BUTTERFIELD Melinda * DSL

From: Jay Dirkse <jasond@gretteassociates.com>
Sent: Friday, December 18, 2020 9:26 AM
To: Lauren Senkyr - NOAA Affiliate; Jen Kassakian; BUTTERFIELD Melinda (melinda.butterfield@state.or.us); 'Melody White' (Melody.J.White@usace.army.mil); Wagner, Andrea R CIV USARMY CENWP (USA); RUDENKO Melody
Cc: Andy Gregg
Subject: RE: Linnton Mill Restoration Site Year 1 monitoring report (NWP-2014-477; 58909-RF; 59636-MBI)

Not having heard from any of you with alternate upload locations, the Year 1 report can be downloaded here:
https://gretteassociatesc-my.sharepoint.com/:f:/g/personal/jasond_gretteassociates_com/Erij32QtwMNIsTSPD-s9mRsBgMvlFApRcRvzA7WzJ1qYXA?e=frR8PD
Please let me know if you encounter any problems downloading, and direct any questions or concerns with the report to me.
Merry Christmas and happy holidays!

Jay Dirkse – Biologist
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Celebrating 18 years of providing natural resource services to the Pacific Northwest

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From: Jay Dirkse
Sent: Thursday, December 17, 2020 1:31 PM
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Cc: 'Andy Gregg' <andyg@restorcap.com>
Subject: Linnton Mill Restoration Site Year 1 monitoring report (NWP-2014-477; 58909-RF; 59636-MBI)

All,
I wanted to let you know that the Linnton Mill Restoration Site Year 1 monitoring report is just about finished and ready to submit. If any of you have a preferred upload website, please let me know and I'll be sure to upload it there. Otherwise, I will upload it to our Sharepoint site and send out a download link. I hope to have it ready by COB tomorrow.
Thanks,

Jay Dirkse – Biologist
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LINNTON MILL RESTORATION SITE
(NWP-2014-477; 58909-RF; 59636-MBI)

YEAR 1 (2020) MONITORING REPORT

PREPARED FOR:

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DECEMBER 18, 2020

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Attachment 3. Bird Assemblage Monitoring Datasheets

1 INTRODUCTION AND SUMMARY

This document has been prepared to present the results of Year 1 monitoring at the Linnton Mill Restoration Site (Site). Per the Restoration Plan (Exhibit B), Table 1 presents a brief summary of performance standards that were to be monitored in Year 1, and a summary of the results of monitoring. A more detailed discussion of Year 1 monitoring is presented in Section 2, and detailed results presented in Section 4.

Table 1. Summary monitoring results

Monitoring Element	Performance Standards	Met?
Geomorphic/ Structural Habitat Elements	A6. Off-Channel Habitat (OCH) and ACM within 10% of as-built area	• YES (Section 4.1.1)
	A7. Increase in elevation in OCH <20%	• YES (Section 4.1.2)
	A8. Increase in elevation in ACM <20%	• YES (Section 4.1.2)
	A9. Fish access: • No physical conditions that prevent fish access to the OCH • OCH channel gradient < 4% slope • Jump heights will not exceed 6 inches • The Linnton Creek culvert discharge 11/1-6/30 • Linnton Creek thalweg remain wetted during low water.	 • YES (Section 4.1.3.1) • YES (Section 4.1.3.2) • YES (Section 4.1.3.3) • YES (Section 4.1.3.4) • YES (Section 4.1.3.5)
	A10. Presence of at least 80% LWD	• YES (Section 4.1.4)
Hydrology and Hydraulics	B1. Area of 50% inundation within 20% pf as-built condition.	• YES (Section 4.2.1)
Vegetation	***Riparian/Upland Forested*** • C8. > 1,200 native woody stems per acre. • C9. > 3 native tree species and 5 native shrub species. • C10. Cover: ○ ≥ 10% native herbaceous ○ ≤ 30% non-native herbaceous ***Off-Channel Shrub*** • C11. > 1,200 native woody stems per acre. • C12. > 5 native shrub species. • C13. Cover: ○ ≥ 10% native herbaceous ○ ≤ 30% non-native herbaceous ***Off-Channel Emergent*** • C14. > 5 native emergent/herbaceous species. • C15. Cover: ○ ≥ 30% native herbaceous ○ ≤10% non-native herbaceous	 • NO (Section 4.3.1) • YES (Section 4.3.1) ○ YES (Section 4.3.1) ○ YES (Section 4.3.1) • YES (Section 4.3.2) • NO (Section 4.3.2) ○ YES (Section 4.3.2) ○ YES (Section 4.3.2) • NO: None ○ NO: None ○ YES: None
Water Quality	N/A	Section 4.4
Fish and Wildlife	Fish monitoring—usage, size (no performance standard)	Salmonids <60mm present (Section 4.5) Lamprey: USFWS to collect/ report separately.
	Bird assemblages (no performance standard)	207 bird sightings, 18 spp (Section 4.6)
Photo Monitoring	Photographs (no performance standard)	Attachment 1

2 MONITORING ACTIVITIES AND PERFORMANCE STANDARDS

The monitoring program is presented in the Site-Specific Performance Plan (SSPP) for the site, Exhibit B of the Restoration Plan (Grette Associates 2018). Please refer to that document for full details on the monitoring plan. Below are the monitoring questions posed in the SSPP, the monitoring activities employed to answer those questions, and the applicable Year 1 performance standards to gauge success.

2.1 GEOMORPHIC/ STRUCTURAL HABITAT ELEMENTS MONITORING

Below are the monitoring questions related to geomorphic/structural habitat, and following each question is the corresponding performance standard applicable for Year 1.

- Is the restoration site meeting its interim performance standards (IPSs)?

  A6: Total area of Off-Channel habitat or ACM habitat within 10% of the as-built condition (minimum 0.5 ft)

- Is the total quantity of Off-Channel and ACM habitat that was created being retained over time?

  A7: Increase in elevation within the Off-Channel habitat of no greater than 20%

  A8: Increase in elevation within the ACM habitat of no greater than 20%

- Are the fish able to enter and exit the site?

  A9: No physical conditions that prevent fish access to the Off-Channel habitat:

  - ***The channel gradient throughout the off-channel habitat will not exceed 4% slope and jump heights will not exceed 6 inches,***
  - ***The Linnton Creek culvert outlet will discharge from November 1st through June 30th, when juvenile Chinook are likely present in the Willamette River, and***
  - ***The channel thalweg downstream of Linnton Creek will remain wetted during low water conditions in Years 1 through 10.***

- Are habitat elements being retained on site?

  A10: Presence of at least 80% of the total number of large woody debris/structural habitat elements that were placed below the 100-year flood elevation, including any volunteer LWD ≥18" diameter and ≥30' length.

2.2 HYDROLOGY AND HYDRAULICS

Below are the monitoring questions related to hydrologic/hydraulics, and following each question is the corresponding performance standard applicable for Year 1.

- What is the total area of the site that is inundated by the river during periods of high flow?

  B1: Areal extent of the 50% inundation level within 20% relative to the as-built condition.

2.3 VEGETATION MONITORING

Year 1 vegetation monitoring is intended to track vegetational development to ensure that planted species are establishing as intended. Year 1 monitoring is critical for identifying initial design problems or shortfalls and set the site up for success into the future. Below are the monitoring questions related to vegetation, and the applicable Year 1 performance standards.

- Is vegetation developing in a way that will ultimately generate a native assemblage of appropriate vegetation types?
- Is the restoration site meeting its interim performance standards (IPSs)?

Riparian/Upland Forested

C8: ***A minimum of 1,200[1] native woody stems per acre.***

C9: ***At least 3 native tree species and 5 native shrub species.***

C10: ***Cover (during the first 5 years, trees/shrubs will be excluded from percent cover):***

- ***≥ 10% native herbaceous***
- ***≤ 30% non-native herbaceous***
- ***The remaining percentage of cover can be made up of bare ground, rocks or native herbaceous.***

Off-Channel Shrub

C11: ***A minimum of 1,200[1] native woody stems per acre.***

C12: ***At least 5 native shrub species.***

C13: ***Cover (during the first 5 years, shrubs will be excluded from percent cover):***

- ***≥ 10% native herbaceous***
- ***≤ 30% non-native herbaceous***
- ***The remaining percentage of cover can be made up of bare ground, rocks or native herbaceous***

Off-Channel Emergent

C14: ***At least 5 native emergent/herbaceous species.***

C15: ***Cover (during the first 5 years, trees/shrubs will be excluded from percent cover):***

- ***≥ 30% native herbaceous***
- ***≤10% non-native herbaceous***
- ***The remaining percentage of cover can be made up of bare ground, rocks or native herbaceous.***

[1] The Oregon DSL Removal/Fill permit requires 1,600 stems/acre in the.

2.4 WATER QUALITY MONITORING

Below are the monitoring questions related to water quality. No performance standards are associated with this question, but the methods used to address the question are presented below.

- Is water quality at the site improving over time and comparable to an appropriate reference condition?

  Conduct continuous water temperature monitoring, and periodic dissolved oxygen level monitoring, in the off-channel habitat.

2.5 FISH MONITORING

Fish presence monitoring was required in Year 1 to determine if fish species are using the site. No performance standard was associated with this monitoring component; results were only informative in nature.

- Are native fish using the newly restored habitat?

  Conduct snorkeling or beach seining to determine fish use.

2.6 BIRD ASSEMBLAGE MONITORING

Bird assemblage monitoring was required in Year 1 to characterize bird use of the site and compare to pre-construction usage. No performance standards are associated with this question, but the methods used to address the question are presented below.

- What birds are using the site? Do changes in the bird assemblage, diversity and abundance at the site indicate that habitat quantity and quality have improved?

  Conduct bird surveys during spring to determine all species and abundances of birds that use the site.

3 MONITORING METHODS

3.1 GEOMORPHIC/ STRUCTURAL HABITAT ELEMENTS MONITORING (A6 THROUGH A10)

A6: Total Area of Off-Channel and ACM Habitat

The total area of off-channel habitat or ACM habitat was measured by conducting a focused topographic survey of these areas along pre-determined cross sections (Figure 1). Topographic surveys were conducted at these cross-section locations using field surveying equipment, with elevations collected every 3 meters. As part of these surveys, the location of OHW was determined. The total area connected by these points along the transects was used to determine changes in ACM and Off-Channel habitat[1]. The performance standard allows for changes less than 10%.

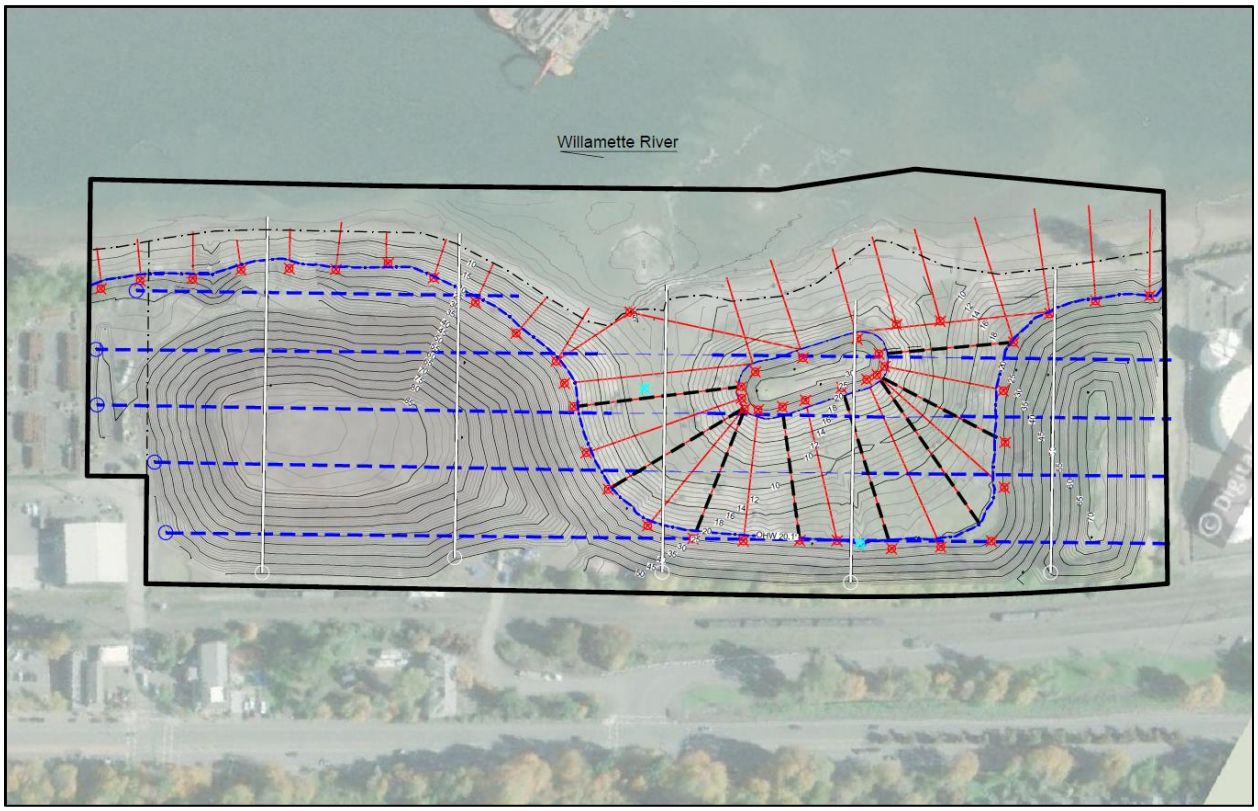


Figure 1. Monitoring transects (from As-Built Report Attachment 3, Figure 8).

A7 and A8: Increase in Elevation within Off-Channel Habitat and ACM

The focused topographic survey described above was also used to detect changes in elevation within the Off-Channel and ACM habitat zones. Topographic data were collected along the pre-determined transects were used to compare with the as-built elevations at the same location. The

[1] Since total habitat area was calculated using limited sampling points rather than a full topographic survey and resulting high precision contours, the total area may differ from the acreages reported in the as-built report. However, Year 1 and as-built acreages compared herein will both be from the limited subset of sampling points, and thus comparisons will be in-kind.

performance standard allows for changes less than 20%. This was defined in the Restoration Plan as follows:

> *Performance Standards A7 and A8 measure percent change in elevation. This will be measured relative to elevation below OHW (+20.1 ft NAVD88). For example, if the elevation is +10 ft, the distance below OHW is 10.1 ft; thus a 20% increase will be ~2 ft and an elevation of greater than +12 ft will exceed this performance standard (Table 2). If the elevation is +15 ft, elevation below will be 5.1 ft and 20% change will be ~1 ft, or +16 ft NAVD88. The minimum elevation change that will trigger review is 0.5 ft.*

Table 2. +20% Change from Select Elevations.

Elevation	Feet below OHW	20%	Compliance Elevation (i.e. 20% increase)
+5 ft	15.1	3.0 ft	+8.0 ft
+6 ft	14.1	2.8 ft	+8.8 ft
+7 ft	13.1	2.6 ft	+9.6 ft
+8 ft	12.1	2.4 ft	+10.4 ft
+9 ft	11.1	2.2 ft	+11.2 ft
+10 ft	10.1	2.0 ft	+12.0 ft
+12 ft	8.1	1.6 ft	+13.6 ft
+14 ft	6.1	1.2 ft	+15.2 ft
+16 ft	4.1	0.8 ft	+16.8 ft
+18 ft	2.1	0.5 ft	+18.5 ft
+20 ft	0.1	0.5 ft	+20.5 ft

An alternative evaluation method of quantifying percent change is proposed herein: at each monitoring transect, the cross section is mapped and overlaid with the as-built cross section. The percent change is measured by the cross-sectional area above the ground surface and below the OHW elevation (i.e., "area over the curve"), then compared to the same from the as-built survey. For the purpose of performance standards, any cross section where the Year 1 area is over 20% smaller than the as-built area will result in performance standard failure. Additionally, any specific locations along the cross sections that exceed 20% change per Table 2 above table will be addressed in greater detail.

A9: Fish Access

Performance Standard A9 assesses fish access to the site by a variety of metrics. Specifically, the channel gradient cannot exceed 4% slope and jump heights cannot exceed 6 inches, the Linnton Creek culvert outlet will discharge from November 1st through June 30th, and the channel thalweg downstream of Linnton Creek will remain wetted during low water conditions in Years 1 through 10.

Changes in gradient will be measured using the topographic survey described above. The gradient of the off-channel habitat was constructed at a gradient of less than a 1% throughout. Jump heights were assessed through a low-tide visual survey, looking for any vertical drops greater than 6 inches. Photo points (Attachment 1) throughout the site are also used to identify vertical drops. In

addition to jump heights, visual surveys were conducted to identify areas with the potential for stranding at low tide.

Linnton Creek discharge was visually checked periodically throughout the year to determine if the channel continues flowing at least through June 30 and begins flowing again by November 1. Photo point photographs were used to document flow.

The channel thalweg downstream of the Linnton Creek outfall was also visually checked throughout the year to document the presence of freshwater inputs. Photo point photographs were used to document this condition. Additionally, temperature data collected from the probe placed in the Linnton Creek plunge pool was used to confirm flow during the dates between visual inspections.

A10: Structural Habitat Features

Performance Standard A10 assesses the retention of placed structural habitat features on site. It was assumed that all structural features above the reach of the river would be retained, thus monitoring was limited to structural features below the 100-year flood elevation (+30.5 ft NAVD88). All structural features below the 100-year flood elevation were placed within the line-of-sight of photo points. Monitoring was conducted using photo point photographs to identify structural features and compare their presence/type with the as-built drawings.

3.2 HYDROLOGY AND HYDRAULICS (B1)

This performance standard requires calculation of the total area that is inundated at least 50% of the time, and requires that total acreage at this elevation be within 20% of the as-built acreage. This was defined in the Restoration Plan as follows:

> *This will be measured relative to the portion of the site that is inundated 50% of the time from April – June, which is +11.56 ft NAVD88 (Waterways Consulting 2013). The total area below this elevation within the Off-Channel habitat will be calculated from the as-built survey, based on a polygon connecting the +11.56 ft NAVD88 elevation points from the monitoring transects described [therein].*

Water level information was collected using a water data probe placed near the mouth of the off-channel habitat site. These data will be used to refine the 50% inundation level, then the areal extent will be re-calculated using elevation data collected at each of the transects described in Section 3.1. The appropriate elevation at each of the off-channel topographic sampling transects will be noted, then the area below this line within the off-channel habitat will be calculated by connecting these points along each transect. This will be compared to the same area/elevation in the as-built survey using the same methods.

