Wallowa Falls Hydroelectric Project

FERC Project No. P-308

Revised Study Plans – Instream Flow and Habitat

December 2011

Prepared by:
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Hydro Resources
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PACIFICORP ENERGY
A DIVISION OF PACIFICORP

For Public Review

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1.0 INTRODUCTION

PacifiCorp Energy (PacifiCorp) is applying for a new operating license with the Federal Energy Regulatory Commission (FERC) for the Wallowa Falls Hydroelectric Project (Project, FERC No. P-308). The Project is owned and operated by PacifiCorp under the jurisdiction of a 30-year FERC license which will terminate on February 28, 2016.

On February 23, 2011 PacifiCorp initiated the relicensing process for the Project by filing a Pre-Application Document (PAD) with FERC. The PAD identifies studies that PacifiCorp proposes to conduct to provide information needed to make informed decisions about the continued operation of the Project. The Scoping Document 1 (SD1), issued by FERC on April 22, 2011 in response to the PAD, incorporates PacifiCorp's proposal for a study to document the effects of Project operations on fish habitat (FERC 2011).

Per SD1, PacifiCorp is proposing an Instream Flow Study Plan (study) to assess the fish habitat-instream flow relationship in the East Fork Wallowa River (East Fork Wallowa Bypass or Bypass). Details of this study are described below.

2.0 STUDY DESCRIPTION AND OBJECTIVES

PacifiCorp, Oregon Department of Fish and Wildlife (ODFW), and the U.S. Fish and Wildlife Service (USFWS) participated in a site visit and discussion in May 2011 that helped shape the instream flow study proposed in this study. The goal of the study is to assess the relationship between bull trout (*Salvelinus confluentus*), Rainbow trout (*Oncorhynchus mykiss*) and Kokanee (*Oncorhynchus nerka*) habitat availability and flows in the East Fork Wallowa Bypass in support of a new FERC license application for the continued operation of the Project. The objectives of the study are to:

1) Quantify the habitat available to bull trout, rainbow trout, and Kokanee in the lower segment of the East Fork Wallow Bypass
2) Develop a habitat-discharge relationship for the lower segment of the Bypass to describe how habitat availability changes with flow, particularly during the critical spawning period in the early fall
3) Provide scientifically grounded, repeatable results to guide decision-making for balancing power generation with the habitat needs of bull trout, rainbow trout, and Kokanee.

3.0 RESOURCE MANAGEMENT GOALS

Bull trout, rainbow trout, and Kokanee are fish species present in the East Fork Wallowa Bypass that have important jurisdictional and/or management implications. Bull trout are an Endangered Species Act (ESA) listed species. The Columbia River basin population segment was originally listed as threatened in 1998 (USFWS 1998) and the designation was upheld during the most recent 5-Year Review (USFWS 2008). Although previously considered extirpated above Wallowa Lake Dam, bull trout were observed spawning in the East Fork Wallowa Bypass in 2010 by a PacifiCorp biologist. Kokanee from Wallowa Lake migrate up the Wallowa River to spawn, and have been observed spawning in the lowest reaches of the Bypass (PacifiCorp 2011). Kokanee have important recreational and

economic values, as Wallowa Lake supports a very popular Kokanee fishery. Rainbow trout present in the bypass are also an important recreational species. This study was developed in support of the management goals for these species held by the following entities:

A. U.S. Fish and Wildlife Service (USFWS)

The USFWS released a Bull Trout Draft Recovery Plan in 2002 for the Grande Ronde River Recovery Unit with the goal of ensuring "the long-term persistence of self-sustaining, complex, interacting groups of bull trout distributed throughout the species' native range, so that the species can be delisted" (USFWS 2002). The recovery plan lists certain objectives and actions in support of the restoration goal; relevant to this study is the objective to "restore and maintain suitable habitat conditions for all bull trout life history stages and strategies," which translates to the action of "providing habitat conditions and access to them that allow for the expression of various life-history forms."

