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# memorandum

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to Lara Thomas

from Aaron Booy and Margaret Clancy

subject McCormick Park Reconnaissance / Opportunities and Constraints Assessment

ESA Adolfson (ESA) prepared this memorandum to assist the City of Duvall in evaluating mitigation and restoration opportunities and constraints at William F. McCormick Park. The City is interested in exploring restoration opportunities at the site to meet City resource protection and enhancement goals. The City is also considering the establishment of a mitigation 'receiving area' on city-owed lands to help offset impacts of future development.

This memo describes current and historic conditions, provides a preliminary inventory of conditions on the Snoqualmie River shoreline, and identifies potential mitigation and restoration focus areas. This information is intended to help the City evaluate potential future uses of the park area and can inform the City's comprehensive Shoreline Master Program update, which is scheduled to begin later this year.

## *Site Overview*

The McCormick Park project area (project area) is approximately 60 acres in size, and borders approximately 1.1 miles of the Snoqualmie River to the west and State Route 203 (Main Street) to the east (Section 13, Township 26 North, Range 6 East; Figure 1). The Snoqualmie Valley Trail (valley trail), which follows an old railroad right-of-way, bisects the project area (Photo 1). King County owns and maintains the valley trail, which is elevated above the adjacent river valley on a fill berm. The limits of the project area extend outside of McCormick Park proper to several other contiguous City- and publically owned areas, including: the undeveloped portions of the valley trail corridor, areas of Depot Park (City-owned), and two other undeveloped City-owned open-space parcels (Figures 2 and 3).

The project area from the river to the valley trail corridor varies in width from about 330 feet at the narrowest point in the middle of the site to 1,500 feet at the southern end of the site. To the east of the valley trail corridor, two areas of City-owned property extend an additional 300 to 400 feet to the east toward Main Street.

The McCormick Park project area lies almost entirely within the alluvial valley of the Snoqualmie River (Photos 2 and 3; Figures 2 and 3). Limited portions of the eastern limits of the project area, within Depot Park and in the vicinity of the Police Station, are outside of the alluvial valley.

The majority of the City of Duvall, including Main Street, is located on the hillside above the site. This hillside drains generally to the west. Coe-Clemens Creek and Thayer Creek, along with unnamed tributary streams, flow from east to west down the hillside before reaching the project area (see Figure 1 and the City of Duvall

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Environmentally Sensitive Areas maps, available:
http://www.duvallwa.gov/appsformspubs/planningappsformspubs.html).

Overall topography across the project area is flat, befitting its floodplain landscape position (Photos 2 and 3). There are subtle topographic features in some locations, including small swales, and a slight slope to the east (away from the river). Coe-Clemens Creek and Thayer Creek flow across the Snoqualmie River floodplain, in some cases within straight channels that suggest that they were channelized when the land was converted from forest to agriculture (see further discussion of streams and historical conditions below) (Photos 4 and 5). Several reaches of Coe-Clemens Creek, however, meander through the site (Photo 6; see *General Hydrology* and *Coe-Clemens Creek* descriptions for further detail).

The northwest portion of McCormick Park is partially developed including mowed fields, gravel trails and several picnic benches over approximately 4.75 acres (Photo 2; Figure 2). This area of the park includes an interpretive 'flood pole' documenting the elevations of past flood events. Access to the developed area of McCormick Park is provided by two trails linking to the Snoqualmie Valley Trail. The northern-most of the trails passes over the northern branch of Coe-Clemens Creek via a small bridge. The trail providing the most direct access from the valley trail to McCormick Park is located approximately 200 feet upstream. The stream flows through a culvert at this location. Depot Park, to the east of the developed portion of McCormick Park and the valley trail, includes a parking lot, a historic rail depot that now serves as a community building, and trails linking to the valley trail and McCormick Park. The parking lot at Depot Park also serves the adjacent police station. Throughout the remainder of the project area, there are gravel and dirt maintenance roads that provide access from the valley trail to the river shoreline and project area. During our field investigations, it was apparent that these unpaved roads are commonly used as trails by the public.

**General Hydrology**

Hydrology within the project area is generally influenced by direct precipitation, surface and shallow subsurface inflow from Coe-Clemens Creek, Thayer Creek, and other unnamed tributaries draining the hillslope to the east, and from the Snoqualmie River. The large majority of the project area is located within the 100-year floodplain of the Snoqualmie River (FEMA 1995). The floodplain extends from the river's right-bank to or near to Main Street in most areas of the City.

Generally, surface and ground- waters from the eastern hillslide flow to the valley and valley trail berm via surface and shallow subsurface pathways. Flows from Coe-Clemens Creek, Thayer Creek, and the other small unnamed drainages co-mingle in the wetland system immediately east of the valley trail corridor, an area mapped with poorly drained soils[1]. The relative volume of surface flows through each of the three stream channels downstream (west) of the valley trail likely varies over time dependent on beaver activity and other channel variables (see stream mapping on Figure 2).

**Snoqualmie River Shoreline Conditions**

The project area is located along the right (east) bank of the lower mainstem of the Snoqualmie River between river miles 7.5 and 10.5[2]. The Snoqualmie River is a Shoreline of the State (and also a Shoreline of Statewide Significance) as it passes along the western edge of Duvall. As such, the river is managed under the requirements of the Shoreline Management Act (SMA, RCW 90.58) and the City's Shoreline management regulations (DMC

[1] The United States Department of Agriculture Soil Conservation Service Soil Survey of Snoqualmie Pass Area, Washington (parts of King and Pierce Counties) mapped soils throughout the large majority of the project area as moderately well drained Nooksack silt loam (0 to 2 percent slopes). Other on-site mapped soils include poorly drained Puget silty clay loam (0 to 2 percent slopes), located in the vicinity of the ponded and wetland areas associated with Coe-Clemens Creek to the east of the Snoqualmie Valley Trail.

[2] The project area is located within the Snoqualmie River basin which drains an approximately 693 square mile area. The Snoqualmie River, along with the Stillaguamish River, is a main tributary to the Snohomish River. The Snohomish is designated as water resource inventory area (WRIA) 7.

14.78). Jurisdiction under the SMA extends 200 feet from the ordinary high water mark and includes any associated floodplains and wetlands. Within the project area, the approximate extent of SMA jurisdiction for the Snoqualmie River appears to be largely coincident with the limits of the 100-year floodplain (see Figures 2 and 3 for mapping of approximate SMA jurisdiction).

The reach of the Snoqualmie River through the project site, and along the entire western boundary of the City, is incised into the alluvial valley (Photo 8). During normal flows, the river is a low energy system characterized as a glide stream environment with a relatively slow flow rate and no pooling or riffle area. During significant flood events, however, the river engages much of the valley including the majority of the project area. During our reconnaissance there was substantial evidence throughout the project area of the most recent significant flood event, which occurred in January 2009 (Photos 3, 7 and 8). This flood inundated the majority of the site and included significant overbank flow that left the main channel approximately 5,000 feet south of the project. This flow continued north across the Snoqualmie River valley then spilled back into the main channel as flows receded, as evidenced by significant wrack deposition on the floodplain and on the floodplain (landward) side of riparian vegetation. Overbank flow onto the site is likely relatively common; according to the flood pole, it appears that flows have engaged the site in 50 percent of years.

