D. Johnson Creek

From its headwaters near Boring, Johnson Creek flows west for approximately 25 miles before reaching its confluence with the Willamette River in the City of Milwaukie. Although the entire watershed covers approximately 34,560 acres, the portion within Portland's urban services boundary includes 623 acres in the FEMA 100-year floodplain and 1996 Flood Inundation Area (see Table 32).

TABLE 32: JOHNSON CREEK FLOODPLAIN (IN ACRES)

	Tax lots (#)	100-Year Floodplain	Metro Title 3/1996 Flood Inundation Area	1996 Actual Flood Extent[21]	100-Year & 1996 Flood Inundation Area
Johnson Creek	1,615	607	149	149	623

The two main tributaries to Johnson Creek are Crystal Springs Creek and Kelley Creek. These two streams contribute the largest amount of consistent flow to the mainstem. In addition, Crystal Springs Creek is fed mostly by cold groundwater, which adds important cold-water flow to the urbanized mainstem that suffers from the temperature effects of constructed in-stream ponds that are located both in the City of Portland, and in reaches of Johnson Creek that are upstream from Portland. Unfortunately, like most of historic streams and tributaries in urban areas, many of Johnson Creek's tributaries have been piped or diverted to the combined sewer system.

The area of its watershed north of the mainstem is generally characterized by large, flat floodplains that have repeatedly been inundated by shallow flooding across hundreds of residential properties in the Lents neighborhood. But flooding issues in the Portland reaches of the Johnson Creek watershed are not just confined to the Lents/Powellhurst Gilbert neighborhoods, there are also areas of concern in the Crystal Springs corridor, in the area around Tideman Johnson Park, in the area between SE 82nd Ave and SE 92nd Ave, and near the southern base of Powell Butte, in the Pleasant Valley neighborhood.

In contrast to the relatively flat northern floodplains, the topography to the south of the mainstem of Johnson Creek is much steeper and more varied and contains the majority of Johnson Creek's remaining tributaries. The historically forested and functioning floodplain and riparian areas along Johnson Creek have been greatly reduced by development and alternations for over 100 years. The most significant alteration was most likely the changes made by the Works Progress Administration

[21] Statistics for the actual 1996 Flood Extent are included for informational purposes, only. Portland does not apply floodplain regulations to this area.

(WPA) in the 1930s. At that time, the WPA attempted to control flooding by straightening, deepening, and rock-lining the creek. This created a trapezoidal channel for 15 of the 25 stream miles. Rather than control flooding, this work disconnected the channel from its floodplain, degraded streambank conditions, and substantially altered the creek's ability to dissipate energy and absorb the annual high winter flows (BES, 2005c). Johnson Creek was flood prone prior to the WPA work, and their efforts did little to change that. As of 2005, Johnson Creek had flooded 37 times, and has flooded on various occasions since then. However, the City of Portland, particularly BES, has completed multiple large-scale restoration projects on Johnson Creek and its tributaries. This work has and will continue to improve the conditions of Johnson Creek both at the restoration sites as well as downstream.

As is shown in Table 7 (see page 30), tax lots within the floodplain of Johnson Creek are predominantly zoned for single-family residential development. Of particular importance from a flood risk prospective, these tax lots contain 902 structures that were built prior to the NFIP or the associated building code requirements. Given their time of construction, adequate floodproofing is unlikely to have been incorporated into these structures (subsequent upgrades could have been made). Additionally, some regionally significant industrial properties are located along the creek, as well as substantial areas of OS-zone tax lots generally owned and managed by the City of Portland.

Johnson Creek Plan District

Johnson Creek is unique from a regulatory perspective in that it is the only area in Portland that has Zoning Code and Building Code regulations directly addressing floodplains, tree removals in floodplains, and flooding and flood risks. Elsewhere in the city, floodplains may have additional protection provided by environmental, greenway, or river overlay zones, but generally these regulations address floodplains by way of general habitat and natural resource protections. With the exception of the areas of floodplain associated with Crystal Springs Creek and Errol Creek, as well as floodplain within the Pleasant Valley Plan District, Johnson Creek Plan District encompasses all of Johnson Creek and its floodplain within Portland's USB. Within the Plan District, Title 33 Zoning Code regulates tree removal in the 100-year floodplain and applies additional development standards in both the 100-year floodplain, as well as in the area designated as the Johnson Creek Flood Risk Area.

In addition to the Title 33 requirements, Title 24.50 Flood Hazards, specifically applies special provisions to all Johnson Creek flood zones, as well as to the Johnson Creek Flood Risk Area. For all flood areas, the balancing cut required for fill in the floodplain is required to occur on the same site as the fill. In the Johnson Creek Flood Risk Area, the same requirement applies, as well as the prohibition on reducing flood capacity and designing buildings to meet special criteria related to the base flood elevation. Past work in the Lents neighborhood, culminating in 2018 with the Lents Stabilization and Job Creation Collaborative, has sought to address the unique challenges that are presented by periodic flooding and local economic conditions. Because of the interplay between zoning, land use and a relatively diverse population that could potentially be vulnerable to displacement and other pressures that could be

imposed by changes to the regulatory structure, and changes and improvements to the Johnson Creek Plan District will be made as part of a specific Johnson Creek project. The effectiveness of the existing regulations and potential for improvements will be analyzed as part of the future Johnson Creek floodplain project.

i. Riparian Buffer Area

In much the same way as the watershed as a whole, the conditions of Johnson Creek's riparian areas have been largely shaped by development pressures, alterations, and impacts to native vegetation. The present-day natural resource functions have been vastly reduced from historic levels. However, within the 258 acres of Johnson Creek's estimated riparian buffer area mapped across 511 tax lots (see Table 33, below), there are approximately 142 acres of tree canopy coverage. A significant portion of the riparian area tree canopy is located on the 131 acres of OS-zoned tax lots along the creek. In addition, approximately 136 structures are currently located within the riparian buffer area, further limiting riparian functions. Moving forward with this regulatory work, it will be important to analyze how best to improve floodplain and riparian habitat functions on the 124 acres of riparian buffer area that is not zoned OS, as well as how to address redevelopment of the structures currently located in the RBA.

TABLE 33: JOHNSON CREEK RIPARIAN BUFFER AREA

Base Zone	Tax lots with RBA	Acres of RBA	Structures in RBA
OS	191	134	8
R10	87	32	1
EG2	30	22	9
R20	28	19	14
R5	45	11	20
RM1	44	11	48
IG2	20	7	8
RF	21	7	0
RM2	2	7	9
R7	17	4	2
CE	15	2	7
CM1	4	0.9	1
RMP	1	0.8	5
CI1	3	0.6	2
IG1	3	0.2	0
Grand Total	**511**	**258**	**136**

ii. Potential Impact of Development in the Floodplain

Along the mapped floodplain of Johnson Creek in Portland, approximately 1,615 individual tax lots (623 acres) are partially or fully within a mapped floodplain (100-Year and/or Metro Title 3/1996 Flood Inundation Area). Of these tax lots, 812 are located completely (95 percent or more) within a floodplain and 803 are located partially within a floodplain (see Table 34, below).

TABLE 34: JOHNSON CREEK TAX LOTS WITHIN THE FLOODPLAIN BY BASE ZONE

Row Labels	Fully Within (>95%)	Partially Within	Total
R5	336	161	497
OS	128	145	273
R7	135	98	233
R10	59	143	202
RM1	20	73	93
IG2	44	39	83
EG2	24	32	56
RM2	36	20	56
R20	7	25	32
CM1	12	12	24
RF	1	21	22
CE	5	10	15
IG1	2	12	14
RMP	0	4	4
CI1	0	3	3
CR	3	0	3
EG1	0	3	3
CM3	0	2	2
Grand Total	**812**	**803**	**1,615**

A closer look at the tax lots partially within a floodplain allows an estimate of the potential for new development or redevelopment to impact floodplains. Using the maximum building coverage allowed by the base zone as a proxy, we analyzed whether tax lots contained the development area allowed by the base zone outside of the floodplain. This analysis (summary results in Table 35, below), which did not include areas such as the Environmental Protection overlay zone, found that of the 1,615 properties within a floodplain, 477 tax lots (29.5%) have sufficient area outside of the floodplain to develop to maximum building coverage. Development on the remaining 965 tax lots (53.5%) would either include some building in the floodplain or the building coverage would have to be less than the maximum

allowed to avoid floodplain impacts. The percentage of the maximum building coverage that is within the floodplain on individual tax lots varies significantly.

