



# TECHNICAL MEMORANDUM

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TO: Bellevue City Council, Denny Vidmar (Bellevue Utilities Director)

FROM: Kit Paulsen, Environmental Scientist/Watershed Planning Supervisor (x4861)

DATE: July 13, 2010

SUBJECT: What are the relative impacts of the two light rail alignments (B7 and B2M) on salmon?

## EXECUTIVE SUMMARY

Existing information was used to assess the relative impacts of the proposed B2M and B7 light rail alignments on salmon and salmon habitat and the ability to obtain environmental permits. Data regarding specific fish habitat use of Mercer Slough are limited, but the relative impacts to salmon from the alignments as proposed can be reasonably determined.

Chinook salmon (protected under the Endangered Species Act), sockeye, coho salmon and steelhead have all been documented in the Kelsey Basin, upstream of Mercer Slough. Lake Washington and Mercer Slough are considered potential foraging habitat for bull trout (protected under the Endangered Species Act).

The B2M alignment would have indirect impacts to salmon resulting from reducing the vegetated buffer along the full length of the route and potentially have a small area of direct impact to the secondary channel of Mercer Slough west of Bellefields Office Park. Given the low velocity, high temperature, and low dissolved oxygen, very few adult salmon use the secondary channel in the late summer and early fall migration period. Juvenile use of the secondary channel is likely low, as the majority of Kelsey Creek chinook are believed to rear in the stream, rather than the lake. The B2M alignment is likely to be approved for permits, but might require some mitigation for the impacts to vegetated buffers along the secondary channel.

In general, only the B7 alignment would have direct impacts to salmon. These impacts would occur at critical migration points within Mercer Slough. Given reviews of light rail bridge impacts to salmon habitat in Oregon earlier this year, it is probable that U.S. Fish and Wildlife Services, the federal fisheries agencies responsible for evaluating impacts to salmon and trout protected under the Endangered Species Act, would review the B7 alignment as "likely to adversely impact" listed species but not affect overall survival of the population. Therefore, the B7 alignment would likely still be approved for permits, but with substantially more mitigation.

In summary, either alignment would be expected to receive permits from the federal fisheries agencies. However, as currently described the B7 alignment would be expected to have substantially higher impacts to salmon habitat and require more thoughtful mitigation than the B2M alignment.

Should the northern end of the B7 alignment be modified to the East so the rail line and additional road lanes avoid the fish ladder and the southern span near I-90 be modified to avoid pilings in the main channel of Mercer Slough, the impacts could be substantially reduced.

## BACKGROUND

### Salmon Use of Mercer Slough

*What salmon use the Slough? Where do they congregate, migrate, rear and spawn?*

Mercer Slough is the mouth of the greater Kelsey Basin, which comprises the primary salmon spawning area within Bellevue (see figure 1). Chinook, sockeye, and coho salmon as well as cutthroat and rainbow trout use the main channel of Mercer Slough for migration. The Slough is the gateway to the Kelsey Basin, the primary spawning streams of Bellevue. Kelsey chinook are part of the Sammamish population and are considered important for the survival of the population even though Kelsey is not a core spawning area. Adult salmon are found in Mercer Slough from late August until December, adult trout can be found in the Slough all year. Juvenile salmon use of the Slough is unknown. It is presumed that a small portion of the juvenile chinook salmon could migrate January through March to the lake to rear. These juveniles would seek shallow shoreline habitats, which are limited in the Slough.