The Snoqualmie River riparian corridor within the project area is characterized by a steep bank (due to the incised river) backed by a narrow deciduous forest corridor. The bank is vegetated with herbaceous trees and shrub species, with Himalayan blackberry as the dominant (invasive) shrub growing along the large majority of the bank. The forested community is generally only about 10 to 20 feet wide from the bank, but it is approximately 50 feet wide around the confluences with the tributary channels. The Stilly-Snoqualmie Task Force has recently installed native plants along portions of the Snoqualmie River riparian buffer, primarily in areas to the south of the Thayer Creek confluence with the river (Photo 7).

The riparian vegetation along the river slows surface flows from the tributary channels across portions of the floodplain and promotes infiltration, which improves water quality. However, channel incision within the lower end of the tributaries concentrates runoff, and increases fine sediment loading. Water quality is also affected by the presence of a large ponded area along the channel of Coe-Clemens Creek, directly east of the valley trail. The pond raises water temperatures, which affects outflows to the Snoqualmie River.

Historical Alterations: To assess the type and extent of historical alterations to the Snoqualmie River shoreline, and throughout the project area, we reviewed 1870s-era Government Land Office (GLO) maps (Figure 4) and 1936 aerial photography (Figure 5), both of which have been geo-referenced as part of the UW River History Project. Our investigation of historical mapping and photos specifically looked for changes in channel plan form, land cover, and other key site features.

Changes to the mainstem of the Snoqualmie River reach within the project area over the last 100 years have been focused on the northern and southern portions of the McCormick Park project site. Both areas include meander bends, while the majority of the site is in a straight reach. The straight reach through the central portion of the project area appears to have been relatively stable. In the southern portion of the project area, it appears that the channel has migrated to the south and east (see red, green, and blue lines on Figures 4 and 5 for comparative locations). The magnitude of this channel movement is less than one bankfull width, or approximately 175 feet. This change appears to be ongoing, with the formation of an in-channel bar on the river's left (west) bank, and continued erosion on the outside (east side) of the bend.

The most significant channel movement of the Snoqualmie River appears to have occurred at the northern end of the park (Figures 2, 4 and 5). Over this short reach the channel has been straightening itself, eroding the river's right bank, and building a new bar on the opposite shoreline. This movement appears to have been on the scale of one bank full width. This migration may have been influenced by bank protection measures (riprap) that have

been installed along the river's left bank. This channel movement is evident currently, as the right (east) banks of the river along McCormick Park are systemically failing (Photo 8).

The GLO map shows three tributaries that flow through the site in the general location of the existing Coe-Clemens Creek channel, Thayer Creek channel, and unnamed creek channel to the south. This mapping suggests that the existing unnamed channel in the southern portion of the site (located entirely within the southern portion of the project area; see Figure 3 and stream section below) was at one time the mouth of the creek that drains through King County's Duvall Park (to the south of the City). Flows from the Duvall Park area are now conveyed through a ditch system that enters the river farther upstream. The tributary alignments shown on the GLO maps generally support our assumption that the tributaries were channelized when the property was claimed for agricultural use.

The 1936 air photo confirms that the majority of the site was used for agriculture. This land conversion likely resulted in some land leveling, including filling and modification of original channel alignments, potential installation of tile drains (not confirmed by site observations), vegetation removal, and potentially the installation of informal 'push-up' levees (no information reviewed, beyond field observations, suggesting the installation of informal levees).

**Streams**[3]

Coe-Clemens Creek: Flow from Coe-Clemens Creek enters the project area through a highly impounded culvert beneath Main Street. The channel meanders through the eastern portion of Wetland I (see below), and becomes braided, poorly defined, and intermittent within this wetland area. Flow from the creek disperses to the north, toward the ponded area immediately west of Depot Park, as well as to the south, where surface water eventually converges with Thayer Creek. The majority of flows from Coe-Clemens Creek spill over a beaver dam that has been augmented with an artificial inlet structure (HDPE pipes that flow through the beaver dam). The beaver dam and flow-through structure are located directly below a bridge along the valley trail corridor. There are additional beaver dams and inlet structures on the west side of the trail berm along the stream corridor.

From the ponded areas created by these impoundments, surface flow reaches the river via a northern channel that appears to be the mouth shown on the 1936 photo and the GLO maps (Figures 4 and 5), and to the west via a straightened channel that was likely created during the land conversion to agriculture. Both channels are influenced by beaver activity. The western channel flows through one of the larger wetland areas on the site (Wetland H); water levels in the wetland are likely dependent on flows from the upper pond, and elevation controls at beaver dams within the west channel (Photo 6). This wetland appears to have seasonal surface ponding, and likely dries out in most summers.

Thayer Creek: Thayer Creek enters the McCormick Park project area from the southeast, where it passes near the southern and eastern edges of the City's wastewater treatment facility. To the east of the valley trail berm, the creek channel is straight, and flows directly along the toe of the trail berm for approximately 200 feet. Thayer Creek flows under the valley trail berm via a culvert crossing before flowing directly west into the river. It appears that the creek was channelized into its current alignment, which moved the discharge point to the river approximately 500 feet upstream (south). The remnant mouth remains in a forested section of the Snoqualmie river riparian area, approximately 400 feet to the north of the area of the GLO-mapped mouth (Figures 2 and 4).

Unnamed Channel: An unnamed channel flows into the Snoqualmie River within the southern portion of the project area (Figure 3). This unnamed feature is a blind channel that extends for approximately 400 linear feet, but may have historically extended further to the south according to GLO mapping (Figure 4). The upper-most

[3] Stream channels were identified based on inventory data available from the City's Stream Habitat Assessment – Existing Conditions Report (Herrera Environmental Consultants, Inc., April 2006) and in-field observations of defined bed and bank and evidence of surface water flows consistent with the City's Critical Areas Ordinance (DMC 14.42.310).

stretch of the channel is very narrow and appears to have been ditched. The channel becomes more incised as it approaches the Snoqualmie River, similar to the Thayer Creek and Coe-Clemens Creek confluences. There was no flow within the channel during our site visit.

**Wetlands**

Existing inventory information, including the City's wetland inventory map and the United States Fish and Wildlife Service (USFWS) *National Wetland Inventory* (NWI), were reviewed prior to our field reconnaissance. NWI mapping for the project area identifies the majority of the project area as freshwater emergent wetland (NWI Online Mapper, accessed April 2009, available: http://www.fws.gov/wetlands/Data/Mapper.html).

Wetlands and streams were identified by walking transects across the McCormick Park project area and analyzing aerial photos[4]. Fourteen wetlands occur on-site and three occur off-site. Figures 2 and 3 show the approximate locations of identified wetlands within the McCormick Park project area. Because the wetlands were not formally delineated during the site visit, wetland size was interpreted based upon points collected in the field using a hand held GPS, previous delineations, observations made in the field, and examination of aerial photography. Table 1 provides information describing all on-site and off-site wetlands.

