



King County

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September 8, 2020

TO: Jo Wilhelm, Project Manager, Ecological Restoration and Engineering Services Unit,
Water and Land Resources Division (WLRD), Department of Natural Resources
and Parks (DNRP)

FM: Jen Vanderhoof, Senior Ecologist, Science and Technical Support Section, WLRD, DNRP

RE: Belted Kingfisher and Osprey observations at Dockton Park prior to project
construction

Jo,

As you know, the Dockton Bulkhead Removal Project was a habitat restoration project to remove 225 feet of concrete bulkhead at Dockton Park on Maury Island to restore natural shoreline conditions and forage fish spawning habitat. Approximately one week before construction was scheduled to begin, a Belted Kingfisher nest burrow was discovered approximately 5.5 feet from the end of the bulkhead that was scheduled to be demolished. An Osprey nest was also spotted in a tree rooted approximately 30 feet from the bulkhead.

Most native bird nests, including Belted Kingfishers and Osprey, are protected under the Federal Migratory Bird Treaty Act, and both these species are also protected under King County's Critical Areas Ordinance. Belted Kingfishers are a King County Species of Local Importance, whose nest sites are protected as Wildlife Habitat Conservation Areas, and Osprey nest sites are protected as Wildlife Habitat Conservation Areas. You requested I visit the site to try to determine the nesting status of both nests, because project construction would be postponed if the nests were active in order to avoid harming or potentially killing any nestlings.

This memo describes observations I made over three site visits in late July/early August. The discussion is grouped by species. The memo concludes with some "lessons learned."

Belted Kingfisher

First I'll go through the daily observations that I made then I'll discuss how some of my observations didn't align with what the literature describes.

Log of observations

Below are my observations from July 29 and 30 and August 2, 2020, and observations made by Greg Rabourn, the King County Vashon Island and Maury Island Basin Steward, on July 31 and August 9, 2020, are also included.

7-29-20, Wednesday

I arrived on site at approximately 5:50am, on Wednesday, July 29. From the upper parking lot I could hear Belted Kingfisher vocalizations in the distance while I donned my field gear. At 5:58am I entered the park from the southwest/boat trailer entrance and headed in the direction of the marina. Just before reaching the marina pier, I took a set of stairs down to the beach/tidal area and continued walking in a northeast direction under the pier and past the downed trees that were cut as part of the project. Almost immediately I saw two Kingfishers flying and calling continuously (Figure 1). I observed them for several minutes. They flew together, almost in parallel, never dipping into the water, never landing, and calling almost constantly. They flew all around the marina area, up and over the wooden structures, but not landing. They would fly further out over the water and then return, always flying together, often fully in sync, and not landing. After a while, maybe 10 or 15 minutes, they began landing on the big wooden structures occasionally (my first photo of one landed was at 6:13am). Most frequently, one would land for a fraction of a second, just barely touching down, and the other would follow it, so that the first one would fly off and the second one would touch down for a moment where the first one had been. Then the second would move on and catch up to the first in the air or at the next touch-point. These landings were initially extremely brief—a second or two at most. As I continued to watch, they made more and more landings, but rarely sat for longer than a few seconds, though the durations noticeably grew during the time I was observing.



Figure 1. Two Belted Kingfishers, flying in tandem. Early morning light resulted in silhouettes; this photo has been lightened, but coloration of breast belt is indeterminate. However, these are likely an adult male and a juvenile that were seen repeatedly this day.

You (Jo) arrived on site approximately 45 minutes after I did. Together we found the nest burrow, and no sounds of nestlings were coming from it (Figure 2).



Figure 2. Active nest burrow indicated by arrow. Second, more visible burrow in center of frame was unused. It's not unusual for a pair to have an unused burrow near the active nest. The arrow at bottom right indicates the end of the bulkhead to be removed.

I made the following observations.

