FINAL REPORT

City of Bellevue Stream Typing Inventory

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Final Report
City of Bellevue Stream Typing Inventory

1. Introduction

The City of Bellevue Utilities Department has requested that the approximately 64 miles of stream flowing within the City be inventoried according to the water typing standards set forth by the Washington State Department of Natural Resources (DNR). The City of Bellevue currently classifies all streams within City limits according to the City of Bellevue Land Use code for sensitive areas, which defines riparian corridors according to three types (A, B, or C). These classifications are habitat based and do not specifically include information regarding fish use. However, the DNR typing system is primarily based on the presence/absence of fish[1] or fish habitat within a stream corridor. To accurately determine the presence/absence of fish in all streams, the City has contracted with The Watershed Company to perform a stream-typing inventory on all identified streams within the City of Bellevue, and to retype those streams using the DNR typing system.

Streams within the City of Bellevue range from shoreline streams (Mercer Slough), major tributaries to Lake Washington and Lake Sammamish (Coal Creek, Kelsey Creek, and Lewis Creek), and smaller tributaries and headwater segments. The City has identified the streams by segment numbers, dividing them according to topography changes (gradients) and physical features (i.e. culverts). A total of 308 segments comprise the 64 miles of stream within the City, of which 232 segments (~40 miles) have not been investigated for fish use (City of Bellevue 2001). DNR has previously typed approximately 23 miles of stream within the City limits (DNR Water Type Maps). However, since this data is greater than twenty years old and includes some obvious errors, the records needed review and amendment. The remaining streams needed reclassification based upon either existing data from the City of Bellevue Utilities Department or new field investigations of fish use. The Watershed Company has inventoried Bellevue's streams or stream segments with unknown fish use and has reviewed existing fish use data and DNR Water Type Maps, and with that information, has retyped the City's streams using the DNR typing system. Field investigations were performed between 5 June and 1 August 2001. This report presents the methods used for, and results of that retyping effort.

[1] According to the DNR definition, "fish" means species of the vertebrate taxonomic groups *Cephalospidomorphi* (lampreys) and *Osteichthyes* (bony fish).

The Washington Forest Practices Board (FPB) has recently revised the DNR stream typing system (effective 1 July 2001) in an effort to establish a model-based stream classification system. It is the intent of the FPB to eventually use a multi-parameter, field-verified geographic information system (GIS) logistic-regression model (WAC 222-16-030) to determine suitable fish habitat based on certain geomorphic indicators such as gradient, basin size, and elevation. However, the model will not become effective until the FPB adopts the fish habitat water type maps, which are currently being developed. During the interim, stream typing will follow rules similar to the old system (WAC 222-16-031).

The previous water typing system had five numeric classes, Types 1 through 5: "Type 1" are all waters inventoried as "shorelines of the state" under chapter 90.58 RCW; "Type 2" are any waters which do not fall under Type 1 and have high fish, wildlife, or human use; "Type 3" are any segments of natural waters which do not fall under Type 1 or 2 and have a moderate to slight fish, wildlife, or human use; "Type 4" are all segments within the bankfull width that are perennial[2], non-fish habitat streams; "Type 5" are any segments which cannot be classified as Type 1, 2, 3, or 4. Type 5 streams have seasonal flow and lack fish habitat. Habitat features are used for stream typing when fish-use studies are not possible. Electrofishing data supercedes a habitat assessment when typing a stream.

The interim rules combine the Type 2 and Type 3 classes. The new permanent rules are strictly habitat-based regarding fish use. Thus, the new designations are Type S water (shoreline), Type F water (fish habitat), Type Np water (non-fish habitat perennial), and Type Ns water (non-fish habitat seasonal). The conversion table is listed below.

Water Type Conversion [3]

Permanent Water Typing	Interim Water Typing
Type "S"	Type 1
Type "F"	Type 2 and 3
Type "Np"	Type 4
Type "Ns"	Type 5

2. Methods

For the purposes of this study and the benefit of the City of Bellevue, our analysis entailed a direct study of fish use and did not constitute a habitat assessment. The City wished to determine which streams within its boundaries contain fish or the

[2] Meaning the stream does not go dry during a normal rainfall year
[3] WAC 222-16-031

potential for fish use. Therefore, we sampled all identified streams with unknown fish use. Electrofishing was performed downstream to upstream, beginning with the farthest downstream segment with unknown fish use. Although resident fish are known to exist above fish barriers, the decision was made—based on a time constraint[4]—to make fish use determinations at the farthest point downstream. Thus, if fish were discovered within a given segment, that segment and all segments downstream were considered to have fish use. Likewise, if no fish were discovered in a segment, that segment and all segments upstream were considered not to support fish. If fish were found anywhere within a segment, the entire segment was considered to have fish.

In the DNR interim rules, the protocol for distinguishing between Type 2 and Type 3 streams based on electrofishing data is never clearly defined. The difference between "high" and "moderate to slight" depends on personal interpretation. For this investigation, we considered most streams with observed fish presence to be Type 2, and for streams with minimal observed fish use, or without observed fish but with habitat suitable for fish use to be Type 3.

Each stream segment in the City of Bellevue received an identification number. The numbering system is based on two-digit blocks. The first two digits identify through which basin the stream flows. The next two digits indicate a segments position relative to other segments within that basin (e.g., 01 represents the furthest downstream segment within each basin, and segment 02 would be immediately upstream of segment 01). A tributary to the main channel is represented by an additional two-digit block. The first digit identifies the tributary along a particular segment. The second digit represents how far upstream the segment is along the tributary. For example, in segment 84_04_12, the number 84 identifies that the segment lies within the Coal Creek basin, the number 04 refers to the fourth segment upstream from the mouth, and the number 12 refers to the second segment along the first tributary to segment 84_04.

Sampling Protocol

Sampling for fish use followed the DNR protocol, section 13 of the FPB Manual: "Guidelines for Determining Fish Use for the Purposes of Typing Waters Under WAC 222-16-030." No potential shoreline areas were to be sampled under this study and we anticipated sampling only a limited number of major tributaries. Section 13 of the Manual describes the method for determining the absence of fish through electroshocking. To determine the absence of fish, a minimum of 12 pools that are 3 feet square and 1 foot deep must be sampled within a quarter-mile length of stream. If these conditions do not exist, then the area is sampled where

[4] According to DNR, sampling for fish use must be completed between March 1st and July 15th

possible and the discrepancy noted. During the course of the study, very few streams fit the Section 13 criteria. All streams that did meet the criteria were found to support fish. For the purposes of this study, any capture of fish was deemed to constitute fish use within the segment, except when sampling at the confluence of a known fish-bearing stream. In such circumstances, sampling was to begin above the first gradient change upstream from the confluence. According to the DNR Manual, a continuous gradient of greater than 20 percent indicates the absence of fish.

If fish were found in a given segment, then the sampling protocol was halted and a new sampling point was established at the beginning of the next upstream segment. From there, the protocol was repeated, until it could be sufficiently determined that fish were no longer present, at which point sampling for that tributary ceased.

3. Results

The results of our field studies are reported individually for each of the 22 stream basins. Tables at the end of each section list the key results regarding fish use, species presence, observation source, and stream type designation. The City of Bellevue has provided basin maps found at the end of each section that include color-coded stream type designations.

Rainfall over the current year was taken into consideration when determining between Type 4 and Type 5 waters, because precipitation has been well below normal for most of the past water year. This makes the determination between seasonal and perennial streams more difficult, because a perennial stream may stop flowing during especially dry years. For our field study, streams that were dry or very nearly dry were considered Type 5 waters.

A comprehensive collection of stream data can be found in Appendix A. This appendix contains the physical properties (length and gradient), stream type, fish species present, and sampling information for each segment. Like the data tables in the results section, the appendix only lists fish usage for segments that have documented fish presence. Segments that were not visited in the field were typed based on either fish use upstream or fish absence downstream. Field notes from each survey site have been reproduced in Appendix B.

Yarrow Creek Basin (#70)

Overview:

Yarrow Creek and its tributaries flow through the northwest corner of the City of Bellevue. However, its headwaters and outflow into Lake Washington lie within the City of Kirkland. Overall, this system has sustained significant degradation of in-stream and riparian buffer habitats, yet it remains an important area for fish populations. Land use along Yarrow Creek and throughout the basin is largely residential with some commercial development along Northup Way. Upstream segments, east of I-405, flow through sparse residential development with relatively wide, forested buffers. The main impacts to Yarrow Creek are caused by a series of culverts and disturbed areas beneath SR 520 and I-405. A narrow riparian buffer adjacent to Northup Way moderates some of the effects of commercial development. In-stream habitat is generally favorable to fish, with clear water, pool-riffle sequences, gravel substrate, and moderate flows in the main channel.

Fish Use:

Cutthroat trout were found within the entire portion of the main channel of Yarrow Creek within City of Bellevue limits. Cutthroat trout also inhabit the tributary flowing north of Northup Way along NE 33rd Place (70_05_11). Fish were not found in the other tributaries. However, the habitat characteristics in one tributary (70_03_11) were suitable for fish use. Field surveys along this segment found sufficient stream flow and a connection to Yarrow Creek with little gradient change. Despite 294 seconds of fishing, no fish were found. Based on the hydrologic condition of this segment and its connection to Yarrow Creek, segments 70_03_11 and 70_03_12 were classified as Type 3 with slight to moderate fish use. Segment 70_03_11_1 is a short stream with a steep gradient and was considered a seasonal, non-fish bearing stream (Type 5).

The only tributary of Yarrow Creek supporting fish was segment 70_5_11 along NE 33rd Place. Nine recently emerged cutthroat trout were captured. The habitat was in surprisingly good condition for a roadside ditch, with gravel substrate, shallow pools, and a landscaped buffer shaded by young ornamental trees. The upstream segment (70_05_12) flows entirely within a culvert.

An electrofishing survey produced no fish in the other tributary south of SR 520 (segment 70_01_23), accessed from Lake Washington Boulevard. At least 10 pools were sampled, none of which exceeded 6 inches in depth. The habitat features included gravel substrate and step pool sequences, but stream flow was simply inadequate for any life stage of fish. The 302-foot-long culvert (70_01_22) beneath SR 520 immediately downstream of the test reach may prevent fish access to this tributary system.

Four recently emerged cutthroat trout were caught during the first survey of the

main stem of Yarrow Creek along Northup Way at the intersection with NE 33rd Place (70_05). Favorable habitat conditions along this stretch include pools greater than 1 foot deep and fine gravel and sand substrate. A subsequent survey upstream between I-405 and 116th Avenue NE (70_11) identified a yearling cutthroat trout, where habitat features, most notably the amount of flow, are less suitable than the downstream conditions. Survey efforts farther upstream also found cutthroat trout, as well as a backyard fishpond that had been created in-stream at the confluence of the main stem and the small tributary, 76_11_41. The outflow of this pond is a significant fish barrier, and several cutthroat trout were observed in the first pool downstream. Due to the prevalence of cutthroat trout at the upstream end of Yarrow Creek (The Watershed Company 1998), it is presumed that fish also inhabit all downstream areas along the main stem.

None of the other upstream tributaries support fish. The entire length of tributary 70_11_41 was fished, but inadequate streamflow appears to prevent fish use. The next two tributaries downstream on Yarrow Creek (70_11_41_1 and 70_11_3) could not be located, and are therefore presumed to have seasonal flows. The steep tributary 70_11_21 carried barely enough water to sample, and numerous culverts under private driveways further reduced its fish use potential. Based on hydrological conditions, this tributary would be classified as a perennial non-fish-bearing stream (Type 4). Segment 70_11_1 is another roadside drainage flowing from a relatively new residential development. It was nearly dry and was classified as seasonal and non-fish bearing (Type 5).