Overall, wetlands within the project area are limited to areas that receive surface and shallow subsurface flow from the tributary channels. The small wetlands located on the slope above the Snoqualmie Valley, immediately west of Main Street, receive shallow groundwater from hill-side seeps. Much of the project area is dominated by relatively coarse soils that allow for rapid infiltration and percolation which prevents development of wetland conditions. Some areas to the south appear to have finer surface deposits, which result in perched water tables (south-end depressional wetlands – see Table 1).

The vegetation communities of the project area wetlands are similar. Wetlands A, C, and D are entirely herbaceous. Herbaceous wetland areas were dominated by common velvet grass (*Holcus lanatus*), cattail (*Typha latifolia*), and soft rush (*Juncus effusus*). Reed canarygrass (*Phalaris arundinacea*) is a dominant invasive species throughout all of the palustrine emergent (PEM) wetland areas.

All other wetlands have emergent (PEM) and scrub/shrub (PSS) communities. Dominant PEM vegetation within these areas is consistent with wetlands A, C, and D. PSS vegetation communities were dominated by salmon berry (*Rubus spectabilis*), vine maple (*Acer circinatum*), and willow species (*Salix spp*.). The understory of these areas included soft rush, trailing blackberry (*Rubus ursinus*), giant horsetail (*Equisetum telmateia*), skunk cabbage (*Lysichitum american*) and lady fern (*Athyrium filix-femina*). Himalayan blackberry (*Rubus armeniacus*) was the primary invasive species observed within shrub communities, although Japanese knotweed (*Polygonum cuspidatum*) was also observed in an upland area near the northern outlet of Coe-Clemens Creek. Small areas of tree canopy associated with Wetlands H and I include red alder (*Alnus rubra*) and black cottonwood (*Populus balsamifera*).

Standard protective buffer widths for wetlands are specified by DMC 14.42 and depend on category, as determined by Ecology's Western Washington Wetland Rating System (Hubry, 2004). Estimated wetland categories (including scores for water quality, hydrologic, and habitat function) and associated buffer widths are

[4] Wetland determinations were made during our reconnaissance-level investigation using methods defined in the Washington State Wetlands Identification and Delineation Manual (Washington State Department of Ecology, 1997), a manual consistent with the Corps of Engineers Wetlands Delineation Manual ("1987 Manual") (Environmental Laboratory, 1987) and the City's Critical Areas Ordinance (DMC 14.42.200). The methods outlined in the manual are based upon three essential characteristics of wetlands: (1) hydrophytic vegetation; (2) hydric soils; and (3) wetland hydrology. Field indicators of these three characteristics must all be present in order to make a positive wetland determination. It is recommended that wetland boundaries be formally delineated by professional scientists and surveyed by a professional land surveyor prior to detailed site planning.

shown in Table 1. Preliminary wetland rating forms, prepared during field investigations and through interpretation of aerial photography, are attached to this memo.

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**Table 1. Wetlands in and adjacent to the McCormick Park project area.**[5]

| Wetland Name | Landscape position | Modifications / Impairments | Area (SF and/or acres) | | Estimated Wetland Category and Buffer | | | On-site or off-site |
|---|---|---|---|---|---|---|---|---|
| South-end Depressional Wetlands (A, B, C, D, E, F, Q) | Within unnamed south-end drainage; no outlets – drain via shallow groundwater flow to Unnamed south-end channel and directly to Snoqualmie River.<br><br>All areas except for sloped portion of Wetland B within Snoqualmie River floodplain. | Reed canarygrass is dominant in significant areas of all South-end Wetlands.<br><br>Wetland B is a slope wetland to the east of the trail, extending across an off-site property; highly constricted by the trail berm, with hydrologic connection to depressional area of Wetland B through trail bridge. | A | 30,000 SF / 0.68 acres | A | Cat. II (53 points overall, 20/20/13) | 60 feet | Wetlands A, C, D, E, F are all entirely on-site.<br><br>Wetland B is a slope wetland to the east of the Snoqualmie Valley Trail (off-site – delineation completed by others) and a depresional wetland to the west of the trail (on-site).<br><br>Wetland Q is entirely off-site<br><br>(Figure 3) |
| | | | B | 4.7 acres total[6] | B | Cat. II (66 points overall, 24/20/22) | 100 feet | |
| | | | C | 250 SF | C | Cat. III (41 points overall, 20/8/13) | 60 feet | |
| | | | D | 150 SF | D | Cat. III (41 points overall, 20/8/13) | 60 feet | |
| | | | E | 12,000 SF / 0.3 acres | E | Cat. II (57 points overall, 20/20/17) | 60 feet | |
| | | | F | 500 SF | F | Cat. III (50 points overall, 20/14/16) | 60 feet | |
| | | | Q | 35,500 SF / 0.8 acres | Q | Cat. II (61 points overall, 20/20/21) | 80 feet | |
| G | Immediately west of trail berm and north of access road; no distinct outlet – potential hydrologic connections include Wetland E to south, Thayer Creek to east and north, and Snoqualmie River to west. Shallow groundwater flow into and out of the wetland.<br><br>Entirely within Snoqualmie River floodplain. | Wetland area likely historically contiguous with Wetland areas G and N. Isolated by trail and maintenance road fill berms. | 1 acre | | Category II with58 points overall (20/20/18)<br><br>60 foot buffer | | | On-site (Figure 2) |

[5] When wetlands and streams were located, ESA staff used a hand-held global positioning system (GPS) Trimble unit (rated at 1 meter accuracy) to identify the approximate boundaries of wetlands and stream features. Several wetlands adjacent to the McCormick Park site were delineated by others in the past as part of site development submittals provided to the City. For these areas, ESA staff made observation from the site to verify survey data provided by the City was accurate, and did not mark the boundaries with the GPS unit. Adjacent wetland areas are mapped on Figures 2 and 3 as off-site wetlands.

[6] 3.3 acres of Wetland B on-site to the west of the berm.



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| Wetland Name | Landscape position | Modifications / Impairments | Area (SF and/or acres) | Estimated Wetland Category and Buffer | On-site or off-site |
|---|---|---|---|---|---|
| H | Primary source of hydrology is overbank flow from Coe-Clemens Creek and the Snoqualmie River.<br><br>Immediately west of trail berm within the primary Coe-Clemens Creek drainage. Contiguous with Wetland I via main Coe-Clemens outlet under trail, however hydrologically separated by beaver dam, except during river flood events.<br><br>Entirely within Snoqualmie River floodplain. | Wetland area historically contiguous with Wetland I; constrained by trail berm. | 3.4 acres | Category II with approximately 69 points overall (28/16/25)<br><br>120 foot buffer | On-site (Figure 2) |
| I | Immediately east of trail berm within the primary Coe-Clemens Creek drainage. Extends east to Main Street fill slope / Coe-Clemens Creek impounded inflow culvert. Stream disperses into wetland area, with channels / intermittent channels fanning out to the north and south. Contiguous with Wetland H via main Coe-Clemens outlet under trail, however hydrologically separated by beaver dam, except during river flood events. Southern portion of the wetland drains to south and combines with Thayer Creek immediately upstream of culvert under the Snoqualmie Valley Trail.<br><br>Entirely within Snoqualmie River floodplain except for limited slope portions extending upslope near Wetland J and K. | Wetland area historically contiguous with Wetland H; constrained by trail berm.<br><br>Large ponded area extends from northern tip of wetland to the main outlet under the trail; ponded area created by trail berm, and potentially other historic modifications. | 11.7 acres total[7] | Category II with approximately 64 points overall (14/24/26)<br><br>140 foot buffer | Majority of wetland is on-site. Southern lobe of wetland, except for southern-most extent, is off-site – off-site area depicted on Figure 2 is approximate. |

[7] Approximately 7 acres of Wetland I are on City owned park lands; privately owned area of Wetland I is located on undeveloped portion of commercial/industrial parcel extending from Main Street to Snoqualmie Valley Trail.