1. Observations (and photos) of the first two birds revealed there was no adult female present, so these two birds were not the mated pair (Figure 1). At least one of the two was a juvenile.
2. The birds were not feeding. Because adults continue to feed their young post-fledging for a few days until they learn to fish on their own, I interpreted this lack of

fishing as normal newly fledged juvenile behavior. In retrospect, it is possible the adult male was teaching one of the juveniles to fly (that would explain the constant calling as well as the follow-the-leader touch-and-go landing behavior, none of which I could find described in any literature).

3. At about 6:45am, a third Belted Kingfisher joined the first two. It was also not an adult female. To me this meant we were seeing at least two juveniles. One of the three birds went fishing at this point. Two of the three birds are shown in Figures 3 and 4; it is not possible to know which two.
4. I saw no birds entering the nest site the 1 hour and 45 minutes I was present. Additionally, no juvenile sounds were coming from the burrow the entire time I was in the area.



Figure 3. Adult male Belted Kingfisher. Inset is different view verifying there are no rust-colored feathers on this bird.



Figure 4. Juvenile Belted Kingfisher. It can be identified as a juvenile by the rust-colored feathers in the breast band; as an adult, the band will be solidly blue-gray or only rust-colored on the margins of the blue-gray band.

Belted Kingfishers are highly territorial and not social birds, so it would be strange for unrelated birds to come into another pair's territory in the manner I was witnessing, or if one did, it would likely be chased off by one of the resident adults. I therefore concluded that I was seeing juvenile kingfishers that were newly or recently fledged from the nest burrow.

With all the evidence I saw, as described above, I concluded the nest was empty. It seemed quite obvious that the nestlings had fledged, because I saw juvenile birds with at least one adult.

However, after I left, you (Jo) heard and recorded chattering coming from inside the burrow. The nest was not empty after all. This revelation was followed by confusion and a lot of questions. The foremost question relevant to the project was whether we could determine when the nestling(s) would fledge. At this point we had no idea if the other birds had just fledged and maybe the one(s) in the nest was just a day behind. That would have been unusual, but not nearly as unusual as what ended up being the case.

I recommended that someone be on site the next morning by first light to see what transpired at the burrow – if birds exit, if so how many, and/or if adults come to the

entrance with fish to feed birds inside or entice the young to come out (which is something they do when the young are ready to fledge). But because it was not possible to have anyone present at first light, the next best option would be arriving as early as possible and spending as much time as necessary observing to look for: a bird that appeared newly fledged and looked/acted more helpless than the others; more than 3 birds flying outside the burrow (really, more than 4, because the adult female had not been seen on this first visit); birds flying in and out of the nest area, especially with fish; sounds continuing to come from the burrow, including while other birds were flying around outside. I would plan to stay far away from the burrow to conduct most of my observations in the event human presence keeps adults away from the burrow. While near the burrow I would try to be as inconspicuous as possible to hopefully hear anything that might be going on inside.

I also suggested that in lieu of someone being on site at first light, that we install a trail cam. Greg Rabourn (Basin Steward) got one from the Vashon Nature Center and went out to install it later this same day. On arrival at around 4pm, he found an unfledged juvenile Belted Kingfisher out of the nest on the sand below the burrow. It was squawking but not moving around much. (Belted Kingfishers have unique little feet with partially fused (syndactyl) outer digits that are thought to be adapted for excavating their burrows but are not made for walking, so it wasn't unexpected this bird could not walk well.)

In the event there were more unfledged nestlings still in the nest, Greg installed the trail cam. It was placed about 12 inches away from the burrow entrance, aimed directly at the entrance.

Our new focus became when the displaced nestling might it fly, and whether there were others still in the nest.

7-30-20, Thursday

The next morning I was in the park at 5:45am, and 5 minutes later at 5:50am I heard the first kingfisher of the morning. As I drew near to the pier at 5:54am, I realized two kingfishers had been perched or roosting on the northern railing. I spooked one and it flew off to the south, possibly circling under the pier. I lost sight of it immediately. The second bird, a female (Figure 5), flew to the other railing but did not flush. About a minute later, three kingfishers flew in together from the northeast, while the female was still on the railing. I lost track of the one that flew off the railing, so I cannot confirm I saw five total, though it seemed likely given the three that flew in from the northeast came together as a group.