B. Oregon Department of Fish and Wildlife (ODFW)

The resource management goals of ODFW are embodied in the mission of the Oregon Native Fish Conservation Policy (ODFW 2002). The policy was drafted to "ensure the conservation and recovery of native, naturally-produced fish." Certain priorities are listed for the implementation of conservation plans to support the policy. Those priorities which apply to this study include species listing under Federal or State Endangered Species Acts (i.e. bull trout), and species that have a have public interest, or an economic interest in the local community (i.e. Kokanee, rainbow trout).

C. Tribal

The traditional lands of the Nez Perce Tribe include the area surrounding the Wallowa Falls Project. The tribe has an extensive Department of Fisheries Resources Management, dedicated to advancing the vision "to recover and restore all species and populations of anadromous and resident fish within the traditional lands of the Nez Perce Tribe" (Nez Perce Tribe 2011). This broad-reaching goal encompasses the protection of native bull trout, Kokanee, and rainbow trout that utilize waters affected by the Wallowa Project.

4.0 EXISTING INFORMATION

ODFW performed a habitat survey on the East Fork Wallowa Bypass in 1992 that extended approximately 3000 feet upstream from the mouth of the river. The results of the survey are displayed in Table 4.0-1. Although these results are dated, it is likely that the East Fork Wallowa Bypass is in a state of dynamic equilibrium, and that these results characterize present conditions. The survey ends at a location where the stream transitions to steep cascading channel, apparently considered the extent of fish habitat by the surveyors.

Table 4.0-1 Distribution of habitat types mapped by ODFW in the lower segment of the East Fork Wallowa Bypass Reach, 1992.

Habitat Type	Total Length (ft)	% Composition
Rapid/boulders	1967	63.1%
Cascade/boulders	538	17.3%
Riffle with pockets	245	7.9%
Riffle	196	6.3%
Pool-plunge	101	3.2%
Pool-dammed	44	1.4%
Step/structures	15	0.5%
Step/boulders	6	0.2%
Step/log	5	0.2%
Total	**3116**	**100%**

5.0 NEXUS TO PROJECT

The Project diverts up to 15 cubic feet per second from the East Fork Wallow River at the Wallow Falls dam, located 1.7 miles upstream of the confluence of the East and West Forks of the Wallowa River. The Project also diverts up to 1 cubic feet per second from the tributary Royal Purple Creek. Royal Purple diversions are routed into the forebay behind the dam. A pipeline conveys up to 16 cubic feet per second to the Wallowa Falls powerhouse, which discharges to the West Fork Wallowa River. The current license requires a minimum release at the dam of 0.5 cubic feet per second. The amount of accretion from small tributaries and springs in the East Fork Wallowa Bypass has not been quantified. PacifiCorp proposes to assess how the flow regime affects fish habitat in the East Fork Wallowa Bypass.