Additionally, on-site water level data will be compared with nearby, publicly available water level data at a maintained water level gauge[1] to determine if this public data can be used to determine 50% inundation just as effectively as an on-site data probe.

3.3 VEGETATION MONITORING (C8 THROUGH C14)

Vegetation monitoring was conducted by biologists on August 12-13, 2020. Biologists conducted the monitoring according to the monitoring protocols listed in Grette Associates 2018. Specifically, for forested habitat (riparian, upland, and portions of the off-channel habitat), biologists walked pre-determined transects and collected vegetation data every 50 meters, beginning with a randomly-selected starting point. At each data collection point, all individual trees and shrubs were recorded within a 5-meter radius circle. Additionally, herbaceous species were sampled at two 1 m^2 plots within the 5-meter radius circle. Woody species were sampled by stem count, and herbaceous species were sampled by percent coverage by species. For scrub-shrub habitat, a similar sampling method was used, though with a total of sixteen 3 m radius sampling plots located within the narrow scrub-shrub zone along pre-determined transects. One herbaceous plot was also sampled at each of these plots. Within the emergent vegetation zone in the off-channel habitat, herbaceous species were sampled at a series of plots aligned on pre-determined transects.

Performance standards require that within each of the forested and scrub-shrub zones, stem density exceed of 1,200 stems per acre[2] (C8 and C11), that species diversity exceed three tree species and five shrub species in the forested zone (C9) and five shrub species in the scrub-shrub zone (C12), that herbaceous cover exceed 10% in all zones, and that noxious weed cover be less than 30% (C10, C13, C15).

To qualify for the purposes of the diversity performance standards, a species must have at least 5% cover and appear in at least 10% of the plots. Thirty-two (32) forested plots and 16 scrub/shrub plots were sampled, thus a species must be present in at least 3.2 plots (rounded to 3 plots) and 1.6 plots (rounded to 2), respectively, at over 5% cover. In lieu of coverage measurements, a species was counted as exceeding 5% cover if the individual stems of that species were greater than 5% of the total stems in an individual plot.

3.4 WATER QUALITY MONITORING

Water quality parameters included temperature and dissolved oxygen (DO). Temperature was measured using data probes installed at the site, one near the downstream mouth of the off-channel habitat and one in the pool beneath the Linnton Creek outfall (see Figure 1 for probe location). Collected data were compared against public data from the Morrison Street Bridge USGS station (station 14211720).

DO was collected by periodic measurements rather than continuous probe data. Due to difficulties including COVID-19 related restrictions and instrumentation calibration, DO data was collected

[1] Morrison Street USGS gauge # 14211720; https://waterdata.usgs.gov/or/nwis/uv/?site_no=14211720&PARAmeter_cd=00065,00060.
[2] The Oregon DSL Removal/Fill permit conditions require 1,600 stems per acre.

only once in March, then monthly collection began in November. Thus, only one data point is reported herein.

3.5 FISH MONITORING

Fish monitoring was conducted per the monitoring protocols described in the Restoration Plan (Grette Associates 2018). Due to COVID-19 related restrictions, only two of the specified eight fish surveys were conducted, and were not conducted until May and June, respectively.

During the May sampling event, sampling consisted of 90 minutes of snorkel observations and two hours of shore observations. The snorkeler conducted the survey by floating at the surface and recording all fish observed, to species if possible. While the snorkeler was in the water, a second biologist conducted shore-based observations. Snorkeling was of limited effectiveness due to poor water visibility (24-30 inches).

During the June sampling event, because of poor visibility encountered previously during snorkeling, sampling occurred with a Fyke net rather than snorkeling. The biologist set the Fyke net in the off-channel habitat to sample fish moving downstream along the shoreline. The Fyke net remained in place for approximately 5.5 hours, during which time shore-based observations were conducted.

During each site visit, observations of fish number, species, approximate size, and behavior were recorded to the extent feasible.

3.6 BIRD ASSEMBLAGE MONITORING

Bird monitoring was conducted by a biologist on three occasions during April-June 2020. Surveys were conducted according to the monitoring protocols listed in Grette Associates 2018 and carried out during pre-construction monitoring.

Monitoring consisted of point surveys along pre-determined transects, with each point survey occurring for a minimum of 5 minutes and consisting of bird counts, including species and numbers of each bird observed, as well as qualitative observations of habitat use. Any birds flushed or observed while walking between point survey locations were also recorded.

Five monitoring transects, running perpendicular to the Willamette River, were established in the Baseline Monitoring Plan (blue dashed lines in Figure 1), spaced approximately 100 m apart. Point surveys occurred beginning at a randomly-selected point (between 0 and 50 m from the transect starting point) and spaced at a maximum of 50 m along transects thereafter. This resulted in two to three point-surveys on each transect, depending on transect length and inundation of the off-channel habitat.

4 RESULTS

4.1 GEOMORPHIC/ STRUCTURAL HABITAT ELEMENTS MONITORING

4.1.1 A6: Total Area of Off-Channel and ACM Habitat

Topographic data were collected along the transects discussed in Section 3.1 and shown in Figure 1. Based on focused topographic monitoring described above, the total the total ACM habitat in Year 1 monitoring was 3.26 acres, and the as-built total using the same methods was 3.21[1] acres (Figure 2). This represents an increase by 1.6%.

Using the same methods, Off-Channel habitat area in Year 1 monitoring was 4.43 acres, as compared to an as-built total using the same methods of 4.44[5] acres (Figure 2). This represents a reduction by 0.2%.

The performance standard for these parameters was 10% change or less. Thus, both the ACM and Off-Channel habitat pass this performance standard.

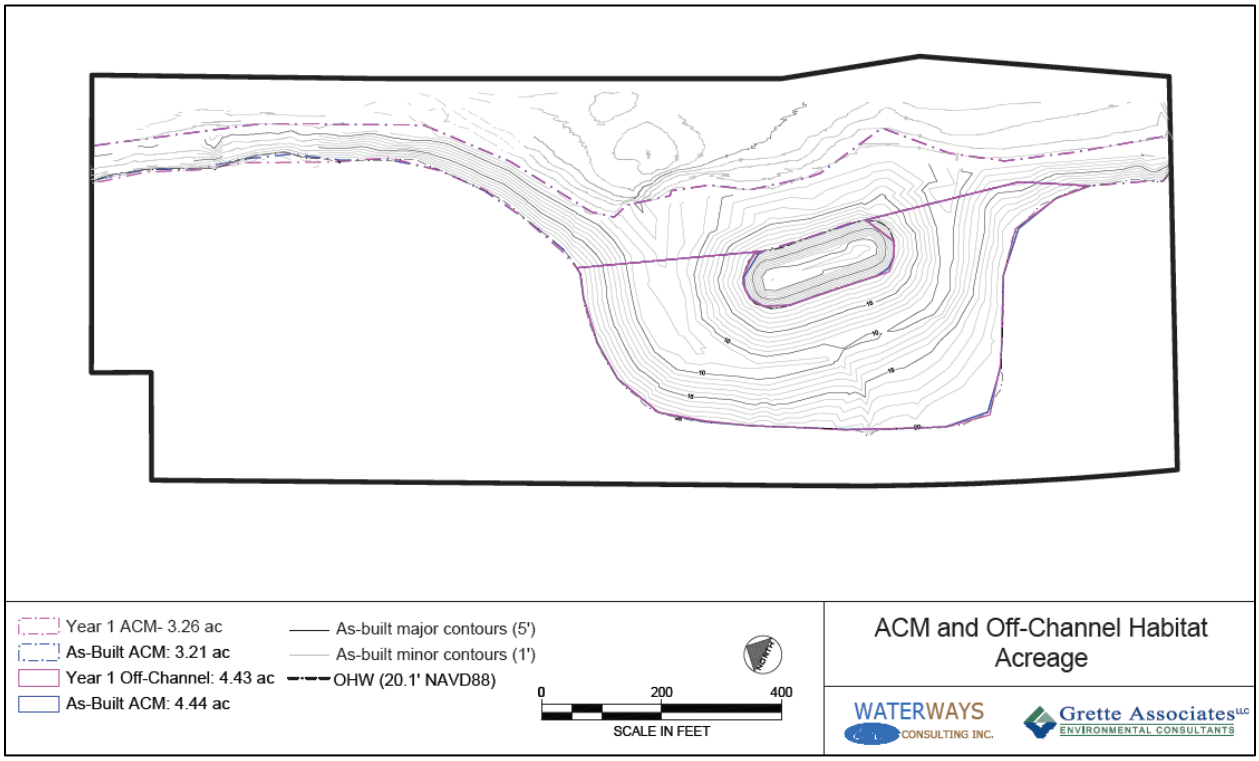


Figure 2. Total ACM and Off-Channel Habitat

4.1.2 A7 and A8: Increase in Elevation within Off-Channel Habitat and ACM

Focused topographic sampling (Figure 1) described above was used to detect any changes in elevation within the ACM and Off-Channel habitats (Attachment 2). For the purposes of

[1] In the as-built report, a total of 3.19 and 4.45 acres of ACM and off-channel habitat were reported, respectively. As noted in Section 3.1, the discrepancy is due to the limited sampling points used. For consistency, this approach was used for the as-built total and the Year 1 total herein.

performance standards, changes in elevation were quantified by percent change over the entirety of the transect, as described in Section 3.1. Additionally, spot elevations that exceed the 20% threshold per Table 2 were identified and are discussed below. Table 3 below lists overall percent change by transect.

Table 3. Percent change at each topographic transect

Transect	% change	Transect	% change	Transect	% change	Transect	% change
A	-3%	K	+4%	U	-5%	AE	+4%
B	-7%	L	+4%	V	-3%	AF	+6%
C	-9%	M	+3%	W	+3%	AG	-5%
D	-23%	N	+4%	X	-7%	AH	+1%
E	-43%	O	+3%	Y	-1%	AI	+7%
F	-10%	P	+1%	Z	-2%	AJ	-2%
G	-11%	Q	+1%	AA	-1%	AK	+1%
H	-5%	R	-1%	AB	+5%	AL	+4%
I	-6%	S	-1%	AC	-3%		
J	-2%	T	-5%	AD	0		

*Positive percent change indicates accretion and negative indicates erosion; yellow indicates ACM transect and blue indicates Off-Channel transect.

4.1.2.1 ACM

Based on sampling, only two ACM transects exceeded 20% change—sections D and E (Attachment 2), and these represent an increase in habitat rather than a decrease. These transects occur on the downstream outer bank of the site, and it is likely that these do not indicate large-scale erosion, but rather a discrepancy in topographic sampling—see discussion in Section 6.1. The mean percent change is -5%, or a moderate erosion. Excluding transects D and E mentioned above, the mean percent change is -2%.

Additionally, Table 2 was used to determine individual spot locations that exceeded 20% change in the ACM transects. Based on this table, the following locations exceeded 20% change[1]:

- Erosion in Transect C, over approximately 27 linear ft above +15 ft.
- Erosion in Transect F, over approximately 16 linear ft above +13 ft.
- Aggregation in Transect G, over approximately 7 linear ft above +17 ft.
- Aggregation in Transect AE, between +16 ft and +18 ft.
- Aggregation in Transect AI, between +17 ft and +18 ft.

All of these locations are along the outer bank of the Willamette River, near where the mouth of the Off-Channel habitat interfaces with the Willamette River. Additionally, the exceedances are near the upper elevations of the cross sections, near OHW where the 20% threshold is lowest.

[1] Areas where the only baseline survey data is the pre-construction survey were not included; these areas will be re-evaluated in Year 2 against the Year 1 survey data (transects A, B, D, and E)

As discussed above, transects D and E are not included in the performance standard comparison (discussed further in Section 6.1). Based on sampling data, the elevation performance standard for ACM habitat has been met.

4.1.2.2 Off-Channel Habitat

Based on sampling, percent changes among Off-Channel habitat transects were marginal. The greatest change at an individual transect is -7% (erosion; Transect X). Overall, the mean percent change is 0%.

Additionally, Table 2 was used to determine individual spot locations that exceeded 20% change in the Off-Channel transects. Based on this table, two spot locations exceeded 20% change:

- Aggregation in Transect L, over approximately 13 linear ft between elevation +15 and +17 ft adjacent to the riparian island.
- Aggregation in Transect AC, over approximately 22 linear ft on the downstream side between elevation +17 and +19.

Both of these locations are near the mouth of the Off-Channel habitat where it interfaces with the Willamette River. Additionally, as with the ACM habitat, the exceedances are near the upper elevations of the cross sections, near OHW where the 20% threshold is lowest and changes are least impactful on the function of the habitat.

Based on sampling data, the elevation performance standard for the Off-Channel habitat has been met.

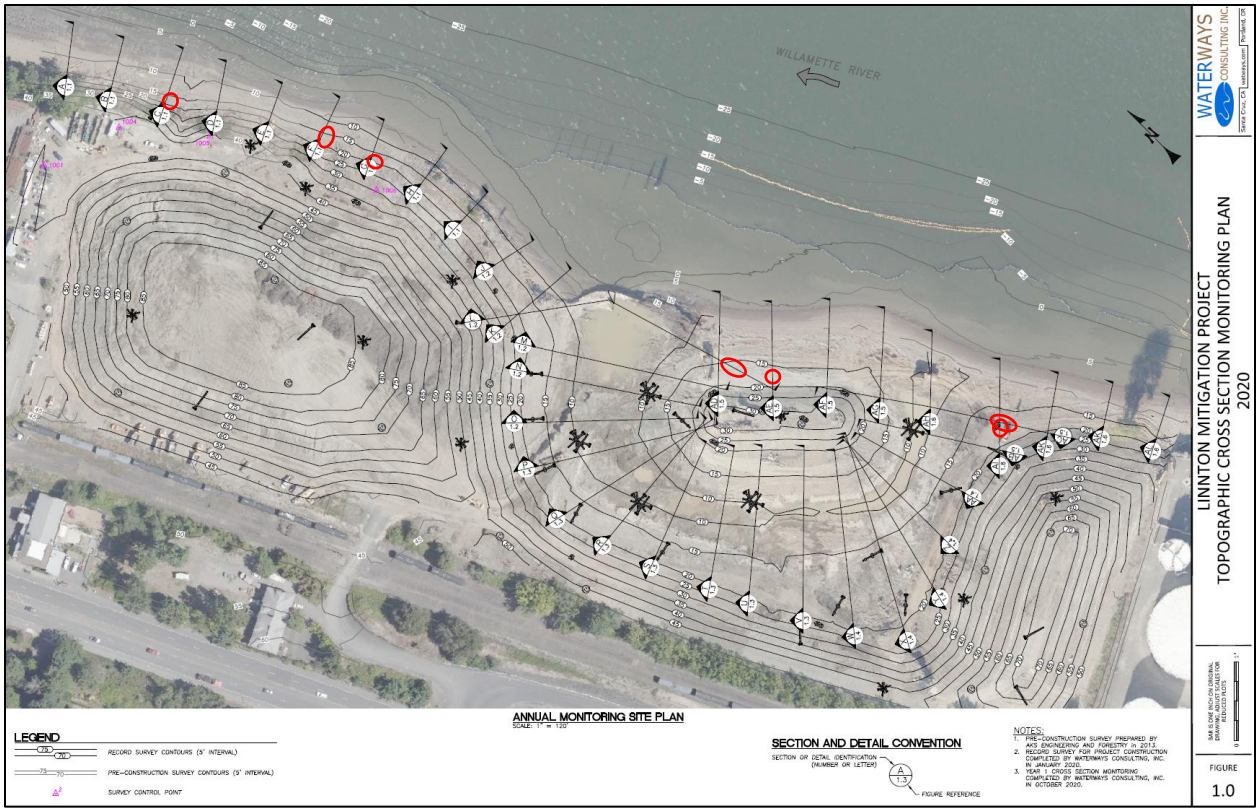


Figure 3. Topographic monitoring transects; red indicates spot exceedances of 20% change.

4.1.3 A9: Fish Access

4.1.3.1 No Physical Conditions that Impede Fish Access

Based on a visual survey, no physical conditions exist that prevent fish access to the site. The photo series presented below (Photograph 1) illustrates that fish can access the site and leave the site freely, without impediments.

Photograph 1. Photo series: off-channel habitat fish access (river water level +6.2 ft)

As part of fish access monitoring, potential stranding risks in the off-channel habitat were assessed visually. A potential risk was identified at the upstream mouth of the off-channel habitat (Photograph 2). A berm is present on the outer edge of the site, and immediately inward of the sand cap is a depression that retains water following dewatering of the off-channel habitat. This depression is approximately 1-2 ft deeper than the surrounding channel. As is visible in the photo, water is retained in this depression after the water level recedes. This depression may pose a stranding risk to smaller fish using the off-channel habitat.

Photograph 2. Sand berm at the upstream mouth of the site

Additionally, sand appears to be accumulating at the mouth of the off-channel habitat, forming a small berm that extends a portion of the way across the channel (Photograph 3, Photograph 4). Though this does not constitute a stranding risk, if it continues to extend and connects across the mouth, this could cause an additional stranding risk. This is unlikely though, as continual outflow from the off-channel habitat due to year-round Linnton Creek flow as well as seeps from the hillside will likely keep this outlet open.

Photograph 3. Emerging berm on the downstream end of the off-channel habitat, facing southeast.

Photograph 4. Emerging berm on the downstream end of the off-channel habitat, facing northeast.

4.1.3.2 Gradient <4%

Based on topographic sampling discussed above, the gradient of the site is approximately 1%, as it was in the as-built report. This meets the performance standard requiring slope be no greater than 4%.

4.1.3.3 Jump Height <6 Inches

Based on visual monitoring, the site contains no vertical jump heights greater than 6 inches. Photograph series 1 above shows the off-channel habitat starting at the mouth and ending at the head, and illustrates the lack of vertical jumps.