Initially I took this bird to be the adult female, because none of the other birds had the rust-colored band all the way across the breast, and according to some resources, the band does not fully connect in some juvenile females when they are newly fledged. While writing this memo and examining my photos, I realized that the adult female was a different bird that I would not see or photograph until Sunday. What is noteworthy about this observation is that I conducted two site visits without ever seeing the adult female.



Figure 5. Female kingfisher on pier railing, first thing Thursday morning. This bird would be subsequently confirmed as a juvenile after identifying a separate bird as the adult female plus seeing the juvenile coloration of the top band in better light.

At 6am two kingfishers began flying loudly in and out of the nest area. One bird, which appears to have been the adult male, was observed fishing, though I never confirmed fish being taken to the burrow. The two birds flew in tandem much of the time, like two of the birds did the previous morning. However, one of these kingfishers was a juvenile not seen or photographed previously (Figure 6).



Figure 6. Juvenile Belted Kingfisher. This juvenile is different than the ones seen yesterday, as the rust-colored markings on the flanks are more extensive.

The unfledged nestling had survived high tide and raccoons during the night and was still present below the burrow (Figure 7). It was able to ambulate, but it was nowhere near being ready to fly. It would call, and other birds would come in and call back loudly. I don't know if adults were feeding the nestling; I did not see any bird carrying a fish, but other birds were in and out of the area a lot and could have been taking fish. I walked down the beach close to where the nestling was at approximately 7am; the unfledged bird seemed highly stressed so I did not stay long. At approximately 8am, I approached the area from the bulkhead. I never heard sounds coming from the burrow. It was loud with the nestling and adult(s) calling, so sounds from within the burrow could easily have been missed. I reported no sounds from the burrow, but in retrospect I realize the amount of noise occurring would make it difficult to accurately determine whether some of the noise was coming from within the burrow.



Figure 7. Belted Kingfisher nestling that had left the burrow prematurely, prior to fledging.

At 8:45am I saw three kingfishers simultaneously and photographed them (Figure 8).



Figure 8. Three individual Belted Kingfishers seen on Thursday, July 30. Left bird is juvenile; center bird juvenile; right bird adult male. It is unknown if the center bird caught the fish itself or if the adult male delivered it.

By the time I went to leave on this morning, I had the impression the displaced nestling was the only bird of concern. The behavior and composition of the multiple birds seen were a puzzle, and we were trying to solve the puzzle to determine when the nestling might fledge, provided it survived tides and raccoons long enough.

7-31-20, Friday

Greg returned to the site the following morning, and the nestling was gone. Raccoon tracks were abundant, so it is assumed the young bird was taken by a raccoon. Importantly, Greg heard the sound of another nestling in the burrow. The nest remained active.

We began trying to understand when the remaining nestling(s) might fledge. The trail cam captured photos of it coming up to the edge of the burrow to receive fish from its parents (Figure 9). The literature (see Kelly et al. 2020¹) says that by day 16² nestlings will come up to the edge to be fed when the parents come in. Under normal circumstances, Belted Kingfishers lay their eggs about a day apart, but the female does not start brooding until all the eggs are laid, so they hatch at approximately the same time. Therefore it would make sense that the two nestlings would be about the same age. Assuming the dead nestling had fallen from the burrow when it first began approaching the edge when it was 16 days old, and considering fledglings depart from the burrow 27–29 days after hatching, I estimated the current nestling would fledge on approximately Saturday, August 8, which would mean construction would be delayed for the whole week if this were true.



Figure 9. Trail camera image capturing an adult bringing a fish to the begging nestling.

¹ Kelly, J.F., E.S. Bridge, and M.J. Hamas. 2020. Belted kingfisher (*Megasceryle alcyon*), version 1.0. In Poole, A.F., Ed. Birds of the world. Cornell Lab of Ornithology, Ithaca, NY, USA. <https://doi.org/10.2173/bow.belkin1.01>. Note the citation is dated 2020 because of a change of version from Birds of North American to Birds of the World. It appears the last time the document was updated was 2009.

