

**APPENDIX E**  
**BMPC Project Operations Monitoring Plan**

# **THE BOWERSOCK MILLS & POWER COMPANY**

EXPANDED KANSAS RIVER HYDROPOWER PROJECT  
Project Operations Monitoring Plan - Rubber Dam Revision  
Rubber Dam Installation  
FERC LICENSE P-13526  
March 28<sup>th</sup>, 2015

**Federal Energy Regulatory Commission  
Project Operations Monitoring Plan Requirements  
Expanded Kansas River Hydropower Project  
Licensee P-13526**

Article 402 of FERC License P-13526 issued to The Bowersock Mills & Power Company for the Expanded Kansas River Hydropower Project requires the development of a Project Operations Monitoring Plan. The following plan meets the requirements as set by FERC.

“The plan shall include, at minimum: (1) the location of gauges to record millpond elevations, flows through the turbines, and gated releases; (2) procedures to record water surface elevations at least hourly; (3) a description of how the project would be operated to maintain compliance with the ROR (run-of-river) requirement of Article 401; (4) procedures to maintain ROR operation during planned and emergency shut-downs; and (5) procedures for refilling the Bowersock Millpond in the event of flashboard collapse, while maintaining adequate flows downstream during refill to maintain aquatic resources. The plan shall detail the mechanisms and structures that would be used, including any periodic maintenance and calibration necessary for any installed devices or gauges, to ensure that the devices work properly, and shall specify how often the millpond elevations and ROR operational compliance shall be recorded.

The licensee shall prepare the plan after consultation with the Kansas Department of Health and Environment, the U.S. Army Corps of Engineers, and the U.S. Fish and Wildlife Service. The licensee shall include with the plan a schedule for implementing the plan, documentation of consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to the agencies, and specific descriptions of how the agencies’ comments are accommodated by the plan. The licensee shall allow a minimum of 30 days for the agencies to comment and to make recommendations before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing shall include licensee’s reasons, based on project-specific information.”

**PROJECT OPERATIONS MONITORING PLAN - Revised, 3/2015**

**1. Location of gauges to record millpond elevations, flows through the turbines, and gated releases.**

The Bowersock Mills and Power Company (BMPC) will utilize the existing upstream USGS Lecompton Station 0689100, USGS Kansas River at Lawrence, KS Station 06891080 (Upstream of Bowersock Dam) , and the BMPC North Powerhouse millpond gauge to document river flows upstream of the Bowersock Dam, and the BMPC North Powerhouse tailwater gauge and existing USGS Kansas River at Lawrence, KS Station 06891080 (Downstream of Bowersock Dam), USGS DeSoto Station 06892350 to document river flows downstream of the Bowersock Dam. Within the North Powerhouse, three pressure transducers with manual float backup monitor the water surface elevations at 3 separate points: millpond elevation directly upstream of the North Powerhouse, elevation directly behind the North Powerhouse trash racks, and the tail water directly downstream from the North Powerhouse. In addition to the transducers and floats, BMPC will install a manual gauge directly upstream and downstream from the North Powerhouse to confirm and calibrate the transducers.

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As stipulated in the Kansas Division of Water Resources Vested Right, File No. DG-11 and Appropriation of Water, File Nos. 45,444 and 47,275, flows through the turbines will be calculated by obtaining two measured values 5 days per week of data necessary to convert the kWh produced and the net head to CFS flow through the turbines. These data are documented in a table that includes the summation of the water diverted through the turbines for each right daily. Gated releases may be documented based on the difference between turbine consumption and downstream flows of the Bowersock Dam.

## **2. Procedures to record water surface elevations at least hourly**

The water surface elevations from the transducers or floats will be recorded by the SCADA program hourly and archived for documentation as required by the Kansas Division of Water Resources. A hard copy document log will be maintained at the BMPC Data Center including daily, weekly and monthly records of operation and generation from both the North and South Powerhouses. Annual reports to the Kansas Department of Agriculture Division of Water Resources, the Energy Information Administration, and any other government agency will be based on these records. An electronic database will record and track the relevant data.