6.0 STUDY AREA

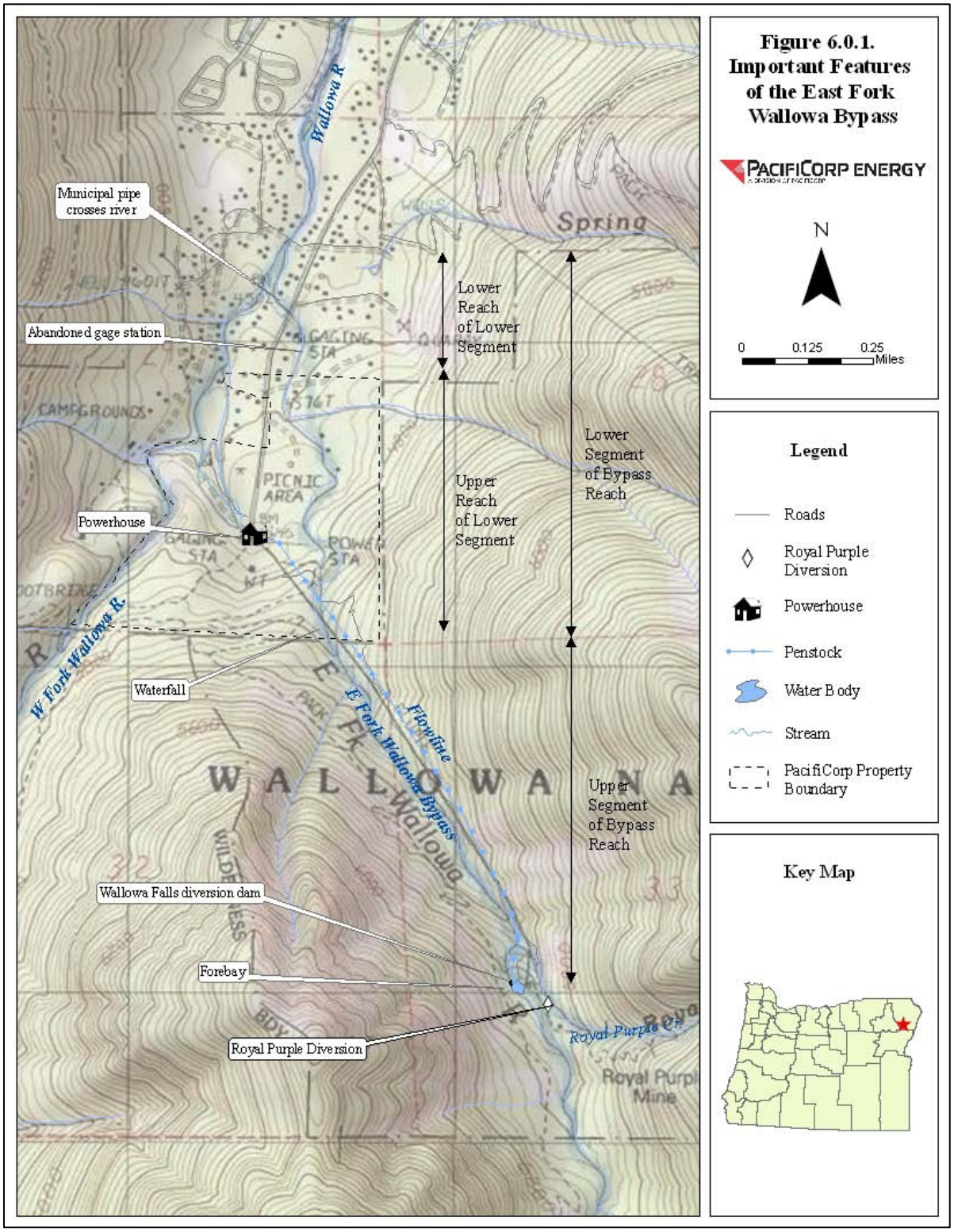
The Study Area was discussed during a preliminary visit to the Project by PacifiCorp, ODFW and USFWS on May 11, 2011 and a reconnaissance visit by PacifiCorp on May 24-25, 2011. The two occasions allowed PacifiCorp and the agencies to broadly assess existing stream conditions, identify future data needs, and develop a framework for an appropriate instream flow study. Several important stream attributes were observed that helped guide study planning.