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| Wetland Name | Landscape position | Modifications / Impairments | Area (SF and/or acres) | Estimated Wetland Category and Buffer | On-site or off-site |
|---|---|---|---|---|---|
| J and K | Wetlands J and K are slope wetlands immediately west of Main Street. Wetland hydrology is from shallow groundwater seeps. Wetlands have no distinct outlet – defuse into upland shrub and herbaceous areas to the west. | Both wetlands are dominated by Himalayan blackberry. In addition, past filling and grading and channelization on the off-site property has modified the hydrology of these wetlands and limited their habitat function. | J: 4,200 SF (small area extending onto City park land)<br>K: 3,200 SF (small area extending onto City park land) | Category IV with approximately 28 points overall (6/6/16)<br><br>50 foot buffer | Majority of these wetlands are off-site – western most portions extend onto City park lands (Figure 2). |
| L, M, and N | Wetlands L and M are located in small depressions immediately upslope of the Thayer Creek channel. Hydrology to wetlands from shallow groundwater seeps (from hillside to east) and stormwater discharge.<br><br>Wetland N is located in a small depression, and is bisected by a gravel maintenance road. | Wetlands are dominated by reed canarygrass and Himalayan blackberry. In addition, past filling and grading and channelization in these areas has modified the hydrology of these wetlands and limited their habitat function. Wetland N is bisected by an unpaved maintenance roads. | L: 1,250 SF<br>M: 300 SF<br>N: 2,800 SF | Category III with 32 – 34 points overall (16/8/8-10)<br><br>60 foot buffer | All three wetlands are on-site (Figure 2/3). |
| O, P, and Q | Wetlands O and P are slope wetlands immediately west of Main Street. Wetland hydrology is from shallow groundwater seeps. Wetlands have no distinct outlet – defuse into upland shrub and herbaceous areas to the west.<br><br>Wetland Q is located entirely within the Snoqualmie River floodplain. It is a depressional wetland, likely extends further south. No outlet. | Wetlands are dominated by reed canarygrass and Himalayan blackberry. Modified and degraded by past land modifications and land use activities within and immediately adjacent.<br><br>Wetland Q was likely historically connected with Wetland H before placement of the fill berm along the valley trail corridor. | O: 4,300 SF<br>P: 0.25 acres<br>Q: 0.8 acres (likely extends to south) | Off-site with no near access from publically owned areas – no wetland rating forms completed | All three wetlands are off-site (Figure 3). |

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### *Potential Restoration Opportunities*

In the near term, and considering the City's potential use of this area to provide off-site mitigation for development impacts throughout the City, we have developed some generalized treatment options for the site. The intent is to capture restoration options that span different levels-of-effort, and could be installed either all at once, or using a phased approach. To facilitate discussion of the area, potential restoration opportunities are presented in six focus areas:

1. Coe-Clemens and Thayer Creek channels.
2. Coe-Clemens pond.
3. Southern (Wetland B) swale and depressional wetlands.
4. Snoqualmie River bank stabilization.
5. Non-native plant control
6. Mainstem off-channel habitat.

The general locations of each focus area, except for non-native plant control which is applicable throughout the project area, are identified on Figures 2 and 3.

**Focus 1: Coe-Clemens and Thayer Creek Channels**
Significant portions of both Coe-Clemens and Thayer Creeks flow through straightened, degrading channels from Main Street to their confluence with the Snoqualmie River. In their current degraded conditions, the streams limit the hydrologic, water quality, and habitat functions of the site wetlands and buffer areas. As documented by the City's 2002 Stream Restoration Plan (Herrera Environmental Consulting, Inc., 2002), the straightened and degrading streams limit water contact time with floodplain vegetation and soils, and are a source of fine sediment to the river. The existing streams limit upstream migration available to adult salmonids and habitat availability for juvenile salmonids, and provide a toe hold for non-native invasive weeds. By creating new stream corridors with greater sinuosity and re-routing at least portions of the tributary channels through the site to the west of the trail corridor, the City could achieve the following goals:

- Increase channel length;
- Potentially increase wetland area;
- Increase channel stability; and
- Restore native riparian forest.

Our initial assessment indicates that restoration of the Thayer Creek channel would be, in general, easier than restoration of the Coe-Clemens Creek channel. Coe-Clemens is more challenging as it is constrained by the existing developed portion of the park to the north, and its flow through and proximity to the most significant wetland area in the project area (Wetland H/I complex).

The primary design challenge for re-routing the tributary channels will be the design of the transition from the tributary to the river. The overall drop from the berm to most river levels is on the order of 15 to 20 feet. Holding the elevation of the tributary high through the majority of the project area will result in the greatest potential for increasing wetland area, but would increase the need for engineered structures (log or otherwise) to prevent headcutting at the mouths of the tributaries. Further, the drop at the end of the channel could preclude fish movement from the main channel into the tributary channels. The overall grade of these channels is influenced by beavers, so it is likely that stepping the channel down gradually would be better solution for this issue.

Costs associated for this option would be dependent on the amount of excavation necessary. The significant depth at the mouth would likely necessitate a fair amount of material removal.

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**Focus 2: Co-Clemens Pond**
It is likely that the large pond to the east of the trail corridor and west of Depot Park elevates Coe-Clemens Creek water temperatures during the summer. The Snoqualmie River is listed on the 303(d) list for fecal coliform (with TMDL implemented), so reducing summer temperatures should be an overall goal. Installing trees around the pond, and placing shallow mounds of fill in the pond to allow shrubs and trees to grow could help reduce water temperatures. The pond is also currently at least a partial migration barrier for fish (Herrera, 2002 and 2006).

It may be beneficial to install some temperature loggers through spring and summer of 2010 to determine the magnitude of the temperature issue. This would be a relatively inexpensive way to determine how important this focus could be.

**Focus 3: Southern (Wetland B) Swale and Depressional Wetlands**
Hydrology from the Wetland B tributary area supports the depressional wetland complex along the Snoqualmie Valley Trail berm. Hydrologically, this area appears to function at a high level. Water is detained on the surface, and is infiltrated, becoming shallow subsurface flow to the river. Therefore, we recommend that any modifications in this area intended to create additional wetland area be carefully planned and designed to avoid degrading existing functioning.

If increasing wetland area in the southern area is determined to be an objective, earthwork would need to be very subtle. Grading of shallow swales could occur to potentially expand wetland area further to the west. However, the amount of water flowing to this area is limited, so it does not appear that significant wetland area could be created here. Enhancement of Wetland B and other south-end depressional wetlands, buffers, and upland riparian areas with installation of native vegetation and habitat features may be a more successful approach.