² By day 16, nestlings also reach the same body weight as adults.

8-2-20, Sunday

I returned early Sunday morning. The tide was higher than on my previous visits, and the morning started out pretty quiet in terms of bird activity. I saw one silent kingfisher at 6:05am. Then at 6:15am, three kingfishers came in to the area but did not go near the nest site.

At 6:30am, two kingfishers began going in and out of the nest area, and for the first time I saw the adult female carrying fish to the nest (Figure 10). Photographs also confirm the adult male present. At least one nestling was still in the burrow, and both parents were tending to it. It is noteworthy this was my third visit but the first time I saw either, let alone both, adults feeding young.

The adult female was accompanied on some of the nest visits by a juvenile appeared to be one of the juveniles seen Thursday and shown in Figure 6.



Figure 10. Adult female with a fish for the nestling.

8-9-20, Sunday

I conducted no additional site visits prior to fledging. Greg Rabourn continued to monitor the trail cam until he captured the moment of fledging of a single Belted Kingfisher from the nest burrow on Sunday, August 9, at 8:45am (Figure 11).



Figure 11. The last nestling leaving the nest for the first time.

Confounding factors

Although this story seems relatively straightforward and simple to discern now, in real time we did not have the benefit of hindsight nor of all the information we have since pulled together on Belted Kingfishers. And even at the time of writing this memo, some things still don't align with what the literature indicates. This section discusses several apparent discrepancies between the available literature and what we saw, discrepancies that added confusion as we tried to determine what was happening at the nest site.

1. Nest site visits. I didn't see either adult taking fish to the nest site on the first or second visit. Not seeing this behavior was one of the main reasons I initially thought the nest was empty, because one of the best ways to determine if an active nest is present is by seeing the parents take food into the nest. This disparity might be explained by unlucky timing on my part, though I was present early in the morning, when feeding should have been most frequent, according to both logic (they'll be hungry first thing in the morning) and the literature (for example, Hamas 1975³). Mousley (1938⁴, as cited in Kelly et al. 2020) observed nestlings unattended for as long as 2.5 hours. A minimum standard observation time frame, such as 3 hours, if established for future Belted Kingfisher nest verification, might yield more reliable observations.

³ Hamas, M.J. 1975. Ecological and physiological adaptations for breeding in the belted kingfisher (*Megaceryle alcyon*). PhD Thesis. University of Minnesota. 86pp.

⁴ Mousley, H. 1938. A study of the home life of the Eastern Belted Kingfisher. Wilson Bulletin 50:1-12.

2. Nestling mortality. That a Belted Kingfisher nestling at Dockton Park left the nest burrow prematurely and subsequently died is not in dispute. However, I could find no other records in the literature on premature exiting of the burrows as a cause of death. That said, the literature detailing nest observations is relatively thin. Furthermore, according to the peer-reviewed literature, in the absence of flooded nest burrows, nest success is extremely high (extremely low mortality). For example, in Minnesota Hamas (1975) reported fledging success of 97 percent at 29 nests over four breeding seasons (and no nest failure from predation). Most of the peer-reviewed literature on nestling mortality only comes from one or two papers, so it is likely the information on mortality is not comprehensive. In fact, a report produced for General Electric⁵ in Massachusetts that provided detailed information on a study where 10 nest sites were regularly monitored sheds additional light on mortality factors of Belted Kingfishers. Of those 10, three were destroyed by predators (and in one case the two adults were also killed). An additional nest site was lost to human disturbance. Of the remaining six nests, one nestling went missing from one, two to three died in another (cause unknown), and at only four sites did 100 percent of nestlings survive to fledging. These findings suggest that (1) in addition to flooding, predation has the potential to impact kingfisher nest success, and (2) individuals from a nest may die for various reasons (for example, Hamas documented a 5-day-old nestling that died when it was fed a fish too large to swallow, and it appeared to die of asphyxiation).
3. Evidence for a unique family structure. During my visits, I saw a total of four to five kingfishers flying around this territory, usually two at a time, but sometimes three together and occasionally with a fourth nearby. Juveniles and adults were both there together and interacting with one another while there had been two (then one) nestlings in the burrow. Given how territorial this species is, and given the fact that I saw adults flying with the juveniles and apparently still feeding them while also taking fish to the one remaining nestling, it seems almost certain the fledged juveniles and nestling(s) must have been from the same adult pair. Further, multiple elements of my observations point towards fledged and unfledged juveniles all being from the same nesting period:
 - The literature states that Belted Kingfishers typically have one clutch per breeding season unless a nest was destroyed early on. It is possible but improbable these birds are from different nesting cycles of the same parents.
 - Kelly et al. (2020) states that that fledglings stay with their parents for 3 weeks after emerging from the burrow. When the juveniles are able to feed themselves, the adults disperse. If the juvenile birds were from a first nesting, and the nestlings were from a second nesting, these juveniles would be hanging around much longer than 3 weeks. The fact that the juveniles were

