

## Boundary Conditions List

### Spokane River & Lake Spokane CE-QUAL-W2 Model

Boundary conditions are inputs or forcing functions that are required to run the model. These are inputs that occur at all model boundaries – the flow at the beginning of your model, an input from a discharger, the flow at the outlet of a dam, wind and other meteorological variables at the air-water boundary, or groundwater flow at the bottom of a lake/reservoir/river. They do not include information within the model domain such as field data profiles within Long Lake, which are used to compare model predictions to field data.

A list of field data used as model boundary conditions include:

- Groundwater inputs to the Spokane River (flow, temperature and water quality)
- Inflow to the river at the beginning of the model boundary – at Coeur d’Alene Lake in Idaho (flow, temperature, water quality)
- Specified flow rates at dams
- Point source flow rates, temperature, and water quality data
- Meteorological data (air temperature, dew point temperature, wind speed, wind direction, and cloud cover or short wave solar radiation)

Other field data are used to develop the model grid or structure. These data include:

- River bathymetry
- Reservoir bathymetry
- Information on the hydraulic structures – elevations of withdrawal, spillway locations

Field data used for comparing model predictions to field data.

- Surface water elevations (water levels)
- Water Quality & temperature data from upstream, mainstem river tributaries, and Lake Spokane (collected from the sites in Table 1, parameters measured are in Table 2).

**Table 1. Spokane Watershed monitoring locations**

Site ID	Description	River Mile	Surface Water		Ground water	Peri-phyton
			Quality	flow		
USGS12433000	SPOKANE RIVER AT LONG LAKE, WA	32.1		x		
LL0	Long Lake @ Station 0 (near dam)	32.66	x			
LL0.5	Long Lake @ Station 0.5	35.90	x			
LL1	Long Lake @ Station 1	37.62	x			
LL2	Long Lake @ Station 2	42.06	x			
LL3	Long Lake @ Station 3	46.42	x			
LL4	Long Lake @ Station 4	51.47	x			
LL5	Long Lake @ Station 5	54.20	x			
LSK56.4	Little Spokane River @ Long Lake (near mouth): near HWY 291 Bridge	56.40	x			
USGS12431000	LITTLE SPOKANE RIVER AT DARTFORD, WA	56.9		x		

Site ID	Description	River Mile	Surface Water		Ground water	Peri-phyton
			Quality	flow		
SPK57.1-A	Spokane River @ Long Lake: a 1-mile below Nine Mile Dam	57.10	x			
SPK57.1-B	Spokane River @ Long Lake: a 1-mile below Nine Mile Dam	57.10	x			
SPK57.74	Spokane River Below 9 Mile Dam, Spokane River at 9 mile bridge	57.74	x			
SPK58.1	Just d/s of Nine Mile Dam at the road bridge	58.10	x			x
SPK58.3	Spokane River 0.2 mi above Nine mile Dam	58.30	x			
SPK58.9	Spokane River 0.8 mi above Nine mile Dam	58.90	x			
SPK60.2	Spokane River 2.1 mi above Nine mile Dam	60.20	x			
SPK60.9	Spokane River 2.8 mi above Nine mile Dam	60.90	x			
SPK61.4	Spokane River 3.3 mi above Nine mile Dam	61.40	x			
SPK61.9	Spokane River 3.8 mi above Nine mile Dam	61.90	x			
SPK62.0	Spokane R @ Seven Mile Br	62.00	x			
BGC	Below Gun Club	64.6				x
SPK66.0	Spokane R @ Riverside State Park	66.00	x			
SPT67.4	Spokane River WTP effluent discharge	67.40	x			
SPK67.6	Spokane R Upstream Spokane WTP	67.60	x			x
SPK69.8	Spokane R near Fort Wright Bridge	69.80	x			
HNG72.4 USGS12424000	Hangman Creek at mouth, upstream with Confluence with Spokane River	72.40	x	x		
SPK72.5	Spokane R Upstream of Hangman Cr.	72.50	x			
CPS	Clark Pump Station	72.7				x
SPK72.8 USGS12422500	USGS gauging station, Spokane River at Spokane	72.80	x	x		
SPK74.4	Spokane River @ Walkbridge behind Spokane Center	74.40	x			
SPK74.8	Spokane River at Division St Bridge	74.80	x			
5315L01	Olive & Fiske monitoring well, NW corner Fiske & Olive	76.34			x	
SPK76.5	Spokane River at Mission Street Bridge, 76.5	76.79	x			
5309M04	Avista monitoring well near SE corner of Main Office, Avista MW4	76.87			x	
5308H01	Denver & Marietta, City monitoring well	77.12			x	
SPK78.0	Spokane R @ Green St. Bridge	78.00	x			x
5310R01	GE MW-22	78.86			x	
5311E03	Avista Beacon Substation 208 well	78.95			x	
SPK79.5	Downstream of Upriver Dam Powerhouse	79.50	x			
5311J07	Hale's Ale Nested Site, middle	79.65	x			
5311J05	Hale's Ale Nested Site, east	79.65	x			
SPK79.7	Spokane River at Upriver Dam, downstream, 79.5	79.78	x			
SPK79.8	Spokane R Upstream Upriver Dam Powerhouse	79.80	x			
SPK79.9	Spokane River 0.1 mi above Upriver Dam	79.90	x			
SPK80.2	Spokane River 0.4 mi above Upriver Dam	80.20	x			
5312C01	Felts Field City monitoring well	80.41			x	
SPK81.0	Spokane River 1.2 mi above Upriver Dam	81.00	x			
SPK81.6	Spokane River 1.8 mi above Upriver Dam	81.60	x			
SPK82.5	Spokane River 2.7 mi above Upriver Dam	82.50	x			