Table 1: Yarrow Creek Fish Data

Segment ID #	Cutthroat	Coho	Other	Interim Type	Permanent Type	Date Sampled
70_01_22				4	Np	
70_01_23	–	–	–	4	Np	6/18/01
70_01_23_11				4	Np	
70_01_23_12				4	Np	
70_01_24				4	Np	
70_01_24_1				4	Np	
70_01_25				4	Np	
70_02				2	F	
70_03				2	F	
70_03_11	–	–	–	3	F	6/18/01
70_03_11_1				5	Ns	
70_03_12				3	F	
70_04				2	F	
70_05	4 (0+)	–	–	2	F	6/18/01
70_05_11	9 (0+)	–	–	2	F	6/18/01
70_05_12				2	F	
70_06				2	F	
70_07				2	F	
70_08				2	F	
70_09				2	F	
70_10				2	F	
70_11	4 (1+)	–	–	2	F	6/20/01
70_11_1	–	–	–	5	Ns	6/20/01
70_11_21	–	–	–	4	Np	6/20/01
70_11_21_1				4	Np	
70_11_3	–	–	–	5	Ns	6/20/01
70_11_41	–	–	–	4	Np	6/20/01
70_11_41_1	–	–	–	5	Ns	6/20/01

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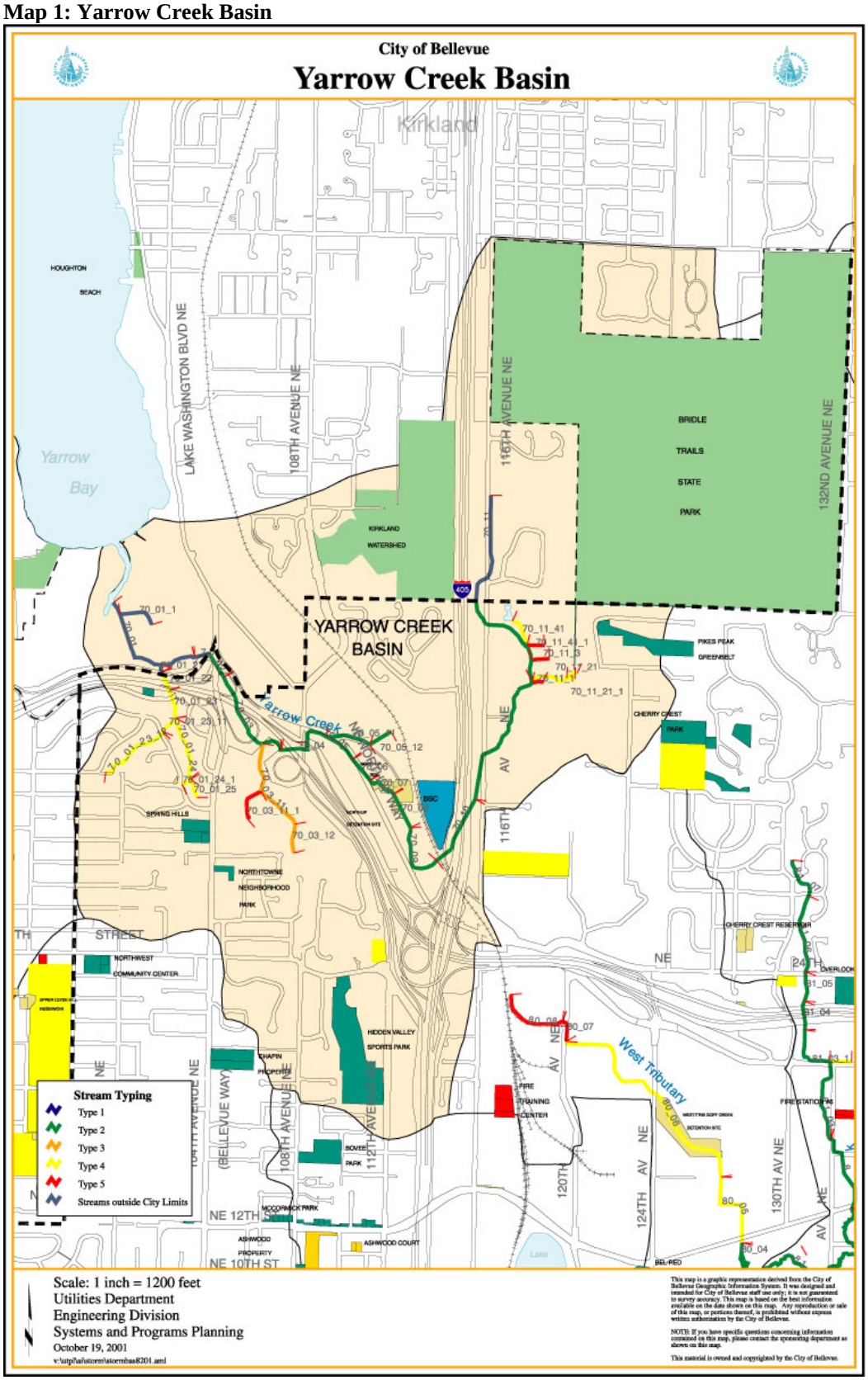
Map 1: Yarrow Creek Basin



Meydenbauer Creek Basin (#72)

Overview:

Located within downtown Bellevue, Meydenbauer Creek is perhaps the most urbanized of all the City's streams. Its short length of less than one-half mile flows through commercial and multi-family residential lots before flowing into Lake Washington's Meydenbauer Bay. It is a low-gradient stream with fairly gentle flow, but there are few riffles. The substrate is sandy with a silt layer in some places.

Fish Use:

Survey efforts during this study covered the three upstream segments of Meydenbauer Creek. The upstream segment (72_04) was accessed from 102nd Avenue SE, just upstream of a 220-foot culvert. The lower portion of this segment flows adjacent to an apartment complex parking lot. The reed canarygrass and Himalayan blackberry buffer had been recently mowed and the clippings were choking the channel. Farther upstream, the creek flows through a forested greenbelt. No fish were found, despite suitable flow and one-foot deep pools. Poor water quality may play a role in the absence of fish. No fish have been documented in the past for this segment. Downstream of the culvert, west of 102nd Avenue, in segment 72_02 cutthroat trout, stickleback, and sculpin were caught. In-stream habitat is slightly better along this stretch, with more woody debris and a wider forested buffer, although it is still lined with reed canarygrass.

Table 2: Meydenbauer Creek Fish Data

Segment ID #	Cutthroat	Coho	Other	Interim Type	Permanent Type	Date Sampled
72_01				2	F	
72_02	1 (0+)	–	3 Stickleback, 1 Sculpin	2	F	7/2/01
72_03	–	–	–	4	Np	7/2/01
72_04	–	–	–	4	Np	7/2/01

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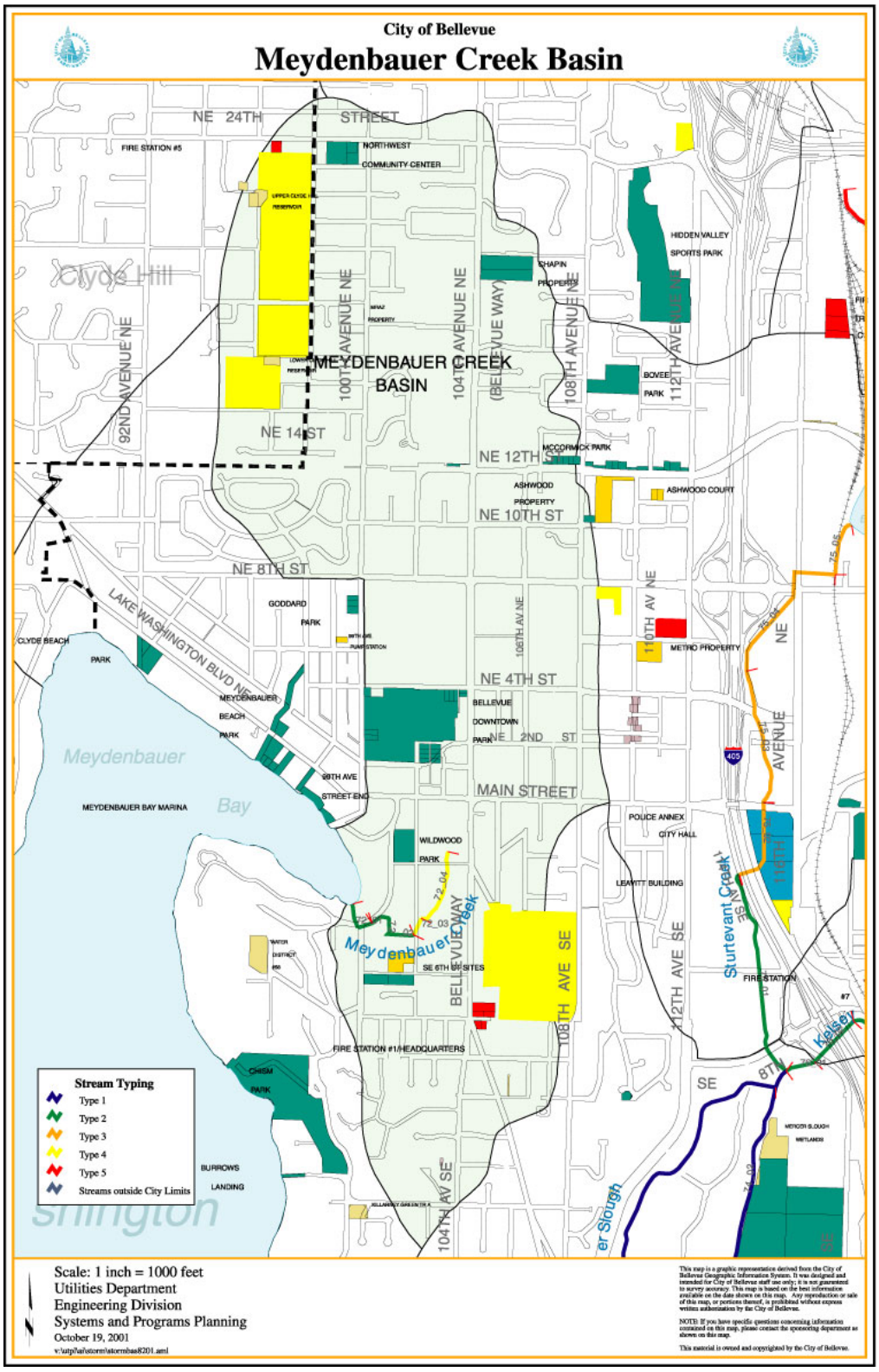
Map 2: Meydenbauer Creek Basin



Mercer Slough Basin (#74)

Overview:

Mercer Slough is the final destination of roughly half of Bellevue's streams. Because of its importance as a natural resource, it has been designated as a "shoreline of statewide significance" (segments 74_01, 74_02, and 74_03). It is the only stream in the City of Bellevue to carry this distinction. As a biologically critical area, Mercer Slough merits special protection. Accordingly, most of Mercer Slough and the surrounding lands are under public ownership as the Mercer Slough Nature Park. Low gradient, sluggish flows, and a large volume of water characterize the habitat. Associated wetlands surround the slough on all sides and provide additional habitat features for fish and other wildlife. Two minor tributaries flow from the east near the Bellefields Nature Trail.

Fish Use:

Mercer Slough is a large-volume waterbody connected to Lake Washington. As such, fish use can be expected from all species present in the lake. Of special importance are chinook, coho, and sockeye salmon, which pass through the Mercer Slough en route to spawning grounds in the Kelsey Creek system. Due to the availability of information, it was unnecessary to conduct fish surveys along the main stem of Mercer Slough.