Documentation of water use through the project will be conducted in accordance with the conditions 15 and 18 of the BMPC Division of Water Resources Appropriation of Water, File No. 47,275. Condition numbers 15 and 18 read as follows:

*“15. That the applicant shall maintain daily records in a table format that provides two (2) measured values for five (5) days each week obtained at least six (6) hours apart for the following: a) Total feet of head b) Millpond elevation c) Discharge (in CFS). Additionally, the table should include a daily summation of the quantity of water diverted under this appropriation since the beginning of the calendar year for each day. These records shall be submitted monthly to the Division of Water Resources, Topeka Field Office, by the 15<sup>th</sup> day of each month or upon request of the Topeka Field Office. If necessary, the Chief Engineer or his designated agent can require more frequent measurements.”*

*“18. That the applicant shall maintain an on-site record of hourly millpond surface elevation readings, which can be readily reviewed at the request of Division of Water Resources personnel.”*

Reports to the Division of Water Resources are public record, and are available to any requestor under the Kansas Open Records Act (KORA). These records may be obtained through a standard KORA request to the Division of Water Resources on the appropriate form. A fee may be required to process the KORA.

While the Kansas Division of Water Resources requests only millpond elevation readings, BMPC will also take hourly tailwater elevation readings in order to meet requirements as established in Article 401 of the BMPC FERC License P-13526 which require that both millpond and tailwater be monitored, so that “at any point in time, flows, as measured immediately downstream of the project, approximate the sum of inflows to the project millpond as measured by hourly water surface elevations.”

By documenting both millpond and tailwater surface elevation readings on an hourly basis, BMPC will establish clear documentation of the “run of river” nature of the operation, as per the Federal Energy Regulatory Commission recommendation that BMPC “minimize fluctuations in the millpond surface elevation.”

**3. A description of how the project would be operated to maintain compliance with the ROR (run-of-river) requirement of Article 401;**

BMPC run of river operations are defined by the Federal Energy Regulatory Commission in the license document as follows:

*“Article 401. Run-of-River Operation and Bowersock Millpond Levels. To protect aquatic resources in the Kansas River, the licensee shall operate the Expanded Kansas River Hydroelectric Project in run-of-river (ROR) mode, where instantaneous outflows approximate instantaneous inflows to the project. In addition, the licensee shall operate the project to maintain the level of the Bowersock Millpond at elevation 813.5 feet National Geodetic Vertical Datum (NGVD), with deviations no greater than plus or minus 6 inches due to operational constraints.*

*The licensee shall at all times act to minimize the fluctuation of the Bowersock Millpond surface elevation by maintaining a discharge from the project so that, at any point in time, flows, as measured immediately downstream of the project, approximate the sum of inflows to the project millpond as measured by hourly water surface elevations.”*

Under normal operations, both BMPC powerhouses will pass all river flows, such that instantaneous outflows approximate instantaneous inflows to the project. Headwater control devices mounted on the dam’s crest, Elev. 808 NGVD, will raise the millpond water surface to Elev. 813.5 NGVD plus or minus 6 inches. Two types of devices installed at the dam will facilitate the passage of river flows in excess of the flows which may be passed by the powerhouses. Obermeyer Gates on the north and south ends of the dam (one 20 ft. gate at the north end and fifteen 10 ft. gates at the south end), which can be lowered and raised pneumatically, and a rubber dam, consisting of four separate air bladders, inflated with a low-pressure blower system, which may be inflated or deflated to allow the passage of excess flows. Throughout medium and low-flow conditions, all headwater control devices will be in the raised position (fully inflated), to maintain the millpond headwater at a nominal elevation of 813.5 NGVD.

The existing and new powerhouses will operate as a single unit. With larger turbine/generator sets at the North Powerhouse (maximum flow of @ 1,000 CFS for turbines 9 and 10, and 700 CFS for turbines 8 and 11), and smaller turbine/generator sets at the South Powerhouse (maximum flow of @ 300 CFS), the two powerhouses will operate in tandem to create a smooth power generation curve as flows increase in the river. As river flows increase, units will be placed into operation as indicated for maximum efficiency until all four generators from the North Powerhouse and all 7 generators from the South Powerhouse are online.

As the river flows increase beyond what the 11 turbines can pass, the South or North Obermeyer gates will lower automatically to pass excess flows. The North Obermeyer gate will use transducers and elevation set points to automatically open and close the gate to keep the millpond at elevation 813.5 plus or minus six inches. If the river flows exceed the capacity of all 11 turbines and the North Obermeyer Gates, the South Obermeyer Gates will be lowered to keep the millpond within the appropriate elevation range. The South Obermeyer Gates are automated through the use of a bubbler system. The continuous operation of both sets of Obermeyer Gates as described will allow the millpond elevation to be maintained at the nominal elevation of 813.5 up to river flows of 14,900 CFS, as the operation of the North and South

Powerhouses and both sets of Obermeyer Gates have the capacity to pass approximately 14,900 CFS.