Site ID	Description	River Mile	Surface Water		Ground water	Peri-phyton
			Quality	flow		
INL82.6	Inland Empire Paper Co discharge	82.60	x			
SPK84.7	Spokane R Foot Bridge @ Plantess Ferry Park	84.70	x			
TI	Trent Road Bridge	85.3				x
KAS86.0	Kaiser Aluminum	86.00	x			
SPK86.1	Spokane R Upstream Kaiser IWTP	86.10	x			
5411R02	Sullivan Road and Centennial Trail, monitoring well, Spokane R @ Sullivan Rd, 200 ft N, SW corner Sullivan Park lower parking lot	87.44			x	
5411R03	Sullivan Park North, monitoring well, Spokane R. @ Sullivan Rd, 100 ft N, Sullivan Park near bluff over river	87.46			x	
5411R04	Sullivan Park South, monitoring well, Spokane R. @ Sullivan Rd, 100 ft S, County Row, W of Sullivan, S. of Trail	87.59			x	
SPK87.8	Spokane R @ Sullivan Rd. Bridge	87.80	x			
5507H01	Barker Road north of river, monitoring well, Spokane R. @ Barker Rd, 100 ft N, W of Barker, N of River	90.24			x	
5508M01	Barker Road Centennial Trail North, monitoring well, Spokane R. @ Barker Rd, 100 ft S, Barker Rd Cent Trail parking lot #1	90.34			x	
5508M02	Barker Road Centennial Trail South, monitoring well, Spokane R. @ Barker Rd, 200 ft S, SW corner Cent Trail parking lot, Barker Rd	90.35			x	
SPK90.4	Spokane R @ Barker Rd. Bridge	90.40	x			x
5509H01	Monitoring well, USGS Well 5	92.42			x	
LIB92.7	Liberty Lake WTP	92.70	x			
USGS12420500	SPOKANE RIVER AT GREENACRES, WA (Barker Rd)	90.3		x		
SPK93.0	Spokane R @ Harvard Rd. Bridge	93.00	x			
5510C03	Monitoring well, USGS Well 18	93.06			x	
USGS12419500	Spokane R Above Liberty Br Nr Otis Orchard, Wash (Harvard Rd)	93.8		x		
5501M03	Monitoring well, USGS Well 10	94.94			x	
5501B03	Monitoring well, USGS Well 3	95.75			x	
SPK96.0	Spokane River at the Stateline Bridge,	96.00	x	x		x
SPK96.08	Spokane River about 400 feet upstream of Stateline Bridge.	96.40	x	x		
USGS12419000	SPOKANE RIVER NR POST FALLS, ID	100.9		x		
12419000	Post Falls Gage Station	100.52	x	x		
BPFD	Below Post Falls Dam	101.14	x			
APFD	Above Post Falls Dam	101.30	x			
USGS12417598	Spokane River at Lake Outlet at Coeur D'Alene ID	111.05	x	x		
CLK111.7	Lake Coeur d'Alene outlet	111.70	x			

**Table 2. Water Quality parameters measured from grab samples and vertical profiles.**

Parameter	Symbol	Units
Water Flow (inflow/discharge rates)		
Water Level		
Alkalinity	ALK	mg/L
Ammonium	NH <sub>4</sub>	
Biochemical Oxygen Demand	BOD	5 day, mg/L
Calcium	Ca	mg/L
Carbonate	HCO <sub>3</sub>	mg/L
Chloride	Cl	mg/L
Chlorophyll a	Chl a	ug/L
Conductivity	Conductivity	umhos/cm
Dissolved Organic Carbon	DOC	mg/L
Dissolved Oxygen	DO	mg/L
Fecal Coliform	Fecal Coliform	MPN/100 ml
Magnesium	Mg	mg/L
Nitrate	NO <sub>3</sub>	mg/L
Nitrate-Nitrite	NO <sub>3</sub> -NO <sub>2</sub>	mg/L
Nitrite	NO <sub>2</sub>	mg/L
pH	pH	
Potassium	K	mg/L
Silicon Dioxide	SiO <sub>2</sub>	mg/L
Sodium	Na	mg/L
Soluble Reactive Phosphorus	SRP	mg/L
Soluble Reactive Phosphorus (uncensored)*	SRP (uncensored)	mg/L
Sulfate	SO <sub>4</sub>	mg/L
Temperature	Temp	°C
Total Kjeldahl Nitrogen	TKN	mg/L
Total Organic Carbon	TOC	mg/L
Total Organic Phosphorus	TOP	mg/L
Total Organic Nitrogen	TON	
Total Persulfate Nitrogen	TPN	mg/L
Total Phosphorus	TP	mg/L
Total Dissolved Solids	TDS	mg/L
Total Suspended Solids	TSS	mg/L
Turbidity	Turbidity	NTU
Ultimate Carbonaceous Biochemical Oxygen Demand	CBOD <sub>u</sub>	mg/L
* Uncensored values are results below the laboratory reporting limit.		