Figure 6.0.1 displays the Project Area and highlights certain features significant to this study. Habitat characteristics divide the 1.7-mile Bypass into two distinct lower and upper segments. The lower segment of the East Fork Wallowa Bypass is 4700 feet long, has an average slope of approximately 7.7%, and is comprised of two distinct reaches. The lower reach extends from the mouth of the Bypass to the PacifiCorp property boundary, a distance of 1500 feet. This reach consists predominantly of riffles and pools and maintains a single, primary channel at the ordinary high water mark. Channel cross sections in this reach tend to exhibit a relatively uniform water surface elevation. The stream is surrounded by residential properties and is lined with boulders and large coble that appear to have been intentionally placed to maintain channel shape. The second reach occurs at the property boundary that separates the residential land from land owned by PacifiCorp. This reach is characterized by a braided channel composed largely of boulder gardens, steps, and plunge pools. This more

complex reach of the stream, 3200 feet long, is laden with woody debris and the cross sections have distinctly non-uniform water surface levels. The lower segment of the Bypass will be the focus of this study. A waterfall over bedrock marks the abrupt transition to the very high gradient upper segment of the Bypass. The upper segment is approximately 4370 feet long and has and average slope of 19%. Steep cascades with turbulent flow over boulders and bedrock characterized the remaining habitat. The upper segment will not be included in the instream flow study due to complex hydraulics and available habitat. It is assumed that study results that would apply to the lower segment to improve habitat conditions would also benefit the upper segment of the Bypass.

Three features were observed during the site visits that are important to fish distribution in the Bypass. In the lower reach of the Bypass, a municipal sewer or water pipe crosses the bottom of the channel 550 feet upstream of the confluence, and is shielded by an intentionally placed log that spans the channel and is embedded in the banks. The step created by the pipe/log complex is located in an area that appears to match the description of a barrier to Kokanee passage that ODFW noted during the 1992 habitat survey. The property owner at this site confirmed that Kokanee do not migrate above the pipe line. A second potential passage barrier occurs approximately 100 feet downstream of PacifiCorp's property boundary, at the location of abandoned USGS Gaging Station No. 13325000. The gaging station includes a concrete slab-like structure which spans the channel and creates a 2-3 foot vertical step into a plunge pool. Although the structure appears to function as a barrier to fish passage, further surveys are necessary to document the presence of fish upstream of the gage. The third fish barrier occurs approximately 4700 feet upstream of the confluence, where a waterfall over bedrock marks the abrupt transition to the very high gradient upper segment of the Bypass. PacifiCorp has developed a separate study plan (Aquatics Study Plan) to address the presence and extent of salmonid use in the East Fork Wallowa Bypass.

Figure 6.0.1. Important features of the East Fork Wallowa Bypass.



7.0 METHODS

PacifiCorp proposes to assess habitat versus flow relationships for bull trout and kokanee using the Physical Habitat Simulation (PHABSIM) programs of the Instream Flow Incremental Methodology (IFIM). This approach entails developing hydraulic models which predict velocity and depth across transects placed in the various habitats present in the Bypass. The output of these hydraulic models is then interpreted based on habitat suitability criteria which evaluate the suitability of the predicted values of depth, velocity, and substrate for the target species and lifestage. Listed below are the steps necessary to complete the proposed study.

7.1 Habitat Survey

A habitat survey will be performed in the lower segment of the East Fork Wallow Bypass to verify and update the results of ODFW's survey. Information collected during the survey will be used to determine the extent of the lower segment that will serve as the focused study reach. ODFW's habitat data is useful for characterizing habitat extent and distribution; however the horizontal and vertical shifts typical of alluvial channels have likely changed the exact locations of mesohabitat features over the past two decades. While the original survey probably characterizes present conditions, it is necessary to resurvey the lower segment to precisely document existing mesohabitat distribution. The completion of a habitat survey will be the initial step of the study, and will serve as a basis for selecting the focused study reach. The survey will be conducted according to the protocol described in the USDA-FS Region 6 Stream Inventory Handbook (US Forest Service 2010). The survey will extend from the confluence of the East and West Forks of the Wallowa River to the location of a waterfall and gradient increase which blocks upstream fish passage.

7.2 Data Collection

7.2.1 Transect Locations

A study reach will be selected based on the information collected during the habitat survey. Transects, or channel cross-sections, will be established within the study reach where the data required by PHABSIM will be collected, and a survey will be performed to tie all transects to a benchmark. The number and placement of transects will be influenced by model constraints and literature recommendations. The transect locations will be developed in consultation with representatives of resource agencies prior to final installation and initiation of data collection.