The following table demonstrates the maximum amount of flow the BMPC Expanded Project has the capacity to pass with a river elevation of 814 NGVD.

**BMPC Project Structure Flow Capacities at Elevation NGVD 814**

BMPC South Powerhouse	2,000 CFS
BMPC North Powerhouse	3,400 CFS
BMPC North Obermeyer Gates	1,500 CFS
BMPC South Obermeyer Gates	8,000 CFS
Total	14,900 CFS

In the event of river flows exceeding 14,900 CFS or below (depending on debris-load in the river), BMPC powerhouse operators will initiate deflation of the rubber dam. The four separate bladders will be deflated in progression, ultimately bringing the entire dam top to its lowest point to allow maximum passage of river flows. The rubber dam bladders will be used to pass flows during high water events (above 14,900 CFS), and not to manage millpond levels. The bladders will either be inflated or deflated, and millpond management level will be maintained through management of the Obermeyer system. This method of operation will allow the downstream river flows to approximate the inflows of the project millpond and minimize any excessive surges in downstream river volume.

Once river flows reach 35,000 CFS or greater, both powerhouses would cease operations. Flows would continue to pass over the dam crest rubber dam section, lowered Obermeyer Gates and the flood passage in the North Powerhouse. Operations at both powerhouses would resume when river flows diminish to approximately 35,000 CFS or below before reinitiating operations.

As river flows recede in the river, BMPC will begin to raise the headwater control structures in progression, such that the millpond level will not go below the authorized level of 813.5 NGVD, eliminating the need for the refill period that was required with the use of manually-raised flashboards.

**4. Procedures to maintain ROR operation during planned and emergency shut-downs;**

Under planned or emergency shutdown of units, operation will be essentially the same as under normal operations. When the river flows exceed the capacity of the operational turbines in the North and South Powerhouses, the North or South Obermeyer Gates will automatically lower to maintain the nominal 813.5 elevation. If the river flows exceed the capacity of the operational turbines and both sets of Obermeyer Gates (or prior depending on debris-load in the river), powerhouse operators will initiate deflation of the rubber dam. The four separate bladders will be deflated in progression. In event that the rubber bladders are overtopped, a pressure sensor located on the air bladder will initiate automatic deflation, which serves as a backup mechanism, ensuring that air bladders are deflated in the event of high water.

In the event both powerhouses were to lose power, the turbines would be shut down during the outage and therefore would not pass any river flows. The Obermeyer gates would not

immediately fall, but can be lowered by use of a relief valve on the air line supply if required to pass flows. Similarly, the rubber dam air bladders have a release valve, which would allow their deflation to pass flows. If flows were low enough that the majority of the dam top water retention structures were required to maintain millpond elevation, a portable air compressor can be used for operation of both Obermeyer Gate Systems, and the rubber dam system may operate with a generator.

In the event of severe icing, BMPC will continue to operate turbines as they are practicable, and will continue to pass any additional flows as required via the Obermeyer Gate and rubber dam systems.

#### **5. Procedures for refilling the Bowersock Millpond in the event of a maintenance-related drawdown while maintaining adequate flows downstream during refill to maintain aquatic resources; Maintaining ROR Compliance During Millpond Refills**

The BMPC operation is considered by FERC to be a run-of-river operation. As with any run-of-river hydropower operation, a millpond refilling period is anticipated following any drawdown, either scheduled or the result of required emergency maintenance. Maintenance may be required on any portion of the water retention system, in the project, which includes headgates, either Obermeyer section, the rubber dam, or the dam itself.