TABLE 35: JOHNSON CREEK – TAX LOT AREA OUTSIDE OF THE FLOODPLAIN IS GREATER THAN OR EQUAL TO THE MAXIMUM ALLOWED BUILDING COVERAGE

Base Zone	No	Yes	Open Space	Grand Total
R5	375	122		497
OS	0	0	273	273
R7	158	75		233
R10	66	136		202
RM1	39	54		93
IG2	67	16		83
EG2	48	8		56
RM2	45	11		56
R20	11	21		32
CM1	19	5		24
RF	3	19		22
CE	14	1		15
IG1	14	0		14
RMP	0	4		4
CI1	0	3		3
CR	3	0		3
EG1	1	2		3
CM3	2	0		2
Grand Total	**865**	**477**	**273**	**1,615**

iii. Additional Floodplain Characteristics

TABLE 36: JOHNSON CREEK ZONING (IN ACRES)

Zone	Tax lots (#)	100-Year Floodplain	Metro Title 3/1996 Flood Inundation Area	1996 Actual Flood Extent[22]	100-Year & 1996 Flood Inundation Area
OS	273	233	76	76	237
R10	202	74	18	18	76
R5	497	70	8	8	71
IG2	83	59	7	7	59
EG2	56	39	17	17	45
R20	32	41	14	14	42
R7	233	36	2	2	36
RM1	93	21	3	3	21
RF	22	7	2	2	8
RM2	56	8	0	0	8
RMP	4	7	1	1	7
CM1	24	5	0	0	5
IG1	14	4	0	0	4
CE	15	3	0	0	3
CI1	3	0	0	0	0
CM3	2	0	0	0	0
CR	3	0	0	0	0
EG1	3	0	0	0	0
Grand Total	**1,615**	**607**	**149**	**149**	**623**

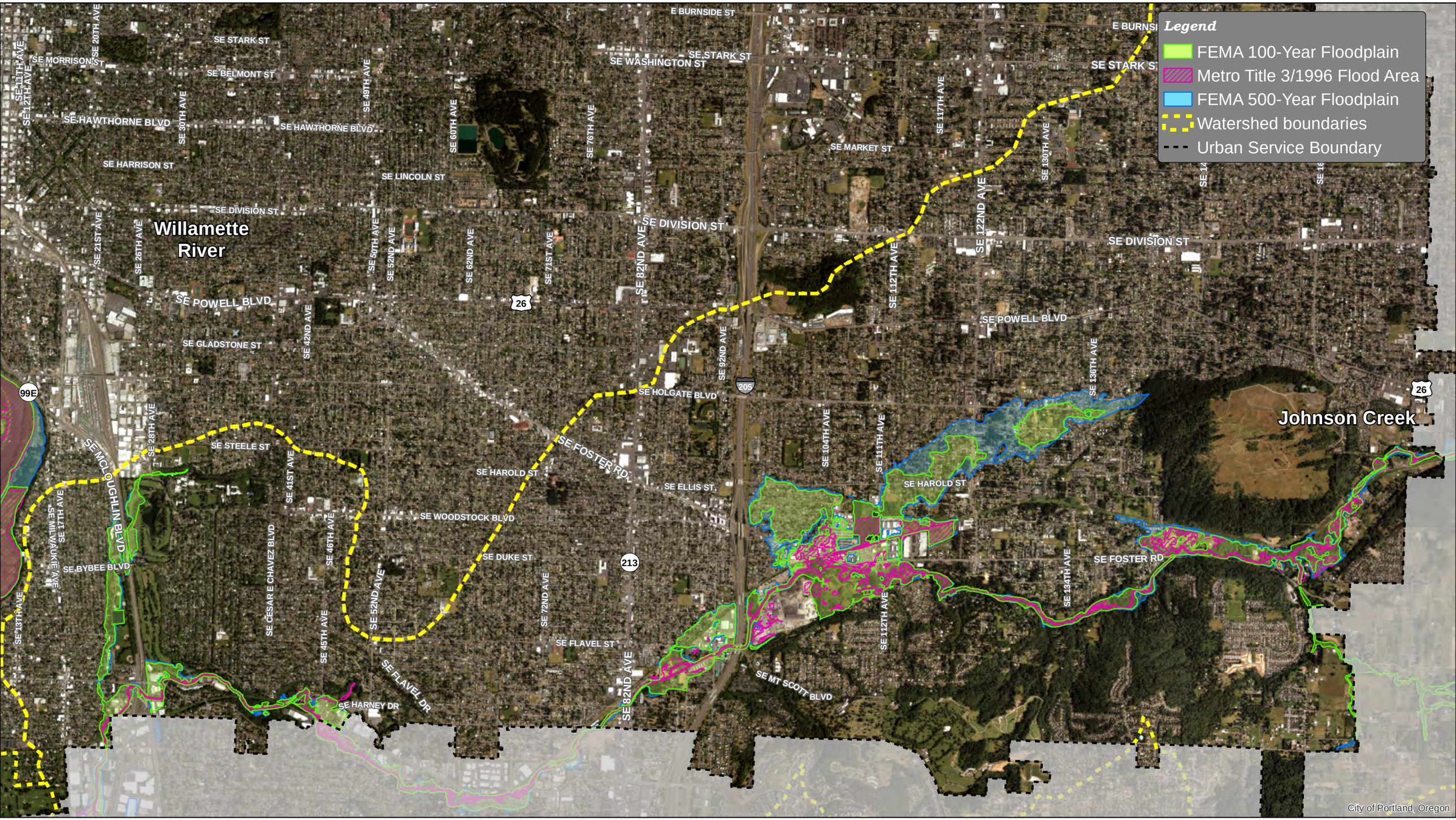
TABLE 37: PROPERTY OWNERSHIP (IN ACRES)

Johnson Creek	Tax lots (#)	100-Year Floodplain	Metro Title 3/1996 Flood Inundation Area	1996 Actual Flood Extent[21]	100-Year & 1996 Flood Inundation Area
Private	1,292	348	65	65	359
Public	322	260	84	84	264
Grand Total	**1,615**	**607**	**149**	**149**	**623**

[22] Statistics for the actual 1996 Flood Extent are included for informational purposes, only. Portland does not apply floodplain regulations to this area.

FEMA Biological Opinion (BiOp) - Existing Conditions:

Aerial Imagery (2020) - Johnson Creek Watershed



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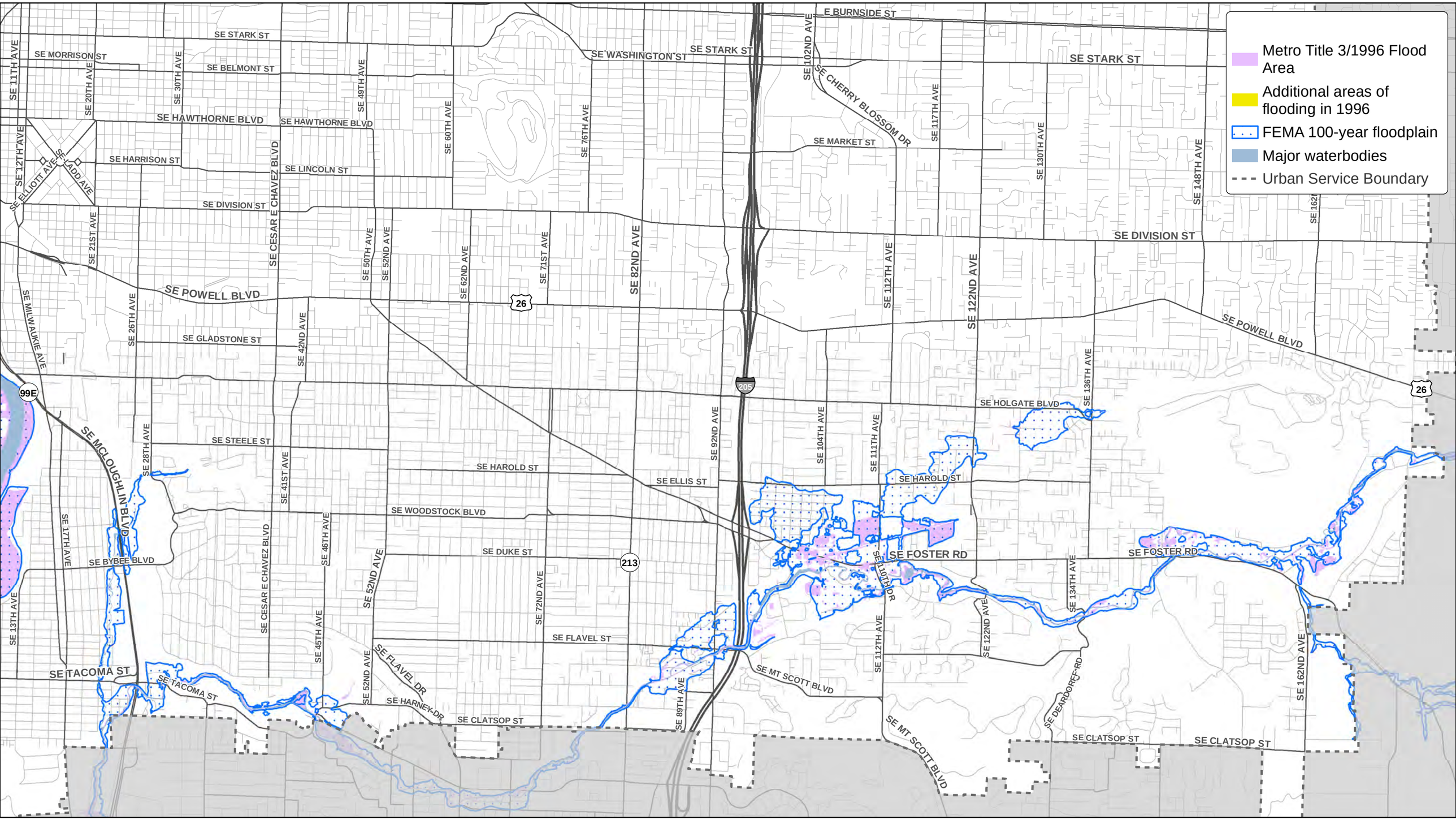
FEMA Biological Opinion (BiOp) - Comparison:

1996 Flood Inundation Areas - Johnson Creek Watershed



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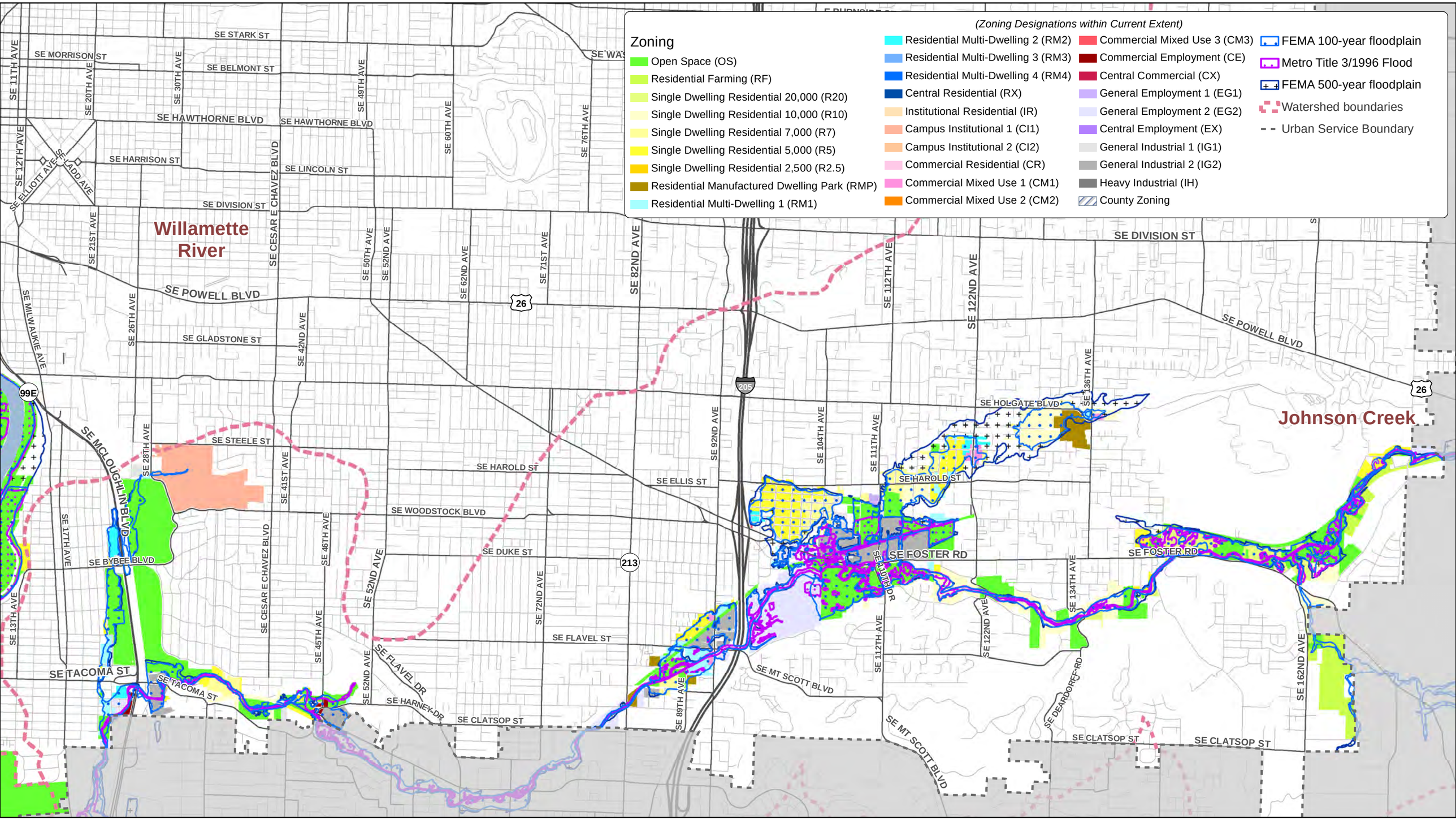
FEMA Biological Opinion (BiOp) - Existing Conditions:

Zoning (2021) - Johnson Creek Watershed



(Zoning Designations within Current Extent)

Zoning

- Open Space (OS)
- Residential Farming (RF)
- Single Dwelling Residential 20,000 (R20)
- Single Dwelling Residential 10,000 (R10)
- Single Dwelling Residential 7,000 (R7)
- Single Dwelling Residential 5,000 (R5)
- Single Dwelling Residential 2,500 (R2.5)
- Residential Manufactured Dwelling Park (RMP)
- Residential Multi-Dwelling 1 (RM1)
- Residential Multi-Dwelling 2 (RM2)
- Residential Multi-Dwelling 3 (RM3)
- Residential Multi-Dwelling 4 (RM4)
- Central Residential (RX)
- Institutional Residential (IR)
- Campus Institutional 1 (CI1)
- Campus Institutional 2 (CI2)
- Commercial Residential (CR)
- Commercial Mixed Use 1 (CM1)
- Commercial Mixed Use 2 (CM2)
- Commercial Mixed Use 3 (CM3)
- Commercial Employment (CE)
- Central Commercial (CX)
- General Employment 1 (EG1)
- General Employment 2 (EG2)
- Central Employment (EX)
- General Industrial 1 (IG1)
- General Industrial 2 (IG2)
- Heavy Industrial (IH)
- County Zoning

- FEMA 100-year floodplain
- Metro Title 3/1996 Flood
- FEMA 500-year floodplain
- Watershed boundaries
- Urban Service Boundary