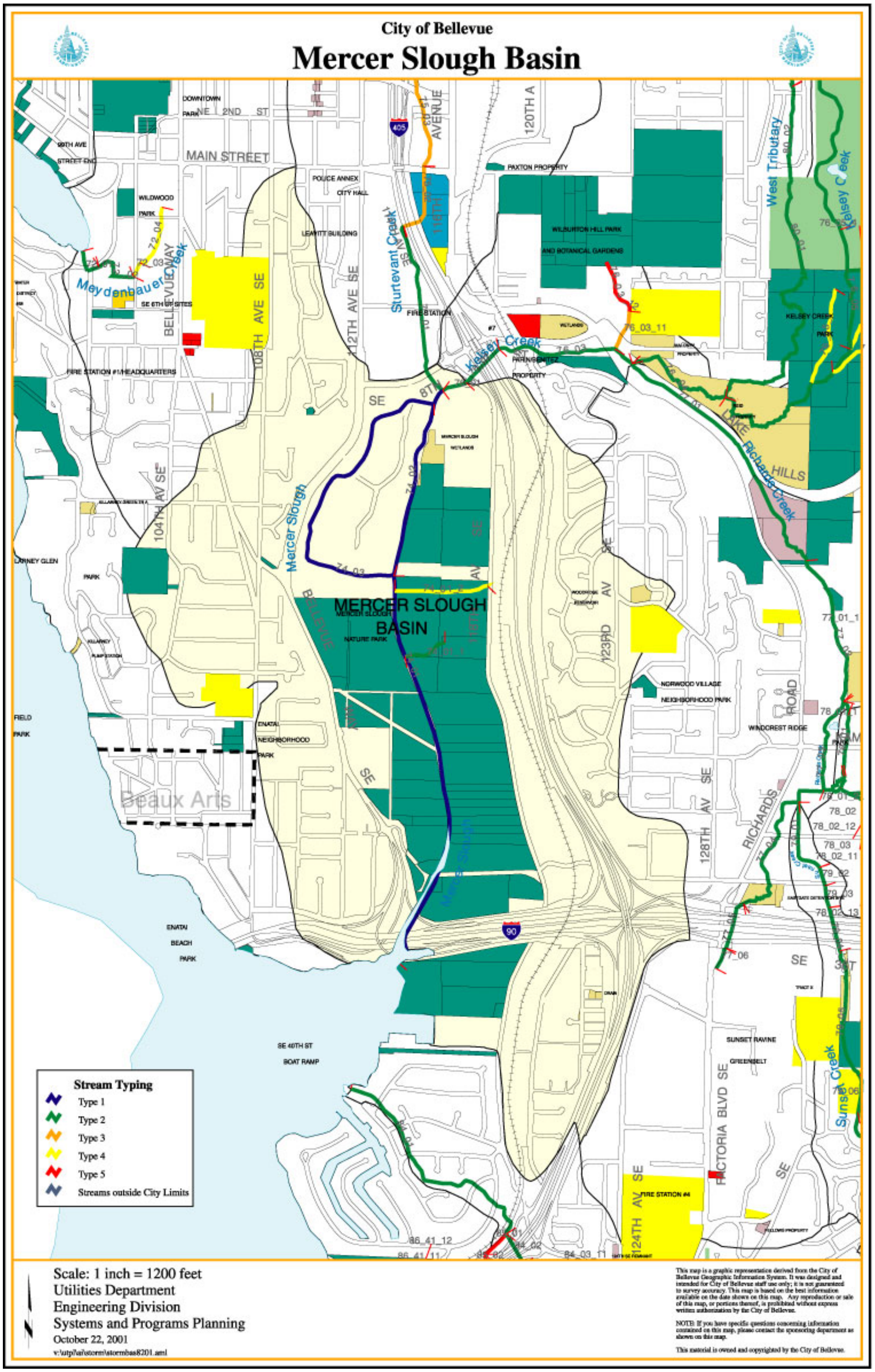
Investigation of the two minor tributaries east of the slough revealed that they were associated with large wetland areas. In the first tributary (74_01_1), survey efforts revealed numerous stickleback, whose distribution extended well upstream. There was minimal flow in this segment, and the stream resembled a series of several small wetlands with surface-water connections. Segment 74_01_2 began upstream as a typical pool-riffle sequence with a medium-sized cobble substrate, before flowing into an extensive wetland. Attempts to locate an outfall into the slough were unsuccessful, and it is suspected that the connection is sub-surface. The upstream end was thoroughly sampled, but no fish were found. A series of channel-spanning weirs had been installed in the channel as part of a previous restoration project to increase pool habitat, but the pools are now isolated due to a lack of flow. Insufficient flow and a disconnection from the slough may explain the absence of fish in this reach.

Table 3: Mercer Slough Fish Data

Segment ID #	Cutthroat	Coho	Other	Interim Type	Permanent Type	Date Sampled
74_01				1	S	

Segment ID #	Cutthroat	Coho	Other	Interim Type	Permanent Type	Date Sampled
74_01_1	–	–	Stickleback (4 adults, 16 fry)	2	F	6/19/01
74_01_2	–	–	–	4	Np	6/19/01
74_02				1	S	
74_03				1	S	

Map 3: Mercer Slough Basin


City of Bellevue
Mercer Slough Basin
MERCER SLOUGH
BASIN
Mercer Slough
Kelsey Creek
West Tributary
Sturtevant Creek
Meydenbauer Creek
Richards Creek
Sunset Creek
Beaux Arts
MAIN STREET
108TH AVE SE
112TH AVE SE
104TH AV SE
123RD
128TH AV SE
124TH AV SE
FACTORIA BLVD SE
RICHARDS
ROAD
120TH A
LAKE
HILLS
Stream Typing
Type 1
Type 2
Type 3
Type 4
Type 5
Streams outside City Limits
Scale: 1 inch = 1200 feet
Utilities Department
Engineering Division
Systems and Programs Planning
October 22, 2001

Sturtevant Creek Basin (#75)

Overview:

Located in downtown Bellevue, Sturtevant Creek flows along and under I-405 before entering Mercer Slough. Heavy commercial development, including several automobile dealerships, covers this basin. The result of this urban development has been channelization and the entrainment of the creek in culverts. The two longest culverts span 37 percent of Sturtevant Creek's total length. Numerous smaller culverts, many of them perched, interrupt the other segments and create barriers to upstream fish migration.

Fish Use:

The City's existing information was used to type the downstream segment (75_01). This segment is the least altered reach within the creek. A coho salmon and over one thousand peamouth chub are documented in the City's records. In addition, coho were known to use the entire stream in 1975 (Williams et al). However, based on recent field investigations, it is unlikely that coho still use any areas upstream of I-405.

Segment 75_03 was accessed via NE 2nd Place. This segment supported substantial flow, which was presumably stormwater runoff, since investigation upstream indicated that segment 75_05 was barely flowing. Several pools were sampled along NE 2nd Place. One pool, up to 3 feet deep, was apparently scoured by a perched culvert that created a 3-foot drop. No fish were found in this segment. The surface of the stream was covered by an iridescent film and soapsuds. Poor water quality is likely inhibiting fish use.

The headwater segment near Lake Bellevue contained almost no water. The channel was muddy with a thick organic layer near the lake, and flow gradually weakened on its way downstream adjacent to the railroad tracks. There was evidence that herbicides had been sprayed in the stream corridor.

Although no fish were found, Lake Bellevue is known to support a population of non-native goldfish. Thus, incidental fish use downstream throughout Sturtevant Creek is expected, by which it qualifies for Type 3 status.

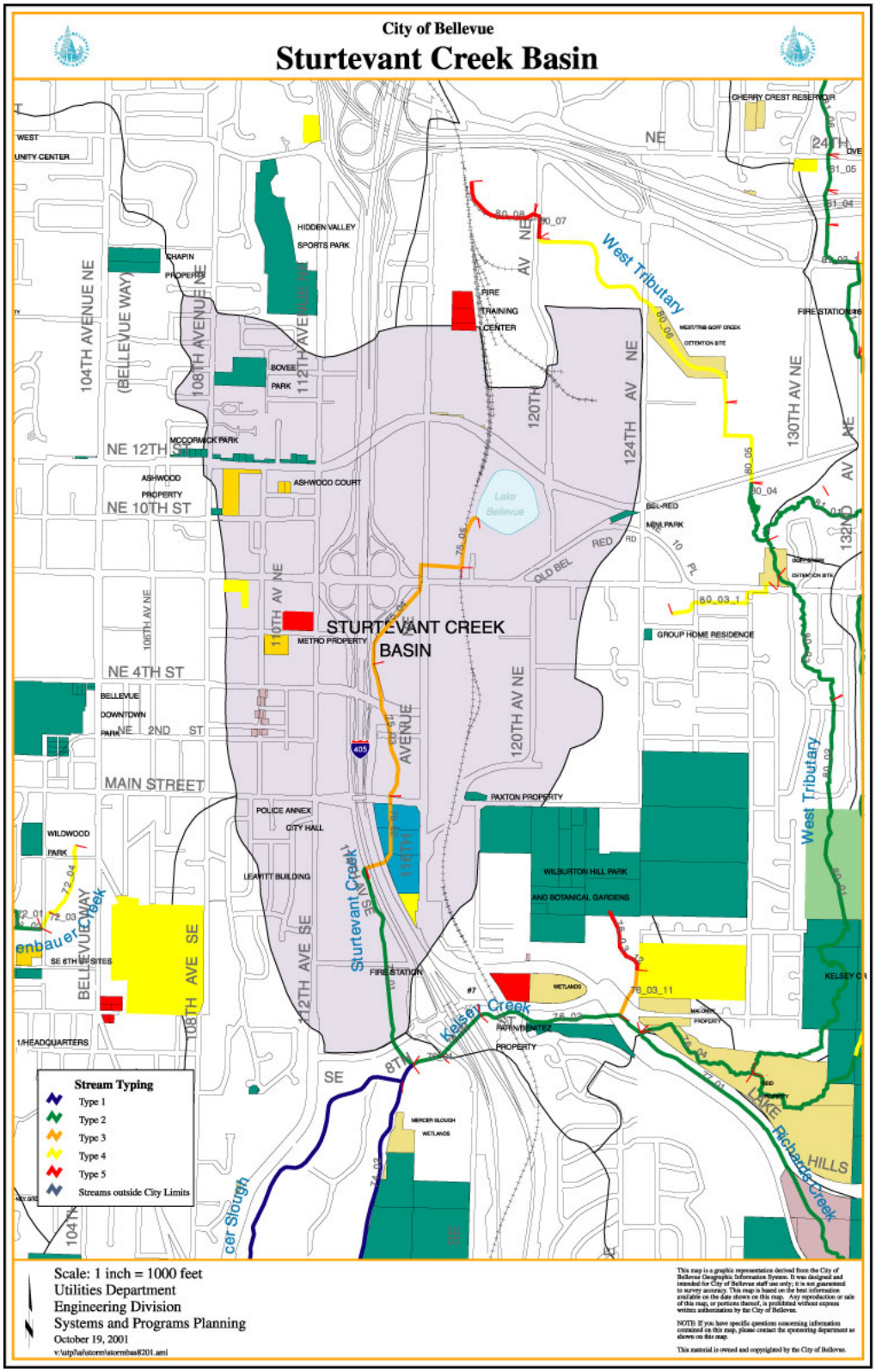
Table 4: Sturtevant Creek Fish Data

Segment ID #	Cutthroat	Coho	Other	Interim Type	Permanent Type	Date Sampled
75_01		Present	Peamouth Chub	2	F	1990, 1991[1]

Segment ID #	Cutthroat	Coho	Other	Interim Type	Permanent Type	Date Sampled
75_02		Present		3	F	1975[2]
75_03	–	–	–	3	F	6/19/01
		Present				1975[2]
75_04		Present		3	F	1975[2]
75_05	–	–	–	3	F	6/19/01
		Present				1975[2]

1- Stream Team. 2- Williams et al.

Map 4: Sturtevant Creek Basin


City of Bellevue
Sturtevant Creek Basin
STURTEVANT CREEK BASIN
West Tributary
Kelsey Creek
Sturtevant Creek
Richards Creek
Lake Bellevue
Stream Typing
Type 1
Type 2
Type 3
Type 4
Type 5
Streams outside City Limits
Scale: 1 inch = 1000 feet
Utilities Department
Engineering Division
Systems and Programs Planning
October 19, 2001

Kelsey Creek Basin (#76)

Overview:

Kelsey Creek flows through the heart of Bellevue and is the primary component of the most productive and diverse stream network in the City. From its headwaters near Phantom Lake to its outflow into Mercer Slough, Kelsey Creek and its tributaries pass through numerous parklands, school campuses, residential areas, commercial hubs, and a golf course. As would be expected for such an extensive urban stream, Kelsey Creek has been rerouted in several places through culverts, most notably underneath I-405 at its downstream end. Fortunately, the City's extensive parks along Kelsey Creek offer a degree of protection that few other urban streams possess.