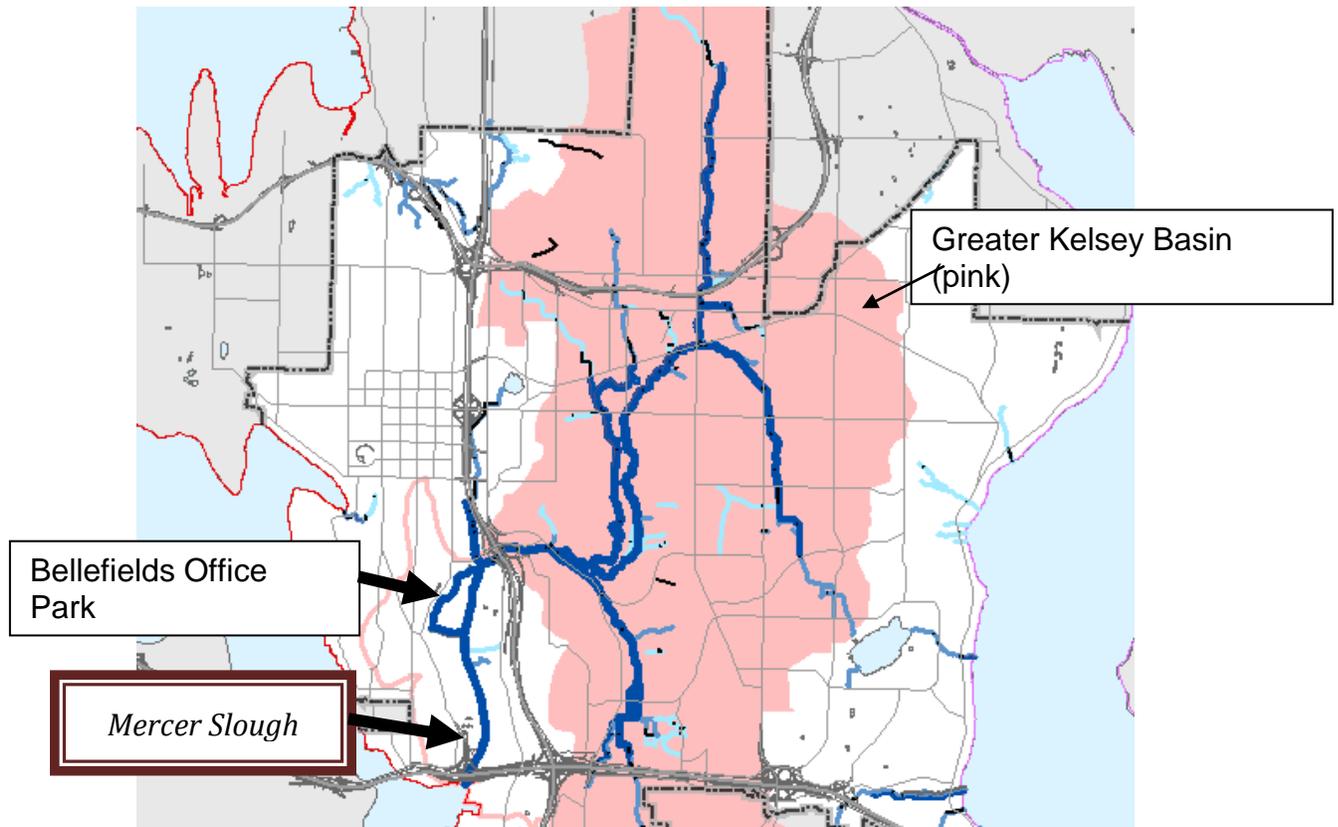


Figure 1: Greater Kelsey Basin showing salmon distribution in dark bold line, cutthroat trout in medium blue, and non-fish bearing in light blue.

Chinook, coho, sockeye, cutthroat trout, rainbow trout, and historically steelhead have been known to spawn in Kelsey Basin waters. Adult salmon use the main channel of Mercer Slough for migration in late summer, avoiding the warmer secondary channel to the east of Bellefields

Office Park. The main channel is the access point for salmon returning from Lake Washington and Puget Sound. Juvenile salmon use of the main and secondary channels is largely unknown.

The Lake Washington/Cedar/Sammamish Watershed has two chinook populations: the Cedar River chinook and the hatchery-influenced North Lake Washington/Issaquah (Sammamish) population. The core spawning (Tier 1) areas are the Cedar River mainstem, Bear Creek, and Issaquah Creek. Distribution of consistent spawning in at least two Tier 2 streams beyond the core (Tier 1) spawning streams of Bear and Issaquah Creeks is deemed necessary for the recovery of the Sammamish chinook population in the Lake Washington Watershed (Lake Washington/Cedar/Sammamish Watershed (WRIA 8) Chinook Salmon Conservation Plan Vol. 1, July 2005). The Kelsey Basin is the only urban stream that consistently has chinook spawning each year and is classified as a “Tier 2” recovery stream in the Lake Washington/Cedar/Sammamish Chinook Salmon Recovery Plan (See Figure 2).