⁵ Henning, M.H., and R.P. Brooks. 2002. Productivity and density of belted kingfishers on the Housatonic River. Prepared for General Electric Company.

typically in the company of at least one adult suggested they were recently fledged and still learning to feed themselves.

- If this nest site were like the literature describes, we would be seeing only juveniles or nestlings, but not both: females lay eggs about a day apart but don't start brooding the whole clutch until all the eggs are laid, so they all hatch within 18 hours of each other. According to Kelly et al. (2020), asynchronous hatching is exceptional. In other words, birds from a Belted Kingfisher nest should all be about the same age.
- In Washington 4-6 eggs per nest has been reported (Jewett et al. 1953⁶, as cited in Kelly et al. 2020), and elsewhere 6 or 7 is most common (Bent 1940⁷). Therefore, if this nest site matched the literature, we would see either more than 2 nestlings or likely more than 3 recently fledged juveniles. However, mortality might be a larger factor than the peer-reviewed literature indicates, so these lower numbers of fledglings and nestlings might not be as unusual as the literature suggests.
- After considering all these observations, it seems that the juvenile birds and the nestlings were all from the same clutch, but that the eggs were laid asynchronously. My first visit was July 29, and if we assume the juveniles I saw that day had fledged 4 days earlier on July 25 (a rough estimate based on physical characteristics and level of ability to fly but seemingly not feed themselves yet), and the one surviving nestling fledged on August 9, that means their age difference was ~15 days, assuming they spent the same amount of time in the nest. It takes approximately 28 days from hatching to fledging, so the older and younger birds would have shared a nest chamber for about 2 weeks. (This anomaly might also have something to do with why one of the nestlings left the nest burrow prematurely.) If this scenario were the case, the adults would have needed to feed the newly hatched young regurgitated food while feeding the older chicks fish; the brooding schedule would have been unique, as the adult female would have brooded the younger chicks at a time when she would not have been brooding the older chicks; and the chicks of different ages and development stages would have had to survive together in the same nest chamber.
- Another explanation would be that instead of the asynchronously laid eggs all being laid and hatched in the same nest, that the female laid eggs a couple weeks apart in two different nest chambers. There was a second burrow present, and although a second burrow is not unusual, using both for

⁶ Jewett, S. G., W. P. Taylor, and J. W. Aldrich (1953). *Birds of Washington State*. University of Washington Press, Seattle, WA, USA.

⁷ Bent, A.C. 1940. *Life histories of North American cuckoos, goatsuckers, hummingbirds, and their allies; orders Psittaciformes, Cuculiformes, Trogoniformes, Coraciiformes, Caprimulgiformes, and Micropodiiformes*. United States National Museum Bulletin 176. Smithsonian Institution. 506 pp.

differently aged chicks would be somewhat unusual. There may be one other record of such an occurrence. Kelly et al. (2020) cites Davis (1980)⁸ for the following statement: “In one instance, a female initiated a second clutch in mid-June while her mate was attending their first brood.” I am unable to currently get a copy of this Davis (1980) thesis because interlibrary loan is currently closed because of the Covid-19 pandemic. Without additional information, it’s not possible to know whether the situation Davis observed might have been similar to this one at Dockton. All that said, when these burrows were first observed on July 22, the second burrow had spider webs in it and gave the appearance of not having been used recently.