#### **Communication to Relevant Agencies**

As directed by the Division of Water Resources and FERC License Article 401, BMPC will communicate significant anticipated or unplanned changes of 6 inches or more from the authorized millpond level of 813.5 as soon as possible, no later than 48 hours after any incident, and prior to any refilling with the following agencies:

- Kansas Department of Agriculture Division of Water Resources
- Kansas Water Office
- Kansas River Water Assurance District No. 1
- Kansas Department of Health and Environment
- US Army Corps of Engineers
- U.S. Fish & Wildlife Service
- Kansas Department of Wildlife, Parks & Tourism

This plan of communication is as per the condition 19 of the Kansas Department of Agriculture Division of Water Resources Appropriation of water, File No. 47,275 which reads as follows:

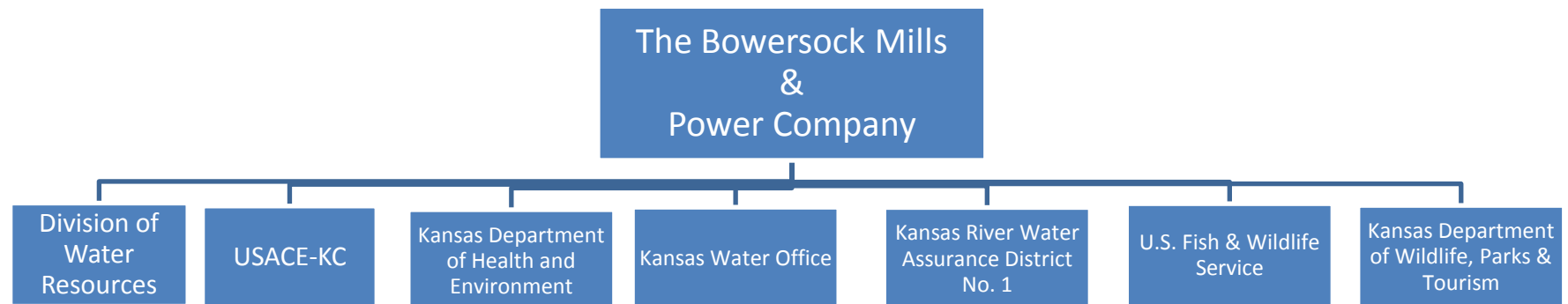
*“19. That per the requirements contained in Article 401 of the Federal Energy Regulatory Commission license for this project, the applicant [BMPC] shall operate the Expanded Kansas River Hydroelectric Project in run-of-river (ROR) mode, maintaining the level of Mill Pond at elevation 813.5 feet NGVD with deviations no greater than plus or minus 6 inches due to operational constraints. Further, in the event that the level of Mill Pond is temporarily modified per the provisions of Article 401, prior to commencing any refilling of Mill Pond the applicant shall contact the Chief Engineer, or an authorized representative of the Chief Engineer, for coordination purposes, and communicate its operational plan for refilling to the Kansas Water Office and the Kansas River Water Assurance District No. 1.”*

When BMPC experiences an Article 401 condition, BMPC will notify the above-named entities with the level in NGVD of current storage in the millpond, the current operation of each

powerhouse, daily diversion under each water right, and the anticipated duration and timing of the drawdown and refill. With regard to coordination of refilling, BMPC will refer to the Department of Agriculture Division of Water Resources to coordinate those discussions.



## BMPC Notification Chart Bowersock Millpond Refill



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Water management on the Kansas River is a responsibility of the Kansas Department of Agriculture Division of Water Resources. As the BMPC water rights and operations are directed by Division of Water Resources, it is anticipated that BMPC will continue to report primarily to the Division of Water Resources, and will look to the Division of Water Resources for the coordination of discussion and collaboration to maintain appropriate river flows while meeting BMPC water rights under low-flow situations.

BMPC will not report significant changes in millpond level above 814 NGVD which take place at high river flows and are a reflection of natural river fluctuations and are outside the control of BMPC operations.

### **Refilling the Millpond Under Normal Flow Conditions (Not under Administration)**

The use of automated (not requiring human power on the dam) headwater control systems will allow BMPC to eliminate many of the millpond refills that were necessary with the manually-raised flashboard system. With the new systems in place, the millpond should only require refilling in the event of required or unplanned maintenance, not as a normal course of operations as it was with the wooden flashboards. Upon completion of any required maintenance of the dam or headwater control systems, BMPC will return all headwater control structures to the raised position, and operate the powerhouses at less than river inflows to facilitate refilling the millpond responsibly to maintain aquatic resources.

Refilling of the millpond under normal flow conditions may occur under BMPC's rights, File Nos. DG-11, 45,444 and 47,275, depending on priority and plant operations. Under File Nos. 45,444 and 47,275, refilling may not interfere with target flows established for the Kansas River Water Assurance Program, meaning that storage under these rights may not result in target flows falling below threshold states in the Kansas River Water Assurance District No. 1 Operations Plan, and that in no case, may any releases from storage made pursuant to the Kansas River Water Assurance District No. 1 Operations agreement be stored in the millpond under any right at any time. Water Assurance District releases are subject to protection by the Division of Water Resources, whereby BMPC shall ensure that a quantity of water equal to or greater than the released quantity will be diverted, by passed, released or otherwise shall pass by, through, or over the Millpond Dam.