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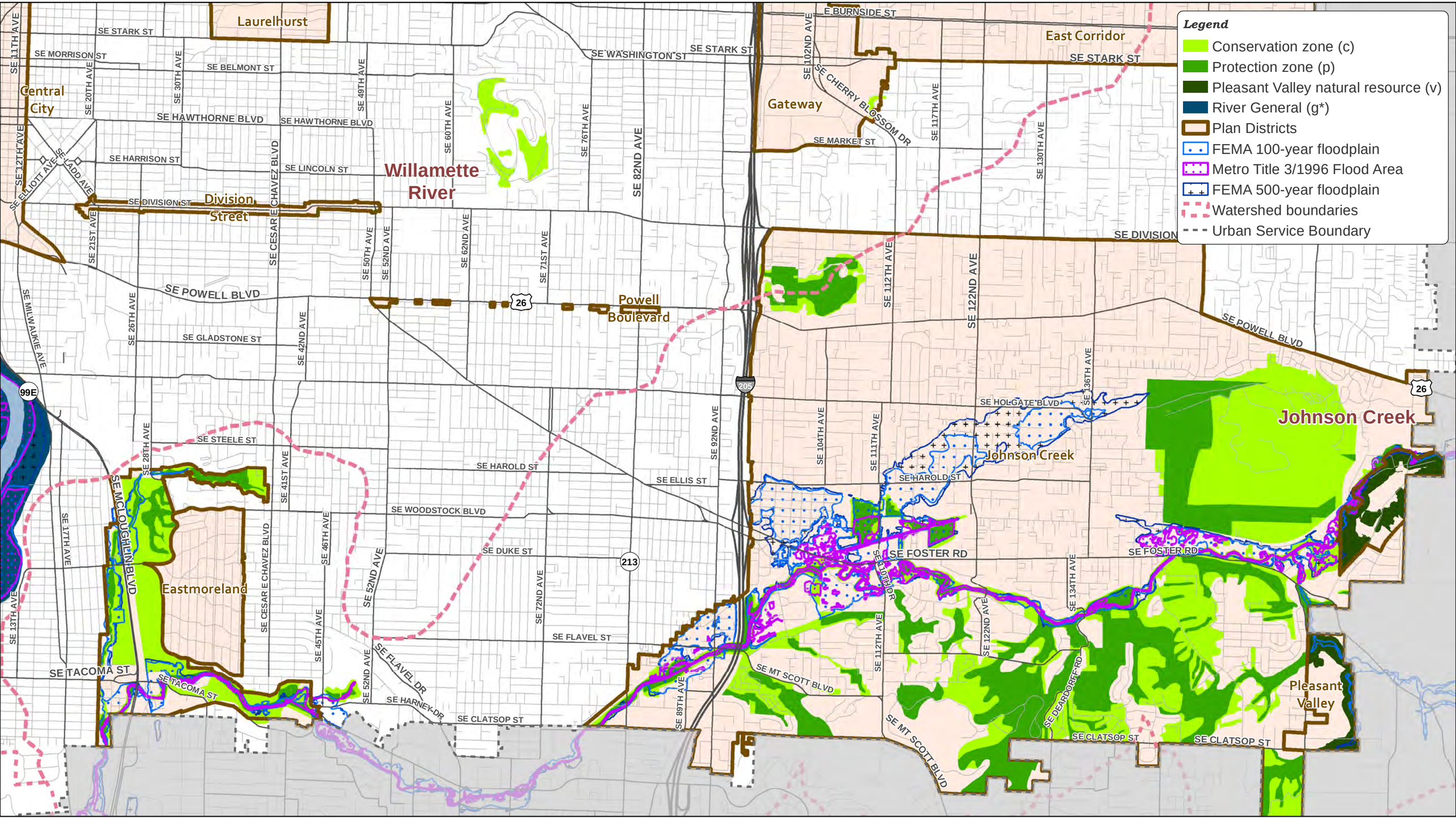
FEMA Biological Opinion (BiOp) - Existing Conditions:

Overlay Zones - Johnson Creek Watershed



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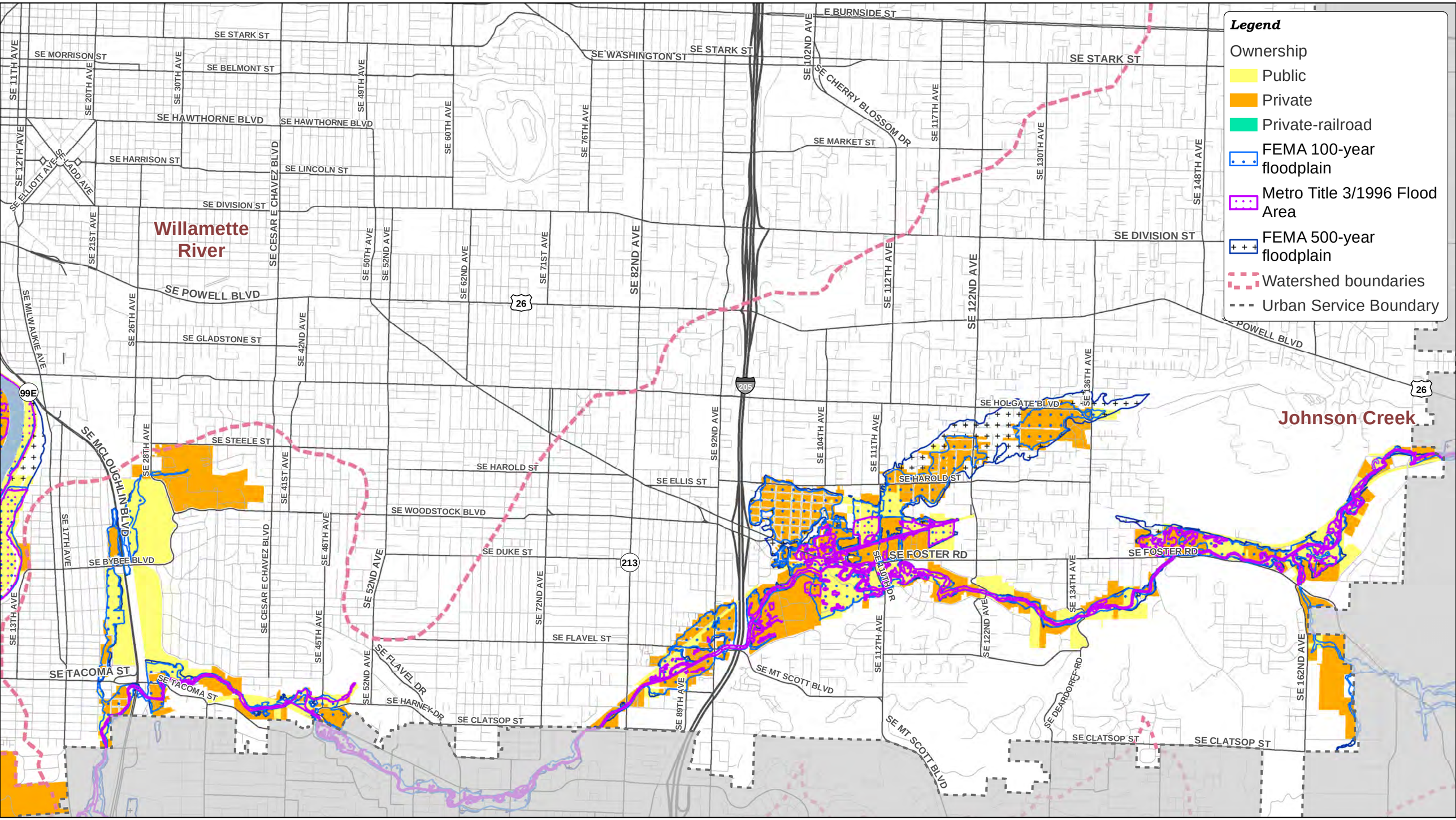
FEMA Biological Opinion (BiOp) - Existing Conditions