4.1.3.4 Linnton Creek Culvert Discharge

Performance Standard A9 requires that the Linnton Creek culvert be discharging from November 1 through June 30. Photographs depict flow on November 8, 2019 (Photograph 5), February 19 (Photograph 6), August 13 (Photograph 7), and October 29, 2020 (Photograph 8). During each of these site visits, flow is present from the Linnton Creek culvert. Though flow was not inspected daily during that period, it is presumed that flow was present between these dates as well.

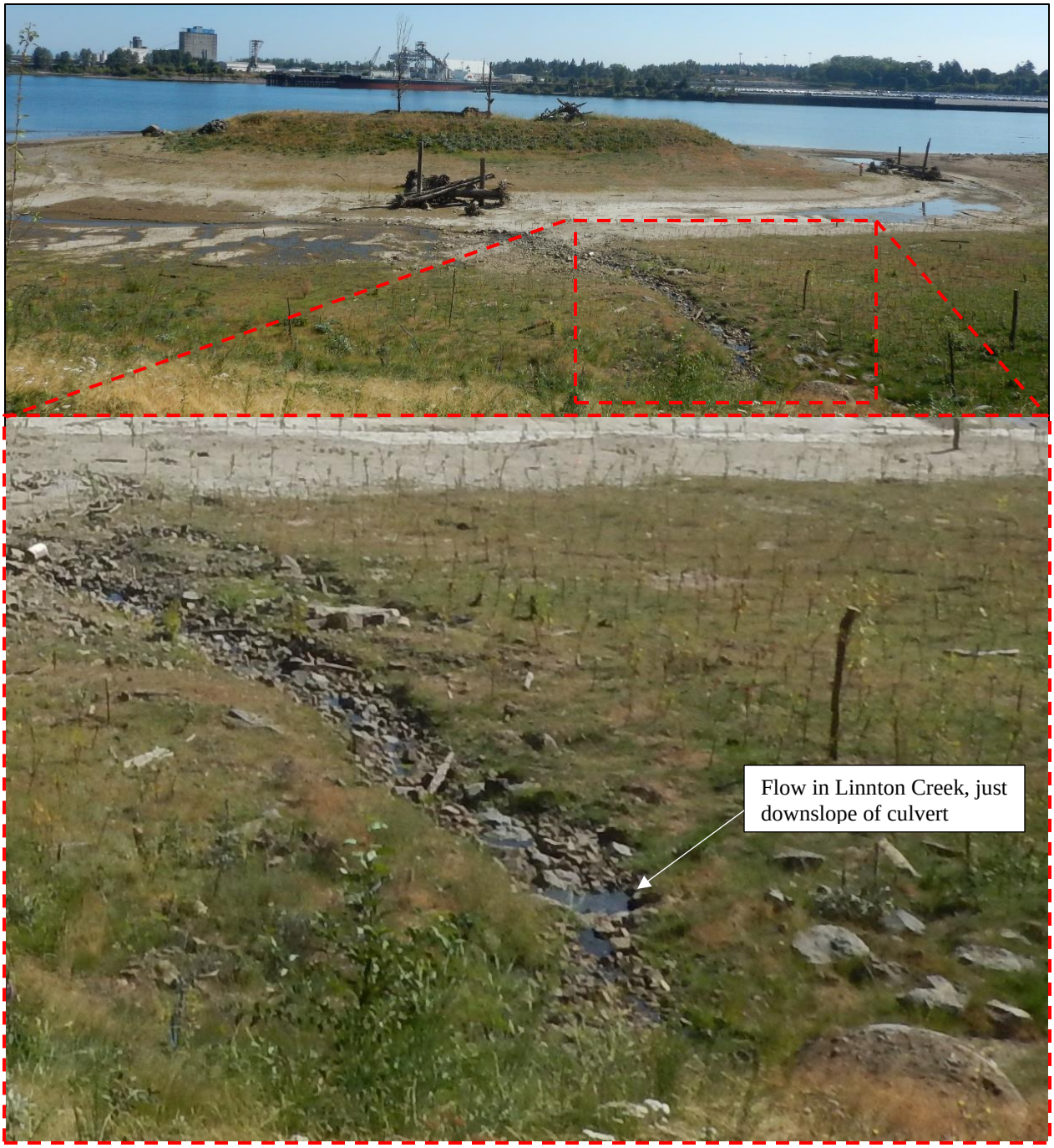
The northeast-facing photo at photo point 12 is consistently the clearest view of flow in Linnton Creek[1]. Flow is difficult to observe from a distance due to the fact that the culvert is rusted, and low flows fall out of the culvert through a rust hole before the end of the pile; this is shown in Photograph 8 from October 29.

Further, the water temperature probe deployed in the Linnton Creek outfall pool recorded data continuously throughout the summer (see Section 4.4). This dataset would have recorded a lack of flow by returning obviously aberrant temperature data. This is not the case—temperature data appears to vary naturally throughout the data collection period.

[1] Though photo point 15 provides a more direct view at the Linnton Creek outfall, the distance and angle, combined with the rocks in the channel, make it more difficult to see flow.

Photograph 5. Flow from Linnton Creek November 8, 2019 (photo point 12, facing NE)

Photograph 6. Flow from Linnton Creek February 19, 2020 (photo point 12, facing NE)



Photograph 7. Flow in Linnton Creek August 13, 2020 (photo point 12, facing NE)

Photograph 8. Flow in Linnton Creek October 29, 2020

4.1.3.5 Off-Channel Thalweg Wetted During Low Water Conditions

Visual monitoring of the thalweg of the off-channel habitat downstream of the outfall was conducted periodically. During every site visit, groundwater was observed seeping out of the southern hillside and collecting in the off-channel habitat. As anticipated, daylighting groundwater provides year-round freshwater inputs to the off-channel habitat, even during dry summer months.

Photograph 9. Freshwater inputs from Photo Point 21, 2/19/20

Photograph 10. Freshwater inputs from Photo Point 21, 8/13/20

Photograph 11. Freshwater inputs from Photo Point 15, 2/19/20

Photograph 12. Freshwater inputs from Photo Point 15, 8/13/20

Photograph 13. Freshwater inputs from the riparian island, 10/29/20.

4.1.4 A10: Structural Habitat Features

As discussed in the as-built report, 65 habitat structural features were installed. Based on a Year 1 survey of these features, 64 features are present with one snag missing. The missing snag was located on the far southern end of the site along the shoreline, just above OHW. No remnant of the snag is visible, thus it is likely to have been washed away in high flows. Photos from photo point 23 in November 2019 versus August 2020 show the snag was installed, but is no longer present.

Performance standards call for retention of 80% of the habitat structural features below the 100-year flood elevation. Of the 65 structural habitat features placed, 42 were placed below the 100-year flood elevation and six of those were snags. Loss of one structure represents a 98% retention of all features, and 84% retention of snags. Thus, this performance standard is met.

Photograph 14. Facing north from Photo Point 23, November 2019

Photograph 15. Facing north from Photo Point 23, August 2020

4.2 HYDROLOGY AND HYDRAULICS

4.2.1 B1: Areal Extent of Inundation

Water level was recorded at the site every 15 minutes, from March 7 through July 20, using the water probe at the mouth of the off-channel habitat[1]. The 50% inundation level (calculated as the

median level of all data points) is +11.0 ft NAVD88[2]. Based on Year 1 topographic monitoring described in Section 3.2, the area extent of the 50% inundation is 50,909 sq ft (Figure 4). Using the same methods, the as-built areal extent of the 50% inundation level is 50,335 sq ft. This represents an increase of area by 574 sq ft, or 1.1%, compared with the as-built survey using the same methods. This performance standard is passed.

The Morrison Street water level data were compared against simultaneous onsite data. Based on that comparison, and after converting datums[3], the mean difference between the two data sets is -0.02 ft—i.e., at a given time, the water level read at the Morrison Street gauge is 0.02 ft lower than the same data recorded onsite.

[1] Due to the large number of data points, the full data set is not included, but is on file and can be provided. Further, due to instrument calibration problems, data were recorded only through July 20. This has been corrected and a full year of data should be available for the Year 2 monitoring report.

[2] At river levels below approximately +8 ft NAVD88, the on-site probe was out of the water, and recorded erroneous data. To supplement the missing data, the gage height data from the Morrison Street gauge (14211720) recorded simultaneously were also analyzed and compared with the on-site probe data. It was calculated that the mean difference between the Morrison Street gauge height and the onsite probe is -0.02 ft (i.e., Morrison Street reads a lower level than the onsite probe). Thus, during periods where the Morrison Street gauge indicated water levels below 8 ft, the Morrison Street gauge value minus -0.02 ft (or plus 0.02 ft) was substituted for the on-site probe data. With those substitutions, the median on-site inundation level is still 11.0 ft.

[3] The Morrison Street gauge datum is 1.55 ft above NGVD29, and the NGVD29 datum is 3.48 ft above NAVD88. Thus, to convert from gauge data to NAVD88, 5.03 is added to the gauge level. For example, +10 ft on the Morrison Street gauge is equal to +14.03 ft NAVD88.

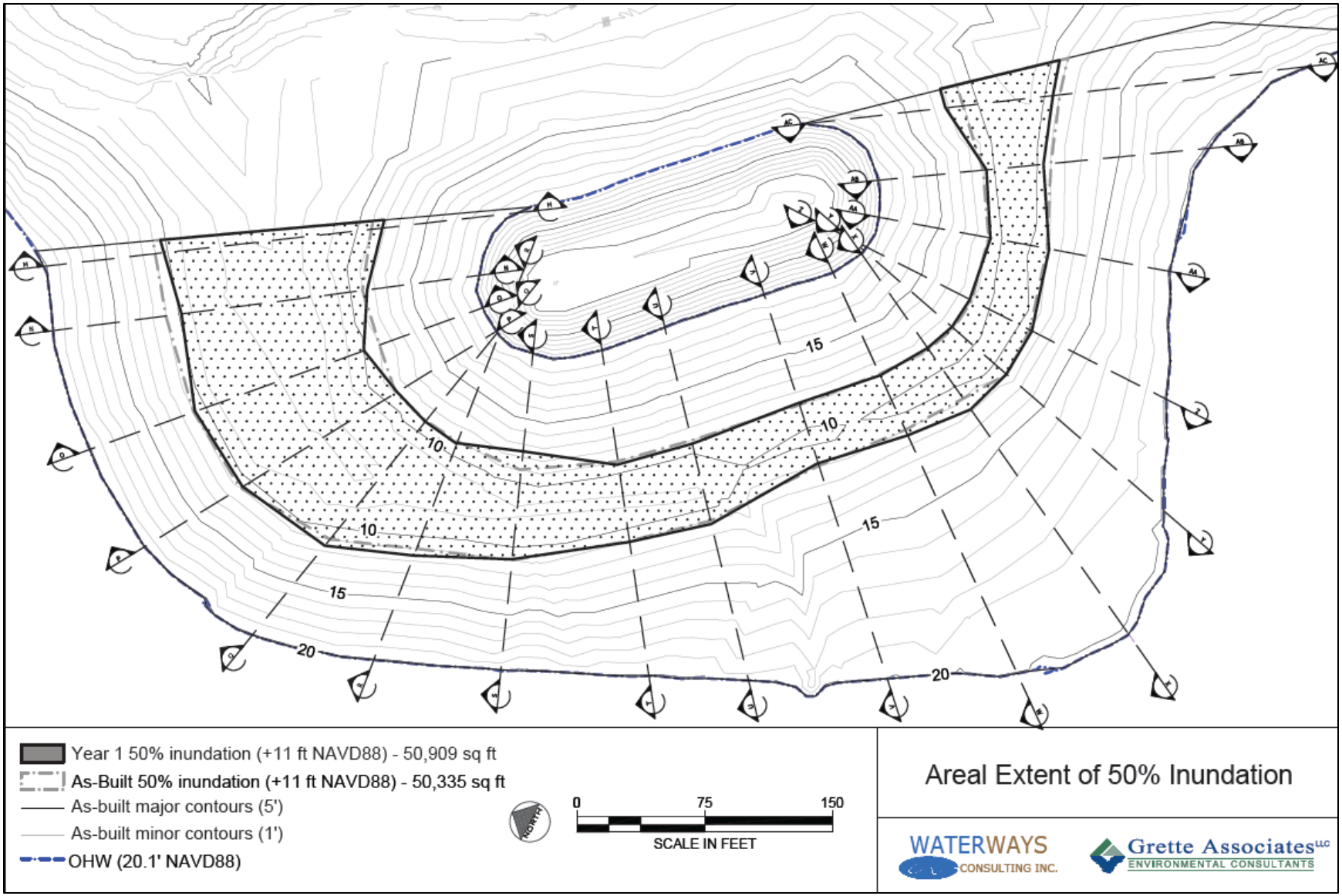


Figure 4. Areal extent of inundation, 11.5 ft contour.

4.3 VEGETATION MONITORING

Vegetation monitoring included sampling per the approved monitoring plan. In year 1, this included a stem count for woody species and percent cover for herbaceous species. Monitoring results are presented below by planting zone. Further, it was observed that the low elevation of vegetation in the off-channel habitat emergent zone is approximately 10.5 ft.

4.3.1 Forested

The forested zone includes all of the Upland and Riparian zones, plus the area between OHW and +13 ft NAVD88. Sampling was conducted to determine woody stem density, species diversity, and coverage of native herbaceous and noxious weed species.

C8: Stem Density

Sampling in 32 plots recorded approximately 885 woody stems per acre (Table 4). One plot (2F) was located on the beach in the northern extent of the property, and included no vegetation at all. Among plots with vegetation present, the lowest cover was observed in plots sampled the slopes of the two mounds on the northern and southern ends of the site. Performance standard C8 required at least 1,200 stems per acre[1]. Thus, this performance standard was failed.

C9: Species Diversity

To qualify for the purposes of this performance standard, a species must have at least 5% cover and appear in at least 10% of the plots. Based on that criteria, 26 species were observed in the monitoring plots—13 tree species and 13 shrub species. Performance standard C9 required three tree and five shrub species. Thus, this performance standard is passed.

C10: Herbaceous Cover

Herbaceous understory cover was sampled by two 1 m square plots. The cover of each species was estimated within coverage bins, and the midpoint of that bin was used as the cover. Herbaceous species constitute approximately 69% cover (Table 5). Overall noxious weed species cover is 1.2%. The only noxious weed species observed was reed canary grass (*Phalaris arundinacea*), and only in one plot in the northern extent of the property. Performance standard C10 required over 10% native herbaceous and less than 30% noxious weed coverage. Thus, this performance standard was passed.

In summary, forested woody vegetation failed performance standard C8 (at least 1,200 stems per acre), but met the performance standard C9 (at least 3 native tree species and 5 native shrub species) and performance standard C10 (at least 10% native herbaceous cover and less than or equal to 30% noxious weed coverage).

[1] DSL requires that 1,600 stems per acre or 50% coverage be achieved for two years without irrigation before determining the site to be successful. Thus, the forested zone is not yet on track to meet this standard.

Table 4. Forested zone monitoring results, tree/shrub

Common	Latin	1F	2F	3F	4F	5F	6F	7F	8F	9F	10F	11F	12F	13F	14F	15F	16F	17F	18F	19F	20F	21F	22F	23F	24F	25F	26F	27F	28F	29F	30F	31F	32F
Tree																																	
Big leaf maple	***Acer macrophyllum***	1						1											2	2		1									1		
Bitter cherry	*Prunus emarginata*							1																									
Black cottonwood	***Populus balsamifera ssp trichocarpa***			1				1									1					3											1
Black hawthorn	***Crataegus douglasii***	11		1	9							2		1																	2		
Blue elderberry	***Sambucus caerulaea***	4												1	2						1							1					
Cascara	***Frangula purshiana***			1									3			6			2										8				
Choke cherry	***Prunus virginiana***					1		5				1		3						1						2			1		1		
Columbia willow	*Salix fluviatilis*										1						12																
Crab apple	***Malus fusca***																	1					2	2									
Douglas fir	***Pseudotsuga menziesii***						4						1		1																		1
Douglas spirea	***Spiraea douglasii***									3	6						6	9						22	3								
Grand fir	***Abies grandis***															2				2							2	2					
Oregon ash	***Fraxinus latifolia***								2	22		3					4						1		5					8			
Oregon white oak	*Quercus garryana*						1								3						1												
Ponderosa pine	***Pinus ponderosa***					2	7									1				1	1					1							
Western red cedar	***Thuja plicata***			2		1							1			2						2				2							
Shrub																																	
Indian plum	***Oemleria cerasiformis***				1	3								2																			
Mackenzie's willow	*Salix rigida*								4														3										
Mock orange	***Philadelphus lewisii***			2	2		1	3				1		2						4	3							2					
Oceanspray	***Holodiscus discolor***					1	2	1							3					5	1					1							
Oregon grape	***Mahonia nervosa***	2				4								3	7						15						5	3					
Pacific ninebark	*Physocarpus capitatus*																3																
Pacific willow	***Salix lucida var lasiandra***																1	1					10	7	6					12		33	
Red elderberry	*Sambucus racemosa*									1	1																						
Red flowering currant	***Ribes sanguineum***						6	1								2																	
Red osier dogwood	***Cornus sericea***										3	4											3		11					13		3	
Salmon berry	*Rubus spectabilis*																						2										
Scouler's willow	***Salix scouleriana***																10						2		2					3		2	
Serviceberry	***Amelanchier alnifolia***	5																	1			12							6		1		
Sitka willow	*Salix sitchensis*																4																
Snowberry	***Symphoricarpus albus***			1						1		1			4		4		1					2									
Swamp rose	***Rosa pisocarpa***								1		1						3	2						4									
Thimbleberry	***Rubus parviflorus***	4		2				2		1												1	1						3		1		
Vine maple	***Acer circinatum***			4			1									2				3									1				
Total		**27**	**0**	**14**	**12**	**12**	**22**	**15**	**7**	**28**	**12**	**12**	**5**	**12**	**20**	**15**	**48**	**13**	**6**	**18**	**22**	**19**	**24**	**37**	**27**	**6**	**7**	**8**	**19**	**36**	**6**	**38**	**2**
Average woody stems per plot		**17.16 stems**																															
Acreage per plot		**0.0194 ac**																															
Approximate woody stems per acre		**884.53 stems/ac**																															

Bold indicates species qualifies for species diversity with at least 5% cover in at least 10% of plots.

