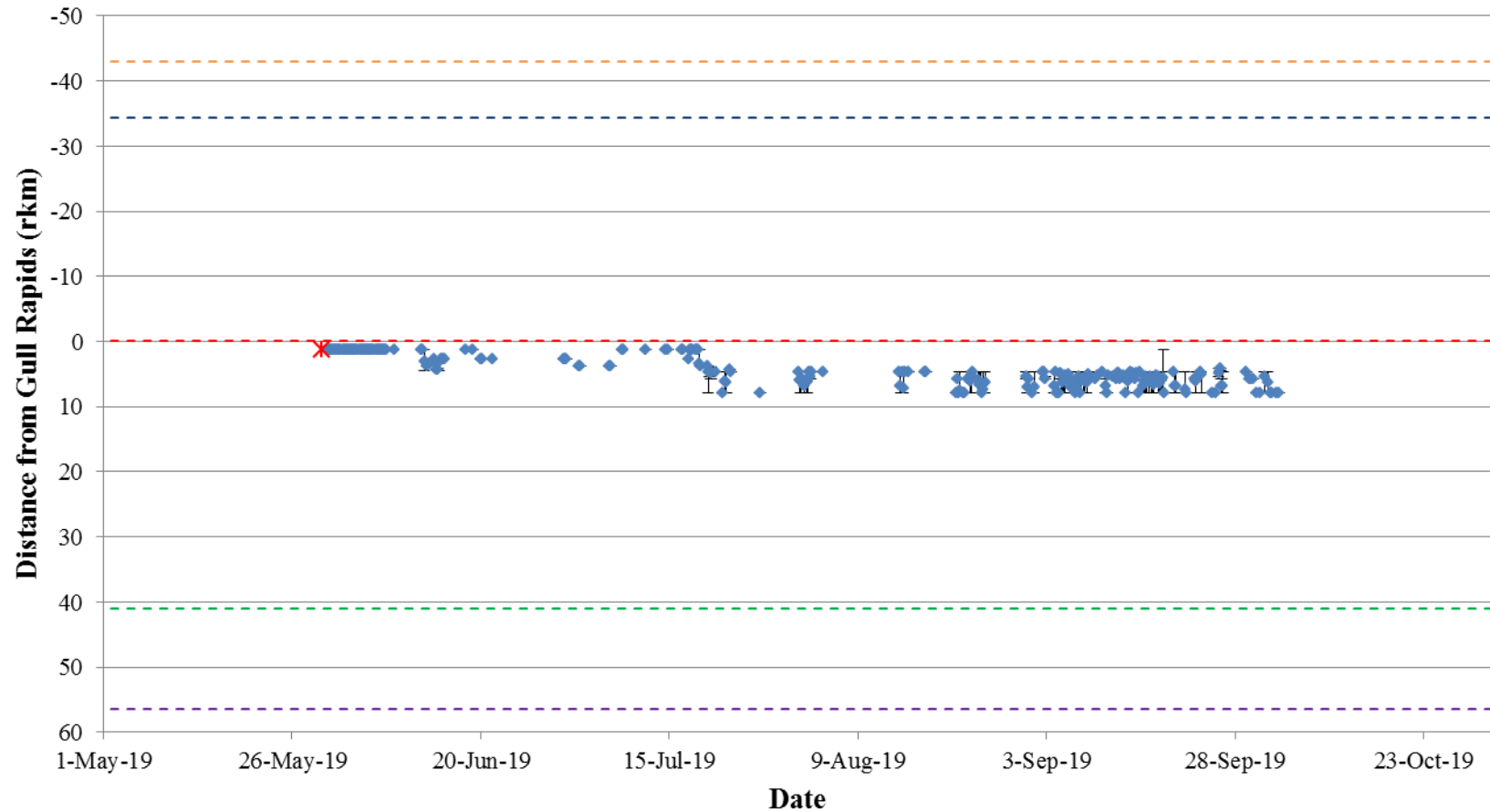


Figure A5-32: Position of a Walleye tagged with an acoustic transmitter (code #20185) in the Nelson River in Stephens Lake in relation to the Keeyask GS (rkm 0) from May 1 to October 7, 2019. Date and location of tagging is indicated by a star. Dotted horizontal lines indicate landmarks in the study area: entrance to Clark Lake (orange), Birthday Rapids (blue), Keeyask GS (red), Kettle GS (green), and Limestone GS (purple).