The Kelsey Creek system is unique among Bellevue's streams in having an abrupt habitat transition towards its upstream end. In general, habitat conditions downstream of 147th Avenue NE favor fish use. Gravel substrates and pool-riffle sequences throughout these reaches, including associated tributaries, have promoted fish use wherever adequate flows exist. In contrast, the areas of Kelsey Creek within and upstream of the Lake Hills Greenbelt are characterized by low gradient, sediment-filled channels with very little or no flow. Reed canarygrass is the dominant riparian plant. This habitat is generally unfavorable for salmonids and primarily inhabited by stickleback and other warm-water species from Larsen Lake.

Fish Use:

Survey efforts in the main stem of Kelsey Creek were unnecessary downstream of the Lake Hills Greenbelt near Larsen Lake because the City had already compiled data for these segments (76_01 through 76_09). Bellevue data indicates heavy fish use throughout these segments, with documentation of 11 different species, including chinook and coho salmon.

Surveys along the tributaries of Kelsey Creek found varying degrees of fish use. Segment 76_03_11, accessed from the Lake Hills Connector, contained four young lamprey in a sediment pool just above the outfall into the downstream culvert. Otherwise, habitat in this segment lacked sufficient flow or substrate to support fish, and the upstream segment was mostly dry.

Within Kelsey Creek Park, segment 76_05_1, which carries pasture runoff, contained no fish throughout its length. Although no apparent barrier exists, the absence of fish in this segment is likely due to flashy flows and poor water quality. The eastern tributaries in Kelsey Creek Park (76_05_2 and 76_05_3), accessed via

trail, were thoroughly sampled, but limited flow and steep gradients prevent fish from using these areas. Between these two tributaries were several non-fish-bearing streams that did not appear on the City's maps. Stream segment 76_05_4, located at the north end of the park, contained several cutthroat fry downstream of the trail's footbridge. Stickleback were also present in this area, which is downstream of a significant gradient change. Fish use of the downstream part of this segment requires a Type 2 designation for the entire segment. The isolated segment north of the park (76_05_5), accessed from SE 2nd Street, trickled down a steep slope into an equally steep culvert. Inadequate flow and steep gradients in this segment preclude fish presence.

Three small tributaries located at the north bend of Kelsey Creek were sampled for fish use. Segment 76_07_1, which lacked fish, flows between apartment buildings. Local residents report the channel is very flashy. Thus, hydrological factors are possibly limiting fish use, since gravel substrate and small pools were observed. It is possible, but unlikely, that fish might access the lower 120 feet of this segment (before reaching a steep culvert) during high flow events. Segment 76_07_21 possesses similar flashy streamflow conditions. No fish were observed within this segment nor is fish use possible due to a steep gradient barrier at the confluence with Kelsey Creek.

Fish use was observed in segment 76_08_1, accessed from NE 16th Place. One recently emerged cutthroat trout was discovered in the first pool upstream from the main channel of Kelsey Creek. Local residents report this is a perennial stream, and although no fish appeared further upstream, the availability of quality habitat suggests the likelihood of minor fish use in the downstream reaches. Riparian cover, a moderate gradient, gravel substrate, and sufficient streamflow provide quality habitat.

The habitat of upper Kelsey Creek, above segment 76_10, is of poor quality. Almost all of the segments are overgrown with reed canarygrass and are channelized through the Lake Hills Greenbelt. Along the main stem (segment 76_12) through the Lake Hills Greenbelt, stickleback from multiple age classes were found in several places (Figure 1). Although no fish were observed in segments 76_11 or 76_11_2, fish use is presumed due to their connectivity with Larsen Lake and upstream reaches containing stickleback. Furthermore, the lack of fish caught may have been partially due to extremely turbid conditions and access limitations due to areas with exceedingly deep sediment.

Figure 1: Stickleback were found in this pool of segment 76_12.

Of the tributary extending west from the Lake Hills Greenbelt across 148th Avenue SE, only segment 76_11_11 contained visible water, which was confined to isolated puddles with high sediment levels and no flow. Electrofishing revealed no fish. Segment 76_11_11_1 contained a few standing puddles, while all other upstream areas accessed from Sammamish High School were completely dry.

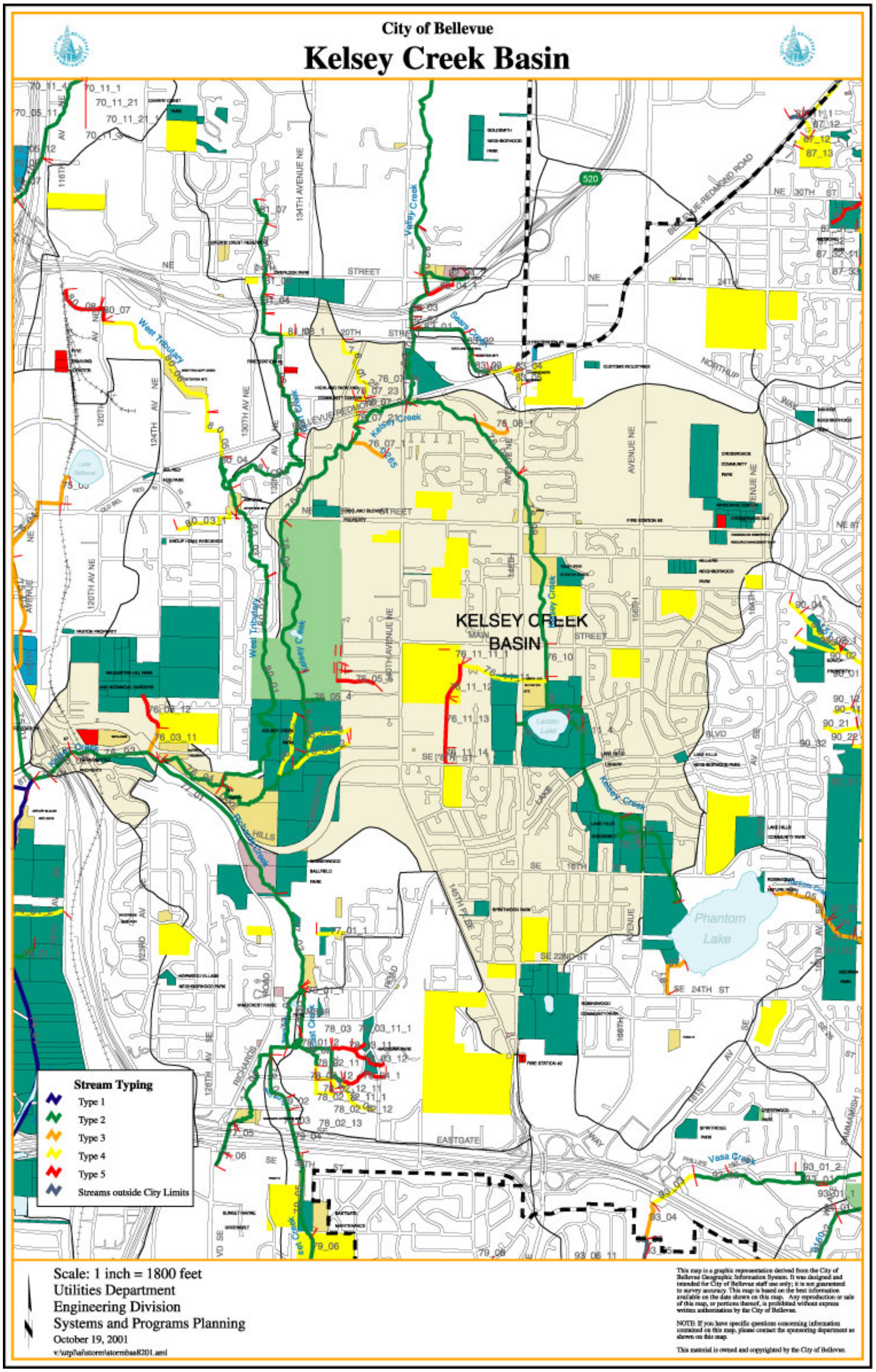
Table 5: Kelsey Creek Fish Data

Segment ID #	Cutthroat	Coho	Other	Interim Type	Permanent Type	Date Sampled
76_01				2	F	
76_02				2	F	
76_03	Present	Present	Bluegill, Dace, and Sculpin	2	F	1996[1]
76_03_11	–	–	4 Lamprey	3	F	6/25/01
76_03_12	–	–	–	5	Ns	6/25/01
76_04				2	F	
76_05		Present	Chinook, Sockeye	2	F	1981[3]
	Present	Present	Dace, Sucker			1996[1]
	Present	Present	Bluegill, Dace, Sucker			1997[2]
76_05_1	–	–	–	4	Np	6/11/01
76_05_2	–	–	–	4	Np	6/11/01
76_05_3	–	–	–	4	Np	6/11/01
76_05_4	10 (0+)	–	9 Stickleback	2	F	6/11/01
76_05_5	–	–	–	5	Ns	6/25/01

Segment ID #	Cutthroat	Coho	Other	Interim Type	Permanent Type	Date Sampled
76_06		Present	Chinook, Sockeye	2	F	1981[3]
	Present	Present	Bluegill, Sucker			1996[1]
	Present	Present	Dace, Sucker			1997[2]
76_07	Present		Lamprey	2	F	1996[1]
76_07_1	–	–	–	3	F	6/20/01
76_07_21	–	–	–	4	Np	6/20/01
76_07_22				4	Np	
76_07_23				4	Np	
76_07_24				4	Np	
76_07_25				4	Np	
76_08	Present	Present	Bluegill	2	F	1996[1]
	Present	Present	Largemouth Bass			1997[2]
76_08_1	1 (0+)	–	–	3	F	6/20/01
76_09	Present			2	F	1996[4]
			Chinook			1999[5]
			Sockeye			1999[6]
76_10				2	F	
76_11	–	–	1 Chinook	2	F	1990[4]
			5 Stickleback (2 adult, 3 fry)			6/25/01
76_11_11	–	–	–	4	Np	6/25/01
76_11_11_1	–	–	–	4	Np	6/25/01
76_11_12	–	–	–	5	Ns	6/25/01
76_11_13				5	Ns	
76_11_14				5	Ns	
76_11_2	–	–	–	2	F	6/11/01
76_12			1 Chinook	2	F	1990[4]
	–	–	7 Stickleback (fry)			6/25/01

1- Ludwa et al. 2- Fresh, Kurt. 3- Morrice, Rob and Alan Johnson. 4- Paulsen, Kit. 5- Barry, Tom. 6- Hillesland, Spencer.

Map 5: Kelsey Creek Basin



City of Bellevue
Kelsey Creek Basin
KELSEY CREEK BASIN
Phantom Lake
Stream Typing
Type 1
Type 2
Type 3
Type 4
Type 5
Streams outside City Limits
Scale: 1 inch = 1800 feet
Utilities Department
Engineering Division
Systems and Programs Planning
October 19, 2001
v:\utp\ai\storm\stormbas8201.aml
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Richards Creek Basin (#77)

Overview:

Located in central Bellevue, Richards Creek flows into Kelsey Creek near the intersection of SE 7th Street and the Lake Hills Connector. It receives flow from Sunset and East Creeks. From its headwaters at the Factoria Mall, Richards Creek navigates through commercial areas and public open spaces, paralleling Richards Road and the Lake Hills Connector. Richards Creek has one minor tributary off SE 20th Street. Habitat is generally conducive to use by salmonids due to the presence of many large pools.

Fish Use:

The City had previously determined fish use in Richards Creek as far upstream as SE 32nd Street. Cutthroat trout and chinook, sockeye, and coho salmon are known to reach segment 77_03. Sculpin, lamprey, and stickleback have been observed in segment 77_02.

Survey efforts for this study covered the upstream end of Richards Creek (77_06) as well as its small tributary (77_01_1). The headwater segment of Richards Creek flows through a ditch at Loehmann's Plaza along Factoria Boulevard (Figure 2). Electrofishing located several cutthroat trout, each greater than 6 inches in length, as well as a juvenile coho salmon. Within the channel, pool formation was minimal due to a lack of woody debris or other significant in-stream structures. The stream was deeper than 2 feet at many places and it flowed steadily. Litter abounded in the sandy substrate.