4. Paired flying. On the first visit on the 29th, I saw two kingfishers flying nonstop, often in sync, all around the marina, calling almost continuously and not landing at all initially. The lighting that morning made it difficult to determine the age and sex of the two birds (clearly no adult females were present, and at least one juvenile was present, but it’s unclear if the other bird was the adult male or another juvenile). On days 2 and 3 I also saw pairs of birds flying together, but they would travel much greater distances and often visit the nest with a fish. On the August 2 visit, I confirmed an adult female and a juvenile bird flying together in this fashion—the female taking food to the nest while the juvenile sat nearby and otherwise flew all over with her. It now seems most likely that on the first day I was witnessing an adult giving flying lessons to one of the juvenile birds.

⁸ Davis, W.J. 1980. The Belted Kingfisher, *Megaceryle alcyon*: Its ecology and territoriality. M.Sc. Thesis, Univ. Cincinnati, Cincinnati, OH.

Osprey

7-29-20, Wednesday

On visiting the site on the first day, one female Osprey, likely adult, was seen perched near the large nest on a dead-top tree (Figure 12). No Osprey were seen in the nest itself during the hour and 45 minutes I was present. I deemed the nest empty.



Figure 12. Female Osprey, age unknown, perched on dead-top tree near the nest tree.

7-30-20, Thursday

My primary focus this day was on the Belted Kingfishers, as I had declared the Osprey nest empty the previous day. Osprey could be heard and seen in the area, but not at the nest. But at 8:15am, as I was planning to leave for the day, I noticed one Osprey sitting in the nest and another perched nearby. Then a third Osprey came flying in with a fish, appeared to go into the nest, but then left the nest still carrying the fish (Figure 13). I waited but did not see it return. Eventually all three birds left.



Figure 13. Osprey that had been in the nest walked up to the edge and sat (upper left corner). Another Osprey perched nearby out of the camera frame. A third Osprey, a female, flew into the nest with a fish then flew back out and away, as seen in the photo, lower right.

Not knowing what I had just witnessed, I began to wonder whether there might be a nestling still in the nest that I simply could not see from my angle. If so, I would expect a lot more activity—more visits from the adults bringing food. On my way to my car 45 minutes later at 9am, I saw one Osprey flying towards the nest with a stick (Figure 14). I further began to wonder if the nest might actually still be active.



Figure 14. Osprey carrying a stick back towards the nest.

I talked with Bud Anderson, a local raptor (birds of prey) expert. He said that this timing is about when young would be fledging. If there were one or more nestlings in the nest, I would have expected to be able to see or hear them or both as they would be fully grown, and I would expect the adults to be present occasionally bringing food. When I told Bud of the repeated days of seeing no young in the nest, he said it sounded empty to him. He said that Osprey will fly in and out of other Ospreys' territories, so there are a few possible explanations to what I saw. It is possible, for example, I saw unrelated Osprey from nearby flying in to check out what was happening near the nest. It's also possible I saw the female adult bringing fish in for a fledged juvenile and landing somewhere out of my vision. According to Bierregaard et al. (2020)⁹, the young will often remain at or near the nest after fledging for up to several weeks to continue to be fed by the parents.

⁹ Bierregaard, R. O., A. F. Poole, M. S. Martell, P. Pyle, and M. A. Patten (2020). Osprey (*Pandion haliaetus*), version 1.0. In *Birds of the World* (P. G. Rodewald, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA. <https://doi.org/10.2173/bow.osprey.01>

Bud also said that Osprey nest failures are somewhat common, and that this one could also be a failed nest. That is most relevant with regards to the adult I saw carrying a stick to the nest. According to Bierregaard et al. (2020), adults will continue to bring sticks to the nest after nest failure, and additionally that nests get flattened over the course of a nesting period such that they are generally flat by the time the young fledge. This nest did not appear to be flat (Figure 15).



Figure 15. Empty Osprey nest.