**Focus 4: Snoqualmie River Bank Stabilization**
As noted in the alterations section of this memorandum, there are long stretches of bank (approximately 500 feet) in the northern portion of the project area that are actively failing (Photo 8). This appears to be part of a longer-term process where the river is migrating east in this location. The river migration process will likely continue. A successful strategy to stabilize the shoreline along this reach could include grading back the banks and planting the banks and riparian area with native vegetation. Shoreline stabilization in the northern portion of the project area would provide an additional buffer between the developed park and the river, reduce fine sediment loading from the failing banks, and improve riparian cover.

**Focus 5: Non Native Plant Control**
There are significant areas of non-native invasive plant species within the project area, most notably Himalayan blackberry and reed canarygrass. Managing these infestations will be key in the long term success of native plantings. There are many options for treatment, including intensive techniques such as removal of the top 18 inches of soil material and/or herbicides. Less intensive techniques include mulching, dense native plantings, etc. Weed control will be a key element of any of the actions within the project area, and will need to be a significant part of restoration planning.

A successful option for control of reed canarygrass could be through establishing areas of dense native tree and shrub vegetation as 'islands' in areas dominated by the invasive weed. This less intensive technique would not eradicate canarygrass, but would shade the plant and provide an opportunity for native vegetation to become established and successfully compete in the project area. This strategy is additionally recommended due to the large canarygrass seed sources from adjacent properties which would limit the effectiveness of eradication.

An additional option for controlling reed canarygrass is to strip the top 18 to 24 inches of soil, roots and seedbank material. This is a very invasive technique and as such application within the project area may be limited. However, it does have the advantage of quickly removing the rootmat that is the most significant challenge in dealing with canarygrass. In this instance, this removal of material could have the added advantage of lowering

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the average elevation of the restoration areas, which would increase floodplain storage, and could potentially be done in a way that could restore and enhance existing wetlands. The disadvantages to this approach would be the cost for removing and disposing of the material, and the significant disturbance to the project area. If large areas of topsoil were removed, it would be necessary to employ significant, pro-active and adaptively managed sediment and erosion control measures. Aggressive removal of reed canarygrass should be considered where grading is proposed as a component of project area restoration.

**Focus 6: Off Channel Habitat**

In general terms, the amount and quality of off-channel habitat all along this stretch has been reduced. Our initial assessment suggests there appear to be three ways that off-channel habitat could be created or enhanced on the McCormick Park project area:

- Enhance riparian vegetation throughout;
- Focus off-channel habitat at tributary confluences; and/or
- Excavation new off-channel features (e.g., oxbows).

The first option is by far the easiest, and should be implemented under any approach. This effort has started, evidenced by new plantings in areas of the Snoqualmie River riparian corridor (Photo 7).

The second option could relatively easily be incorporated into the design of the tributary channel re-alignment discussed in Focus 1. Further, the existing mouths could be left as off-channel habitat, rather than filling the entire existing channels. The primary challenges here are: 1) the significant volume of material that would have to be removed to have off-channel habitats actively engaged with water during most river flows and 2) providing some type of grade control in these channels in order to prevent river headcutting into the site, and to allow the channels to withstand overbank flows re-entering the main channel on this site.

Excavating an entirely new off-channel feature, such as a secondary channel or an oxbow, would require the most design and construction effort. Based on our observations of deposition patterns from the January 2009 event, most overbank flow appears to leave the main channel well south of the McCormick Park project area. Therefore, any feature that would be excavated into the project area may only function as intended in a limited range of flows, before being overwhelmed by overbank flow from the south. Additional feasibility-level design would be necessary and would need to assess river gauge data to determine elevation ranges where this effort may be effective, and investigate reference standards to determine what parameters should be the design focus.

Ideally, over the long term, McCormick Park would be restored to a mature, native, riparian forest community resembling pre-development conditions. Achieving this goal would create a functional floodplain that, despite land use and hydrologic changes in the surrounding contributing basin, would be highly resilient to ecological stressors, and provide high levels of hydrologic, water quality, and habitat ecosystem function.

## *Developing a Mitigation Receiving Area*

Throughout the City of Duvall, development density has increased substantially within the last decade, with rural lands being converted to commercial uses and moderate density residential neighborhoods. Development pressures are anticipated to continue in the coming years, putting additional stress on the City's wetland and stream systems. Consistent with the City's plans to focus critical areas mitigation within McCormick Park and contiguous publically owned areas, this section presents an overview of some of the legal, logistical, and administrative challenges associated with developing a mitigation receiving area[8].

[8] For purposes of this letter, a mitigation receiving area refers to the implementation of required critical areas mitigation from areas with low ecological potential (those areas being developed – the *mitigation sending areas*) to areas with high ecological potential (those areas that the City is targeting for preservation and restoration – the *mitigation receiving areas*).

Creating a mitigation receiving area would likely require some changes to the Duvall Municipal Code in order to establish a preference for mitigating impacts within McCormack Park. The City would need to determine which types of impacts would be eligible for off-site compensation and establish parameters for how on-site versus off-site mitigation decisions would be made. This effort might also entail determining which types of impacts could be mitigated out-of-basin at a mitigation bank, for example. Critical Areas Regulations currently allow for off-site mitigation as long as specific sub-basin and watershed location requirements are met and the City determines that the off-site location will "provide the greatest ecological benefit and have the greatest likelihood of success." The City makes this determination on a case-by-case basis based on the available information, not on specific criteria. The City's upcoming comprehensive SMP update process could provide an opportunity to develop more specific policies and regulations consistent with and supportive of the restoration priorities and receiving area envisioned for the McCormick Park area.

The City would also need to determine how the McCormack Park mitigation would be implemented. One option is for the City to implement all of the mitigation and collect funds from developers (to offset the costs) at the time permits are issued. Fees would be commensurate with the estimated cost of mitigation for the impact that is occurring. This type of in-lieu fee (ILF) approach would likely require formal review and approval by the U.S. Army Corps of Engineers, the Department of Ecology, and possibly other agencies if the program is to be compliant with federal and state wetland regulations. An in-lieu fee system would allow the City to maintain consistent implementation and management of the receiving area. This consistency would allow for uniform maintenance and adaptive management, and generally enhance the likelihood of overall mitigation area success.

Alternatively, the City could require the applicant to prepare a plan and construct the mitigation according to City specifications. Under this scenario, the restoration focus areas identified in this letter, as well as other potential restoration objectives, would be used to create a framework for project implementation. The framework would be used to design individual restoration projects. The scale and extent of the mitigation efforts occurring in the McCormick Park would be commensurate with the scale of the development impact.

A key challenge with either approach will be assuring ongoing maintenance and monitoring of the mitigation area. Under either of these two potentially workable systems (or a combination of both), local regulatory and planning programs would need to be tailored and/or updated to encourage use of the receiving area.

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Photo 1. View of Snoqualmie Valley Trail foot bridge, taken from edge of Wetland B. Bridge height show the approximate elevation change between the valley bottom and the trail (April 2000).

Photo 2. View across northern portion of McCormick Park, facing south. The northern portion of McCormick Park is the only area to the west of the Snoqualmie Valley Trail that has been improved for recreational use (April 2009).