The isolated tributary to Richards Creek (77_01_1), accessed via trail at SE 20th Street, is incapable of supporting fish activity. This weak channel lacks any pools greater than 2 inches deep. There are also numerous natural fish barriers, most notably a 6-foot waterfall at the trail's lower bridge, located near the 13500 block. At the upstream end, rust had naturally stained the stream, similar to some parts of Coal Creek. During the survey, a second stream flowing into this tributary, which does not appear on the City's maps, was found and sampled. Hydrology was also a limiting factor in this stream. No fish were discovered in either channel.

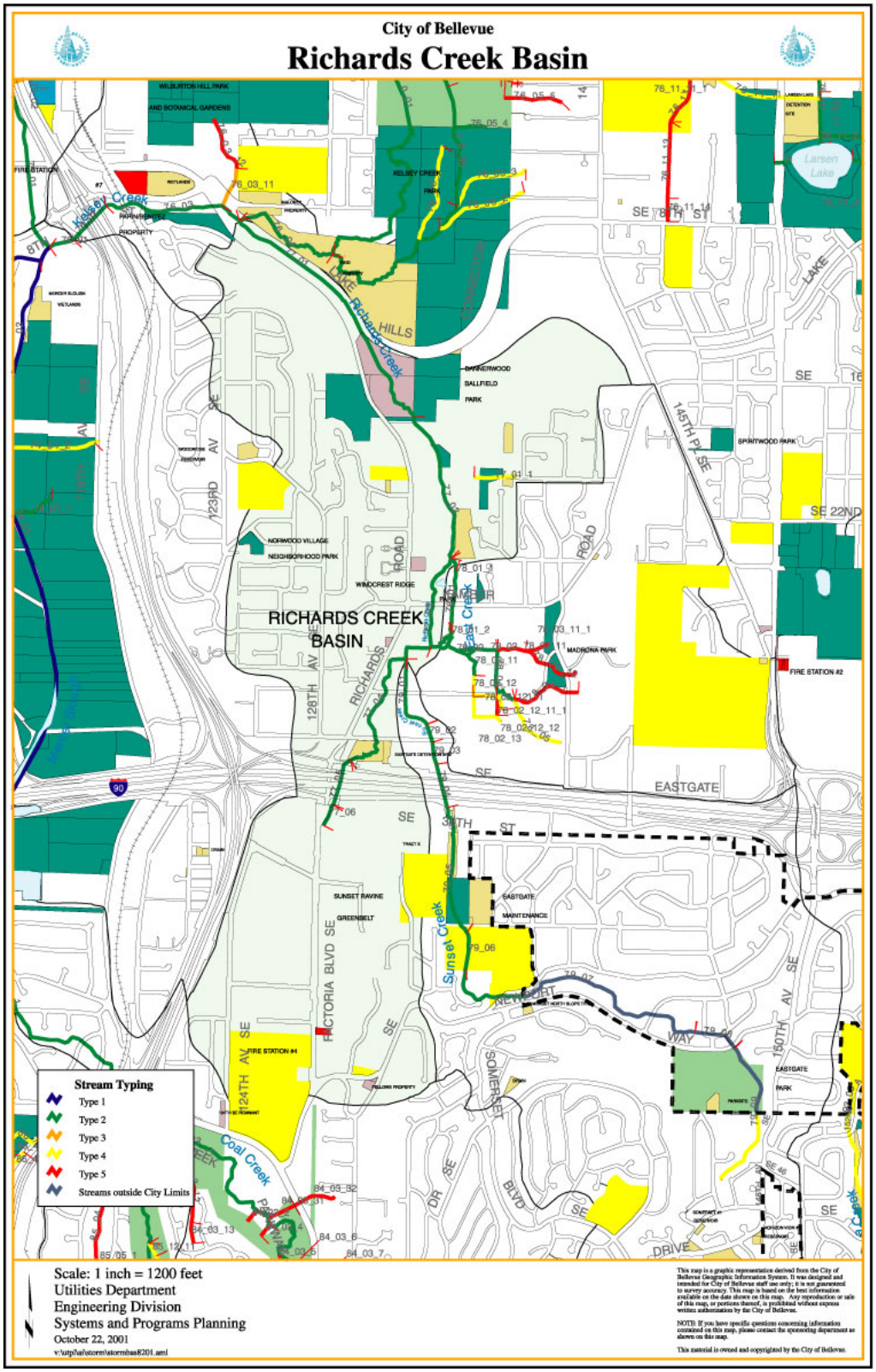
Figure 2: Upper Richards Creek at Loehmann's Plaza, where coho and cutthroat were present.

Table 6: Richards Creek Fish Data

Segment ID #	Cutthroat	Coho	Other	Interim Type	Permanent Type	Date Sampled
77_01				2	F	
77_01_1	–	–	–	4	Np	6/29/01
77_02	Present		Lamprey	2	F	1996[1]
	Present	Present	Lamprey, Stickleback, and Sculpin			1997[2]
77_03		Present	Chinook, Sockeye	2	F	1994[4]
	Present	Present	Sockeye			1996[3]
77_04				2	F	
77_05				2	F	
77_06	3 (7in.)	1 (0+)	–	2	F	6/29/01

1- Ludwa et al. 2- Fresh, Kurt. 3- Paulsen, Kit. 4- Knights, Tom.

Map 6: Richards Creek Basin



East Creek Basin (#78)

Overview:

East Creek flows into Richards Creek in central Bellevue, just north of I-90. The upper segments of the creek flow largely through deciduous forested areas, but the lower segments have been heavily channelized around property boundaries and roadways. The tree roots and wood from the riparian buffer have contributed to pool formation, and in general, fish inhabit all segments that contain sufficient flow.

Fish Use:

Cutthroat trout and coho salmon were previously found in the downstream end of East Creek (78_01, 78_01_1, and 78_01_2). Further field investigations found that all of the open water segments around the H.D. Fowler property contained fish.

To the west, segment 78_02_11 is a sluggish stream over a thick organic substrate. Juvenile cutthroat trout were found in several 4-inch-deep habitats. Upstream, two 300-foot culverts route stormwater into the main stem. None of the segments upstream of the culverts had enough flow to support fish, and one (78_02_12_11_1) was almost completely dry during the survey. These segments were overgrown with watercress and reed canarygrass.

To the north of the H.D. Fowler property, segment 78_03 flows through a more typical channel, with small pools and gravel substrate. Young cutthroat trout filled the available pools, and a few lamprey were also observed. The tributary entering at the northeast corner of the H.D. Fowler property (78_03_11) was nearly dry and incapable of supporting fish.

On the eastern edge of the H.D. Fowler property, segment 78_04 flows through a narrow, linear channel choked with reed canarygrass. The structure of the ditch has discouraged pool formation, and the channel width is significantly less than in 78_03. Nevertheless, juvenile cutthroat trout were found in this stretch up to a culvert under a private, unnamed drive extending east from SE 30th Street. Upstream of the culvert, the stream flows down a forested hillside, splitting into several smaller channels, associated with small wetland areas. Since there is no main channel through this slope, each of the lesser channels flows at a depth of no more than two inches. Further upstream from this slope, at segment 78_05, the channel flow is much stronger with step pool habitat. However, extensive electrofishing efforts did not locate any fish in this segment. It appears that the culvert under the private drive plays a role in blocking fish passage. It is

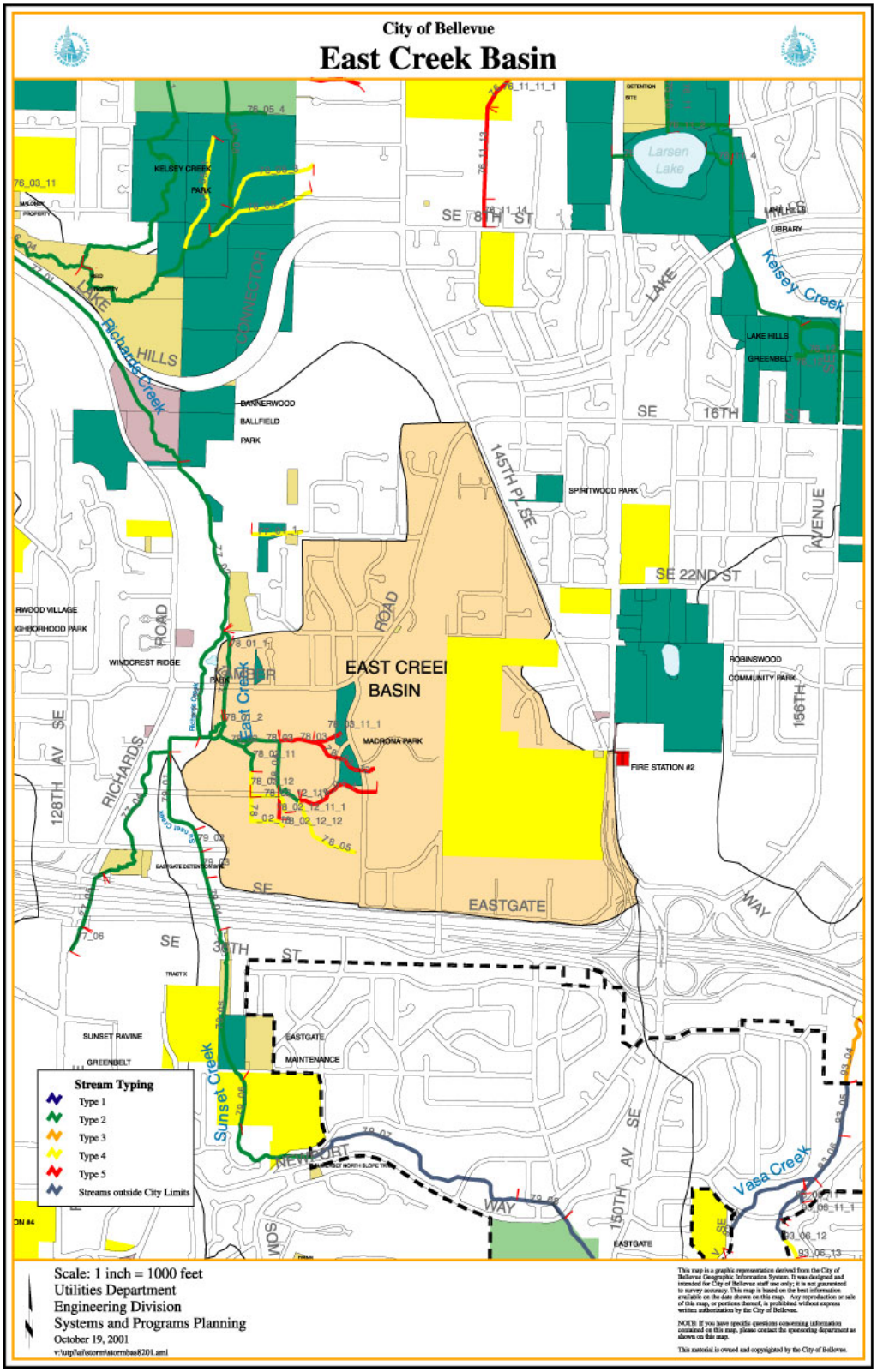
recommended that a new segment boundary be placed at this culvert to reflect the change in fish usage. The tributary from the east, 78_04_1, was dry at the time of the survey.

Table 7: East Creek Fish Data

Segment ID #	Cutthroat	Coho	Other	Interim Type	Permanent Type	Date Sampled
78_01	Present	Present		2	F	1996[1]
78_01_1	Present	Present		2	F	1996[1]
78_01_2	Present	Present		2	F	1996[1]
78_02				2	F	
78_02_11	2 (0+)	–	–	2	F	6/27/01
78_02_12	–	–	–	4	Np	6/27/01
78_02_12_11	–	–	–	4	Np	6/27/01
78_02_12_11_1	–	–	–	5	Ns	6/27/01
78_02_12_12	–	–	–	4	Np	6/27/01
78_02_13	–	–	–	4	Np	6/27/01
78_03	6 (0+)	–	1 Lamprey	2	F	6/27/01
78_03_11	–	–	–	5	Ns	6/27/01
78_03_11_1				5	Ns	
78_03_12				5	Ns	
78_04	4 (0+)	–	2 Lamprey	2	F	6/27/01
78_04_1	–	–	–	5	Ns	6/27/01
78_05	–	–	–	4	Np	6/27/01

1- Paulsen, Kit and Anne Watts.