APPENDIX 6: BIOLOGICAL AND TAG INFORMATION FOR WALLEYE TAGGED UPSTREAM AND DOWNSTREAM OF THE KEEYASK GS

Table A6-1:	Tag and biological information for each Walleye acoustically tagged upstream of the Keeyask GS between 2016 and 2019.....	267
Table A6-2:	Tag and biological information for each Walleye acoustically tagged in Stephens Lake between 2016 and 2019.	270

Table A6-1: Tag and biological information for each Walleye acoustically tagged upstream of the Keeyask GS between 2016 and 2019.

Acoustic Tag #	Floy Tag #	Tagging Date	Tag Life (days)	Expiry Date	Fork Length (mm)	Weight (g)
53763	107147	5-Jun-16	1735	6-Mar-21	510	-
53764	107146	5-Jun-16	1735	6-Mar-21	560	-
53768	110340	5-Jun-16	1735	6-Mar-21	520	-
53769	110341	5-Jun-16	1735	6-Mar-21	393	-
53770	107150	5-Jun-16	1735	6-Mar-21	350	-
53771	107149	5-Jun-16	1735	6-Mar-21	353	-
53772	107145	5-Jun-16	1735	6-Mar-21	400	-
53773	110339	5-Jun-16	1735	6-Mar-21	405	-
53774	110338	5-Jun-16	1735	6-Mar-21	522	-
53775	110337	5-Jun-16	1735	6-Mar-21	514	-
53776	107205	30-May-16	1735	28-Feb-21	535	-
53777	107241	29-May-16	1735	27-Feb-21	404	1050
53778	100336	3-Jun-16	1735	4-Mar-21	523	-
53779	110335	3-Jun-16	1735	4-Mar-21	400	-
53780	110334	3-Jun-16	1735	4-Mar-21	660	-
53781	110333	2-Jun-16	1735	3-Mar-21	525	-
53782	110332	31-May-16	1735	1-Mar-21	509	1550
53783	110331	31-May-16	1735	1-Mar-21	388	850
53784	107208	30-May-16	1735	28-Feb-21	510	-
53785	107207	30-May-16	1735	28-Feb-21	526	-
53786	107203	30-May-16	1735	28-Feb-21	400	-
53787	107202	30-May-16	1735	28-Feb-21	360	-
53788	107201	30-May-16	1735	28-Feb-21	603	-
53789	107235	30-May-16	1735	28-Feb-21	577	-
53790	107240	29-May-16	1735	27-Feb-21	533	2000
53791	107242	29-May-16	1735	27-Feb-21	400	725
53792	-	28-May-16	1735	26-Feb-21	559	-
53793	110520	7-Jun-16	1735	8-Mar-21	560	2125
53794	110519	7-Jun-16	1735	8-Mar-21	440	1200
53795	110518	7-Jun-16	1735	8-Mar-21	410	900
53796	110517	7-Jun-16	1735	8-Mar-21	441	1150
53797	110516	7-Jun-16	1735	8-Mar-21	520	1700
53798	110525	7-Jun-16	1735	8-Mar-21	495	1500
53799	110524	7-Jun-16	1735	8-Mar-21	511	1650
53800	110523	7-Jun-16	1735	8-Mar-21	530	1750
53801	110522	7-Jun-16	1735	8-Mar-21	360	600
53802	110521	7-Jun-16	1735	8-Mar-21	468	1300

Table A6-1: Tag and biological information for each Walleye acoustically tagged upstream of the Keeyask GS between 2016 and 2019 (continued).