Table 5. Forested zone monitoring results, herbaceous cover

Common	Latin	1F	2F	3F	4F	5F	6F	7F	8F	9F	10F	11F	12F	13F	14F	15F	16F	17F	18F	19F	20F	21F	22F	23F	24F	25F	26F	27F	28F	29F	30F	31F	32F
Reed canary grass	*Phalaris arundinacea*	37.5	--	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sweet clover	*Melilotus officinalis*	2.5	--	2.5						37.5		2.5	15.0	15.0	2.5	2.5			15.0	15.0	15.0						2.5						
Small-flower lupine	*Lupinus bicolor*	15.0	--	2.5		15.0	15.0	15.0				15.0			15.0	37.5				2.5						15.0				2.5			
Spike bentgrass	*Agrostis exarata*	15.0	--							2.5		2.5					15.0	85.0					15.0	15.0	97.5					37.5	85.0	15.0	
Prickly lettuce	*Lactuca serriola*	15.0	--																														
Large-leaf lupine	*Lupinus polyphyllus*		--		15.0	15.0	15.0	37.5				15.0	15.0			2.5			37.5		37.5	15.0					2.5	37.5	37.5				37.5
Roemer's fescue	*Festuca roemeri*		--	37.5		15.0	15.0	37.5					62.5	62.5					37.5	62.5	15.0	37.5				37.5	37.5	62.5	37.5				62.5
Blue wildrye	*Elymus glaucus*		--			15.0																					15.0						
Red clover	*Trifolium pratense*		--							2.5				2.5								15.0						2.5	2.5				2.5
Yarrow	*Achillea millefolium*		--	15.0	15.0			15.0		37.5				15.0			2.5			15.0		37.5				15.0	2.5	2.5	37.5				
Slender hairgrass	*Deschampsia elongata*		--		2.5		2.5					15.0										15.0									2.5	15.0	
Unknown grass	--		--								15.0																						
German chamomile	*Matricaria recutita*		--																				2.5	2.5									
Columbia stickseed	*Coreopsis tinctoria*		--																					2.5									
Scotch broom	*Cytisus scoparius*		--										15.0													15.0							
English plantain	*Plantago lanceolata*		--																							15.0							
Rabbit's foot clover	*Trifolium arvense*		--																37.5														
Bird's foot trefoil	*Lotus unifoliolatus*		--									2.5		37.5															37.5			2.5	
Taper-tip rush	*Juncus acuminatus*		--																													2.5	
Rice-cut grass	*Leersia oryzoides*		--																													15.0	
Fringed willowherb	*Epilobium ciliatum*		--																						2.5								
California oat grass	*Danthonia californica*		--																	15.0													
Total (%)		**85.0**	**0.0**	**57.5**	**32.5**	**60.0**	**47.5**	**105.0**	**0.0**	**80.0**	**15.0**	**52.5**	**107.5**	**132.5**	**17.5**	**42.5**	**17.5**	**85.0**	**127.5**	**110.0**	**67.5**	**120.0**	**17.5**	**20.0**	**100.0**	**97.5**	**60.0**	**105.0**	**152.5**	**40.0**	**87.5**	**50.0**	**102.5**
Average (%)		**68.9**																															
Total (%)		**85.0**	**0.0**	**57.5**	**32.5**	**60.0**	**47.5**	**105.0**	**0.0**	**80.0**	**15.0**	**52.5**	**107.5**	**132.5**	**17.5**	**42.5**	**17.5**	**85.0**	**127.5**	**110.0**	**67.5**	**120.0**	**17.5**	**20.0**	**100.0**	**97.5**	**60.0**	**105.0**	**152.5**	**40.0**	**87.5**	**50.0**	**102.5**
Average (%)		**68.9**																															

4.3.2 Scrub-Shrub

The scrub-shrub zone includes the portion of the off-channel habitat between +13 ft and +10.5 ft NAVD88, or the bottom elevation at which shrubs would establish.

C11: Stem Density

Sampling in 16 plots recorded approximately 1,613 woody stems per acre (Table 6). One plot (1S), located on the beach, included no vegetation and was not counted. Performance standard C11 required at least 1,200 stems per acre[1]. Thus, this performance standard was passed.

C12: Species Diversity

Five species were observed in the monitoring plots; four met the requirement of at least 5% cover in at least 10% of the plots. Performance standard C12 required at least five species. Thus, this performance standard was failed.

C13: Herbaceous Cover

Herbaceous understory cover averaged approximately 22% cover among the plots with any herbaceous cover, and no noxious species were observed (Table 7). Establishment of emergent in this zone during Year 1 has been meager, with density especially low below elevation +11 ft NAVD88. Emergent establishment is greatest in the southwestern portion of the off-channel habitat where daylighting groundwater is abundant. Performance standard C13 requires at least 30% native cover and less than 10% noxious cover. Thus, this performance standard is pzssed.

4.3.3 Off-Channel Emergent

C14 and C15

The off-channel emergent zone was defined as the area between +10.5 and +8.5 ft NAVD88. Monitoring was to be conducted as a series of monitoring plots along the pre-determined transects. During Year 1 monitoring no emergent vegetation was present on any of the monitoring transects below +10.5 ft NAVD88. Performance standard Thus, performance standards C14 (native species diversity) and C15 (for native cover) were failed; C15 (for noxious weeds) was passed.

[1] DSL requires that 1,600 stems per acre or 50% coverage be achieved for two years without irrigation before determining the site to be successful. Thus, the forested zone is not yet on track to meet this standard.

Table 6. Scrub-shrub zone monitoring results, woody stem

		T1		T2		T3		T4		T5		T6		T7		T8	
Common	**Latin**	**1S**	**2S**	**3S**	**4S**	**5S**	**6S**	**7S**	**8S**	**9S**	**10S**	**11S**	**12S**	**13S**	**14S**	**15S**	**16S**
Douglas spirea	***Spiraea douglasii***	--		8		2		1					1		11	4	2
Oregon ash	*Fraxinus latifolia*	--						1									
Pacific willow	***Salix lucida var lasiandra***	--	9	2	1	2	19	22	7	5		6	7	16			14
Red osier dogwood	***Cornus sericea***	--			1		1	1	2	1			2		1		
Scouler's willow	***Salix scouleriana***	--		1			3			11	1	1		2			1
	Total	**--**	**9**	**11**	**2**	**4**	**23**	**25**	**9**	**17**	**1**	**7**	**10**	**18**	**12**	**4**	**17**
	Average woody stems per plot	**11.27**															
	Acreage per plot	**0.007**															
	Approximate woody stems per acre	**1,613 stems/ac**															

Bold indicates species qualifies for species diversity with at least 5% cover in at least 10% of plots.

Table 7. Scrub-shrub zone monitoring results, herbaceous cover

Common	**Latin**	**1S**	**2S**	**3S**	**4S**	**5S**	**6S**	**7S**	**8S**	**9S**	**10S**	**11S**	**12S**	**13S**	**14S**	**15S**	**16S**
Spike bentgrass	*Agrostis exarata*	--	--	--			15	--	--	--	2.5	--	--	--	62.5	--	
Columbia stickseed	*Coreopsis tinctoria*	--	--	--		2.5	2.5	--	--	--	15	--	--	--	2.5	--	
Water purslane	*Lythrum portula*	--	--	--	2.5	2.5		--	--	--		--	--	--		--	15.0
Creeping spikerush	*Eleocharis palustris*	--	--	--		2.5		--	--	--		--	--	--		--	
	Total	**--**	**--**	**--**	**2.5**	**7.5**	**17.5**	**--**	**--**	**--**	**17.5**	**--**	**--**	**--**	**65.0**	**--**	**15.0**
	Average (%)	**22.0**															

4.4 WATER QUALITY MONITORING

4.4.1 Temperature

Water temperature was monitored using temperature probes placed at the mouth of the site and at the Linnton Creek plunge pool. Additionally, the Linnton Creek outfall temperatures were compared with the Morrison Street gauge temperature data recorded at the same day/time. On-site temperature readings were taken every 15 minutes, but are presented herein at 30-minute intervals to match the data recorded at the USGS Morrison Street Bridge station (station ID 14211720). Thus, temperatures presented as "average" consist of the mean temperature of all 30-minute interval readings. Data from the Linnton Creek mouth and Morrison Street Bridge are presented from March 7 through October 31, 2020, but due to calibration problems data from the off-channel habitat mouth are from March 7 through July 20. The on-site probes are now properly calibrated and remain in place continuously collecting data.

Based on a comparison between the two probes, the Linnton Creek outfall probe averages 55.36ºF, and the Morrison Street gauge averages 61.67ºF. Thus, Linnton Creek averages 6.31ºF colder than the Morrison Street gauge[1]. The temperature difference is much more pronounced during summer months: Linnton Creek is over 9 degrees colder during July and August than the mouth or mainstem stations (see Figure 5 and Figure 6).

The Linnton Creek data were compared with the data from the off-channel habitat mouth over the same period (March 7 through July 20). Based on that comparison, Linnton Creek averages 6.6ºF colder than the mouth. Additionally, using the same date range, the Linnton Creek mouth probe and the Morrison Street gauge produce similar temperatures—within 0.32ºF.

No performance standard was established for this parameter.

Table 8. Average temperature (F) from two onsite probes and the Morrison Street gauge data.

Month	Linnton Creek	Off-channel mouth	Morrison St
March	43.44	47.80	48.45
April	48.35	54.19	53.32
May	53.17	58.81	58.41
June	55.99	63.68	63.57
July	60.09	69.90	70.82
Aug	62.08	--	73.08
Sept	61.30	--	64.91
Oct	56.18	--	58.29

[1] Compares data from 3/6/20 through 10/31/20.

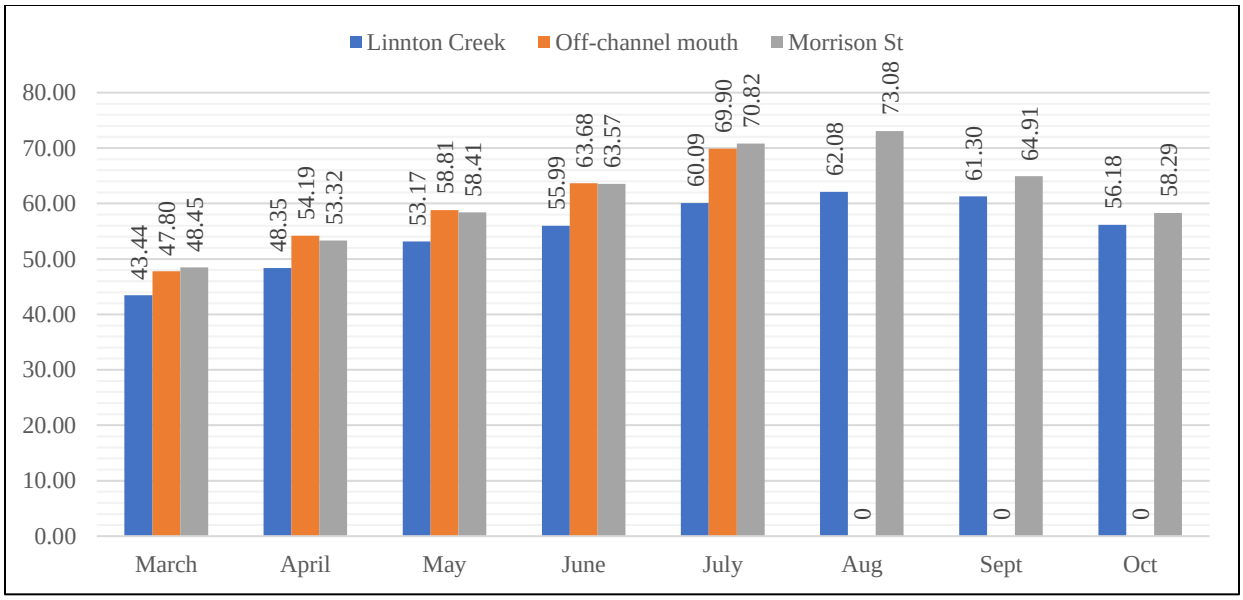


Figure 5. Average water temperature of each sampling location, by month

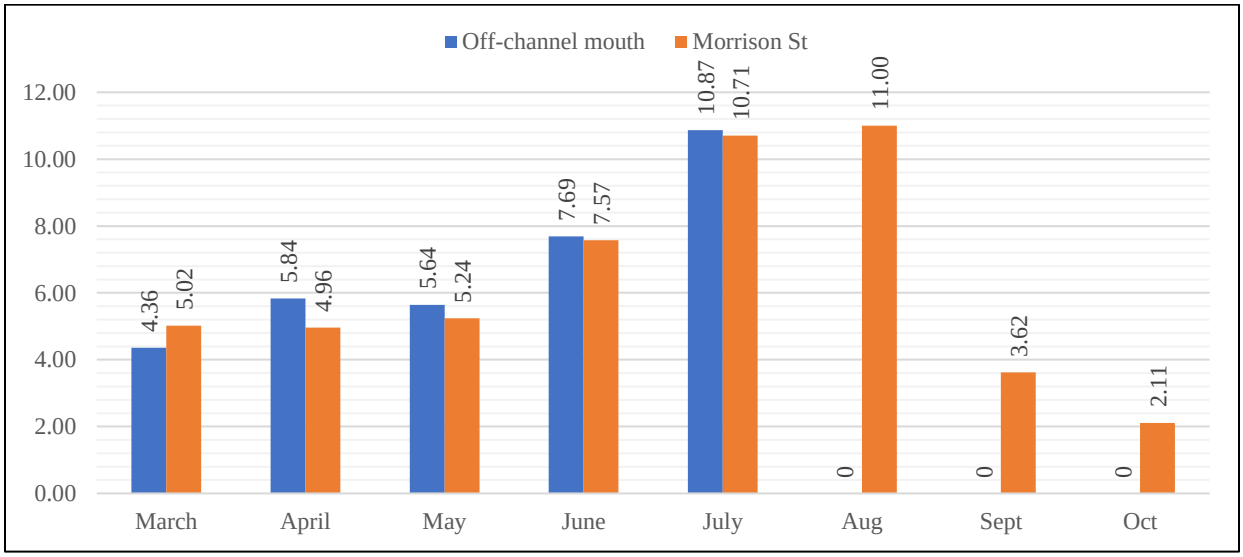


Figure 6. Average monthly temperature difference (degrees warmer) of the mouth and Morrison Street probes than the Linnton Creek probe.

4.4.2 Dissolved Oxygen

As discussed above, complications due to COVID-19 as well as instrument calibration were encountered such that only one dissolved oxygen measurement was taken. This reading occurred on 3/9/20 at 2:50 PM. Dissolved oxygen levels were 11.73 mg/L at the Linnton Creek outfall, and 11.74 mg/L at the mouth of the site at the junction with the Willamette River. At the same time and date, the Morrison Street USGS water data gauge read 11.6 mg/L.

No performance standard was established for this parameter.

4.5 FISH MONITORING

During both of the two fish monitoring events, juvenile fish were observed in the off-channel habitat. Due to poor visibility and limited ability to approach close enough for identification, species was not determined. However, based on qualitative monitoring methods, juvenile salmonids were identified within the off-channel habitat during both monitoring events. Non-salmonids were also observed during the first effort. The second effort was a more targeted effort to attempt to identify salmonids to species. However, no fish were captured in the Fyke net. Data are presented in Table 9.

Table 9. Fish survey data

Shoreline Survey	Snorkel Survey	Fyke Net Survey
5/28/20		
6 salmonids	5 salmonids	N/A
large school (~1.5 cm in length) mid channel in approximately. 6" water; salmonids; ~60 fish		
school (~60 fish, ~2 cm in length) adjacent to LWD		
1 unidentified non-salmonid		
3 (6-8 cm) non-salmonid		
1 (8-10 cm) non-salmonid		
1 perch (species unidentified) ~14 cm		
large school (+60 fish, ~2-3 cm) salmonids		
12-24 (~6 cm) salmonids		
~80 salmonids (~2-3 cm)		
6/12/20		
60-70 salmonids observed surface feeding in front of net immediately after deployment	N/A	None

As mentioned in Section 3.5, poor visibility rendered snorkeling ineffective. A Fyke net was attempted as a potentially more effective method during the second monitoring event. However, no fish were present in the net following a several-hour deployment. Shoreline-based observations were most effective, though species identification was not possible.

Incidental take of juvenile salmonids is allowed by in the Biological Opinion of up to 31 each of Chinook, coho, and steelhead within the 10-year monitoring period. Salmonid monitoring occurred by passive observation only; no salmonids were captured, handled, or released. No incidental take of salmonids occurred during 2020 monitoring.