It should be noted that under any flow condition, including normal flows, that BMPC relies on three water rights, the most senior of which is Vested Right DG-11, which is of particular relevance during low-flow conditions when the river is under administration.

### **Refilling the Millpond Under Low Flow Conditions (Under Administration)**

BMPC recognizes the importance of collaborating with all stakeholders on the Kansas River to manage water flows effectively, and has a history of over 100 years of operation with positive relationships with other river users. While underscoring the importance of clear communication with all river stakeholders, BMPC respectfully reserves the right established under its senior, Vested water right to make beneficial use of natural flows in the Kansas River to operate the BMPC Project.

In the event of a significant change in millpond level and associated need to refill, BMPC will, for the purposes of coordination, communicate the level in NGVD of current storage in the millpond,

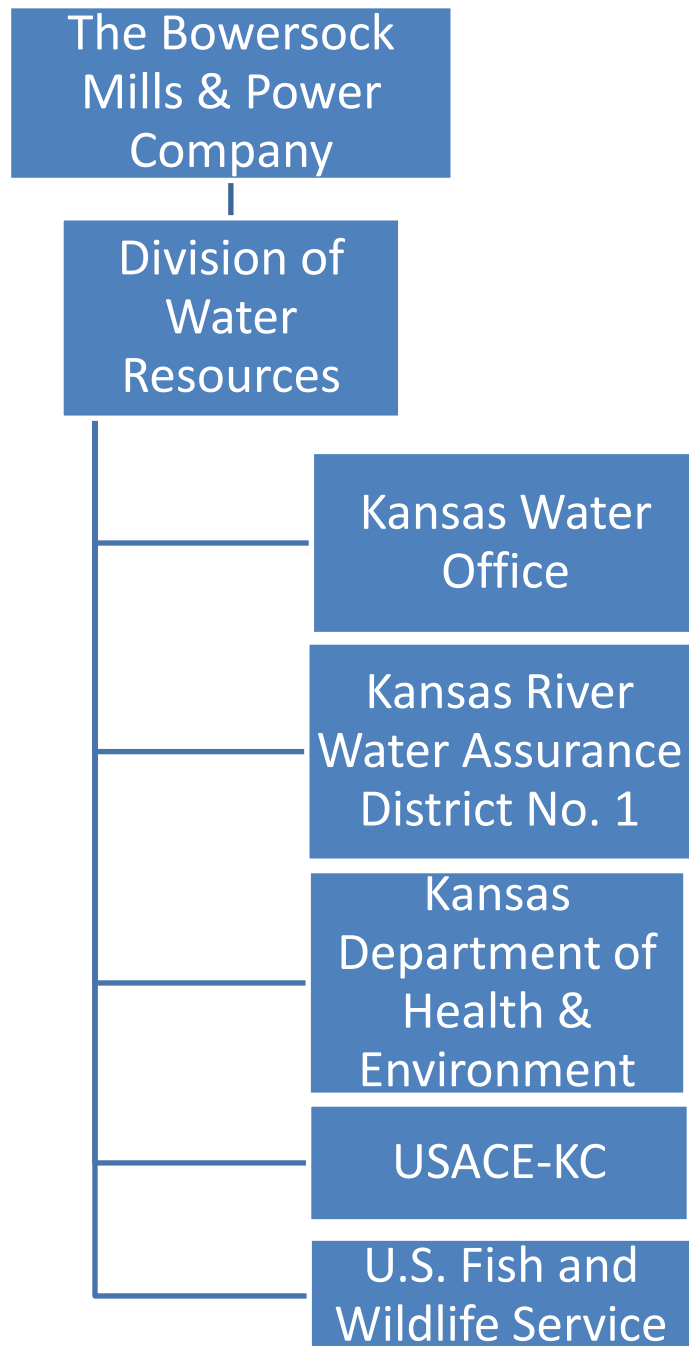
the current operation of each powerhouse, daily diversion under each water right, and the anticipated timing and duration of the fill to the Kansas Department of Agriculture Division of Water Resources, Kansas Water Office, Kansas River Water Assurance District No. 1, Kansas Department of Health and Environment, the USACE-KC and the U.S. Fish and Wildlife Service. The DWR will make determinations on which water right(s) will be storing based on this information and discussions with stakeholder agencies. The timing and duration of the proposed filling will be reviewed.