Map 7: East Creek Basin



Sunset Creek Basin (#79)

Overview:

Located in the Eastgate neighborhood and surrounding areas of south-central Bellevue, Sunset Creek flows through residential neighborhoods and the commercialized I-90 corridor as it flows towards Richards Creek. Four major culverts with a combined length of over 2,000 feet have altered the original character of the stream, limiting fish passage.

Fish Use:

Prior to this study, the City of Bellevue had already compiled fish data for all but the farthest upstream segment. Chinook salmon and steelhead have been observed in the first segment (79_01). Sockeye salmon have been recorded as far upstream as I-90 (segment 79_03), while coho have been found even farther (segment 79_05). Cutthroat trout are present as far upstream as SE 42nd Street in segment 79_07.

Survey efforts for this study were confined to the headwaters (79_09) accessed from the 4400 block of 150th Avenue SE. The survey began at the City boundary and extended 150 feet upstream through a gentle, wooded ravine. This channel consists of small pools no greater than 10 inches deep, connected by short riffles. Pool formation has been aided by woody debris. No fish were detected, although several crawfish were found. Although low streamflow is a limiting factor, the absence of fish is likely due to a barrier downstream, outside of City limits.

Table 8: Sunset Creek Fish Data

Segment ID #	Cutthroat	Coho	Other	Interim Type	Permanent Type	Date Sampled
79_01			Chinook, Sockeye, and Steelhead	2	F	1998, 1992[2]
79_02		Present	Sockeye	2	F	1997[1]
79_03		Present	Sockeye	2	F	1997[1]
79_04				2	F	
79_05	Present			2	F	1996[2]
79_06				2	F	
79_07	Present			2	F	1996[2]
79_09	–	–	–	4	Np	6/29/01

1- Morgenroth, Brian. 2- Stream Team.

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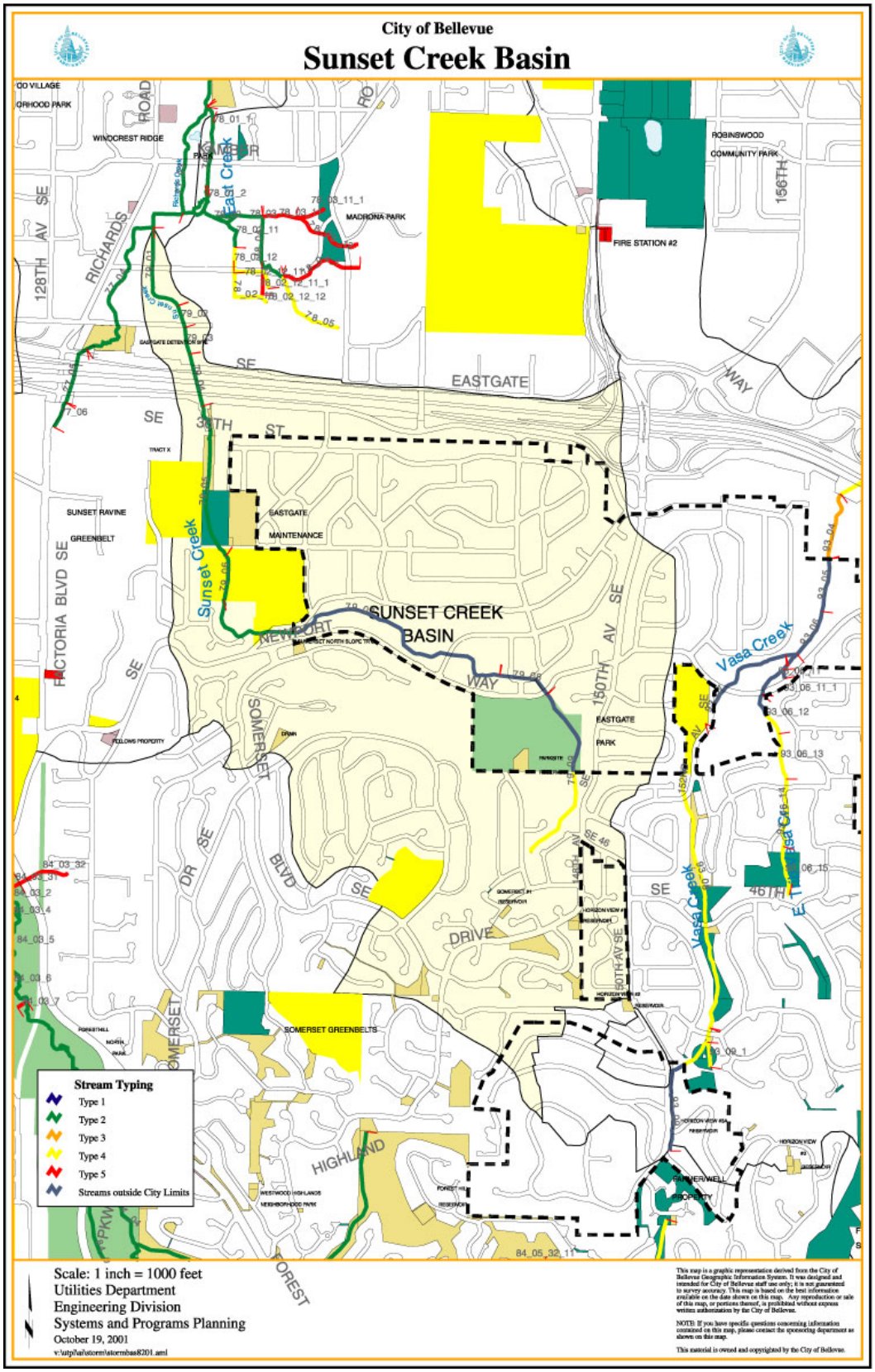
Map 8: Sunset Creek Basin



West Tributary Basin (#80)

Overview:

The West Tributary of Kelsey Creek flows through central Bellevue, from its headwaters near the SR 520 and I-405 interchange to its confluence with Kelsey Creek at Kelsey Creek Park. Goff Creek enters the West Tributary just south of Bellevue-Redmond Road. Land use varies widely across the length of the West Tributary. This includes parklands as well as residential, commercial, and detention site areas further upstream. Stream flow progresses from slow-moving, beaver-dammed reaches upstream to pool-riffle sequences downstream.

Fish Use:

City of Bellevue data was used to type the first four segments of the West Tributary. Chinook, sockeye, and coho salmon are known to use the downstream segments (80_01 and 80_02). Dace and sucker are also present downstream, while cutthroat trout reach as far upstream as segment 80_04.

Survey efforts were necessary upstream of segment 80_04 and at the small tributary near NE 8th Street. Electrofishing on both sides of 124th Avenue NE (segment 80_06) yielded no fish, although a Pacific giant salamander was caught. Habitat characteristics include sluggish flow through pools that are several hundred feet long, apparently created by beaver activity. Substrate consists of a thick silt layer. Further upstream, at 120th Avenue NE, the stream consists of isolated pools with thick silt substrate. Fish were also absent in this segment (80_08).

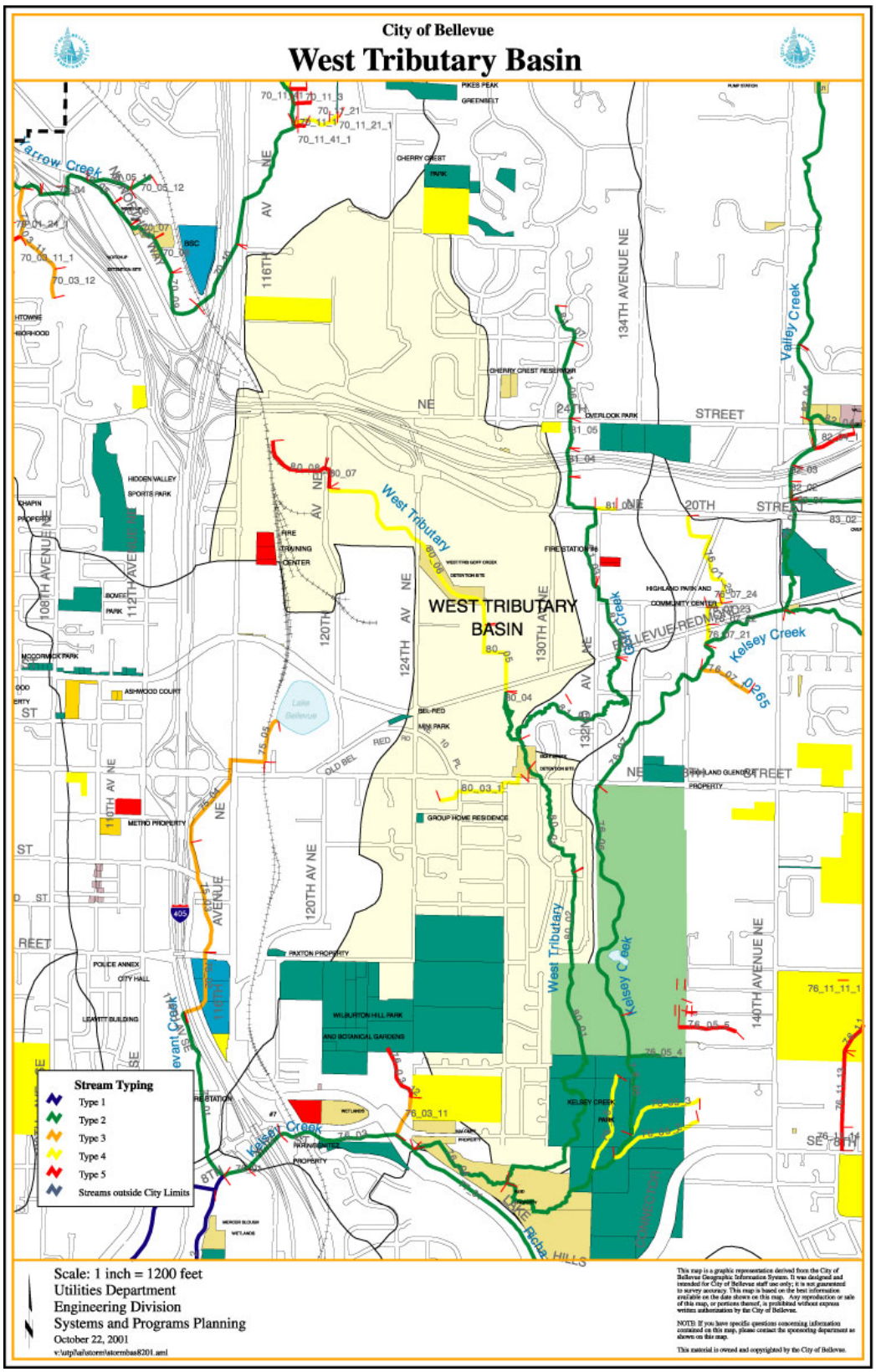
No fish were found in the tributary at NE 8th Street (80_03_1). South of NE 8th Street, the tributary is a sequence of tiny pockets of water, each less than 2 inches deep. Although fish were found at the confluence with the main channel, they are not inhabitants of the tributary and should not alter the classification of the tributary upstream as Type 4.

Table 9: West Tributary Fish Data

Segment ID #	Cutthroat	Coho	Other	Interim Type	Permanent Type	Date Sampled
80_01		Present	Chinook	2	F	1990[3]
80_02		Present	Sockeye	2	F	1990[3]
	Present	Present	Dace, Sucker			1996[1]
80_03				2	F	
80_03_1	–	–	–	4	Np	6/19/01
80_04	Present			2	F	1999[2]
80_05				4	Np	
80_06	–	–	–	4	Np	6/19/01
80_07	–	–	–	5	Ns	6/19/01
80_08	–	–	–	5	Ns	6/19/01

1- Ludwa et al. 2- Morgenroth, Brian. 3- Stream Team.