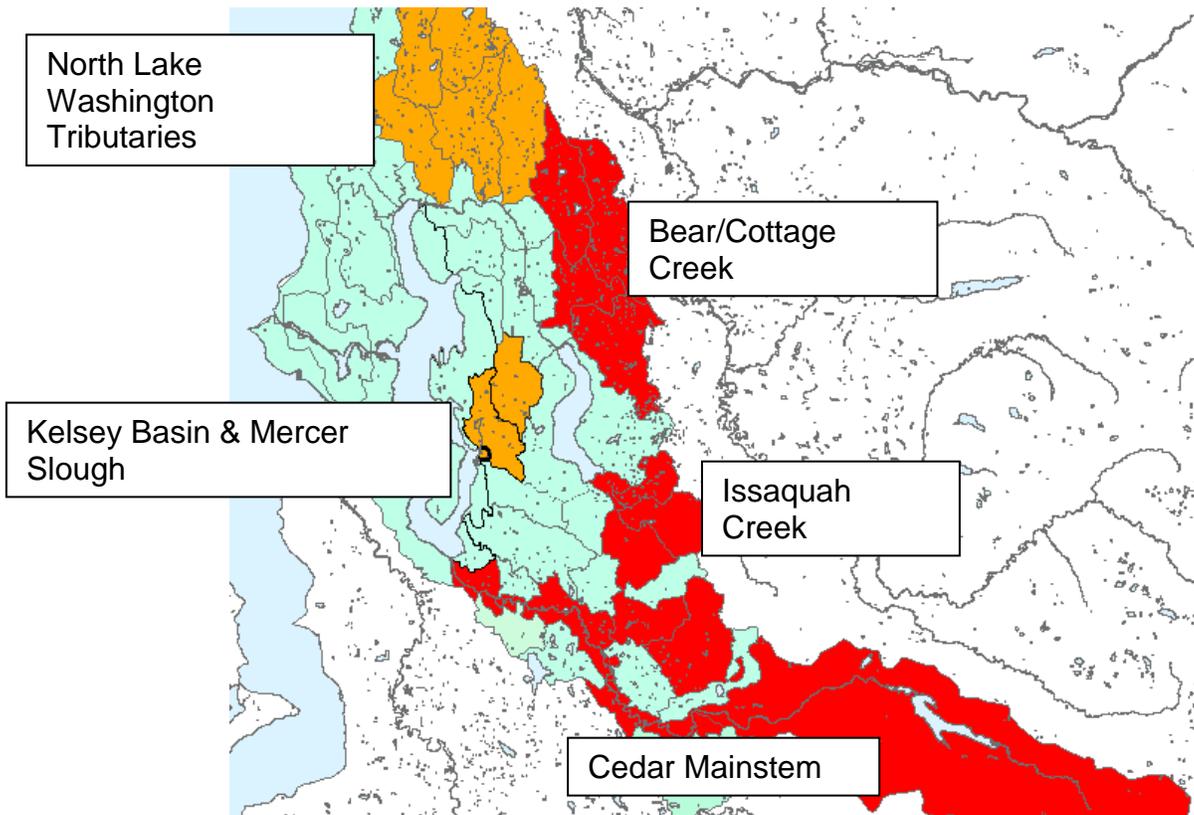


Figure 2: Lake Washington/Cedar/Sammamish core chinook spawning basins (Tier 1-red) and secondary spawning basins (Tier 2 - orange).

Adult chinook and sockeye salmon enter Lake Washington through the Ballard Locks in July and August and then typically move into their natal streams to spawn in September. Coho salmon typically migrate to the streams later, entering Kelsey Basin in October and finishing by late December. Cutthroat trout typically begin spawning in early January, with a second spawning believed to occur for approximately a month in late March or April. During tagging studies in the late 1990s, chinook were observed to hold just South of I-90 prior to moving into Mercer Slough (personal communications, Kurt Fresh, WDFW, 2000). Specific salmon

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spawning studies are conducted in the Kelsey Basin, but observations within the Slough were incidental to other studies. There have not been any formal studies that identify specific adult migration and holding areas for salmon that go through Mercer Slough.

There are two main juvenile rearing strategies in the Lake Washington Watershed: Stream rearing types stay their natal stream for 3-6 months while lake rearing types move quickly to Lake Washington (Seiler et al, 2005). Studies of chinook juvenile migration out of the streams have not been conducted for the Kelsey Basin, but they are believed to be primarily stream rearing, because of the similarities in habitat to Bear Creek, where trapping has shown the juveniles to be predominantly stream rearing chinook. Lakeshore studies of juvenile rearing in Lake Washington, show the Cedar River juvenile chinook disperse equally from the mouth of the Cedar to nearshore habitats starting in January. They utilize shallow (<3 ft) lakeshore habitat or move into small streams (Tabor et al, 2005) to rear for 3-6 months. Shallow water habitat is limited in Mercer Slough, shallow areas are predominantly found near the fish ladder and at the shallow mouth of a small tributary on the southeast side of the Slough.

Juveniles typically begin migrating along the lake shorelines to marine waters in late May or early June. NOAA Fisheries has documented that juvenile chinook move from about 9 feet depths into deeper water to avoid docks and in-water structures (Kitty Nelson, NOAA Fisheries, personal communication, 2005).