Property Ownership - Johnson Creek Watershed



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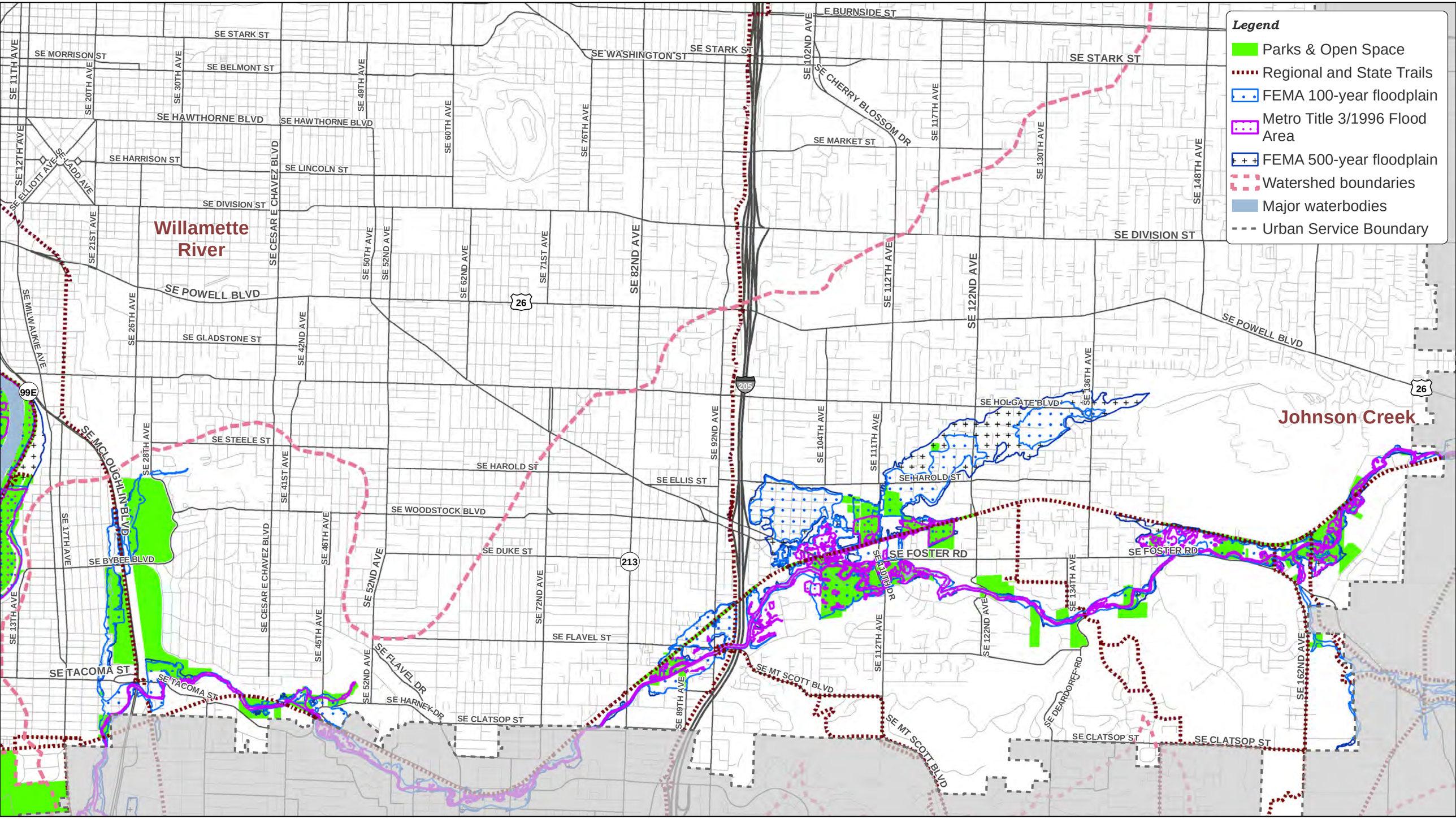
FEMA Biological Opinion (BiOp) - Existing Conditions:

Parks/Open Space & Major Trails - Johnson Creek Watershed



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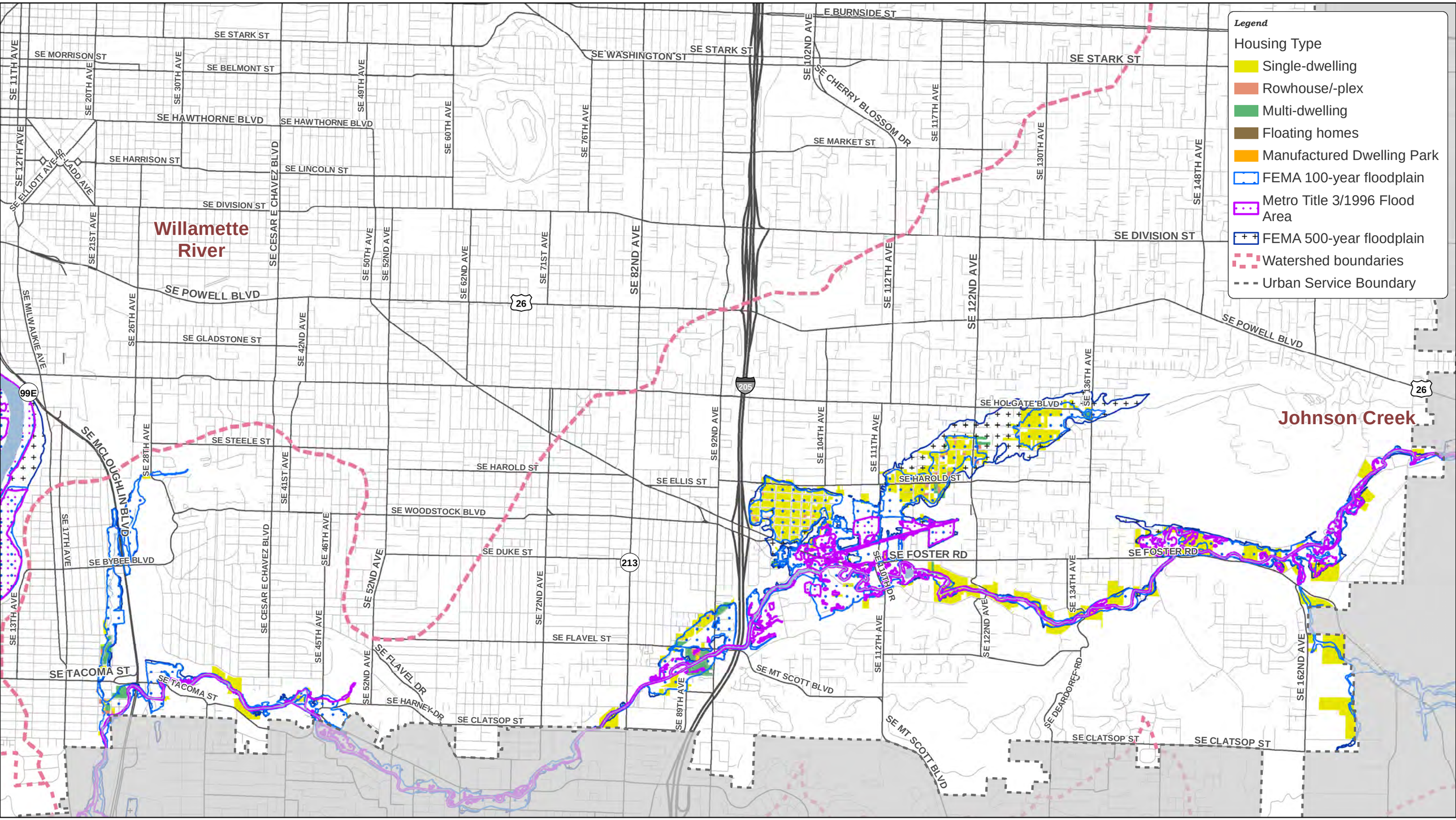
FEMA Biological Opinion (BiOp) - Existing Conditions:

Housing Type - Johnson Creek Watershed



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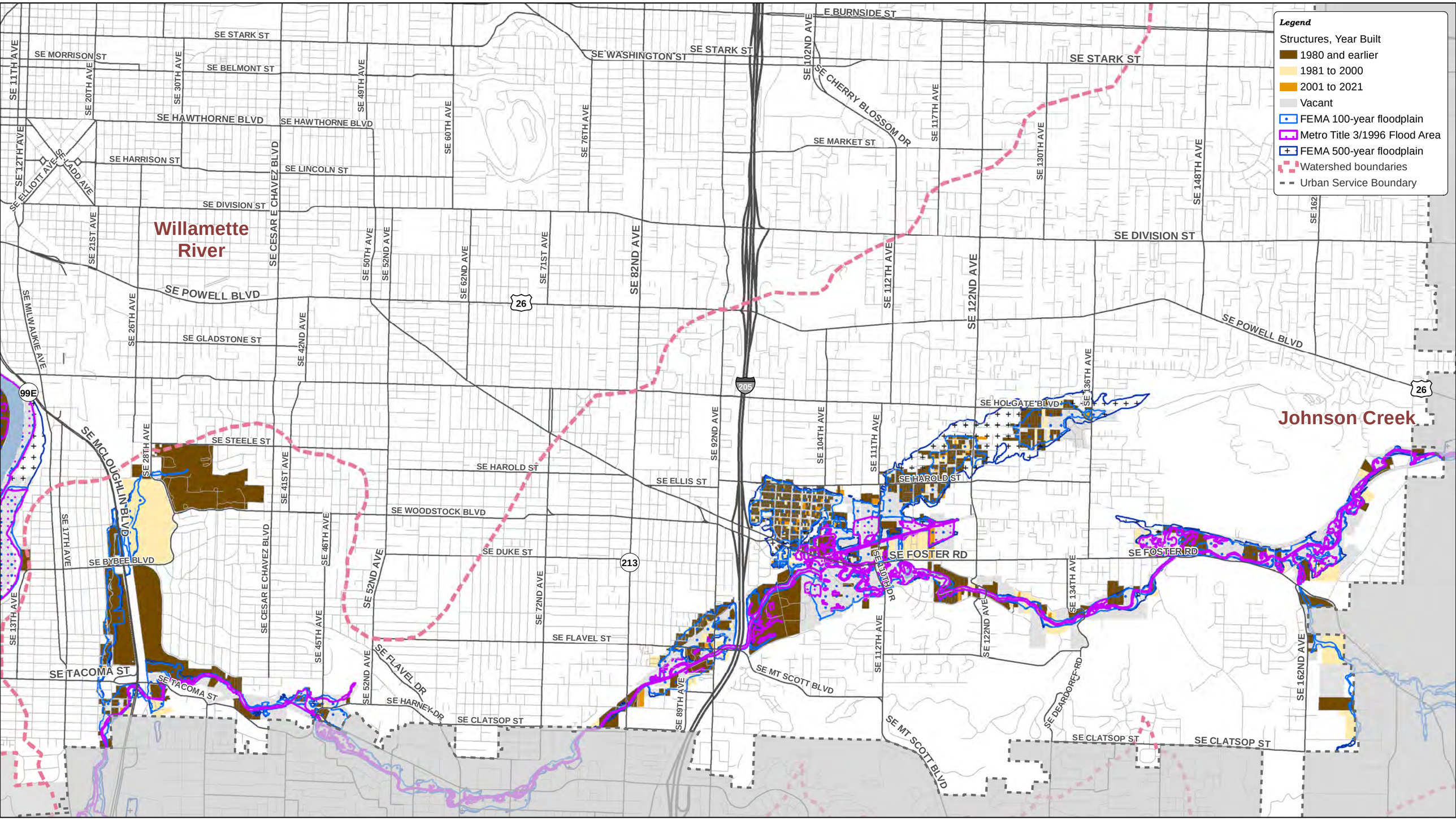
FEMA Biological Opinion (BiOp) - Existing Conditions:

Structures, Year Built - Johnson Creek Watershed



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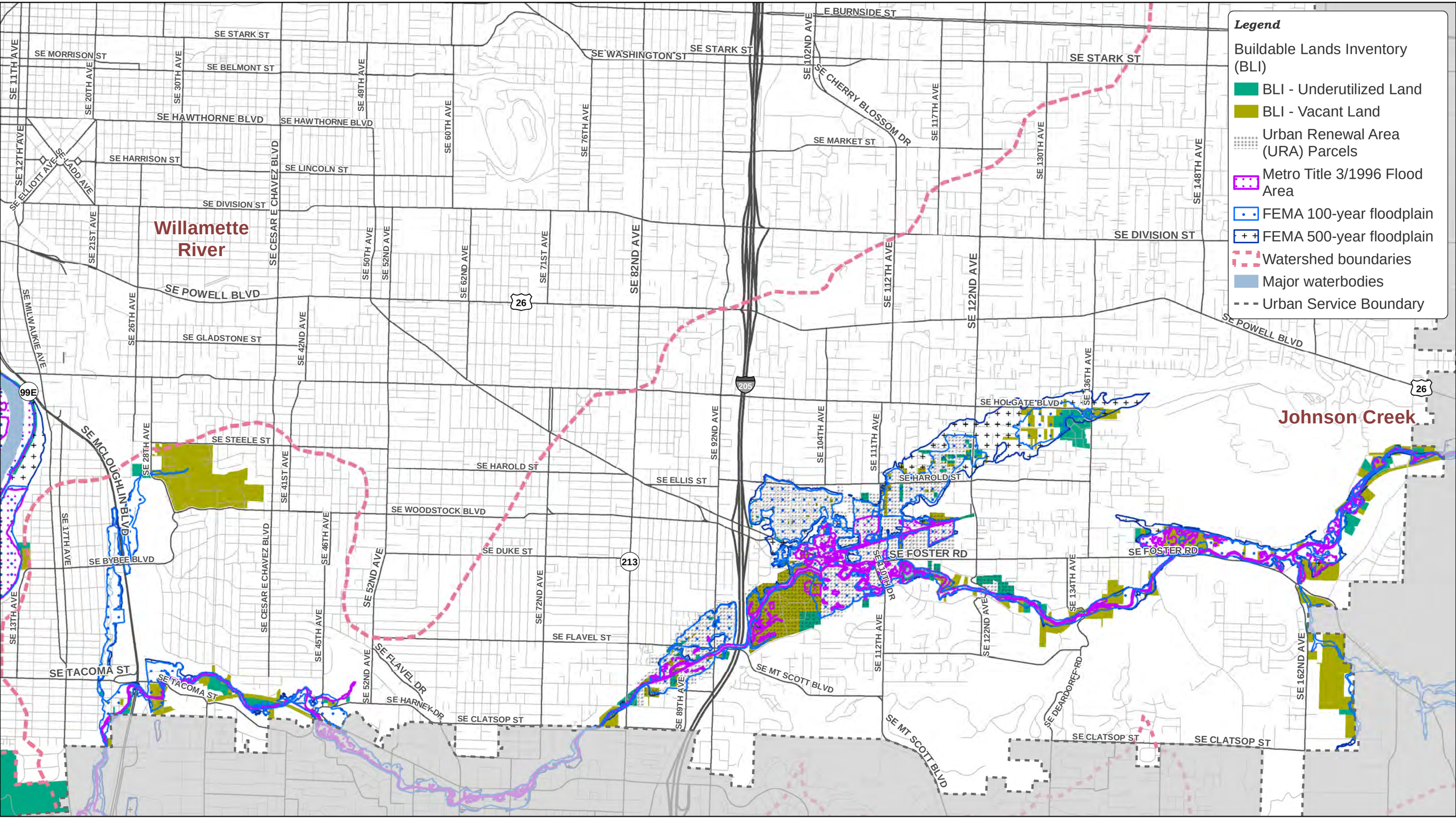
FEMA Biological Opinion (BiOp) - Existing Conditions:

BLI Lands & URAs - Johnson Creek Watershed



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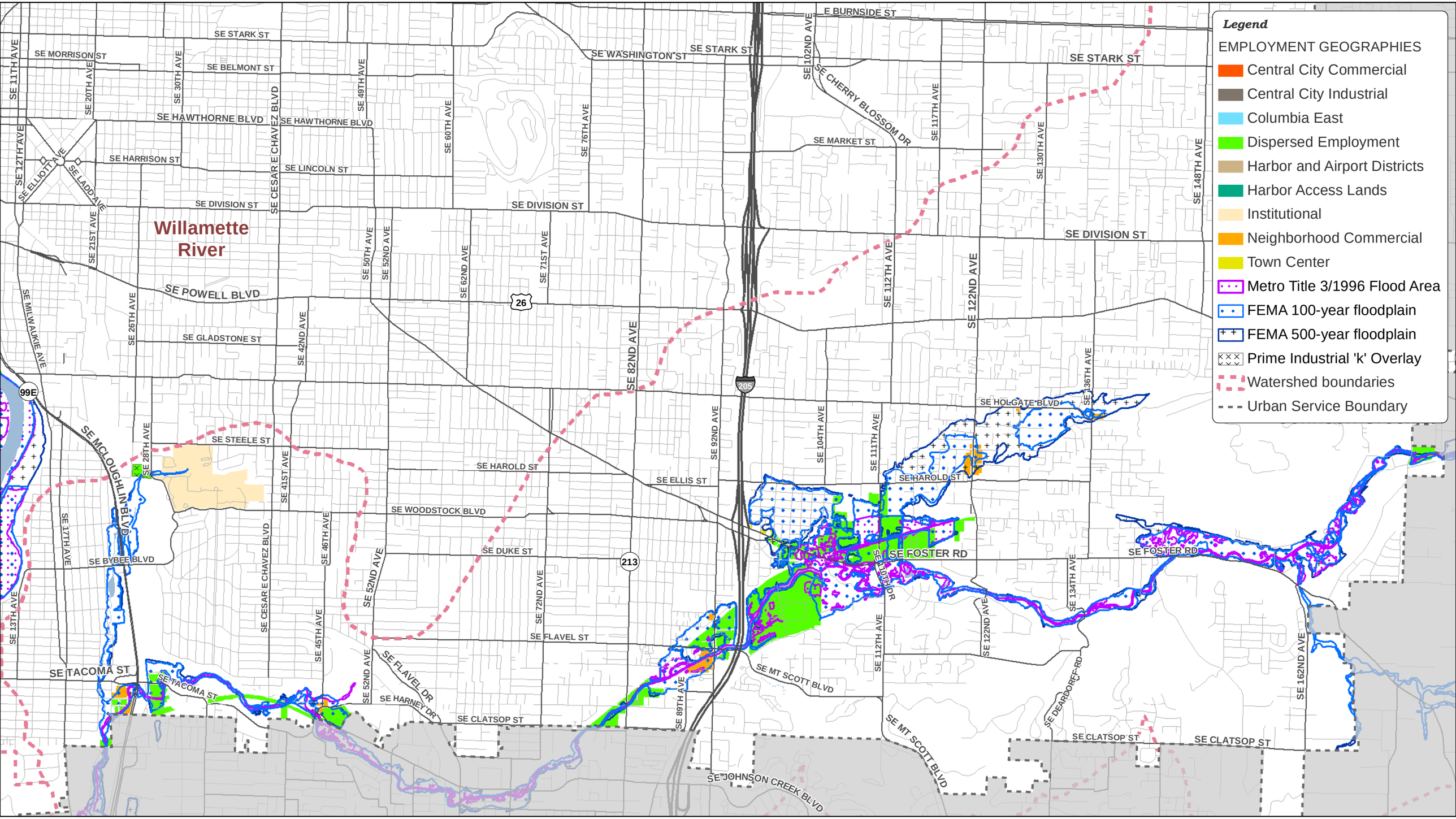
FEMA Biological Opinion (BiOp) - Existing Conditions:

Employment Geographies - Johnson Creek Watershed



Legend

EMPLOYMENT GEOGRAPHIES

- Central City Commercial
- Central City Industrial
- Columbia East
- Dispersed Employment
- Harbor and Airport Districts
- Harbor Access Lands
- Institutional
- Neighborhood Commercial
- Town Center
- Metro Title 3/1996 Flood Area
- FEMA 100-year floodplain
- FEMA 500-year floodplain
- Prime Industrial 'k' Overlay
- Watershed boundaries
- Urban Service Boundary

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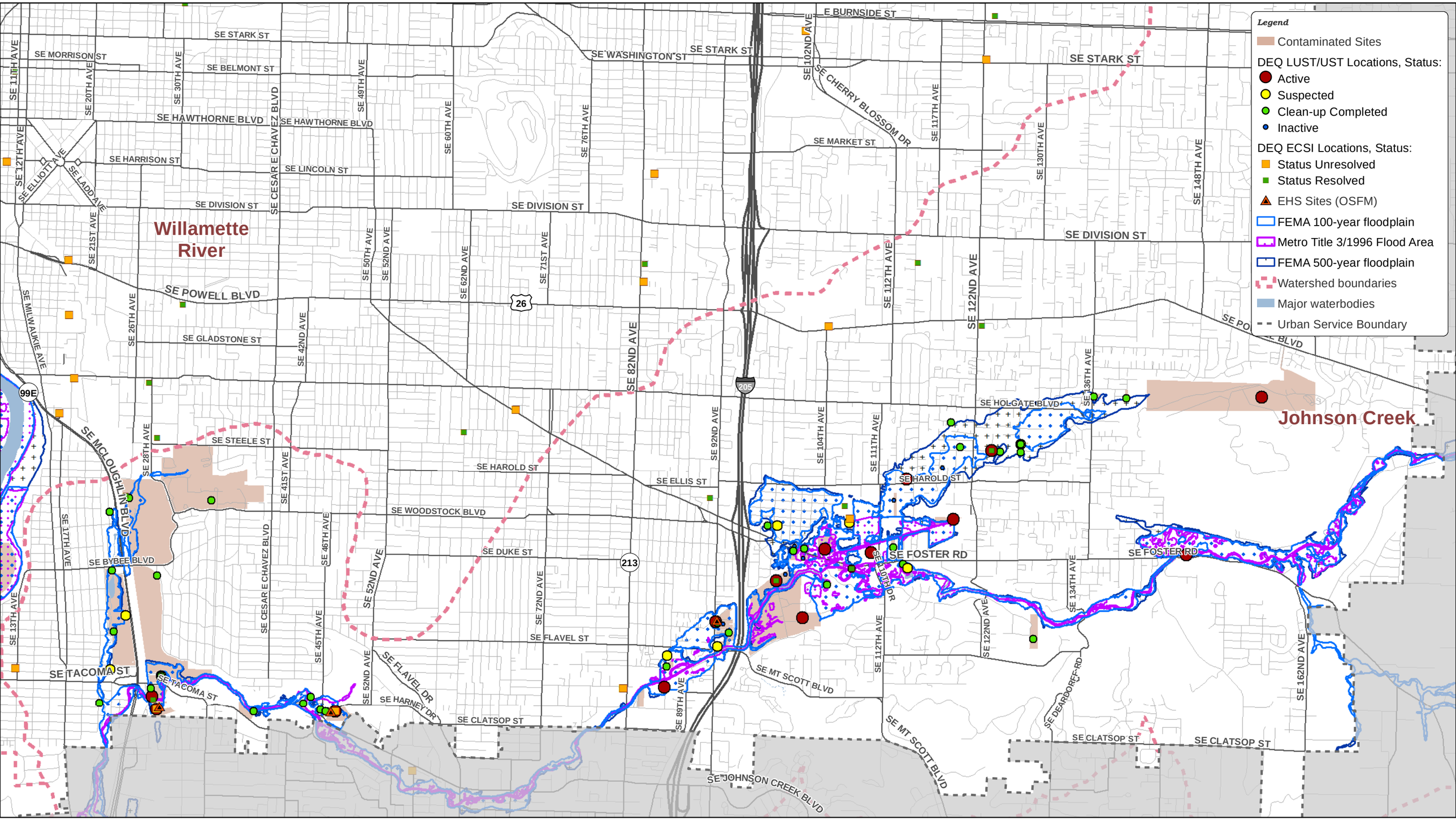
FEMA Biological Opinion (BiOp) - Existing Conditions:

Hazardous Substance Contamination Sites - Johnson Creek Watershed



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- Contaminated Sites
- DEQ LUST/UST Locations, Status:
  - Active
  - Suspected
  - Clean-up Completed
  - Inactive
- DEQ ECSI Locations, Status:
  - Status Unresolved
  - Status Resolved
- EHS Sites (OSFM)
- FEMA 100-year floodplain
- Metro Title 3/1996 Flood Area
- FEMA 500-year floodplain
- Watershed boundaries
- Major waterbodies
- Urban Service Boundary