Photo 3. View of undeveloped area to the west of the trail corridor, facing south from the vicinity of the central Coe-Clemens Creek outlet (April 2009).

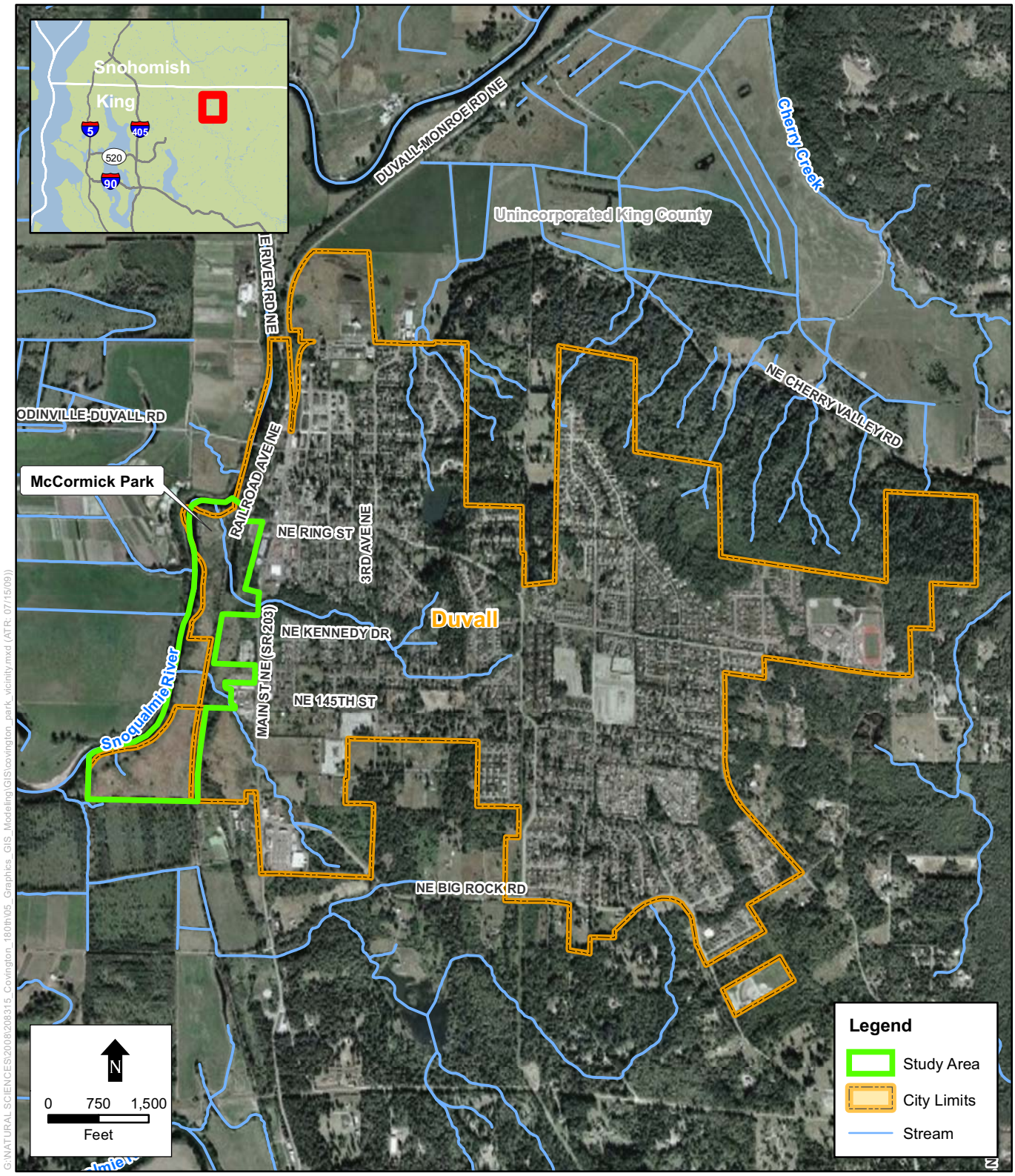
Photo 4. Coe-Clemens Creek channel and incised banks immediately upstream of confluence with the Snoqualmie River (photo looking east, April 2009).

Photo 5. Thayer Creek channel immediately east of the City of Duvall Wastewater Treatment Plant facility (April 2009).

Photo 6. View across Wetland H and meandering Coe-Clemens channel within wetland, to the west of the trail corridor. Note significant amounts of racked flood debris behind alders at the edge of the wetland (April 2009).

Photo 7. View of southern portion of the McCormick Park study area, taken from the bank of Snoqualmie River. Note installed native vegetation throughout the upland meadow area, much of which held flood debris from the previous significant flood event (April 2009).

Photo 8. Snoqualmie River facing south from the northern portion of McCormick Park. Not banks failures along the near bank of the river (April 2009).




SOURCE: AEX, 2007 (Aerial); City of Duvall, 2008; King County, 2009.

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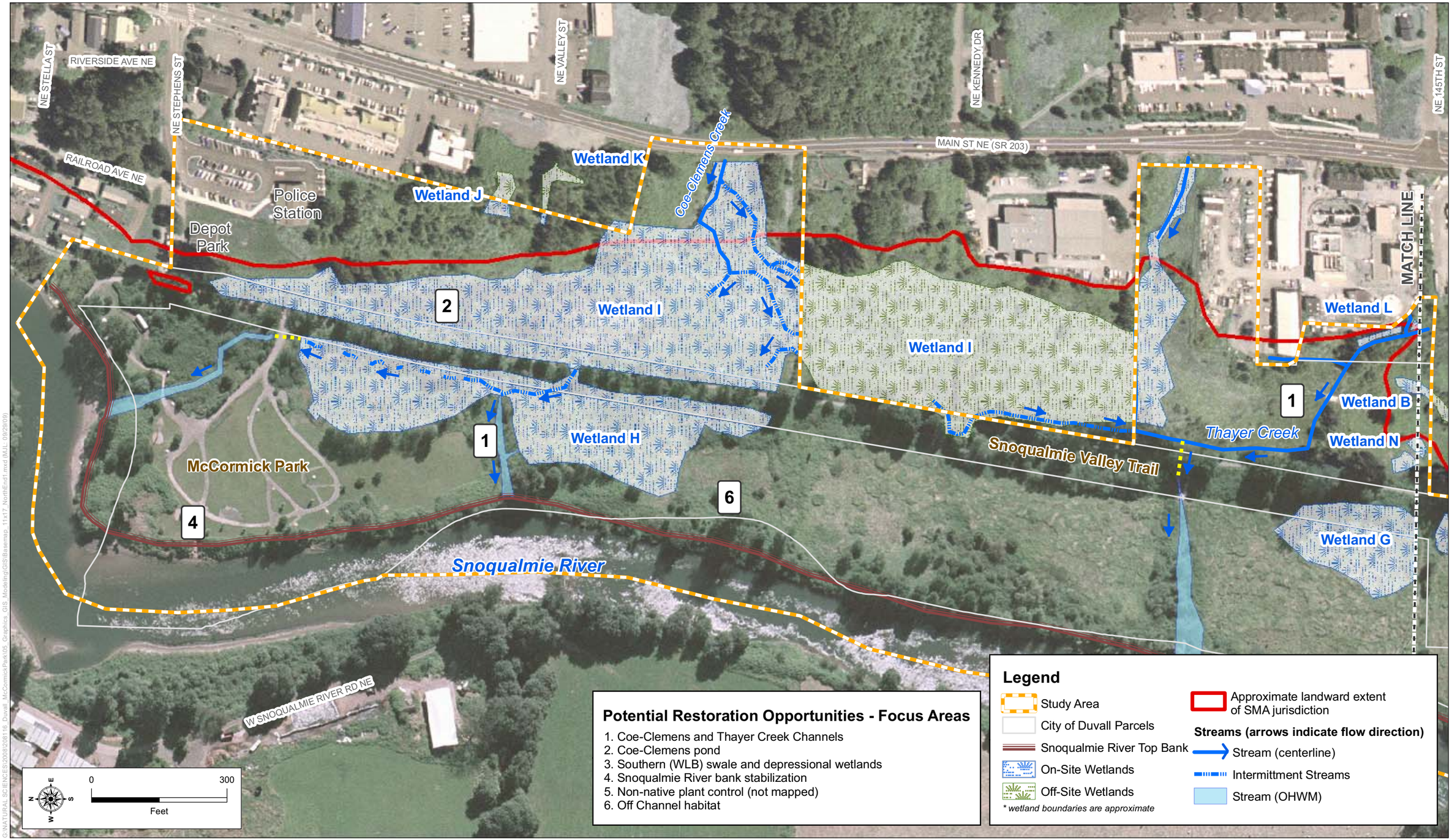
**Figure 1**