Acoustic Tag #	Floy Tag #	Tagging Date	Tag Life (days)	Expiry Date	Fork Length (mm)	Weight (g)
53805	107225	6-Jun-16	1735	7-Mar-21	532	-
53806	107142	6-Jun-16	1735	7-Mar-21	405	-
53807	107126	6-Jun-16	1735	7-Mar-21	451	-
53767	111527	24-Sep-16	1735	25-Jun-21	508	1450
53766	111528	24-Sep-16	1735	25-Jun-21	484	1250
53765	111530	24-Sep-16	1735	25-Jun-21	491	1300
53804	111531	24-Sep-16	1735	25-Jun-21	410	700
53803	111532	24-Sep-16	1735	25-Jun-21	484	1550
53758	111533	24-Sep-16	1735	25-Jun-21	423	750
53759	111535	24-Sep-16	1735	25-Jun-21	362	500
53760	111536	24-Sep-16	1735	25-Jun-21	412	1825
25739	109719	5-Jun-18	1735	6-Mar-23	410	800
25740	109718	5-Jun-18	1735	6-Mar-23	388	550
25742	109712	5-Jun-18	1735	6-Mar-23	320	400
25743	109713	5-Jun-18	1735	6-Mar-23	442	925
25744	109715	5-Jun-18	1735	6-Mar-23	525	1575
25745	109716	5-Jun-18	1735	6-Mar-23	438	850
25746	109717	5-Jun-18	1735	6-Mar-23	504	1750
25747	109704	28-May-18	1735	26-Feb-23	374	575
25748	109706	28-May-18	1735	26-Feb-23	398	525
25749	109705	28-May-18	1735	26-Feb-23	393	550
25750	109710	1-Jun-18	1735	2-Mar-23	403	725
25751	109711	5-Jun-18	1735	6-Mar-23	343	450
25752	109701	27-May-18	1735	25-Feb-23	404	700
25753	109702	27-May-18	1735	25-Feb-23	356	425
25754	109703	27-May-18	1735	25-Feb-23	367	550
25755	109708	1-Jun-18	1735	2-Mar-23	396	775
25756	109709	1-Jun-18	1735	2-Mar-23	452	1050
20147	114247	5-Jun-19	1492	6-Jul-23	523	1769
20148	114246	5-Jun-19	1492	6-Jul-23	383	590
20149	114245	6-Jun-19	1492	7-Jul-23	335	450
20150	114249	5-Jun-19	1492	6-Jul-23	500	1300
20151	114250	5-Jun-19	1492	6-Jul-23	485	1400
20153	114239	6-Jun-19	1492	7-Jul-23	498	1450
20154	114240	6-Jun-19	1492	7-Jul-23	415	800
20155	114241	6-Jun-19	1492	7-Jul-23	417	800
20156	114242	6-Jun-19	1492	7-Jul-23	299	300

Table A6-1: Tag and biological information for each Walleye acoustically tagged upstream of the Keeyask GS between 2016 and 2019 (continued).

Acoustic Tag #	Floy Tag #	Tagging Date	Tag Life (days)	Expiry Date	Fork Length (mm)	Weight (g)
20157	114243	6-Jun-19	1492	7-Jul-23	447	1000
20158	114244	6-Jun-19	1492	7-Jul-23	288	300
20159	114231	7-Jun-19	1492	8-Jul-23	500	1500
20160	114232	7-Jun-19	1492	8-Jul-23	415	800
20161	114226	7-Jun-19	1492	8-Jul-23	446	950
20162	114236	6-Jun-19	1492	7-Jul-23	300	300
20163	114237	6-Jun-19	1492	7-Jul-23	363	600
20164	114238	6-Jun-19	1492	7-Jul-23	343	500
20168	114775	7-Jun-19	1492	8-Jul-23	429	850
20169	114233	7-Jun-19	1492	8-Jul-23	391	550
20170	114235	6-Jun-19	1492	7-Jul-23	365	400
20175	114642	29-May-19	1492	29-Jun-23	374	580
20176	114645	29-May-19	1492	29-Jun-23	419	900
20181	114644	29-May-19	1492	29-Jun-23	345	500
20182	-	25-May-19	1492	25-Jun-23	311	350
20186	114641	29-May-19	1492	29-Jun-23	350	450
20187	114649	23-May-19	1492	23-Jun-23	320	-
20188	114650	23-May-19	1492	23-Jun-23	380	-

Table A6-2: Tag and biological information for each Walleye acoustically tagged in Stephens Lake between 2016 and 2019.

Acoustic Tag #	Floy Tag #	Tagging Date	Tag Life (days)	Expiry Date	Fork Length (mm)	Weight (g)
53723	110348	28-May-16	1735	26-Feb-21	510	1500
53724	110538	28-May-16	1735	26-Feb-21	433	1050
53725	110532	27-May-16	1735	25-Feb-21	480	1200
53726	110544	27-May-16	1735	25-Feb-21	412	800
53727	110537	28-May-16	1735	26-Feb-21	486	-
53728	110347	28-May-16	1735	26-Feb-21	507	1650
53729	110350	28-May-16	1735	26-Feb-21	375	560
53730	110349	28-May-16	1735	26-Feb-21	491	1700
53731	110534	28-May-16	1735	26-Feb-21	442	950
53732	110536	28-May-16	1735	26-Feb-21	530	1825
53733	110326	30-May-16	1735	28-Feb-21	322	500
53734	110343	30-May-16	1735	28-Feb-21	460	1325
53735	110344	30-May-16	1735	28-Feb-21	374	600
53736	110345	30-May-16	1735	28-Feb-21	398	900
53737	110346	29-May-16	1735	27-Feb-21	508	1625
53738	110542	31-May-16	1735	1-Mar-21	522	1875
53739	110540	31-May-16	1735	1-Mar-21	480	1300
53740	110543	31-May-16	1735	1-Mar-21	482	1400
53741	110330	30-May-16	1735	28-Feb-21	404	975
53742	110327	30-May-16	1735	28-Feb-21	452	1250
53743	110422	31-May-16	1735	1-Mar-21	469	1450
53744	110421	31-May-16	1735	1-Mar-21	405	750
53745	110417	31-May-16	1735	1-Mar-21	453	1200
53746	110541	31-May-16	1735	1-Mar-21	467	1380
53747	110418	31-May-16	1735	1-Mar-21	520	1600
53748	110951	31-May-16	1735	1-Mar-21	442	975
53749	110425	31-May-16	1735	1-Mar-21	411	750
53750	110424	31-May-16	1735	1-Mar-21	531	1800
53751	110423	31-May-16	1735	1-Mar-21	422	825
53752	110419	31-May-16	1735	1-Mar-21	468	1400
53753	110952	31-May-16	1735	1-Mar-21	488	1325
53754	110953	31-May-16	1735	1-Mar-21	475	1375
53755	110954	31-May-16	1735	1-Mar-21	506	1475
53756	110957	1-Jun-16	1735	2-Mar-21	495	1800
53757	110958	1-Jun-16	1735	2-Mar-21	534	2200
53808	110963	1-Jun-16	1735	2-Mar-21	503	1725