4.6 BIRD ASSEMBLAGE MONITORING

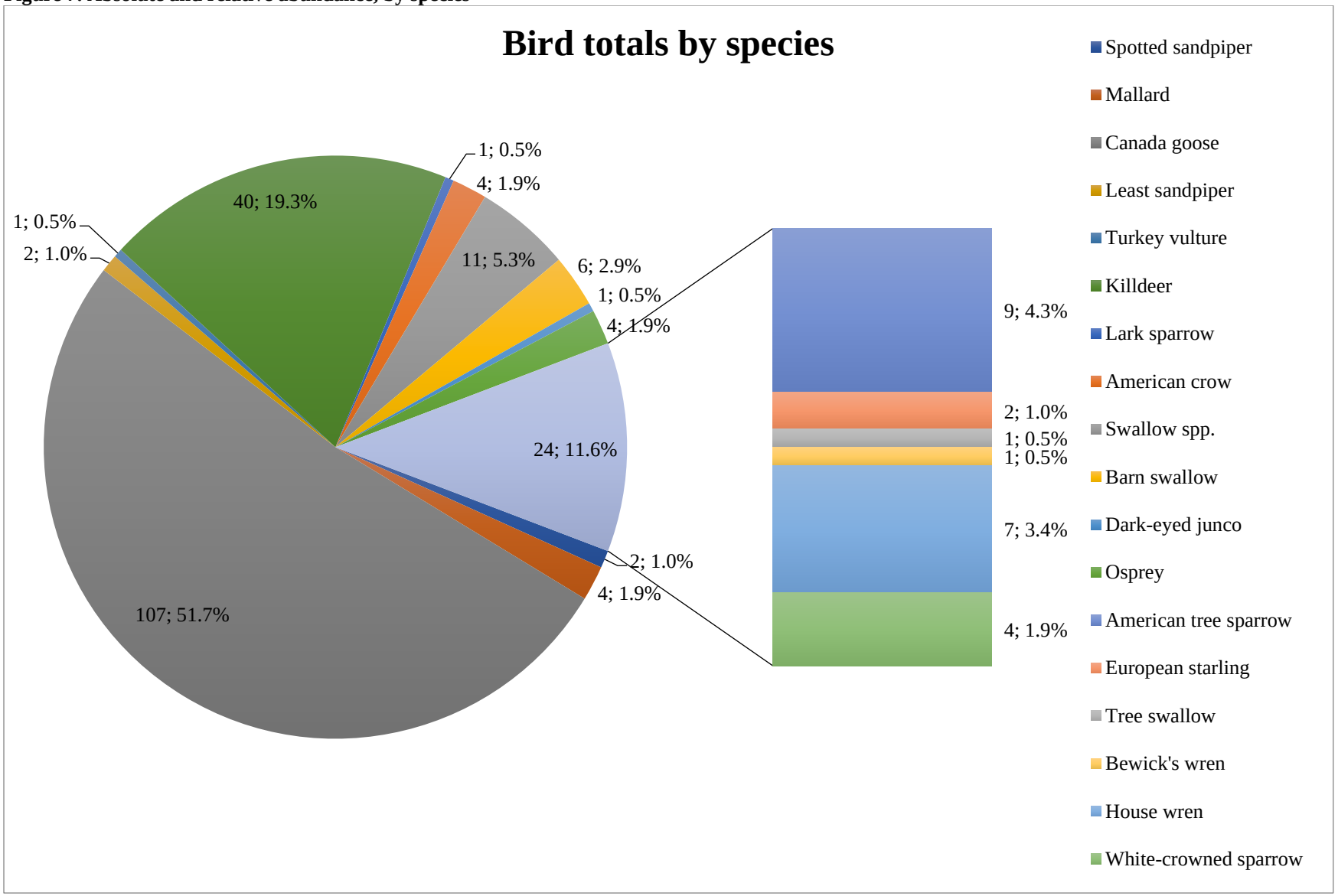
Three bird assemblage surveys were conducted during spring nesting season. Over the course of the three surveys, a total of 207 individuals of 18 species were observed, compared to 219 individuals of 22 species observed during pre-construction monitoring. Most abundant birds were species that feed in shallow water or sandy beaches, such as killdeer or Canada goose. Small passerine birds such as swallows, sparrows, and wrens were also prevalent, though not nearly as abundant as during pre-construction surveys; this is likely due to the presence of derelict buildings

prior to construction. Other species common to urban riverfront areas were also regularly observed, including American crow, osprey, mallard, and spotted sandpiper (Table 10; Figure 7). European starling was the only non-native species observed. Of the 207 total individuals sighted, non-native species sightings comprised less than 1%. Data sheets are present in Attachment 3.

Table 10. Birds observed by species, date, and number.

Species (Latin)	Species (common)	4/24/2020	5/28/2020	6/29/2020	Sum
Actitis macularius	Spotted sandpiper			2	**2**
Anas platyrhynchos	Mallard	1		3	**4**
Branta canadensis	Canada goose	9	44	54	**107**
Calidris minutilla	Least sandpiper			2	**2**
Cathartes aura	Turkey vulture			1	**1**
Charadrius vociferus	Killdeer	11	19	10	**40**
Chondestes grammacus	Lark sparrow			1	**1**
Corvus brachyrhynchos	American crow		2	2	**4**
Hirundinidae fam.	Swallow spp.	3	8		**11**
Hirundo rustica	Barn swallow			6	**6**
Junco hyemalis	Dark-eyed junco			1	**1**
Pandion haliaetus	Osprey		2	2	**4**
Spizella arborea	American tree sparrow		7	2	**9**
Sturnus vulgaris	European starling			2	**2**
Tachycineta bicolor	Tree swallow			1	**1**
Thryomanes bewickii	Bewick's wren			1	**1**
Troglodytes aedon	House wren			7	**7**
Zonotrichia leucophrys	White-crowned sparrow		3	1	**4**
	Totals	24	85	98	**207**

Figure 7. Absolute and relative abundance, by species



Observed bird behavior can be generalized into three categories: perching, ground foraging, or flying over the site (Table 11 and Table 12). The most common use of the site was by water-associated birds foraging along the shore of the river or in the off-channel habitat. Canada goose were the most common species, but other water-associated species included sandpiper, killdeer, mallard, and osprey. Perching behavior was almost exclusively observed on large woody debris or snags.

Table 11. Summary of behaviors by species

Species	Behavior	Number
American crow	Flew and perched on LWD on top of island.	2
	Perched on snag	1
	Cruising low over uplands (likely foraging)	1
American tree sparrow	Uplands, in flight, song	2
Barn swallow	In flight over site, perched on log pile, foraging over water	4
	Foraging over uplands	2
Bewick's wren	Perched on security camera pole	1
Canada goose	Foraging between transects 4 and 5 within channel/tidal area	9
	On top of mound near transect 2-3	8
	Along side near river.	36
	Foraging in intertidal in upstream end of site	51
	Same as transect 3, moving into water	51*
	Resting on upstream mouth of site (same as above)	45*
	Resting on shoreline of island (river side)	3
Dark eyed junco	Perched on snag	1
European starling	Perched on snag	1
	Perched on a snag on island	1
House wren	Foraging in grass, perched on log pile	4
	Calling from LWD pile	1
	Perched on LWD pile	1
	Foraging in grass	1
Killdeer	On top of mound (bench area)	1
	Foraging on island	3
	Foraging along shore	3
	Intertidal area	4
	Extremely active in marsh area.	12
	Foraging/calling along shore	2
	Foraging/calling (same as transect 3)	2
	Foraging/calling (new)	1
	Juvenile chick	1
	Same as above, foraging/calling	3
	Foraging on shoreline of island (site-side)	1

Lark sparrow	Perched on snag	1
Least sandpiper	Foraging probing in seep	2
Mallard	Drake	1
	Foraging in shallow along shore	3
	Foraging in shallows (same as transect 3)	3*
Osprey	Soaring over the site near island. Second osprey began soaring with this prior to moving downstream	1
	One osprey returned and perched on a snag on top of the mound.	1
	Foraging over site	1
	Caught 5-6" fish in habitat (@ transect 4)	1
Spotted sandpiper	Foraging probing in seep	2
Swallow	Flew across site	1
	In flight	2
	Randomly soaring across site and over transect	3
	Randomly soaring across site; activity largely concentrated on top of mound. No ground contact	2
	Soaring over transect 5	3
Tree swallow	Male forging near shoreline/transect 1-4; foraging approximately 1 minute before leaving site	1
	Assorted individuals foraging along the shoreline near transect 2-1. Numerous swallows soaring along shoreline over the site	6
	In flight over site	1
Turkey vulture	Circling high above site	1
White-crowned sparrow	Perched on log pile	1

*Denotes the same birds, observed from a different transect; noted to avoid double-counting

Table 12. Observed behavior, by species.

Perching (perch type)*	Foraging/bathing	Fly-over
American crow (l)	American crow	American crow
Bewick's wren (pp)	Barn swallow	American tree swallow
Dark-eyed junco (l)	Canada goose	Barn swallow
European starling (l)	House wren	Osprey
House wren (l)	Killdeer	Swallow spp.
Lark sparrow (l)	Least sandpiper	Tree swallow
Osprey (l)	Mallard	Turkey vulture
White-crowned sparrow (l)	Osprey	
	Spotted sandpiper	
	Tree swallow	

*s=structure
v=vegetation
pp=power pole

5 GOALS/OBJEVTIVES, PERFOMANCE STANDARDS

The goals and objective of the project are presented below, with notes regarding whether each objective was met (Goals 1 and 2 were met at construction).

Goal 3: Ensure the long-term success of the restored habitat through monitoring, maintenance and stewardship.

- Objective 3a: Conduct select pre-construction baseline lamprey and wildlife monitoring.
  - ***Met?*** ***YES: Baseline wildlife monitoring was conducted by the applicant's representative prior to construction, and results were included in the HDP. Baseline lamprey monitoring was conducted by USFWS prior to construction.***
- Objective 3b: Implement a site-specific performance plan with performance standards to track the development of the site.
  - ***Met?*** ***ON TRACK: It is presumed that Year 1 monitoring was conducted in 2020 by FWS.***
- Objective 3c: Minimize colonization of the site by noxious species, as defined in the performance standards.
  - ***Met?*** ***ON TRACK: The site was seeded with native species, and on-going monitoring and maintenance is being conducted to prevent colonization of noxious weeds. The site passes the performance standards for noxious weed coverage.***
- Objective 3d: Maintain fish access to the Off-Channel habitat.
  - ***Met?*** ***ON TRACK: Year 1 monitoring indicates no obstructions to fish access: fresh water inputs into the off-channel habitat are present year round, no jump heights greater than 6 inches are present, the off-channel gradient remains less than 4%. However, potential stranding hazards were noted. These are addressed below.***
- Objective 3e: Identify and rectify obstacles to habitat development or use, as defined in the performance standards.
  - ***Met?*** ***ON TRACK: Objective 3e is being met through implementation of the post-construction performance plan.***
- Objective 3f: After the Performance Period, implement a long-term stewardship program.
  - ***Met?*** ***ON TRACK: The Long-Term Stewardship Plan has been preliminarily approved, and will be implemented after the 10-year monitoring period.***

Goal 4: Support human enjoyment of the site.

- Objective 4a: Construct a view platform and path, which connects to the City of Portland Greenway Trail that is mapped as passing by the site.
  - ***Met?*** ***ON TRACK: This overlook is under construction.***
- Objective 4b: Discourage human use of the habitat site through fences and signage.
  - ***Met?*** ***ON TRACK: A fence has been installed around the site, and will be continually maintained. Signage is in preparation for installation in late 2020.***
- Objective 4c. Place educational signage on site that informs the public about the habitat site, as well as the history of the site as a lumber and plywood mill.
  - ***Met?*** ***ON TRACK: The educational signage will be installed coincidentally with the overlook described in Objective 4a above.***

Table 13. As-built performance standard comparison

Monitoring Element	Monitoring Question	Performance Standards	Met Performance Standard?
Geomorphic/ Structural Habitat Elements	• Is the restoration site meeting its interim performance standards (IPSs)? • Is the total quantity of Off-Channel and ACM habitat that was created being retained over time? • Are the fish able to enter and exit the site? • Are habitat elements being retained on site? • Have the performance standards been met? If so, is the site ready to move into the long-term stewardship phase?	A6. Total area of Off-Channel habitat or ACM habitat within 10% of the as-built condition (minimum 0.5 ft)	• YES—within 0.02% (Section 4.1.1)
		A7. Increase in elevation within the Off-Channel habitat of no greater than 20%	• YES—mean percent change 0% (Section 4.1.2)
		A8. Increase in elevation within the ACM habitat of no greater than 20%	• YES—mean percent change -0.5% (Section 4.1.2)
		A9. Fish access: • No physical conditions that prevent fish access to the Off-Channel habitat. • The channel gradient throughout the off-channel habitat will not exceed 4% slope • Jump heights will not exceed 6 inches • The Linnton Creek culvert outlet will discharge from November 1st through June 30th, when juvenile Chinook are likely present in the Willamette River, and • The channel thalweg downstream of Linnton Creek will remain wetted during low water conditions in Years 1 through 10.	• YES (Section 4.1.3.1) • YES—gradient 1% (Section 4.1.3.2) • YES—no jump heights >6" (Section 4.1.3.3) • YES—year-round (Section 4.1.3.4) • YES—channel thalweg is wetted year-round (Section 4.1.3.5)
		A10. Presence of at least 80% of the total number of large woody debris/structural habitat elements that were placed below the 100-year flood elevation, including any volunteer LWD ≥18" diameter and ≥30' length.	• YES —98% (Section 4.1.4)
Hydrology and Hydraulics	• What is the total area of the site that is inundated by the river during periods of high flow?	B1. Areal extent of the 50% inundation level within 20% relative to the as-built condition.	• YES—increase by 574 sq ft/1.1% (Section 4.2.1)
Vegetation	• Was the project constructed according to its final design? Are any adjustments necessary to achieve desired site conditions as described in the restoration plan for the site?	***Riparian/Upland Forested*** • C8. A minimum of 1,200 native woody stems per acre.	• NO: 884 woody stems per acre

		• C9. At least 3 native tree species and 5 native shrub species. • C10. Cover (during the first 5 years, trees/shrubs will be excluded from percent cover): ○ ≥ 10% native herbaceous ○ ≤ 30% non-native herbaceous ○ The remaining percentage of cover can be made up of bare ground, rocks or native herbaceous ***Off-Channel Shrub*** • C11. A minimum of 1,200 native woody stems per acre. • C12. At least 5 native shrub species. • C13. Cover (during the first 5 years, shrubs will be excluded from percent cover): ○ ≥ 10% native herbaceous ○ ≤ 30% non-native herbaceous ○ The remaining percentage of cover can be made up of bare ground, rocks or native herbaceous ***Off-Channel Emergent*** • C14. At least 5 native emergent/herbaceous species. • C15. Cover (during the first 5 years, trees/shrubs will be excluded from percent cover): ○ ≥ 30% native herbaceous ○ ≤10% non-native herbaceous ○ The remaining percentage of cover can be made up of bare ground, rocks or native herbaceous.	• YES: 13 tree species, 13 shrub species ○ YES: 69% native, ○ YES: 1.2% (reed canary grass) ○ ~30% bare ground • YES: 1,718 woody stems per acre • NO: 4 native woody species ○ YES: 22% native ○ YES: 0% ○ ~78% bare ground • NO: None ○ NO: None ○ YES: None ○ All bare ground
Portland Harbor NRDA Restoration Goals Questions			**Notes**
Water Quality	• Is water quality at the site improving over time and comparable to an appropriate reference condition?	N/A	N/A—data presented Section 4.4; full data available on file
Fish and Wildlife	• Are native fish using the newly restored habitat?	N/A	Yes (Section 4.5)

	• What size salmonids and lamprey are using the site?	N/A	Salmonids: generally under 60mm (Section 4.5) Lamprey: USFWS collects this data and reports it separately.
	• What birds are using the site? Do changes in the bird assemblage, diversity and abundance at the site indicate that habitat quantity and quality have improved?	N/A	207 individual sightings, 18 species observed (Section 4.6)
Photo Monitoring	• Is vegetation developing in a way that will ultimately generate a native assemblage of appropriate vegetation types?	N/A	Photo point photos are presented in Attachment 1

6 DISCUSSION

6.1 GEOMORPHIC/STRUCTURAL HABITAT ELEMENTS

6.1.1 A6: Total Area of Off-Channel and ACM Habitat

Both the ACM and the Off-Channel habitat appear to be relatively stable. On an acreage basis, neither habitat declined significantly. The 0.5% reduction in Off-Channel habitat corresponded to an 0.6% increase in ACM habitat. Both changes are well below the performance standard of 10%, and no indications of concern over long-term stability of the habitats were observed.

6.1.2 A7 and A8: Increase in Elevation within Off-Channel Habitat and ACM

As discussed in Section 4.1.2, transects used to track changes in elevation indicated only minor changes. Only two transects indicated changes greater than 20%, and those represented a net "erosion" on the downstream end of the ACM habitat on the outer bank of the Willamette River. However, as mentioned above, it is likely that this does not truly indicate erosion as severe as may be supposed by the transect data. Rather, as-built topographic survey did not fully capture the areas of this slope that were not originally to be graded during construction. As described in the as-built report, additional grading occurred in this area beyond what was originally planned. It appears that this additional grading was not captured by the as-built survey. Thus, what appears to be substantial erosion is actually just a comparison between the pre-construction surface and the Year 1 surface (this is indicated on each transect—see Attachment 2).

This slope will be monitored in Year 2 and the results compared with Year 1 transect data. It is anticipated that this will provide more accurate information about the stability of this slope. However, at this time, all slopes appear to be stable.

It is also apparent that none of the established photo points capture this shoreline area; additional photo points will be added in Year 2 to capture this area (see Section 7, Figure 8).

6.1.3 A9: Fish Access

The site is physically accessible to the target fish species and life history stages—no jump heights or steep slopes are present, and cold-water discharge was present from both the Linnton Creek culvert and from hillside seeps year-round as anticipated. Additionally, as noted in Section 4.5 and discussed in Section 6.5, juvenile salmonid use of the site was confirmed.

The only potential concern to fish access is the development of a pond at the upstream end of the off-channel habitat (see Photograph 2 above). This pond can be seen in transect AH (Attachment 2). This berm riverward of the pond is likely a combination of the sand cap that was placed just outside the upstream mouth of the site over the Portland Harbor sediment management area, supplemented by sand being deposited by river currents to reach equilibrium along this recently-altered outer shore. The berm has a maximum elevation of approximately +10.8 ft. Continuing into the off-channel habitat the ponded area drops to a minimum of approximately +8.8 ft, before increasing up to as high as approximately +9.8 ft in transect Z farther down the off-channel habitat.

There is potential for ponding to strand fish when river levels recede, or to isolate fish in an increasingly oxygen-poor pool, or subject the fish to greater avian predation. However, it is likely that the stranding risk here is low, for the following reasons.

- **The resulting pond is flushed by the Willamette River almost daily.** Based on historic water level data from 2014 through 2019[1], the river reaches the elevation that would enter the pond (9.8 ft) at least once an average of 315 of 365 days annually. Thus, even if fish become trapped in the pond, tidal flushing will most often occur within 24 hours

- **Ponding occurs during periods of low fish presence.** Based on historic water level data[14], 73% of the days when the river did not reach 9.8 ft occurred during the in-water work period (July 1 – October 31) when juvenile salmonid presence is at its lowest. Periods of up to 13 consecutive days when this level was not reached were observed in the data, but these multiple-day periods are rare and also generally occurred during the in-water work window. Thus, the timing of the ponding minimizes the opportunity for stranding.