McCormick Park Reconniasance and Assessment - Vicinity Map
Duvall, Washington

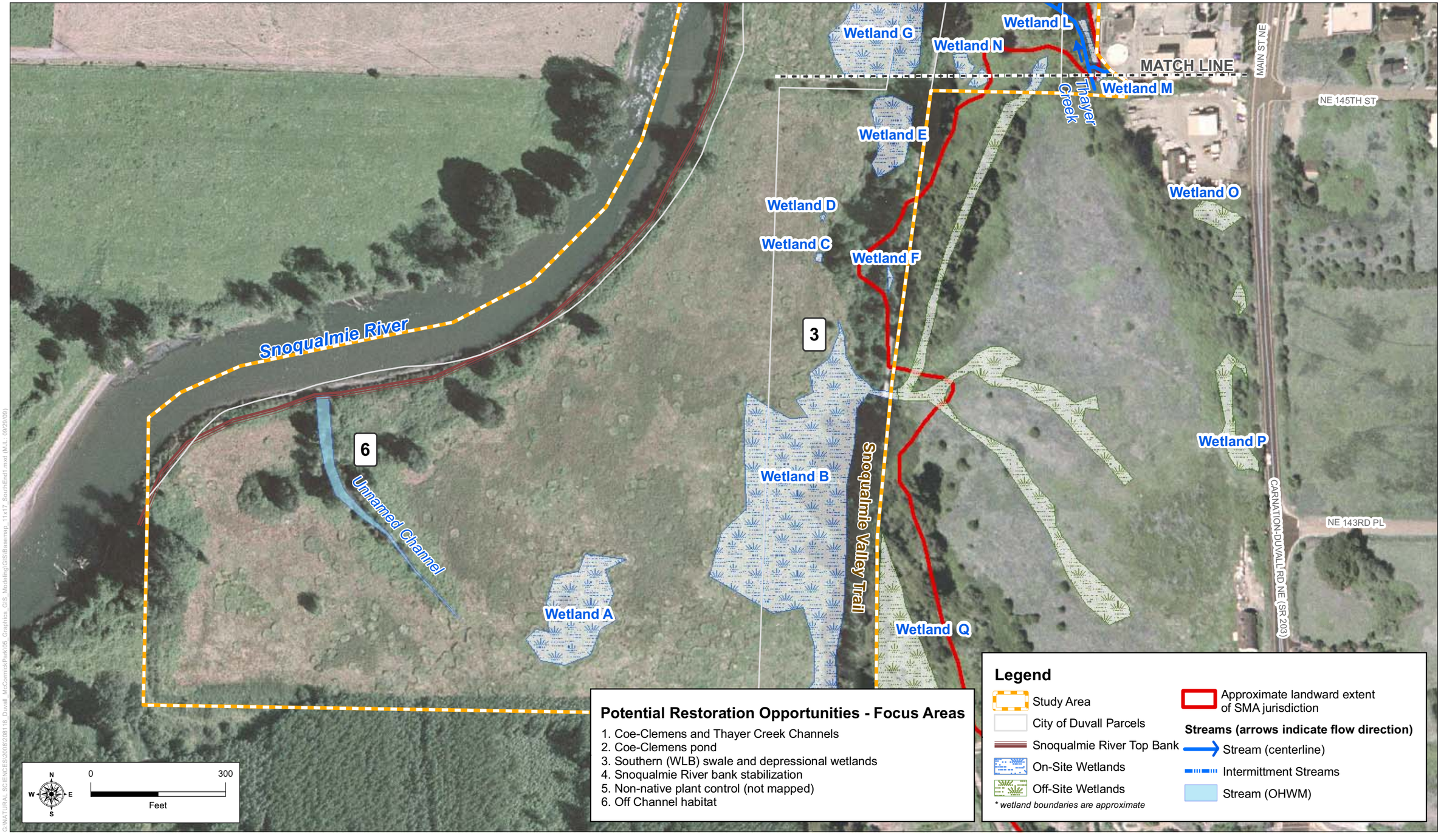



SOURCE: Barghausen, 2006; ESA Adolfson, 2009; King County, (2005) 2009

Duvall McCormick Park . 208116

**Figure 2**

McCormick Park Reconniasance and Assessment - North End
Duvall, Washington




**Potential Restoration Opportunities - Focus Areas**

1. Coe-Clemens and Thayer Creek Channels
2. Coe-Clemens pond
3. Southern (WLB) swale and depressional wetlands
4. Snoqualmie River bank stabilization
5. Non-native plant control (not mapped)
6. Off Channel habitat

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SOURCE: Barghausen, 2006; ESA Adolfson, 2009; King County, (2005) 2009