Map 9: West Tributary Basin



Goff Creek Basin (#81)

Overview:

Goff Creek flows through north-central Bellevue, passing under SR 520 and Northup Way en route to the West Tributary of Kelsey Creek. Heavy commercial and residential development surrounds the creek and contributes surface flow. The significant volume of water in Goff Creek provides abundant opportunities for fish use. However, fish must first pass through major culverts, including one that is over 1,000 feet long at Bellevue-Redmond Road, in order to access the upper segments.

Fish Use:

The City had previously collected data regarding fish use throughout the main channel of Goff Creek. Cutthroat trout are known to inhabit the entire length of Goff Creek, and sockeye salmon have been reported in the first downstream segment.

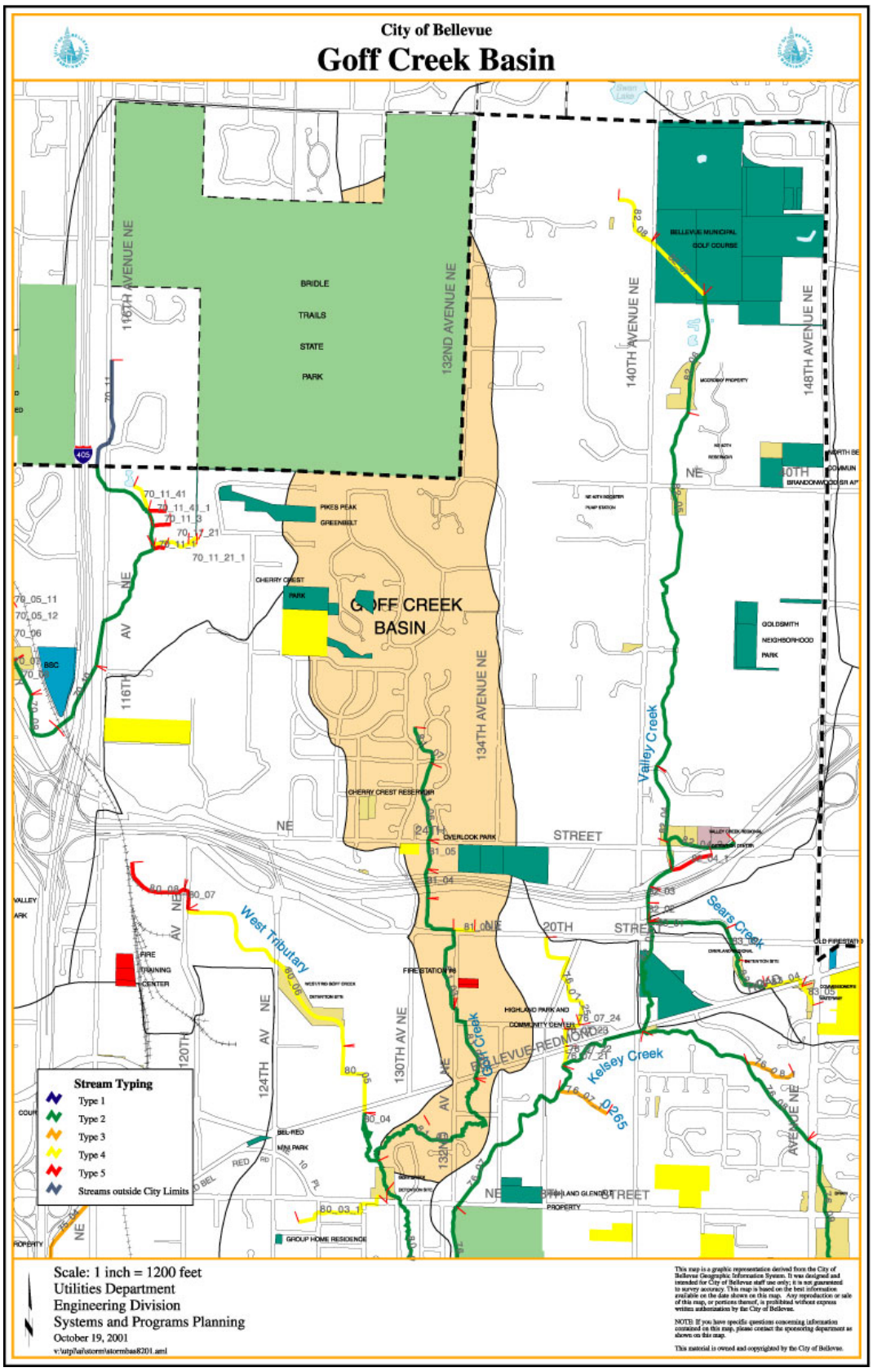
Survey efforts were only necessary for a small tributary (81_03_1) at NE 20th Street. During the site visit, a maintenance crew had just finished mowing along the entire segment corridor, including the in-stream areas. Although this section had very limited flow and was lined with reed canarygrass and emergent vegetation, any available fish habitat became clogged with clippings and debris. The downstream end of this segment, in contrast to the City's basin map, consisted of a 5-foot-deep culvert inlet structure at the northeast corner of the intersection of NE 20th Street and 132nd Avenue NE. Two adult cutthroat trout, measuring almost one foot in length, were caught in this inlet structure. It is recommended that the City's maps show the segment boundary for the main channel immediately upstream of this inlet structure, thus isolating the non-fish-bearing stretch upstream. This would include the inlet structure as part of the main channel.

Table 10: Goff Creek Fish Data

Segment ID #	Cutthroat	Coho	Other	Interim Type	Permanent Type	Date Sampled
81_01			Sockeye	2	F	1988[2]
81_02				2	F	
81_03	Present		Unidentified Trout	2	F	2000[1]
81_03_1	–	–	–	4	Np	6/15/01
81_04	Present		Unidentified Trout	2	F	2000[1]
81_05	Present			2	F	1998[1]
81_06	Present			2	F	1998[1]
81_07	Present			2	F	1998[1]

1- Paulsen, Kit. 2- Stream Team.

Map 10: Goff Creek Basin



Valley Creek Basin (#82)

Overview:

Located in the northernmost part of Bellevue, Valley Creek (also known as the North Tributary to Kelsey Creek) parallels 140th Avenue NE as it cuts through commercial lots and Bellevue Municipal Golf Course. Sears Creek flows into Valley Creek at NE 21st Street, eventually joining Kelsey Creek near Bellevue-Redmond Road. In general, its large water volume supports fish throughout most of the creek. Most of the main stem has gravel substrate and pool-riffle sequences.

Fish Use:

Fish data collected previously was available for nearly all of the Valley Creek system. Information obtained from the City of Bellevue showed sockeye, chinook, and coho salmon presence throughout the main stem of Valley Creek, upstream as far as the outfall of the 1,087-foot culvert at the Bellevue Municipal Golf Course. Bluegill sunfish have been documented in the lower reaches of Valley Creek, and cutthroat trout are present up to segment 82_06.

No fish were found in a 1998 electrofishing survey by The Watershed Company at the upstream end (segment 82_08) of Valley Creek (Johnston, 5 June 1998). Unlike downstream areas, this section was characterized by shallow water full of emergent vegetation and organic, muddy substrate. Although it does not support fish, one Pacific giant salamander was found.

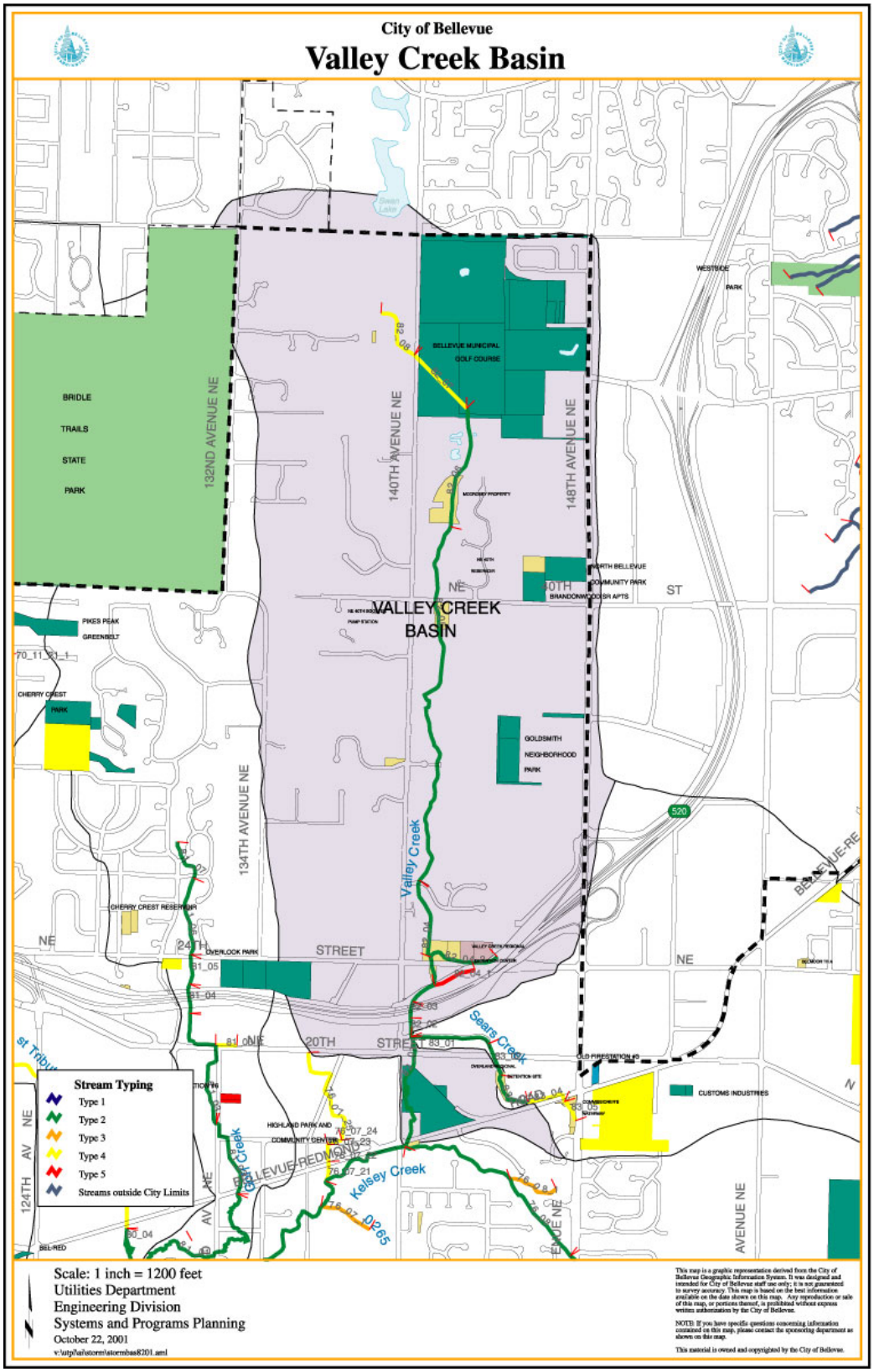
Survey efforts at the small tributary adjacent to SR 520 (82_04_1) revealed a mostly dry, muddy channel incapable of supporting fish. In contrast, the tributary to the north (82_04_2) contained several young cutthroat trout. At the downstream end of this tributary, the stream becomes part of a detention pond. Other than this pond, this segment contains limited flow, and the deepest pools were only 8 inches deep. The trout were found upstream of the pond in a pool-riffle sequence.

Table 11: Valley Creek Fish Data

Segment ID #	Cutthroat	Coho	Other	Interim Type	Permanent Type	Date Sampled
82_01	Present	Present	Bluegill	2	F	1996[1]
	Present	Present	Lamprey			1997[2]
82_02				2	F	
82_03				2	F	
82_04		Present		2	F	1981[3]
	Present	Present				1996[1]
	Present	Present	Lamprey			1997[2]
82_04_1	–	–	–	5	Ns	6/15/01
82_04_2	6 (0+)	–	–	2	F	6/15/01
82_05	Present	Present		2	F	1998[4]
		Present	Sockeye and Chinook			
82_06	Present	Present		2	F	1998[4]
		Present	Sockeye and Chinook			
82_07				4	Np	

1- Ludwa et al. 2- Fresh, Kurt. 3- Morrice, Rob and Alan Johnson. 4- Stream Team. 5- Johnston, Greg.