In consideration of downstream users and aquatic needs, if the proposed plan for refilling the millpond under the senior, Vested right will reduce flows below KRWAD threshold values, or if river flows are under 1500 CFS at the De Soto Gauge and BMPC anticipates deviating from run-of-river operations as defined (where instantaneous outflows approximate instantaneous inflows to the project) by more than 300 CFS or greater, BMPC will notify the above-named agencies, and then work with the Division of Water Resources (which will coordinate with KWO, KRWAD, KDHE, USACE-KC and USFWS), to determine if requesting an additional release from the Water Quality Storage portion of the Water Assurance storage pool pursuant to the upstream Reservation Rights from storage will be necessary, at which time the KWO will request any release necessary from the Army Corps of Engineers.

The Bowersock Mills and Power Company is the owner of vested water right DG-11, dated October 14<sup>th</sup>, 1959, which grants BMPC the right to “to continue the beneficial use of water from the source (Kansas River at the Bowersock Dam) as stated (which) has been determined and established to be a maximum quantity of 1,000,000 acre feet per year to be diverted at a maximum rate of 2,000 cubic feet per second for water power use.” Under the Vested Right, BMPC recognizes the right to refill the Bowersock Millpond using only natural flows at any time the right is in use and, that releases made pursuant to an agreement between the state and the federal government or releases from storage under the authority of the state of Kansas are protected by the Division and may not be stored by BMPC during low flow conditions.

As previously stated, BMPC will report any significant fluctuation over 6 inches of the Bowersock Millpond which is a result of BMPC operations to the relevant, listed agencies. To illustrate, non-reportable fluctuations will occur when river flows are high, naturally above the BMPC headwater control devices, and therefore out of BMPC control. Reportable fluctuations will occur as a result of BMPC operations which alter outflows such that inflows and outflows to the project are not approximately equivalent. Any anticipated changes which are a result of BMPC operations will be communicated in advance, and any unanticipated change which is a result of BMPC operations will be communicated within 48 hours of the incident. In the event that the BMPC Millpond must be refilled when the Kansas River is under administration, every effort will be made to coordinate the refill of the millpond with other river stakeholders with the Kansas Division of Water Resources serving as the primary point of communication between BMPC and other listed river stakeholders.

**Communication Flow Chart Re: Coordination of Discussion  
Required For Refill When River is Under Administration**



For further discussion of the BMPC vested water right and Kansas Water Assurance District rights and responsibilities relevant to the BMPC Millpond, see Appendix A.

### **Schedule for Implementation**

The BMPC Project Operations Monitoring Plan has been established for the purposes of the expansion of the BMPC Project to include a new North Powerhouse. Many aspects of the Project Operations Monitoring Plan may only be established upon completion of the North Powerhouse and associated monitoring systems. Based upon these constraints, BMPC anticipates initiating this Project Operations Monitoring Plan upon start of commercial operations of the proposed North Powerhouse.

### **Incorporation of Comments from Stakeholders:**

In developing this Operations and Monitoring Plan, BMPC collaborated with all the agencies stipulated in the FERC license, including the Kansas Department of Health and Environment, the U.S. Army Corps of Engineers, and the U.S. Fish and Wildlife Service. In an effort to engage and incorporate all the stakeholders on the river, BMPC also collaborated on the development of the plan with additional stakeholder agencies, including the Kansas Division of Water Resources and the Kansas Water Office. This original, submitted version of the plan incorporated as many comments and requests from stakeholder agencies as practicable for BMPC Operations, also recognizing that requests from some agencies were in conflict with requests from other agencies. This revised version of the plan will be submitted for review and comment to the same agencies in addition to the Kansas Department of Wildlife, Parks, and Tourism.

For the full text of comments from required agencies, see the following appendices:

Kansas Department of Health and Environment – Appendix B

US Army Corps of Engineers – Appendix C

US Fish and Wildlife – Appendix D

For the full text of comments from additional agencies, see the following appendices:

Kansas Division of Water Resources – Appendix E

Kansas Water Office – Appendix F

For BMPC responses to the comments from each agency, see Appendix G.

### **Communication with BMPC**

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