The PHABSIM-specific constraints imposed on the selection of transect locations include:

a) Non-turbulent flow;
b) Sloped water surface that is level across the cross section;
c) Rigid boundary conditions (i.e. channel geometry does not change substantially over the range of measured data sets).

Few studies have been performed to determine an appropriate number of transects per stream mile for PHABSIM modeling. A 2004 literature review by Payne *et al* (2004) found that

studies evaluating project effects used a median of 4.17 transects per mile and a mean of 6.60 transects per mile. Payne cautions against over sampling, and references emerging approaches in Oregon and California that establish three transects of every habitat type exceeding a minimum abundance of approximately 5-10% of reach length. The results of such high-frequency sampling are that infrequent habitat types are over-represented and frequent habitat types are under-represented. Due to the relatively short reach of fish habitat in the East Fork Bypass, PacifiCorp is proposing to sample more frequently than either of Payne's findings. PacifiCorp anticipates a sample of 12 transects distributed throughout the 4700-foot lower segment of the East Fork Bypass. The final number of transects will be based on the updated habitat survey and will be selected in consultation with interested stakeholders.

7.2.2 Flow

Hydraulic and habitat data for PHABSIM calibration and modeling will be collected at each transect for three distinct flow releases at the diversion, Releases will likely occur during baseflow conditions during the driest time of the year (late July through late September). Releases will target two, eight, and 20 cfs to allow simulation over the range of one to 50 cfs. This flow range represents base flows through the median June flow.

7.2.3 Hydraulic Variables

During the three discrete flow releases from Wallowa Falls Dam, hydraulic data will be collected at transects consistent with the requirements of PHABSIM (Table 7.2-1). PacifiCorp proposes to collect depth and velocity measurements at the middle and high flows and only water surface elevations at the low flow.

Table 7.2-1 Hydraulic variables measured for PHABSIM modeling.

Parameter	Units	Remarks
Transect Width	Feet	Measured between headstakes
Water surface elevation (WSL)	Feet	Calculated, based on height of headstakes above WSL
X-distance (station)	Feet	Increments of a transect between headstakes where hydraulic variables are measured
Stream bed elevation	Feet	Calculated at each station, based on height of headstakes above stream bed
Channel width	Feet	Actively flowing channel, measured perpendicular to flow
Water depth	Feet	Measured at each station with top-setting wading rod
Mean column water velocity	Feet/second	Measured at each station, averaged over 30 seconds.*
Substrate	% composition	Categorized by size class per USFS Region 6 Stream Inventory Handbook v. 2.10
Cover	Binary	Presence/absence

**Velocity will be measured at the mid- and high-flow targets. PacifiCorp will attempt to collect low flow velocity if possible, as ODFW considers this information "useful but not critical" (Hardin 2011).*

7.2.4 Modeling Approach

PacifiCorp will use the PHABSIM suite of models to predict the habitat versus flow relationship in all habitat types. PHABSIM uses transect specific channel geometry, depth and velocity information to calculate depths and velocities at unobserved flows, based on Manning Equation and a transect-specific stage-discharge relationship. This approach uses the mean column velocities obtained at each vertical along the transect to calculate cell specific Manning "n" values. These "n" values are assumed to remain constant over a modest range of flow values and observed or estimated water surface elevations for stream flows within that range are used as input data to calculate the corresponding sets of mean column velocities.

Habitat modeling will require the selection of an appropriate set of Habitat Suitability Criteria (HSC). PacifiCorp will search the literature for existing HSC curves that are appropriate for the East Fork Wallowa Bypass. The selection of HSC curves will be done in consultation with resource agencies to achieve a composite curve applicable to this study. For this study, PacifiCorp proposes to use HSC for all life stages of bull trout and rainbow trout and for kokanee spawning. If feasible, direct observations in the Bypass will be made to verify the composite HSC curves.