Table A6-2: Tag and biological information for each Walleye acoustically tagged in Stephens Lake between 2016 and 2019 (continued).

Acoustic Tag #	Floy Tag #	Tagging Date	Tag Life (days)	Expiry Date	Fork Length (mm)	Weight (g)
53809	110961	1-Jun-16	1735	2-Mar-21	440	1225
53810	110962	1-Jun-16	1735	2-Mar-21	466	1250
53811	110964	1-Jun-16	1735	2-Mar-21	456	1175
53812	110959	1-Jun-16	1735	2-Mar-21	427	975
25732	90279	9-Jun-18	1735	10-Mar-23	415	525
25734	90277	7-Jun-18	1735	8-Mar-23	395	600
25735	109725	6-Jun-18	1735	7-Mar-23	468	1250
25736	90276	7-Jun-18	1735	8-Mar-23	482	1400
25737	109722	6-Jun-18	1735	7-Mar-23	390	650
25738	109721	6-Jun-18	1735	7-Mar-23	569	1725
25741	109720	6-Jun-18	1735	7-Mar-23	409	625
20129	114779	3-Jun-19	1492	4-Jul-23	363	500
20130	114785	1-Jun-19	1493	3-Jul-23	340	450
20131	114646	31-May-19	1494	3-Jul-23	530	1500
20132	114786	1-Jun-19	1495	5-Jul-23	320	400
20133	114796	31-May-19	1496	5-Jul-23	477	1200
20134	114795	31-May-19	1497	6-Jul-23	500	1450
20135	114783	1-Jun-19	1498	8-Jul-23	330	400
20136	114787	1-Jun-19	1499	9-Jul-23	472	1100
20137	114797	31-May-19	1500	9-Jul-23	482	1450
20138	114794	31-May-19	1501	10-Jul-23	451	1350
20139	114800	31-May-19	1502	11-Jul-23	439	900
20140	114799	31-May-19	1503	12-Jul-23	367	600
20141	114639	31-May-19	1504	13-Jul-23	433	850
20142	114798	31-May-19	1505	14-Jul-23	471	1300
20143	114792	1-Jun-19	1506	16-Jul-23	415	900
20144	114784	1-Jun-19	1507	17-Jul-23	367	550
20145	114782	1-Jun-19	1508	18-Jul-23	426	850
20152	114636	31-May-19	1509	18-Jul-23	479	1150
20165	117592	16-Sep-19	1510	4-Nov-23	465	1200
20167	117590	16-Sep-19	1511	5-Nov-23	420	800
20171	114647	27-May-19	1492	27-Jun-23	386	600
20172	114632	30-May-19	1512	20-Jul-23	470	1200
20173	114633	30-May-19	1513	21-Jul-23	470	1350
20174	114634	30-May-19	1514	22-Jul-23	502	1350
20177	114630	30-May-19	1515	23-Jul-23	460	1300
20178	114631	30-May-19	1516	24-Jul-23	499	1600

Table A6-2: Tag and biological information for each Walleye acoustically tagged in Stephens Lake between 2016 and 2019 (continued).

Acoustic Tag #	Floy Tag #	Tagging Date	Tag Life (days)	Expiry Date	Fork Length (mm)	Weight (g)
20179	114637	30-May-19	1517	25-Jul-23	453	1000
20180	114638	30-May-19	1518	26-Jul-23	520	1500
20183	114635	30-May-19	1519	27-Jul-23	455	850
20184	114628	30-May-19	1520	28-Jul-23	392	700
20185	114629	30-May-19	1521	29-Jul-23	390	650