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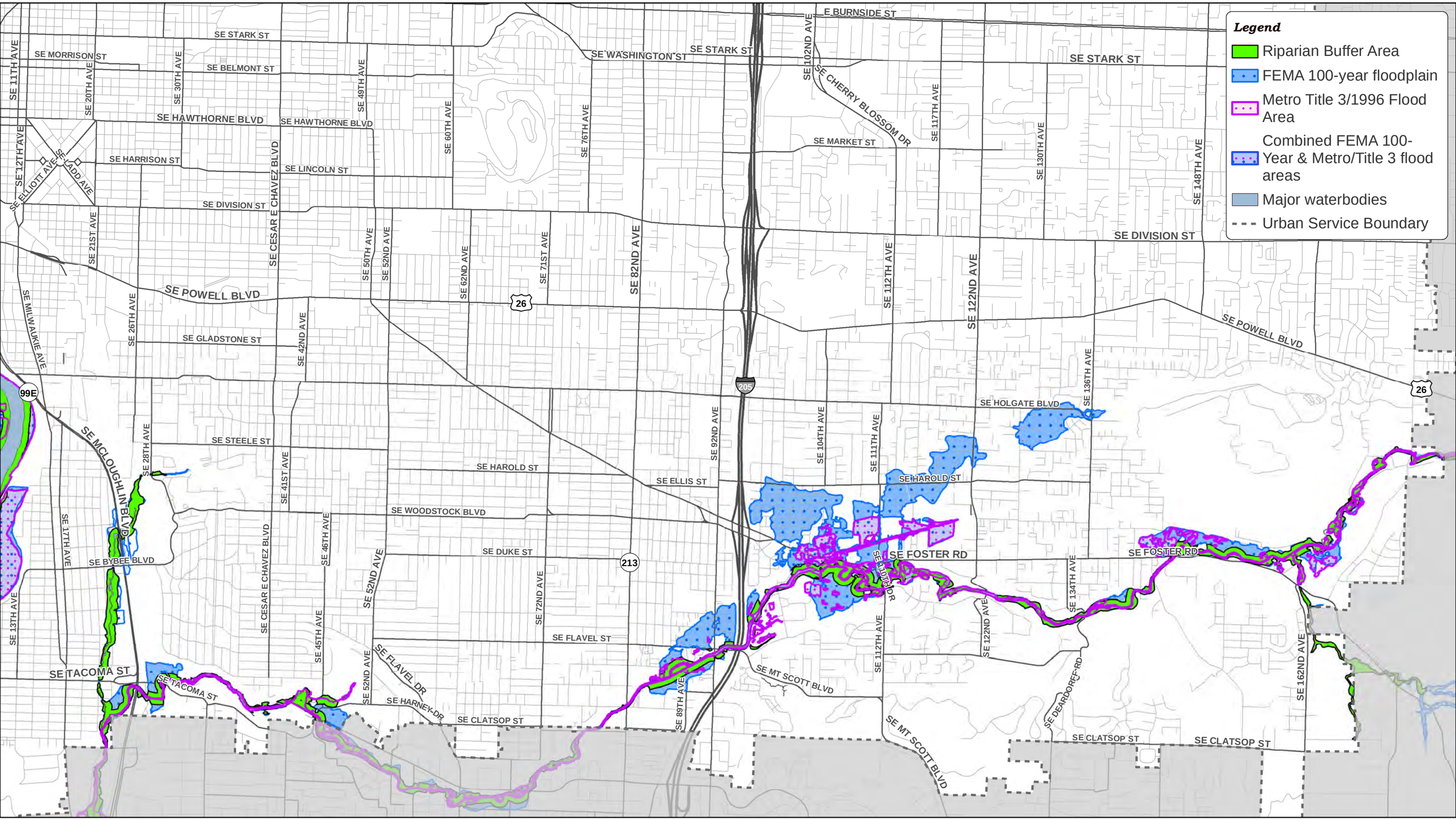
FEMA Biological Opinion (BiOp) - Existing Conditions:

Riparian Buffer Area - Johnson Creek Watershed



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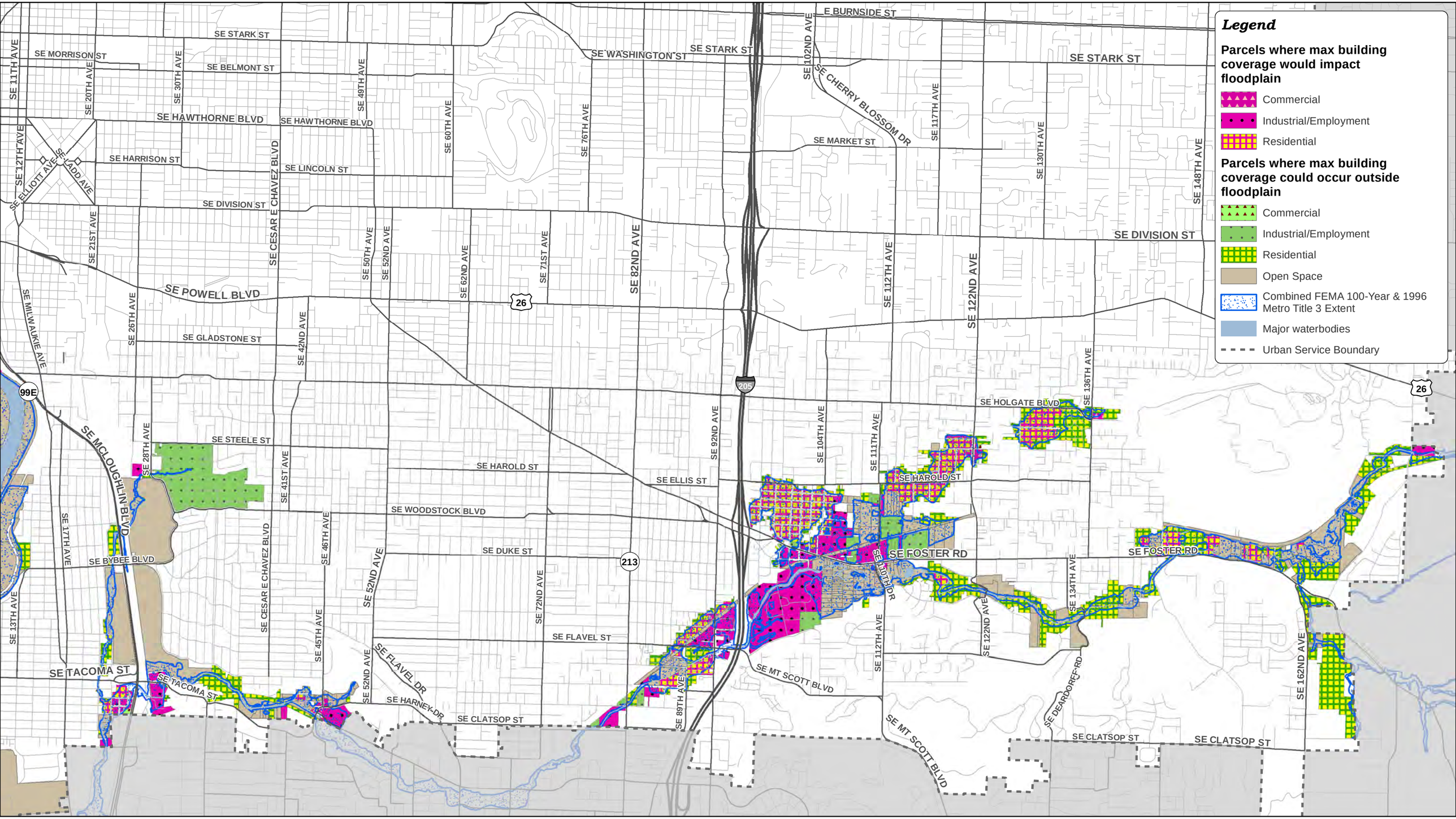
FEMA Biological Opinion (BiOp) - Existing Conditions:

Development Potential - Johnson Creek Watershed



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