7.3 Data Interpretation

The goal of data interpretation is to evaluate the trade-offs between flow and fish habitat to formulate instream flow recommendations. The Weighted Usable Area (WUA) versus discharge data will be combined with hydrologic data to produce a habitat duration curve. Habitat duration curves are cumulative frequency plots that show the probability of a certain amount of habitat being equaled or exceeded during a time period. These curves are useful because they combine WUA, flow, and time into one graph.

The output of the model will conveniently lend itself to an evaluation of the relationship between wetted-width and discharge. An evaluation to this nature will be performed to assess gross changes in aquatic habitat.

If any agency desires to perform additional evaluation beyond the scope of this plan, the stakeholder may request PHABSIM output detailing daily flow files for various project alternatives.

8.0 PROGRESS REPORTING

A study progress meeting will be held in October of 2012. A study progress report (draft Technical Report) will be made available for 30 day stakeholder review and comment in November, 2012. Stakeholder comments will be addressed in the initial study report. The initial study report will be made available for review in mid January, 2013; followed by an initial study report meeting in late January, 2013. Depending on the success of the proposed study and the quality of data collected, data collection may be extended to encompass a second year. If a second year of data collection is warranted, a second year progress report (updated draft Technical Report) will be made available for 30 day stakeholder review and

comment in November, 2013. Stakeholder comments will be addressed in the final Technical Report.

9.0 FINAL PRODUCT

A final Technical Report will be made available for stakeholder review in June, 2013 assuming one season of data collection is sufficient. If a second year of data collection is warranted, the final Technical Report will be made available in January, 2014. The final Technical Report will include detailed specific information obtained during the study concerning the aquatic habitat-instream flow relationship for bull trout and kokanee in the East Fork Wallowa Bypass.

10.0 SCHEDULE

The anticipated schedule for implementation of the Instream Flow Study Plan is proposed in Table 10.0-1.

Table 10.0-1 Schedule for the implementation of the Instream Flow Study Plan.

Component	Completion Date
Identify Habitat Suitability Curves	February-June 2012
First year field study	July-September 2012
Modeling and Data Interpretation	October-November 2012
Study Progress Meeting	October 2012
Study Progress Report	November 2012
Initial Study Report filed with FERC	January 2013
Initial Study Report meeting	January 2013
Meeting Summary filed with FERC	February 2013
Final Technical Report*	June 2013
Updated Study Plan for second year** study*	March 2013
Second year field study**	July-September 2013
Second year Study Progress Report**	November 2013
Final Technical Report (Updated Study Report) filed with FERC**	January 2014
Final Technical Report (Updated Study Report) Meeting**	January 2014
Meeting Summary filed with FERC**	February 2014

**Assumes one season of data collection.*

***If determined necessary by PacifiCorp and stakeholders during initial study report meeting.*

11.0 LEVEL OF EFFORT AND COST

PacifiCorp anticipates an approximate cost of $48,040 for one year of study, which includes labor hours, per diem and travel costs, and the purchase of necessary field equipment and instruments (Table 11.0-1). The estimated expense for a two year study is $95,080, which

represents the addition of a second year of labor and travel costs at the same rate as year one, but no additional equipment costs.

Table 11.0-1 Anticipated level of effort and cost for components of the instream flow study for one year.

Activity	Labor	Per-Diem	Materials	Total
Transect Selection	$4,560	$1,200	$0	$5,760
Flow Measurement	$12,160	$3,200	$1,000	$16,360
Agency Consultation – Habitat Curves	$4,560	$0	$0	$4,560
Modeling and Data Interpretation	$12,160	$0	$0	$12,160
Reporting and Meetings	$7,600	$1,600	$0	$3,040
Total	**$41,040**	**$6,000**	**$1,000**	**$48,040**

12.0 REFERENCES

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