Duvall McCormick Park . 208116

**Figure 3**

McCormick Park Reconniasance and Assessment - South End
Duvall, Washington

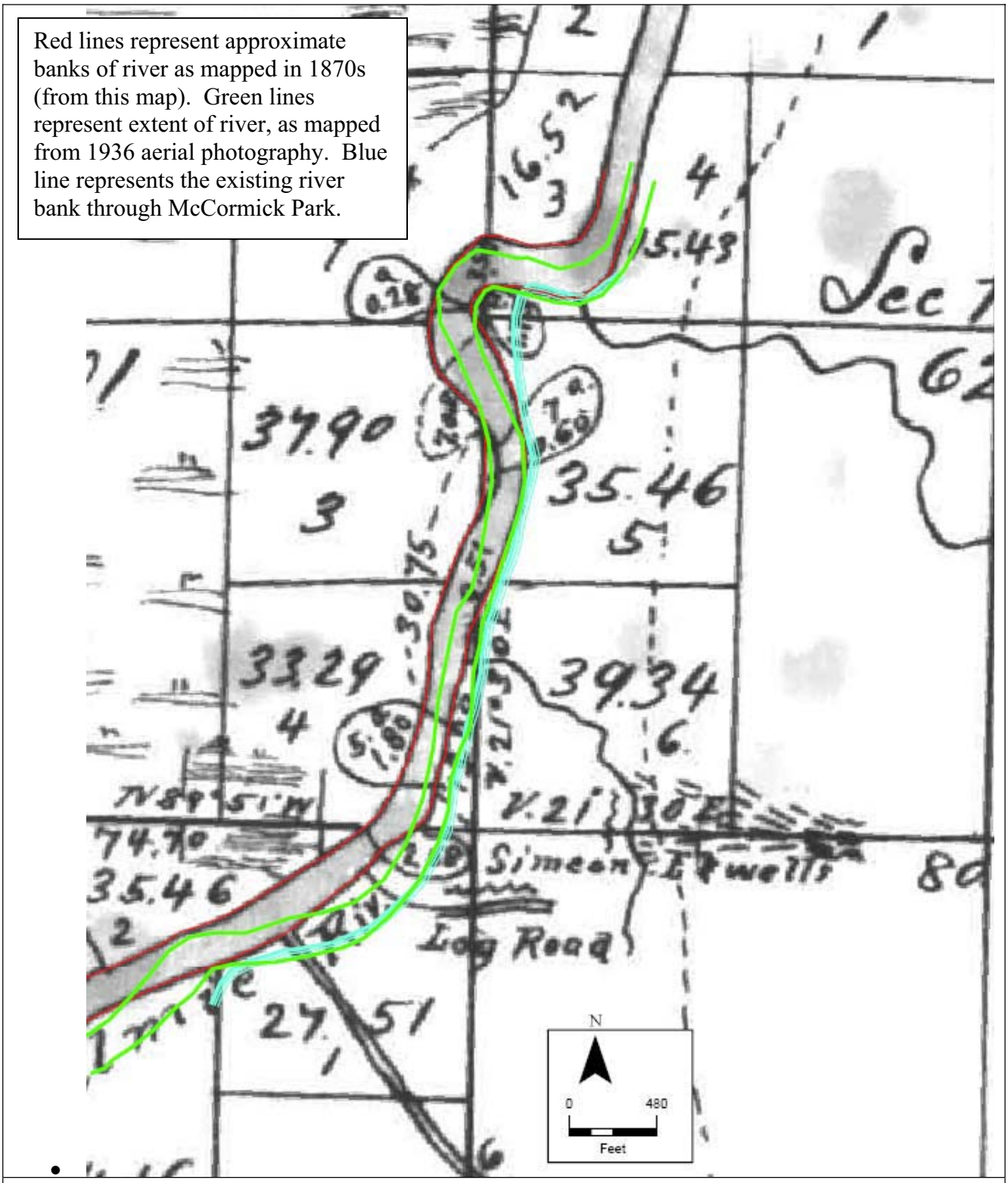


Figure 4. Digital image of 1870s era General Land Office (GLO) map for the McCormick Park Reconnaissance and Assessment project vicinity. Map made available by the University of Washington River History Project.

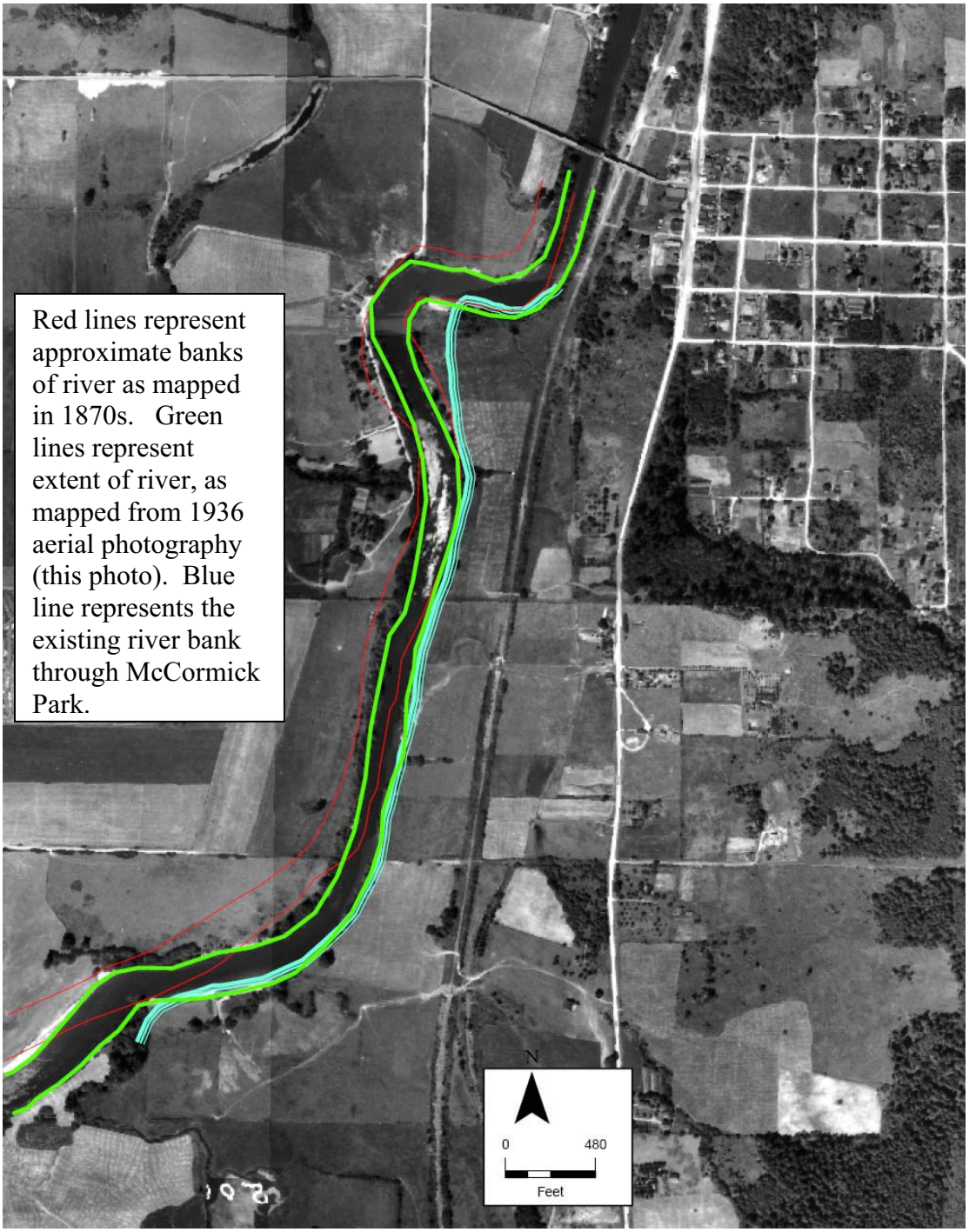


Figure 5. 1936 aerial photography for the McCormick Park Reconnaissance and Assessment project vicinity. Photo made available by the University of Washington River History Project.