## **Light Rail Alignment Impacts to Salmon**

*Is it better to go across the Slough (B7) on pilings or along the buffer (B2M)?*

Alignment influences on salmon would occur through either direct habitat impacts or indirect impacts that affect their habitat. Direct impacts would be changes within the water areas inhabited by salmon. Secondary influences from terrestrial changes adjacent to areas used by salmon would be considered "indirect impacts."

### **Direct Impacts**

#### **B7 alignment**

Direct, in-water impacts are currently anticipated to only be encountered in the B7 alignment as it crosses Mercer Slough at the southern end of the Slough, near I-90, and potentially as it crosses the northern end, near the Mercer Slough fish ladder. This alignment would have temporary direct impacts from the construction process, as well as permanent habitat changes of the pilings and overhead structure.

This June, a light rail bridge project in Oregon received a federal biological review for potential impacts to fish listed under the Endangered Species Act (Stelle, 2010). This project was proposed for the Willamette River and two tributaries that were migration corridors for two chinook populations, two steelhead populations, a coho population, a chum population, and a green sturgeon population, all protected under the Endangered Species Act. While the Oregon project received a "likely to adversely affect" review, it further concluded that the project was "not likely to jeopardize the continued existence" of the salmon, because there was sufficient distribution of listed salmon populations that were not significantly affected by the project. The Oregon light rail project was allowed to proceed with actions to reduce or mitigate the following:



## Temporary Impacts (Construction)

- Re-suspension of pollutants from the sediments which would be disturbed by pile driving
- Hydro acoustics and pile driving (mortality due to concussion) during construction
- Fish mortality from equipment and in-water construction

## Permanent Impacts

- Permanent placement of pilings or other habitat modifications (rip-rap) within the water
- Shading from elevated structures
- Increased predation from modifications to habitat
- Stormwater runoff (water quality impacts)

While the Sound Transit light rail project proposed for Mercer Slough is not exactly the same as the Oregon light rail project, nor are the salmon uses exactly the same as these rivers, it is likely that the potential direct impacts would raise similar concerns for salmon in Mercer Slough. Estimates of how these impacts would affect Kelsey Basin salmon and trout would require further study and cannot be fully quantified without further research.

### *What happens to the fish ladder with B7?*

The B7 crossing near the Mercer Slough fish ladder is anticipated to be on columns approximately 30 feet high. Careful placement of the columns could avoid changes to the fish ladder structure, but would still raise concerns about migration delays due to the added shading and noise or vibrations of the light rail operations at a place that is already a partial delay point because of unnatural constriction of the fish ladder and the long culvert (>600 ft) with lack of ambient light under the road and highway. Migratory delays, especially in warm water, can kill or reduce viability of eggs within the female salmon, cause mortality of the adults prior to spawning, increase disease and parasites, and reduce the distance upstream that the salmon would normally migrate (Water Quality Program, 00-10-070; Groot & Marcolis, 1991).

If the transit station is moved to south of SE 8<sup>th</sup> Street, then it is anticipated that two additional road lanes would be added to 118<sup>th</sup> Ave SE to address the added traffic. The top of the fish ladder is currently approximately 35 feet to the west from the current 118<sup>th</sup> Ave SE sidewalk edge. There are state highway water quality facilities immediately adjacent on the east side of 118<sup>th</sup>. Two additional lanes would require approximately 24 feet of road surface. It is unclear where the lanes could be added without encroaching further on the fish ladder. The nature of the lane construction would need to be investigated further to identify and quantify potential permanent impacts to the shallow water habitat, culvert length, and temporary construction impacts.

### B2M Alignment

The 30 foot impacts to the vegetated buffer from I-90 to 112<sup>th</sup> Ave SE predominantly affect buffers more than 500 feet from the water. This level is beyond the general area of impact to aquatic life, though it may affect wildlife corridors or microhabitat conditions. The December 2008 Draft Environmental Impact Statement Appendix H3 Ecosystems Technical Report does not identify potential groundwater interception, as the evaluated B2 alignments were at-grade or elevated. Potential impacts to the wetlands from existing groundwater flow changes were not included as part of this assessment of possible salmon impacts of the two alignments.

According to Transportation staff, the B2M environmental work states that there will be no in-water impacts from the alignment and only buffer impacts on the East side of Bellefields Office

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Park. A secondary channel of Mercer Slough runs parallel to 112<sup>th</sup> Ave SE the full length of Bellefields Office Park. Just south of the Bellevue Office Park entry off of 112<sup>th</sup> Ave SE, the secondary channel is approximately 25 feet from the road right of way. Further investigation into the potential direct impacts of this approximately 5 X 30 foot area of potential partial encroachment of the light rail would be warranted with this alignment.