- **The pond likely receives continual freshwater inputs.** Throughout the Year 1 monitoring activities, this pond was never observed to have dried out completely. For example, on December 10, 2020, water was present in the pond while the Willamette River level was approximately +5.6 ft. The river had exceeded +10 ft 21 hours prior, and water remained in the pond. Similarly, during vegetation monitoring in mid-August, water was present in the pond, while the river was at +6 ft. The river had not reached +9.8 ft within the previous 24 hours. Continued ponding is likely explained by continual freshwater inputs feeding the pond, as shown in Attachment 1, Photo Point 22. Thus, it is possible that the water in the ponded area remains relatively cold and well-oxygenated even during prolonged periods of ponding.

Nevertheless, LWC recognizes that ponding in the interior of the site is not desirable and is investigating options to remedy the situation. Potential remedies include breaching the outer berm, filling the pond with existing soil below OHW, or excavating a channel down the off-channel habitat to ensure the pond drains with outgoing tides. It is also possible that the shoreline is not yet in equilibrium, and 2020/2021 high flows may further alter this situation and render intervention unnecessary.

6.1.4 A10: Structural Habitat Features

As mentioned above, only one installed structural habitat feature was missing. No additional features were observed to have entered the site. These features were designed to remain onsite, even when subject to high flows, and this has been the case.

[1] Data from USGS station 14211720 Morrison Street Bridge; https://waterdata.usgs.gov/or/nwis/uv/?site_no=14211720&PARAmeter_cd=00065,00060.

6.2 HYDROLOGY AND HYDRAULICS

6.2.1 B10: Areal Extent of Inundation

Based on a change of 0.02%, the areal extent of inundation appears to be stable. Further, based on the minimal difference (0.02 ft) between the Morrison Street data and the onsite data, it may be possible to remove the onsite water level probe and use the Morrison Street data to calculate area of inundation going forward. This may be considered following Year 2.

6.3 VEGETATION MONITORING

6.3.1 Forested

Though the site was irrigated, the forested zone did not meet the performance standard of 1,200 stems per acre[1]. This is likely due to a combination of factors. For many plots, woody stem count is inversely correlated with herbaceous understory growth. For example, seven plots had stem counts under eight and percent herbaceous cover over 60% (12F, 18F, 25F, 26F, 27F, 30F, 32F). Conversely, five plots had stem counts over 24 and herbaceous cover under 50% (16F, 22F, 23F, 29F, 31F). It is possible that high herbaceous cover may be in some cases related to low stem counts. This could reflect herbaceous cover making it more difficult to detect small trees and shrubs. It is also possible that herbaceous growth shaded out young trees and shrubs and led to higher than usual mortality.

It is also possible that the plots with low stem counts coincided with drier areas and poorer soils that will be difficult to establish without some level of mortality. In general, the least successful plots occurred on the slopes of the two mounds. These mounds were created from on-site excavated material, which was generally river sand placed many decades prior. Though some soil amendment occurred, the soils are likely lower in organics and nutrients than typical mature soils. Further, sloped areas may prove to be more difficult to effectively water. Conversely, the most successful plots were those within the off-channel habitat, where water was most abundant and additional organic material from the river may have been deposited.

Despite the low stem counts, there is reason to believe that the forested woody vegetation community is doing well. It is likely that as the trees and shrubs continue to develop, they will extend beyond the herbaceous layer and be more able to compete for sunlight. They will also be more visible during monitoring efforts, and under-counts in Year 1 may give way to a more accurate, higher reading.

6.3.2 Scrub-Shrub

The scrub-shrub zone exceeded the performance standard of 1,200 stems per acre[15]. Based on the monitoring results, as well as qualitative observations, the scrub-shrub zone within the off-channel habitat is thriving. Many of the shrubs are still becoming established, but many have already established very successfully and have grown in size markedly. This is especially true in the southwestern corner of the off-channel habitat where daylighting groundwater from the hillside

[1] 1,600 stems/acre are required by DSL

provides a continuous water source. Stem counts are anticipated to continue to rise, and eventually percent cover is likely to be very high.

Some areas of the scrub-shrub zone did not fare as well, such as the lowest portions of the zone near the upstream end of at the mouth. In this area, Pacific ninebark (*Physocarpus capitatus*) experienced widespread mortality. These may be replaced with a different species. However, in general, shrubs seem to have established down to the lower end of planting at +10.5 ft NAVD88.

The scrub-shrub zone failed the diversity performance standard of at least five species. However, this may have been partially due to the spacing of planting, as well as the slow above-ground first-year establishment of the species as root systems develop. In some cases, individual species were planted in groups that may not have occurred in the sampling area. Six woody species were planted in this zone, and five were identified. However, one of the five (Oregon ash) did not meet the minimum requirement to be counted (5% cover in at least 10% of the plots). It is possible that this species will expand and meet this minimum coverage requirement. Though this diversity standard was failed, the site has the potential to pass this standard in Year 2. Supplemental plantings are not warranted at this time, but as with the entire site, this area is being observed closely by Ash Creek and supplemental plantings will be installed as needed.

Photograph 16. Substantial shrub growth in the southwestern portion of the off-channel habitat, facing ENE

Photograph 17. Shrub establishment facing NNW

Photograph 18. Shrubs, facing NNW

6.3.3 Off-Channel Emergent

As was discussed in the Restoration Plan (Exhibit B, p. 34), the lower end of vegetation establishment in the off-channel habitat was not known, thus native emergent species were seeded down to the lowest likely establishment elevation based on nearby reference sites in order to exclude non-native species establishment. Because of this uncertainty, it was discussed (Exhibit B, p. 34) that this performance standard would subject to review and change if emergent species did not survive down to anticipated elevations.

However, emergent species have generally not survived within the zone between approximately +10.5 ft and +8.5 ft NAVD88. This area will continue to be monitored for future establishment of vegetation. It is possible that with additional fine substrate and organic material deposition emergent vegetation may establish lower, but after Year 1 the low end of emergent vegetation is approximately +10.5 ft NAVD88. Thus, though this area did not meet performance standards, this is due to uncertainty surrounding limitations that were acknowledged prior to construction, and does not constitute a failure.

6.3.4 Vegetation Monitoring Summary

Despite low woody stem densities in the forested zone and lower species diversity in the scrub-shrub zone, there is reason for confidence that the vegetative communities will be successful. As stated above, one additional year of development and growth will allow these species to better compete with the herbaceous layer, and to be more visible to monitoring.

However, the strongest reason for confidence is that the site is continually observed and cared for by the planting contractor, Ash Creek Environmental. During Year 1, they have regularly visited

the site to inspect the vegetative community. They conducted regular maintenance such as installing supplemental plantings, regular watering, weed maintenance, remedial actions such as installing cottonwood fascine bundles within rills that formed from runoff (these bundles have sprouted very successful; Photograph 19), and spreading seeded straw as a mulch/seed for the herbaceous layer. Ash Creek plans to conduct supplemental plantings in the areas that exhibited higher than normal mortality. The planting contractor expresses utmost confidence in the success of the site, in large part due to their ongoing oversight and care of the site.

Photograph 19. Cottonwood establishment from fascine bundles placed in rills, west-facing slope of the northern mound

Ash Creek's oversight is also the best strategy for continuing to meet performance standards for invasive species. Though it did not show up in monitoring plots, Scotch broom (*Cytisus scoparius*) is also present on site. Ash Creek has noted its presence and is continuing to remove them as they are identified. This will ensure individuals do not grow especially large and difficult to remove, and go to seed.

Thus, even though the woody stem count and diversity were lower than desired during Year 1, once the plants are established and with the ongoing maintenance by Ash Creek, there is reason for confidence in the final success of the plantings.

6.4 WATER QUALITY MONITORING.

6.4.1 Temperature

Water temperature data clearly indicates that the site is providing the type of cold-water off-channel habitat envisioned. As the data presented above demonstrates, the water being input into the off-channel habitat was substantially colder than water in the mainstem river, throughout the

year. The temperature data support the design concept that the outfall would be contributing year-round cold-water inputs to the off-channel habitat.

Additionally, the temperature difference is greatest during the warmest summer months. Though the Linnton Creek temperature increases during the summer, it does not increase as much as the mouth and mainstem temperatures. Thus, it appears that Linnton Creek provides the greatest cold-water refugia function relative to the mainstem river during the months when it is most needed by juvenile salmonids.

Finally, the temperature similarities between the Morrison Street gauge and the probe at the Linnton Creek mouth indicate that it may be feasible in the future to remove the probe at the mouth and use the Morrison Street data. This will be revisited during Year 2 monitoring.

6.4.2 Dissolved Oxygen

As mentioned, dissolved oxygen measurements were not recorded monthly as intended, due to difficulties related to COVID-19 and instrument calibration. Monthly recordings resumed as of October, and will continue monthly as scheduled. However, the one reading that was successfully captured (11.73/11.74 mg/L) reveals dissolved oxygen levels well within the optimal level for fish survival.

6.5 FISH MONITORING

While not all fish monitoring events were conducted, the two that were conducted confirmed that fish are using the off-channel habitat, and specifically subyearling juvenile salmonids. Though species-level identification was not made, based on the size (60 mm or smaller) and timing (May/June), these were likely coho or Chinook salmon. Observations of use of the off-channel habitat by subyearling salmonids during the first year that it was connected to the river is note-worthy.

A Fyke net was deployed during the second event in an attempt to capture and identify fish to species. Net-based sampling is allowed by the permits, with an associated level of incidental take protection. However, as mentioned above, no incidental take occurred.

No performance standards were associated with this monitoring parameter; data were for informational purposes only to confirm use of the site. Since one of the main intentions of the off-channel habitat was to support juvenile salmonids, observations of use by subyearling juvenile salmonids in Year 1 constitutes a significant achievement. Year 2 monitoring will endeavor to identify species, and we do not anticipate difficulties beginning sampling in February as were encountered in 2020. Further, beach seining will be attempted in Year 2. Beach seining is allowed in the Biological Opinion until salmonids are identified using the site. Since salmonids were not collected and positively identified to species, it is understood that seining can occur in 2021.

6.6 BIRD ASSEMBLAGES

A shift from species that typically associate with human structures and development to species more associated with undeveloped land and water-associated habitats was observed. During pre-construction, eight of the 22 species (36%) observed were species that either are typically

associated with human development (e.g. buildings) or were observed using buildings on site. Those same types of species comprised four of 18 species in Year 1 monitoring, or 22%. More striking is the reduction in individuals from these species, from 166 individuals in pre-construction down to 19 in Year 1 monitoring. An associated increase in individuals associated with aquatic or shoreline habitat was observed between pre-construction surveying and Year 1 monitoring, coinciding with the sharp decline of individuals associated with human development. Six of 18 (33%) species identified in Year 1 are primarily associated with aquatic habitats—Canada goose, killdeer, least sandpiper, spotted sandpiper, mallard, and osprey. Individuals of these species made up 150 of 207 (72%) individual sightings. During pre-construction monitoring, only three river-associated species (14% of species) were observed—western gull, osprey, and double-crested cormorant—and accounted for three total sightings (1% of sightings). Overall, a clear shift from development-associated bird assemblages to river-associated bird assemblages was evident. It is expected that as vegetation develops bird abundance and diversity will continue to increase.

7 RECOMMENDATIONS AND ACTIONS

Based on Year 1 monitoring, the following recommendations, actions, and modifications are proposed for Year 2:

- Conduct beach seining to attempt to identify salmonids to species.
- Continue to compare water level and temperature measurements at the mouth of the off-channel habitat versus the Morrison Street gauge in Year 2 monitoring; if differences are negligible, or predictably different, it may be feasible to remove this probe.
- Use the "area above the curve" method for calculating 20% elevation increase rather than the elevation-specific table proposed in the Restoration Plan.
- Continue vegetation maintenance rather than focused remedial replanting.
- Investigate the ponding in the off-channel habitat after 2020/2021 high flows, in time to determine the most appropriate remedy and implement during the 2021 in-water work window (July 1-October 31), if necessary. LWC is open to discussing this issue with the Trustees and permitting agencies.
- Monitor the downstream mouth to ensure additional silting does not close off the mouth.
- Add two photo points to capture northern/downstream bank, as depicted below:

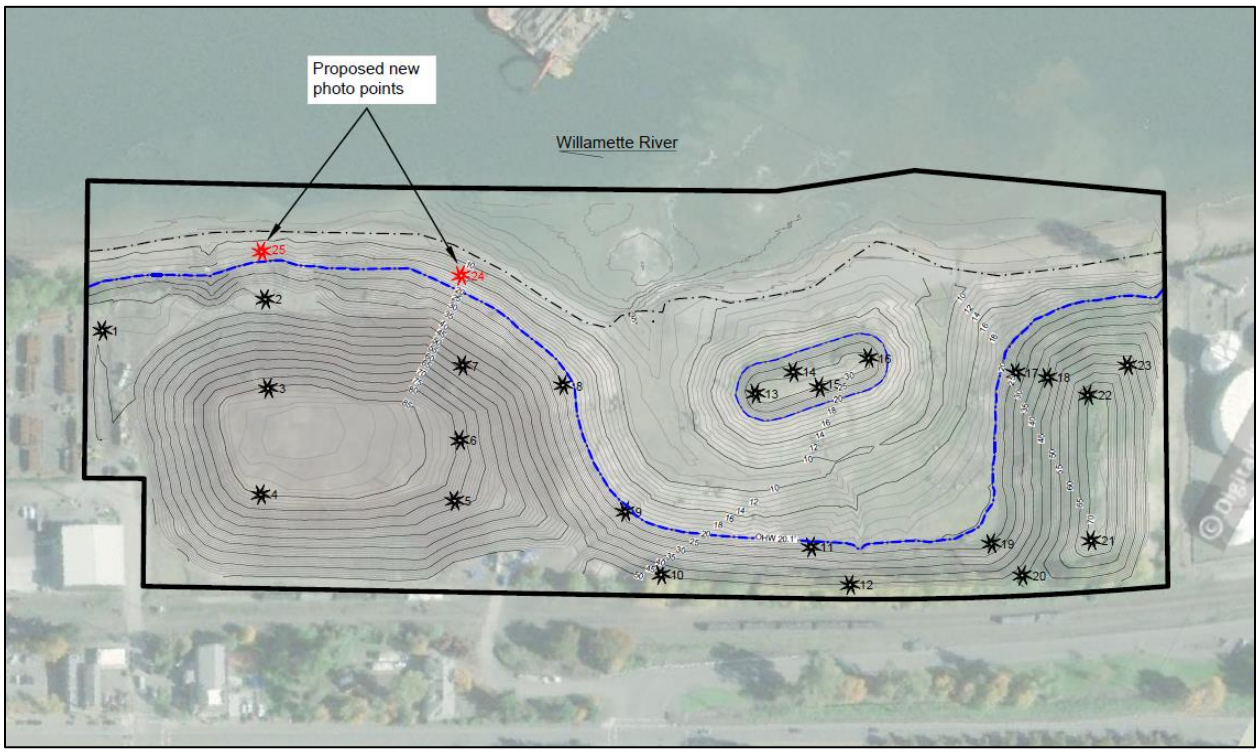


Figure 8. Proposed new photo points

8 REFERENCES CITED

Grette Associates. 2018. Linnton Mill Restoration Site. Restoration Plan (Final HDP – December 4, 2018).

USGS. 2020. USGS 14211720 Willamette River at Portland, OR. URL: https://waterdata.usgs.gov/nwis/uv?site_no=14211720.

Attachment 1. Photo Point Photographs

LINNTON MILL RESTORATION SITE
(NWP-2014-477; 58909-RF; 59636-MBI)

YEAR 1 MONITORING REPORT

ATTACHMENT 1. PHOTO POINT PHOTOGRAPHS

DECEMBER 4, 2020

Grette Associates LLC
ENVIRONMENTAL CONSULTANTS

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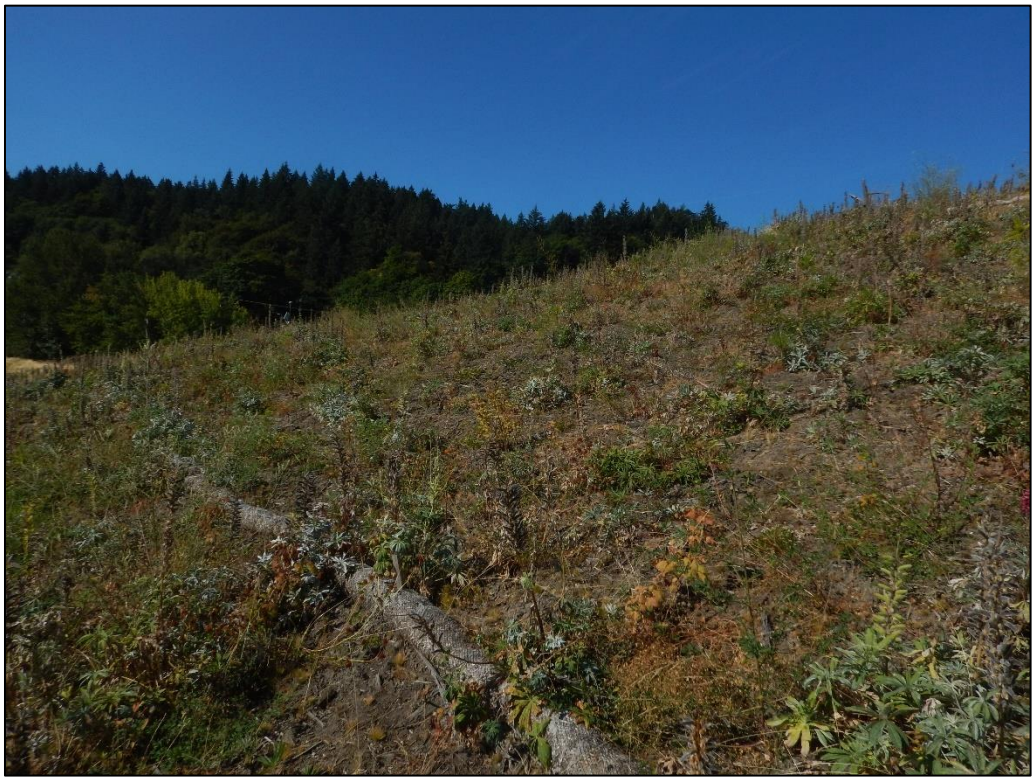