7-31-20, Friday

Greg saw no Osprey in the nest when he was on site Friday.

8-2-20, Sunday

My primary focus this day was to confirm the Osprey nest was not active. I brought a scope along with binoculars and camera with long telephoto lens. I neither saw nor heard any Osprey activity whatsoever this morning. I was on site for 2 hours from 6am to 8am, and the complete lack of any sign of an Osprey confirmed the nest as empty.

Lessons learned

It was quite challenging trying to piece together in real time what was happening on site with these two species, and commonly used and readily accessible literature often did not address our specific questions. Becoming an expert in a single species takes a great deal of time, often years, spent observing the species, studying it, reading books and papers written about it. Only then does one begin to see all the intricacies of behavior and those things otherwise deemed anomalous from a person whose only available resources are field guides and a few peer-reviewed papers, which typically examine very narrow questions. Confounding the lack of species-specific expertise is the fact that a great deal of the basic scientific research on many North American birds was done decades ago, so I was unable to identify any readily accessible experts in these two species that I could reach out to across the country. I was able to speak with an expert in raptors, who offered his thoughts on the Osprey. I sought other avenues of connecting with experts but was unsuccessful. I went into these surveys with general understanding of bird nesting behavior, and I was foiled several times in my attempts to discern nest activity. From this experience I learned several things and would make some associated recommendations for future work:

- Gaps in knowledge. The literature is not always complete. Maybe someday I'll discover descriptions of the Belted Kingfisher and Osprey behavior I saw, but I am currently unable to find anything that adequately explained it, with the possible exception of the Davis (1980) thesis, which I am unable to obtain currently. As much as we know about birds, there is probably ten-fold the amount of information we don't know. Additionally, nesting birds of different species share some things in common, but each species will have its own unique characteristics. Therefore, nothing should be assumed or taken for granted when monitoring nests. Enough time should be built into any such bird nest monitoring effort to allow for accessing and reading as much relevant literature and books as feasible. Birds of the World online is an excellent resource, though it requires a paid subscription, which the County currently does not have. It also does not appear to include gray literature, where valuable observations can often be found.
- The human dimension. It was admittedly challenging to view the situation objectively knowing construction was supposed to begin in a few days. I wanted the nests to be empty, and in retrospect I was not as thorough on the first day as I should have been (though in my own defense I thought seeing fledged young was a pretty clear sign the nest was empty), and even on the second day I missed hearing the nestling in the burrow. To ensure greater objectivity in future studies, I would

recommend implementing standard nest monitoring protocols that include minimum observation times and other requirements intended to avoid false negatives. Standard protocols should include field data sheets with specific questions or checklists to ensure as much relevant information is being collected as possible and recorded in an easily translatable template.

- Wildlife critical areas. Although not required by regulations, it might be helpful to confer with a wildlife biologist very early in the project design process to identify habitat types at the construction site and corresponding potential nesting birds. Then if construction is scheduled to begin in spring or summer, it would be ideal to conduct nest surveys a few weeks in advance of construction in order to avoid surprises. With enough time, trail cameras could also be employed (see next bullet) to provide information and safe staff time.
- Use of trail cameras. If nests are found early in the nesting process, it might be possible to use trail cams to determine what stage nesting is in to better anticipate when fledging will occur. Trail cams are extremely useful and could be employed more regularly to determine wildlife presence, especially the presence of species protected under local and Federal regulations.
- On Belted Kingfishers specifically. Belted Kingfisher nestlings can be silent in their nests for long periods of time. Silence does not mean the nest is empty. Using trail cams or longer visits may be required to detect the presence of nestlings. Additionally, the adult Belted Kingfishers at Dockton appeared to be extremely wary of humans. They seemed to generally avoid the nest area when they detected people nearby. If close-up viewing of a kingfisher nest is needed in the future, a blind may be a useful tool.

Thank you for the opportunity to participate in the Dockton Bulkhead Removal Project.

If you have any questions, please feel free to contact me at 206-477-4840 or jennifer.vanderhoof@kingcounty.gov.