Potential impacts from this alignment for the area that would need to be considered and mitigated might include:

#### Temporary Impacts (construction)

- Erosion and turbidity
- Loss of shade and shoreline vegetation

#### Permanent Impacts

- Loss shoreline vegetation
- Bank hardening and other habitat modifications
- Disturbance to juvenile salmon rearing and winter trout habitat

This alignment has the potential to impact the secondary channel buffer of Mercer Slough. Impacts to this area may affect a portion of the small percentage of Kelsey Basin chinook juveniles that exhibit a lake-rearing life history and migrate into the secondary channel of Mercer Slough. This alignment should not substantively affect adult salmon, as they are not typically found in this area in late summer and early fall. Disruption of the secondary channel buffer may affect winter use by adult trout, but information on trout use of this channel during the cooler winter months is currently unknown.

### **Indirect Impacts**

Indirect impacts to salmon and trout would occur from wetland and buffer impacts with either the B7 or the B2M alignments. Specific indirect impacts to the wetland buffer are being reviewed through a consultant contract for wetland buffer functional values. Buffers can moderate temperature through shading and wind reduction, add organic debris for food and habitat, filter pollutants, and other beneficial actions. The influence of buffers depends on the slope of the land, the size of the water body, the types of organisms using the waters or buffer, and other site specific conditions. In general, reducing buffers on the outer edge of a large buffer have less direct impact to aquatic life than reducing vegetation buffers closer to the water.

Buffer impacts will vary not just on the quantity of wetlands impacts, as identified in the East Link Project Draft Environmental Impact Statement, but also based on the location of those impacts. For potential impacts to salmon, it would be necessary to:

- Identify the specific location and length of impact to the buffer to the Slough
- Evaluate the width and potential functions of the remaining buffer to the main channel of Mercer Slough

#### B7 alignment

The B7 alignment has indirect impacts to the buffers near I-90 to the south and near the fish ladder to the north. The southerly impact would be approximately 30 foot swath of vegetation

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reduction perpendicular to the Slough close to the current buffer impacts of I-90. There would be a second 30 foot buffer impact area parallel along approximately 170 feet at the mouth of Mercer Slough at the fish ladder.

## B2M alignment

The B2M alignment most closely affects vegetation buffers for approximately 2,500 feet along the west side of Bellefields Office Park along a secondary channel of Mercer Slough. While the secondary channel is contiguous with the main channel, the affected area is approximately 1,300 feet away from the areas known to be used by salmonids. Additional research would be needed to determine the influence of the buffer reductions to thermal conditions of the main channel. The reduction of vegetation and operational impacts to potential juvenile use of the channel is unknown and would require further research into the juvenile use of the channel and also the potential impacts of the buffer reductions. Given the limited number of lake-rearing chinook juveniles that might migrate to this area, however, the expense of this type of research may not be warranted.

## Conclusion

*Which alignment has the least impact for salmon?*

To fully answer this question, additional field research and investigation requiring substantial funding over a number of years would be needed to obtain the necessary data. These uncertainties are identified below.

- How do juvenile salmonids utilize the secondary channel habitat in Mercer Slough?
- Do the current I-90 overhead structures significantly delay adult migration into Mercer Slough and would additional overhead structure further impede migration?
- What is the impact of buffer reductions to temperature, organic contribution, pollutant filtration, and erosion control to the aquatic habitat of Mercer Slough?
- Does the temperature in the secondary channel substantively affect the main channel of Mercer Slough and increase migration delays due to high temperatures?

Only the B7 alignment is anticipated to have direct impacts to salmon habitat. These impacts would probably include permanent changes to habitat through column placement, shading, and operational disturbances that could increase predation or delay migration for both adults and juvenile salmon. Temporary damage to fish and habitat could potentially kill fish in the vicinity through de-watering or pile-driving and re-suspend pollutants from the bottom soils.

Both alignments would have indirect impacts to salmon habitat through riparian buffer reduction. The impacts to buffers from the B7 alignment would affect a smaller footprint, but the footprint would be closer to the main channel used by salmon and trout.

The B7 alignment has direct impacts to salmon habitat and additional indirect impacts to riparian buffers adjacent to salmon bearing waters. The B2M alignment has little to no direct impacts and impacts riparian buffers adjacent to waters that might have only a small proportion of potential juvenile salmon habitat and potential winter use by trout. Therefore, as alignments are currently described, the B2M alignment seems to have less overall impacts to salmon and trout in Mercer Slough.



## Literature Citations

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