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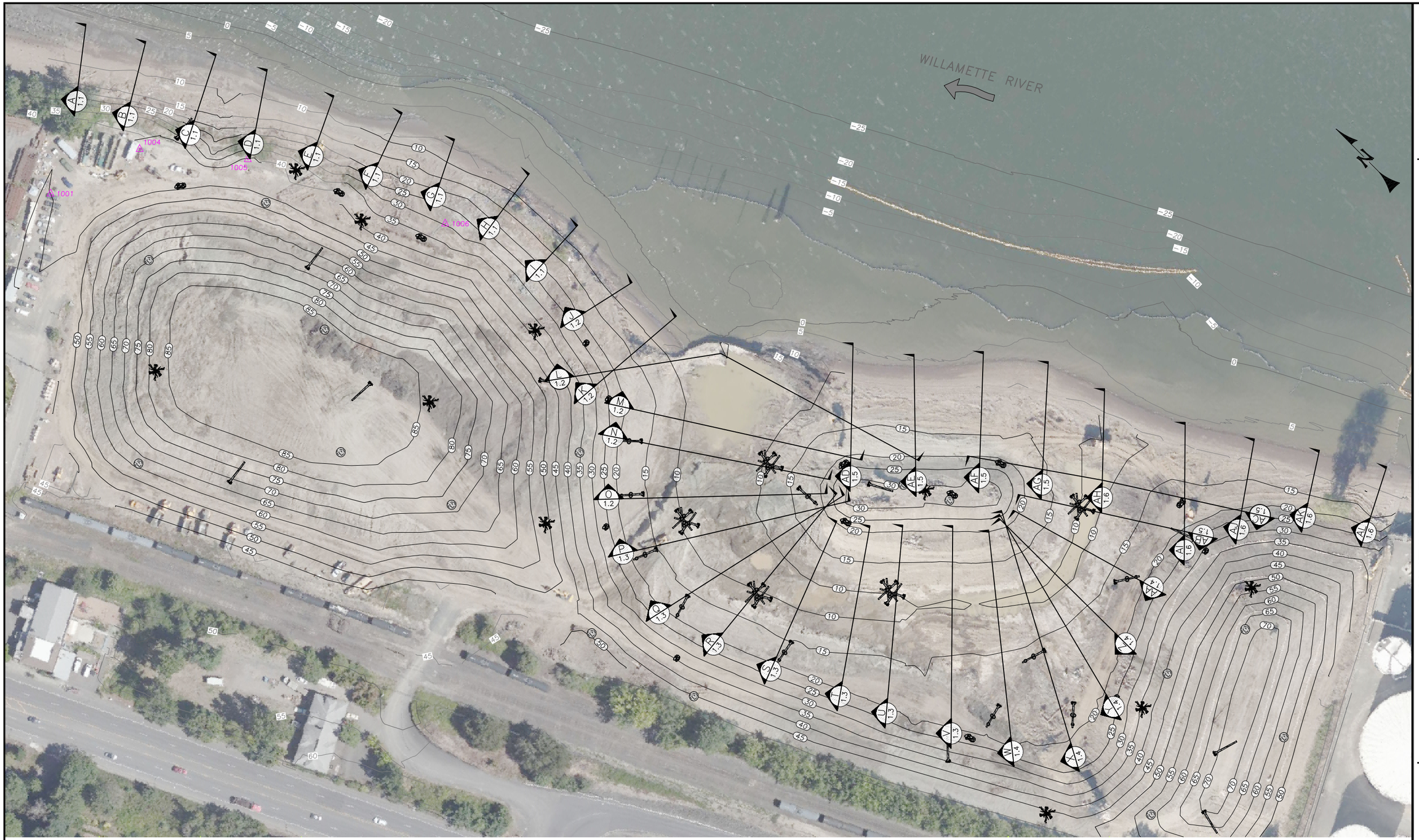
Photograph 200. Facing Northwest at Off-Channel Habitat, Downstream End

Attachment 2. Elevation Cross Section Comparisons



ANNUAL MONITORING SITE PLAN

SCALE: 1" = 120'

LEGEND

75 / 70	RECORD SURVEY CONTOURS (5' INTERVAL)
75 / 70	PRE-CONSTRUCTION SURVEY CONTOURS (5' INTERVAL)
△2	SURVEY CONTROL POINT

SECTION AND DETAIL CONVENTION

SECTION OR DETAIL IDENTIFICATION (NUMBER OR LETTER) — A / 1.3 — FIGURE REFERENCE

NOTES:

1. PRE-CONSTRUCTION SURVEY PREPARED BY AKS ENGINEERING AND FORESTRY in 2013.
2. RECORD SURVEY FOR PROJECT CONSTRUCTION COMPLETED BY WATERWAYS CONSULTING, INC. IN JANUARY 2020.
3. YEAR 1 CROSS SECTION MONITORING COMPLETED BY WATERWAYS CONSULTING, INC. IN OCTOBER 2020.

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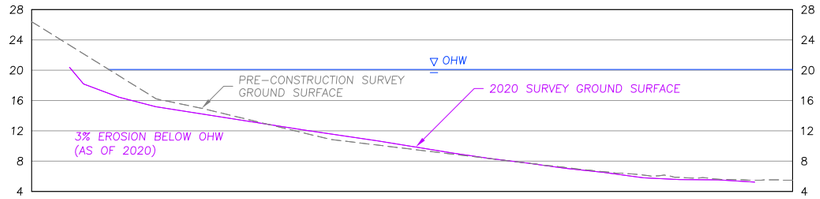
BAR IS ONE INCH ON ORIGINAL DRAWING. ADJUST SCALES FOR REDUCED PLOTS

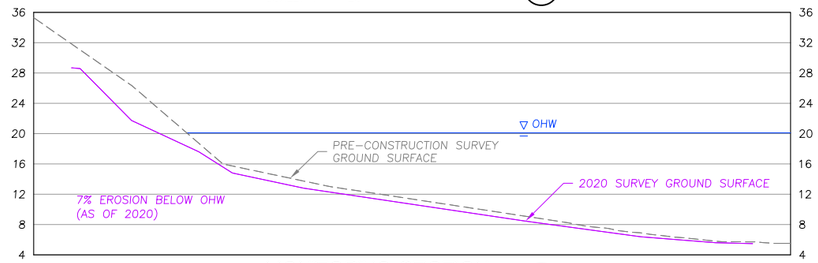
0 — 1"

FIGURE

1.0



MONITORING SECTION A 1.0
SCALE: 1" = 20'



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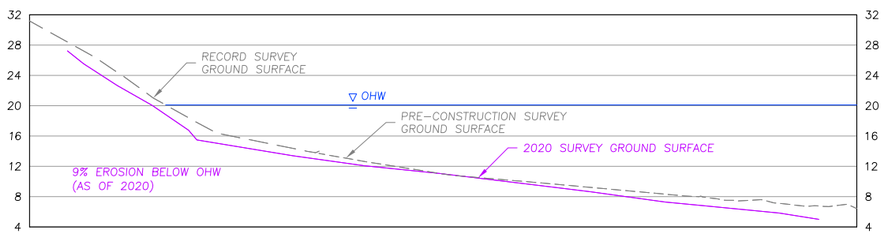

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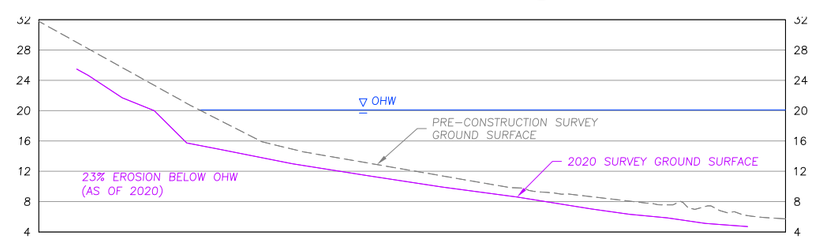

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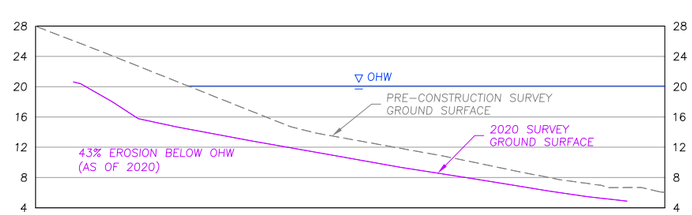
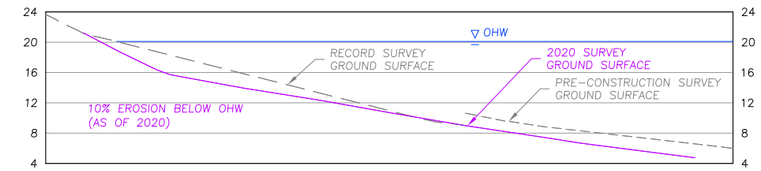


MONITORING SECTION E 1.0
SCALE: 1" = 20'



MONITORING SECTION F 1.0
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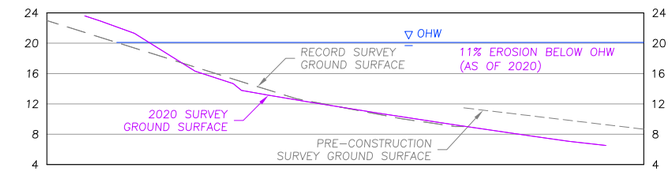

MONITORING SECTION G 1.0
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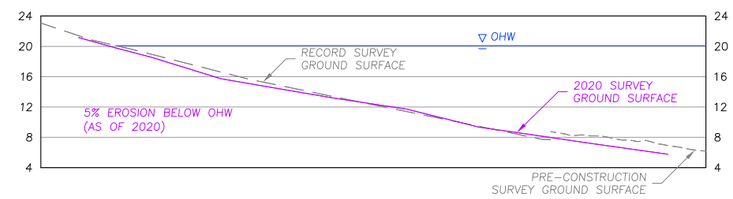

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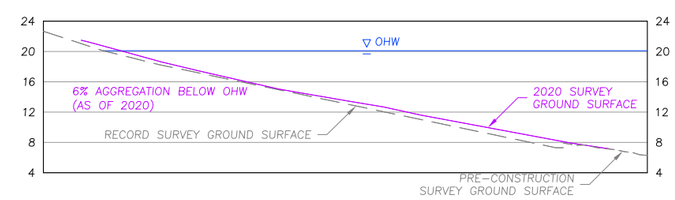

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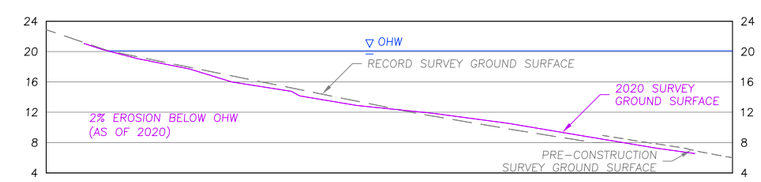

MONITORING SECTION J 1.0
SCALE: 1" = 20'

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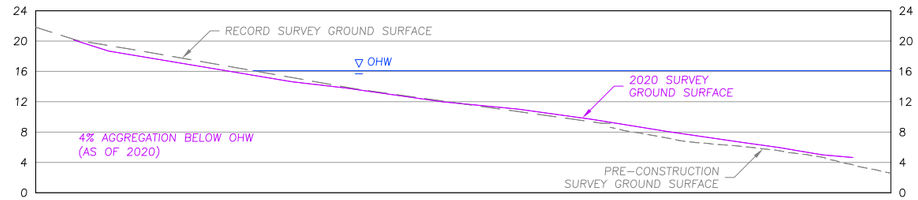
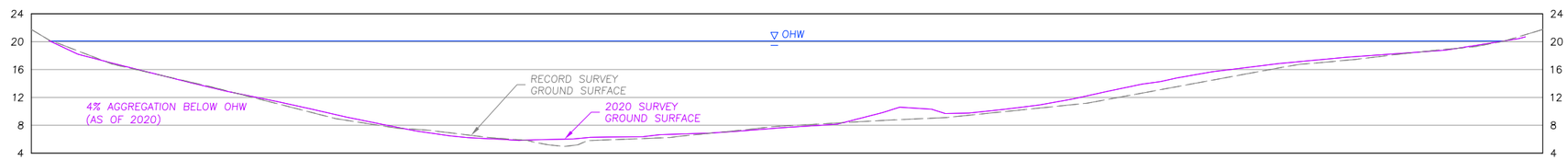
0 1"

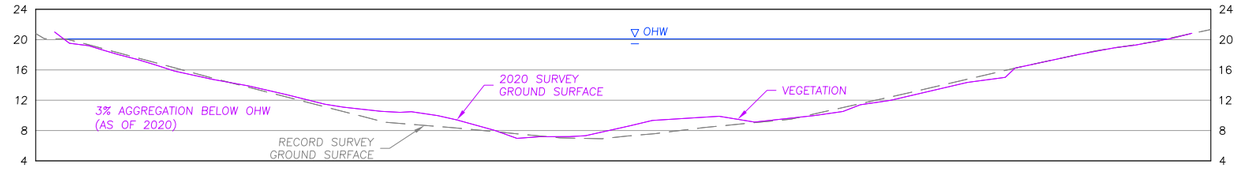
FIGURE
1.1



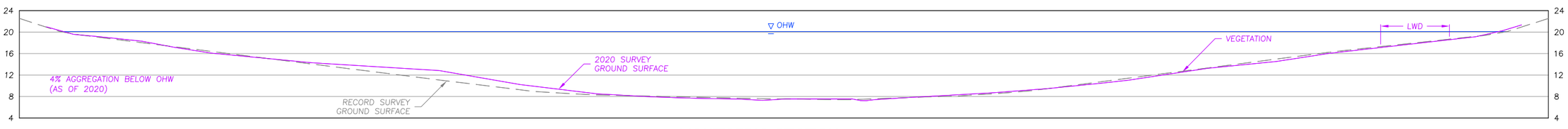
MONITORING SECTION K 1.0
SCALE: 1" = 20'



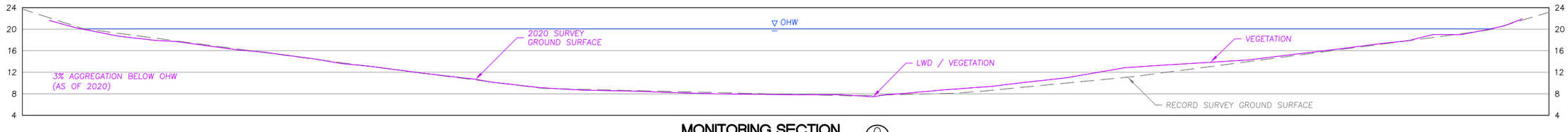
MONITORING SECTION L 1.0
SCALE HORZ: 1" = 40' VERT: 1" = 20'



MONITORING SECTION M 1.0
SCALE HORZ: 1" = 40' VERT: 1' = 20'



MONITORING SECTION N 1.0
SCALE: 1" = 20'



MONITORING SECTION O 1.0
SCALE: 1" = 20'

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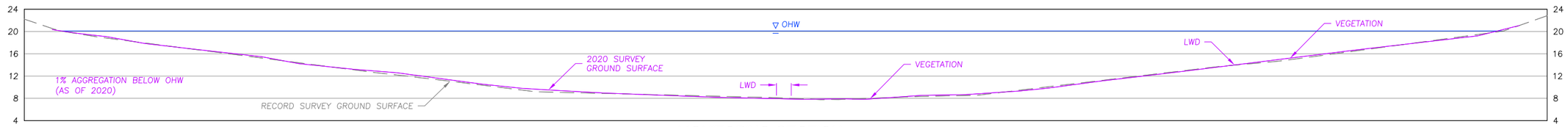
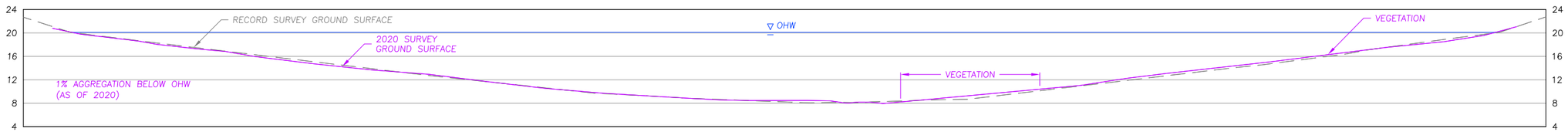
0 1"

FIGURE
1.2



MONITORING SECTION P 1.0
SCALE: 1" = 20'



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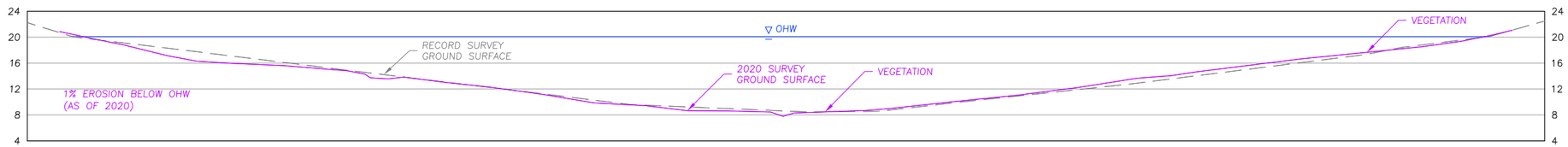
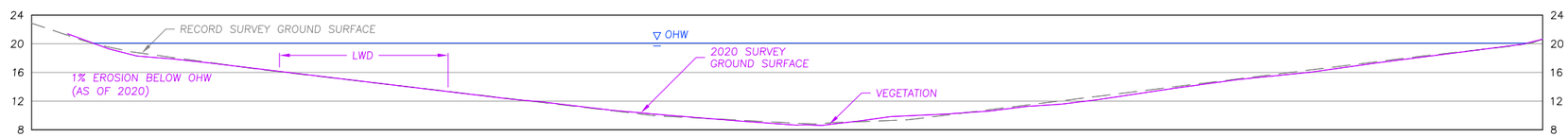


MONITORING SECTION R 1.0
SCALE: 1" = 20'



MONITORING SECTION S 1.0
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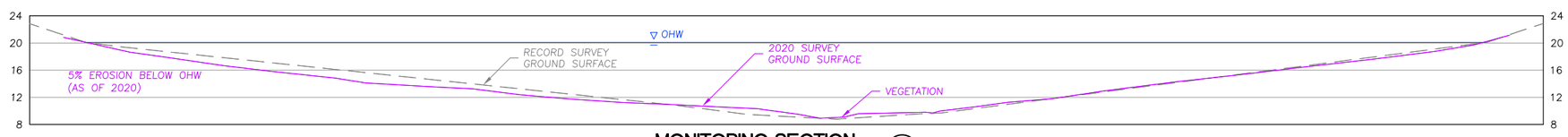
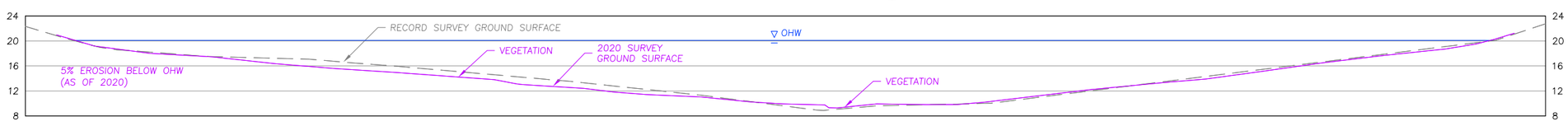


MONITORING SECTION T 1.0
SCALE: 1" = 20'



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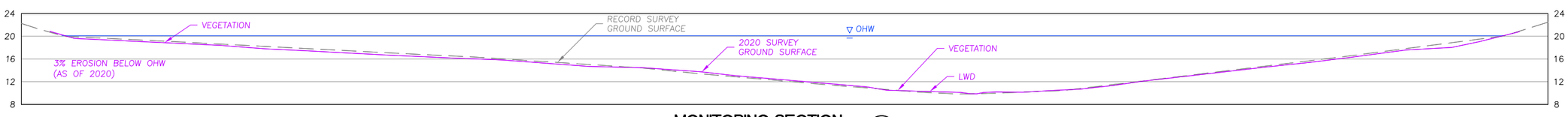

MONITORING SECTION V 1.0
SCALE: 1" = 20'

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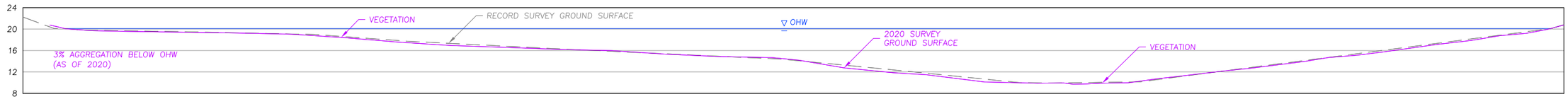
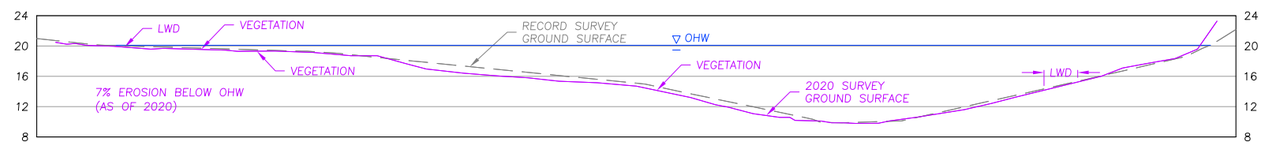
0 1"

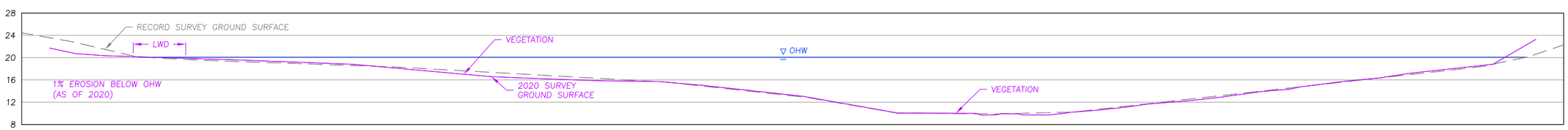
FIGURE
1.3



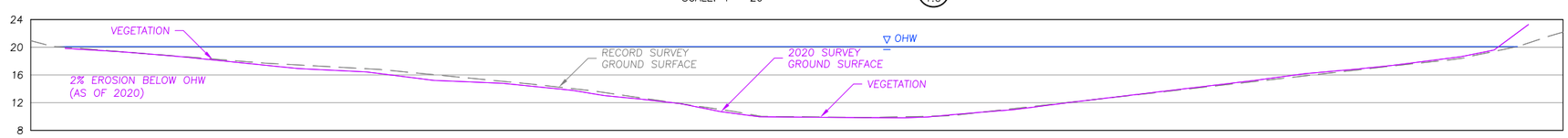
MONITORING SECTION W 1.0
SCALE: 1" = 20'



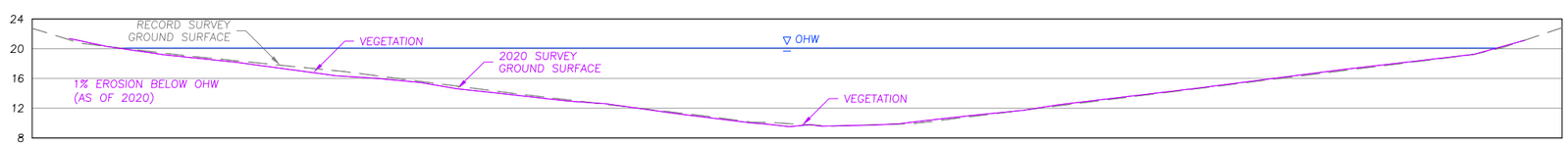
MONITORING SECTION X 1.0
HORZ SCALE: 1" = 40' VERT: 1" = 20'



MONITORING SECTION Y 1.0
SCALE: 1" =20'



MONITORING SECTION Z 1.0
SCALE: 1" = 20'



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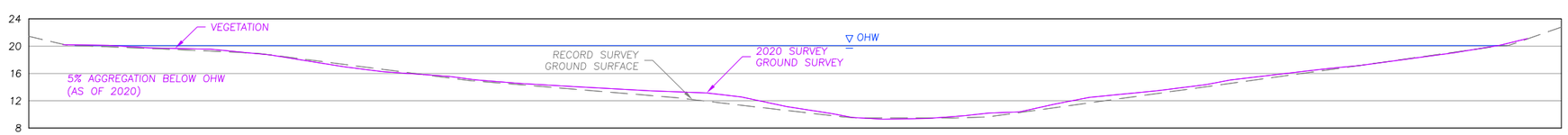

MONITORING SECTION AB 1.0
SCALE: 1" = 20'

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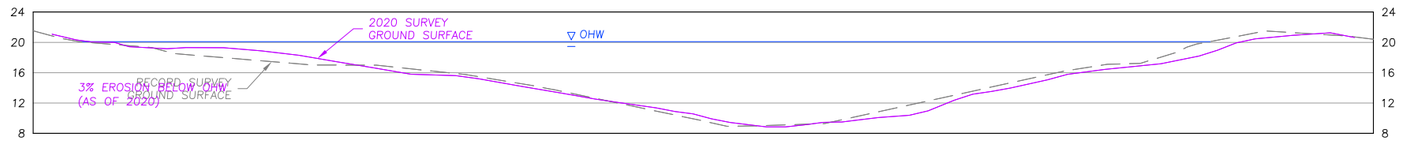
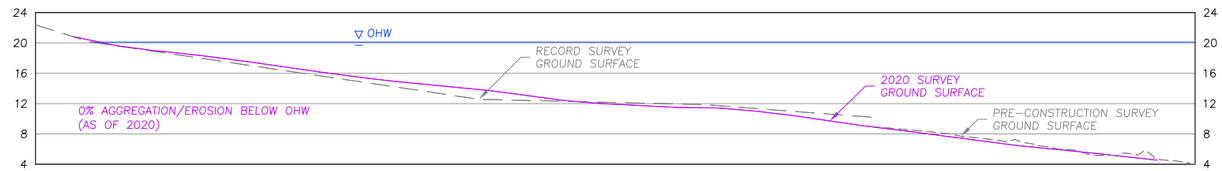
0 1"

FIGURE
1.4



MONITORING SECTION AC 1.0
HORZ SCALE: 1" = 40' VERT: 1" = 20'



MONITORING SECTION AD 1.0
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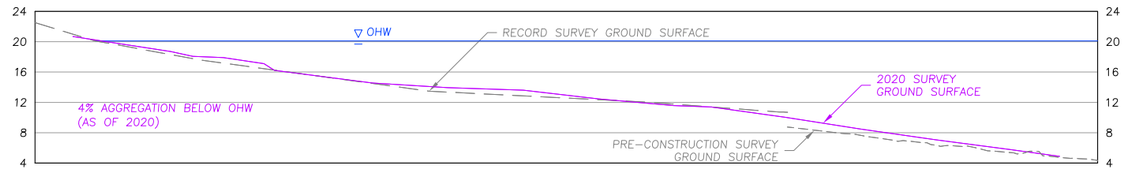

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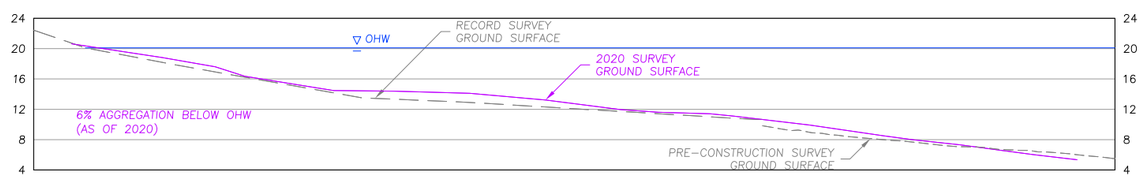

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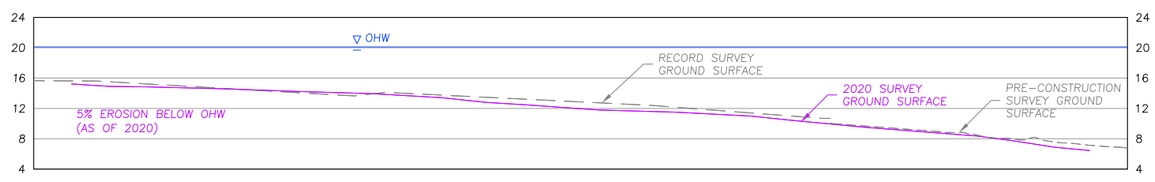

MONITORING SECTION AG 1.0
SCALE: 1" = 20'

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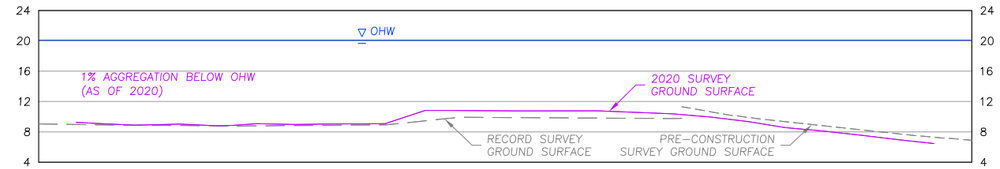
0 1"

FIGURE
1.5



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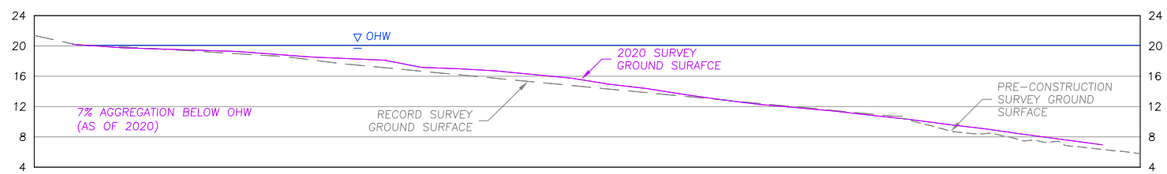

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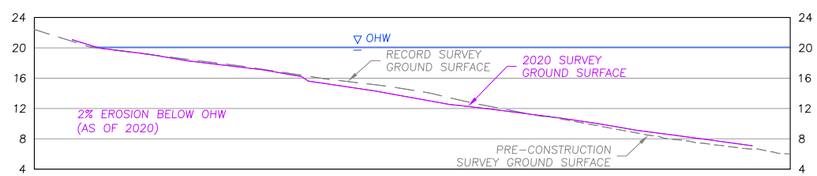

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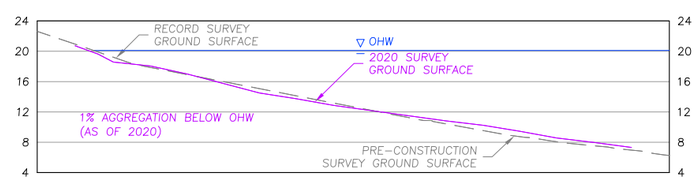

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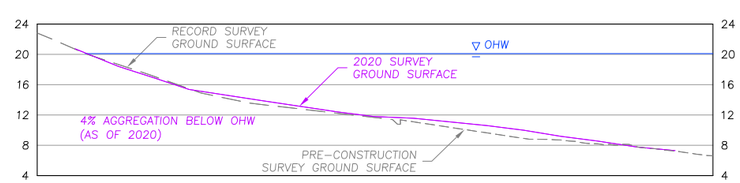

MONITORING SECTION AL 1.0
SCALE: 1" = 20'

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0 1"

FIGURE
1.6

Attachment 3. Bird Assemblage Monitoring Datasheets

SITE:

Bird Assemblage Data Form

Grette Associates LLC
ENVIRONMENTAL CONSULTANTS

Survey Date: 4/24/20 Time: 1000 start Tide:

Staff: S. Maharry Weather: Overcast, drizzle/rain Datasheet ___ of ___

Species	Count	Habitat Use	Notes
None			Transect 1-1
None			Transect 1-2
None			Transect 1-3
None			Transect 1-4
Swallow	1	Flew across site	Transect 2-1
Killdeer	1	On top of mound (bench area)	Transect 2-2
Canada goose	9	Foraging between transects 4 and 5 within channel/tidal area	
None			Transect 2-3
Killdeer	3	Foraging on island	Transect 3-1
Killdeer	3	Foraging along shore	Transect 3-2
		Underwater	Transect 3-3
Killdeer	4	Interidal area	Transect 4-1
Swallow	2	In flight	Transect 4-1
None			Transect 4-2
None			Transect 5-1
None			Transect 5-2
Mallard	1	Drake	Transect 5-3
	24		

Notes: No bird activity observed along Transect 1

SITE:

Bird Assemblage Data Form

Grette Associates LLC
ENVIRONMENTAL CONSULTANTS

Survey Date: 5/28/20 Time: 0745 start Tide:

Staff: S. Maharry Weather: Clear Datasheet ___ of ___

Species	Count	Habitat Use	Notes
Swallow	3	Randomly soaring across site and over transect	Transect 1-1
Swallow	2	Randomly soaring across site; activitiy largely concentrated on top of mound. No ground contact	Transect 1-2
Tree swallow	1	Male forging near shoreline/transect 1-4; foraging approximately 1 mintue before leaving site	Transect 1-3
Tree swallow	6	Assorted infividuals foarigng along the shoreline near transect 2-1. Numerous swallows soaring along shoreline over the site	Transect 1-4
White-crowned sparrow	3		Transect 2-1
Canada goose	8	On top of mound near transect 2-3	Transect 2-2
Osprey	1	Soaring over the site near island. Second osprey began soaring with this prior to moving downstream	Transect 3-1
Osprey	1	One osprey returned and perched on a snag on top of the mound.	Transect 3-2
Killdeer	1		
Killdeer	6		Transect 4-1
Killdeer	12	Extremely active in marsh area.	Transect 4-2
Swallows	3	Soaring over transect 5	Transect 5-1
American crow	2	Flew and perched on LWD on top of island.	Transect 5-2
Canada goose	36	Along side near river.	Transect 5-3
	85		

Notes:

SITE:

Bird Assemblage Data Form

Grette Associates LLC
ENVIRONMENTAL CONSULTANTS

Survey Date: 6/29/2020 1150-1405 Tide: +8.19' to +7.86'

Staff: S. Maharry Weather: Overcast, breezy to sunny, breezy Datasheet ___ of ___

Species	Count	Habitat Use	Notes
American tree sparrow	2	Uplands, in flight, song	Transect 1
European starling	1	Perched on snag	Transect 1
Barn swallow	4	In flight over site, perched on log pile, foraging over water	Transect 1
White-crowned sparrow	1	Perched on log pile	Transect 1
American crow	1	Perched on snag	Transect 1
House wren	4	Foraging in grass, perched on log pile	Transect 1
Tree swallow	1	In flight over site	Transect 1
Dark eyed junco	1	Perched on snag	Transect 2
House wren	1	Calling from LWD pile	Transect 2
Barn swallow	2	Foraging over uplands	Transect 2
Turkey vulture	1	Circling high above site	Transect 2
American crow	1	Cruising low over uplands (likely foraging)	Transect 2
Lark sparrow	1	Perched on snag	Transect 2
House wren	1	Perched on LWD pile	Transect 3
Osprey	1	Foraging over site	Transect 3
Canada goose	51	Foraging in intertidal in upstream end of site	Transect 3
Bewick's wren	1	Perched on security camera pole	Transect 3
Mallard	3	Foraging in shallow along shore	Transect 3
Killdeer	2	Foraging/calling along shore	Transect 3
Canada goose	*51	Same as transect 3, moving into water	Transect 4
Killdeer	2	Foraging/calling (same as transect 3)	Transect 4

Mallard	*3	Foraging in shallows (same as transect 3)	Transect 4
Killdeer	1	Foraging/calling (new)	Transect 4
Killdeer	1	Juvenile chick	Transect 4
Least sandpiper	2	Foraging probing in seep	Transect 4
Spotted sandpiper	2	Foraging probing in seep	Transect 4
European starling	1	Perched on a snag on island	Transect 4
Osprey	1	Caught 5-6" fish in habitat (@ transect 4)	Transect 5
Canada goose	*45	Resting on upstream mouth of site (same as above)	Transect 5
Killdeer	3	Same as above, foraging/calling	Transect 5
House wren	1	Foraging in grass	Transect 5
Canada goose	3	Resting on shoreline of island (river side)	Transect 5
Killdeer	1	Foraging on shoreline of island (site-side)	Transect 5
	98		

Notes: *Indicates same individuals or group counted on previous transects