Map 11: Valley Creek Basin



Sears Creek Basin (#83)

Overview:

Sears Creek is a relatively small tributary to Valley Creek, which flows into Kelsey Creek. The surrounding area is almost entirely commercial development consisting of both small business and multi-story offices. Surface runoff from the commercial area comprises most of the stream flow, maintained throughout the year by a sediment catch basin. The overall condition of Sears Creek is widely variable. From the confluence with Valley Creek, Sears Creek is ditched along NE 21st Street for approximately 1,000 feet, before passing through the first of two 500-foot culverts. This lower segment lacks vegetative cover and in-stream structural complexity. However, the channel substrate provides enough habitat to support fish use. Above the first culvert, a 1,200-foot-long greenway provides a very good riparian corridor. This segment (83_03) had pool-riffle and step pool sequences, in-stream habitat structures, vegetative cover, and sufficient flow to support fish. Above this segment, another 500-foot culvert and a sediment catch basin appear to block the passage of fish. Above the catch basin, the stream is seasonal—the result of dependence on minimal surface runoff.

Fish Use:

Significant fish use (coho and cutthroat trout) was found up to the upper culvert in Sears Creek. During the time of the site investigation, heavy rains had caused both Sears Creek and Valley Creek to swell such that much of the lower segment of Sears Creek had a zero gradient change from Valley Creek. One coho was captured near the confluence with Valley Creek. Since no other coho were captured upstream from this point, it was not determined if coho actually were using Sears Creek or if the captured coho was from Valley Creek. The majority of fish caught were yearling cutthroat trout; only one cutthroat fry was captured during the investigation.

Table 12: Sears Creek Fish Data

Segment ID #	Cutthroat	Coho	Other	Interim Type	Permanent Type	Date Sampled
83_01	7 (6 age 1+, 1 age 0+)	1 (0+)		2	F	6/12/01
83_02	–	–	–	2	F	6/12/01
83_03	6 (1+)	–	–	2	F	6/12/01
83_04	–	–	–	4	Np	6/12/01
83_05	–	–	–	4	Np	6/12/01

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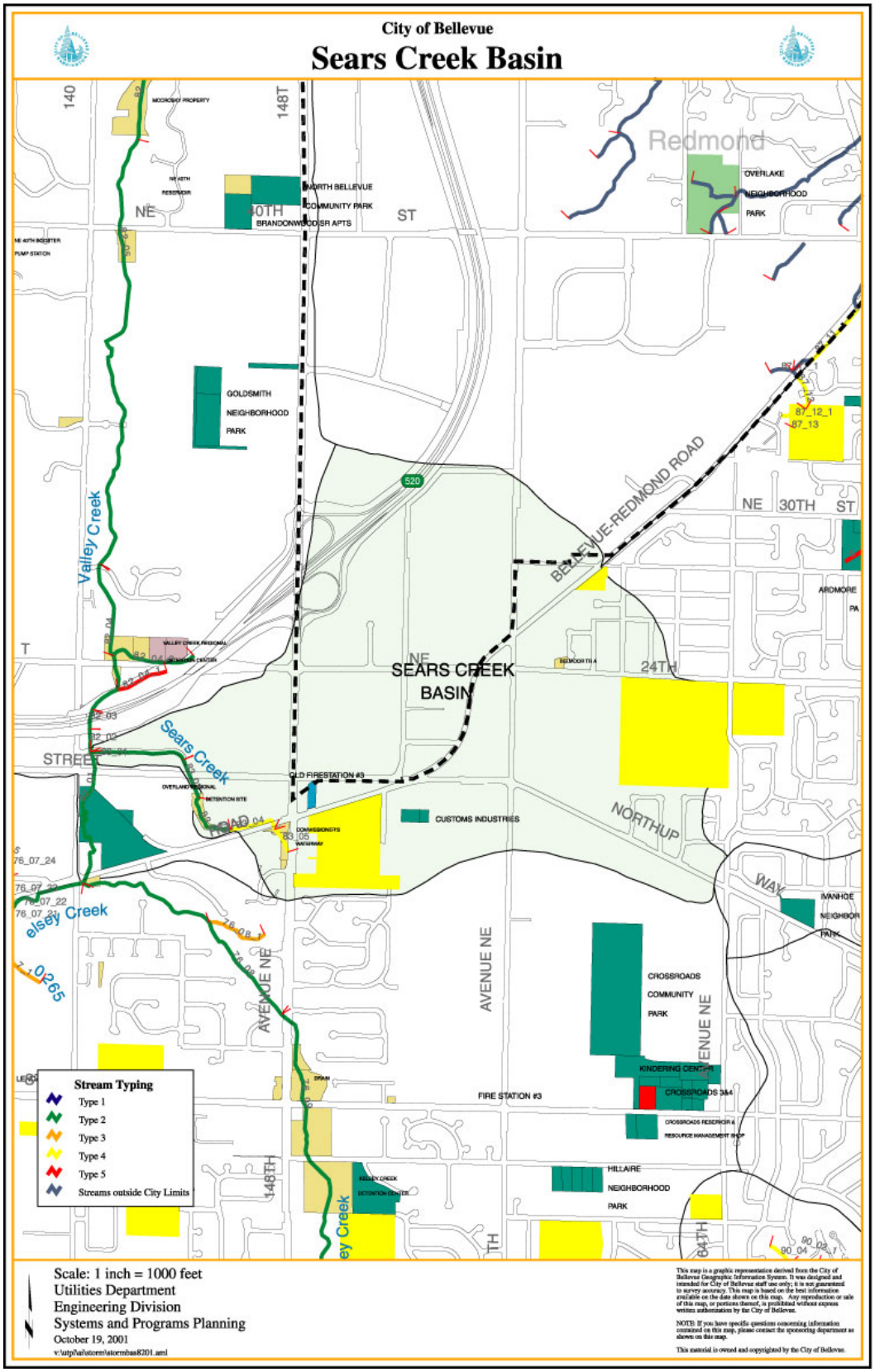
Map 12: Sears Creek Basin



Coal Creek Basin (#84)

Overview:

Cascading across south Bellevue into Lake Washington, Coal Creek is one of the most significant and scenic of Bellevue's streams. Virtually the entire main stem upstream of I-405 is protected as parkland, first as Coal Creek Park and later as Cougar Mountain Park, where its headwaters are located. Furthermore, most of the tributaries have been preserved as greenbelts, with a network of trails enjoyed by local residents. Much of upper Coal Creek (above 84_05) lies outside City limits. At the downstream end, between the lakeshore and I-405, Coal Creek flows through residential lots. In-stream habitat throughout the main channel consists of pool sequences, created by weirs and woody debris. Upstream, there are several impassible natural cascades. Near the headwaters and in many of the tributaries, stream flow was minimal at the time of observation. Otherwise, in-stream habitat is similar to the step pool and pool-riffle sequences downstream. Since this study did not include off-site areas, it is recommended that the City revise the segment boundaries by splitting the segments that cross the City line, in order to more accurately reflect the known fish use data.

Fish Use:

The City had already collected information about fish presence along most of the main stem of Coal Creek, so field investigation concentrated on the creek's many tributaries. Cutthroat trout are known to inhabit the main channel up to segment 84_05, and many juvenile coho were also observed while surveying the tributaries.

Of the first seven tributaries, each branching from segment 84_03, all were seasonal and non-fish-bearing. The first of these (84_03_11) had the most defined channel, with evidence of plunge pool formation in the thick layer of gravel substrate. Presumably this segment supports sub-surface flow. Of the next six tributaries, only two were still flowing on the survey date. In addition, two other small tributaries not appearing on the Bellevue maps were located, flowing from Coal Creek Parkway. The first was approximately 150 feet downstream of segment 84_03_2 and the second was about 150 feet upstream of segment 84_03_3. These two tributaries were also seasonal and non-fish-bearing.

Further upstream, segment 84_04_11 branches parallel to Coal Creek Parkway. It contains step pool habitat. Cutthroat were found in multiple age classes throughout the tributary, while coho salmon and sculpin inhabited the first 50 feet upstream, above which a 2-foot cascade apparently blocked migration. The next

tributary (84_04_2) also features favorable step pool habitat. It contained cutthroat trout and sculpin throughout, while a recently emerged coho salmon was found near the confluence. During the survey, the upstream end of this segment was receiving foamy, soapy runoff from a very steep culvert that originated in an upland residential neighborhood. One short, unmapped tributary to segment 84_04_2 flowed through a shallow, narrow channel extending to the northwest. This tributary had a well-defined channel, but lacked enough flow to sample for fish use, and would therefore be considered perennial and non-fish-bearing.

The next tributary upstream (84_04_3) contained sculpin and juvenile coho salmon for the first 70 feet upstream. However, fish were absent upstream from Forest Drive. A map from the *Washington Catalog of Streams and Salmon Use* shows an impassable cascade between the tributary mouth and Forest Drive SE (Williams et al 1975). It is recommended that Bellevue segment this tributary to reflect the change in fish use, so that downstream of the barrier the stream is Type 2 and the upstream segment is Type 4. A minor perennial, non-fish-bearing tributary to Coal Creek, previously unmapped, was located across a trail just downstream of segment 84_04_3.

The next two tributaries crossing Forest Drive SE (including segments 84_05_31, 84_07_11, and upstream areas) contained no fish. Both tributaries flow through high-gradient step-pool channels sequences, with impassable cascades at their downstream ends (Williams et al 1975). A single Pacific giant salamander was caught in segment 84_07_11.

The upper segments of Coal Creek that flow within City limits do not support fish. Many of these segments lacked enough water to sample during the surveys. Segment 84_09 was the only section to be electrofished. No fish were found upstream of the City boundary. As viewed from Lakemont Boulevard, segment 84_08_11_1 had gone completely dry, while segments 84_10_1 and 84_10_2 were almost dry. All other segments maintain perennial flow.

Table 13: Coal Creek Fish Data

Segment ID #	Cutthroat	Coho	Other	Interim Type	Permanent Type	Date Sampled
84_01		Present	Steelhead	2	F	1990, 1991[3]
84_02				2	F	
84_03		Present	Steelhead	2	F	1991[3]
	Present	Present	Sculpin			1996[1]
84_03_11	–	–	–	5	Ns	7/3/01
84_03_12				5	Ns	
84_03_13				5	Ns	
84_03_2	–	–	–	5	Ns	6/6/01
84_03_31	–	–	–	5	Ns	6/6/01
84_03_32	–	–	–	5	Ns	6/6/01
84_03_4	–	–	–	5	Ns	6/6/01
84_03_5	–	–	–	5	Ns	6/6/01
84_03_6	–	–	–	5	Ns	6/6/01
84_03_7	–	–	–	5	Ns	6/6/01
84_04				2	F	
84_04_11	24 (17 age 0+, 7 age 1+)	3 (0+)	10 Sculpin	2	F	6/5/01
84_04_12	5 (4 age 0+, 1 age 1+)	–	–	2	F	6/5/01
84_04_2	4 age classes	1 (0+)	3 Sculpin	2	F	6/5/01
84_04_3	–	4 (0+)	4 Sculpin	2	F	6/6/01
84_05	Present			2	F	1997[2]
84_05_31				4	Np	
84_05_32	–	–	–	4	Np	6/8/01
84_05_32_11	–	–	–	5	Ns	6/8/01
84_05_32_12	–	–	–	5	Ns	6/8/01
84_07_11	–	–	–	4	Np	6/8/01
84_07_12	–	–	–	4	Np	6/8/01
84_08_11_1	–	–	–	5	Ns	6/8/01
84_09	–	–	–	4	Np	6/26/01
84_09_11	–	–	–	4	Np	6/8/01
84_09_11_1				4	Np	
84_09_11_2				4	Np	
84_09_2	–	–	–	4	Np	6/8/01
84_09_31	–	–	–	4	Np	6/8/01
84_09_32				4	Np	
84_10	–	–	–	4	Np	6/8/01
84_10_1	–	–	–	5	Ns	6/8/01
84_10_2	–	–	–	5	Ns	6/8/01

1- Ludwa et al. 2- Westin, Peter. 3- Stream Team.

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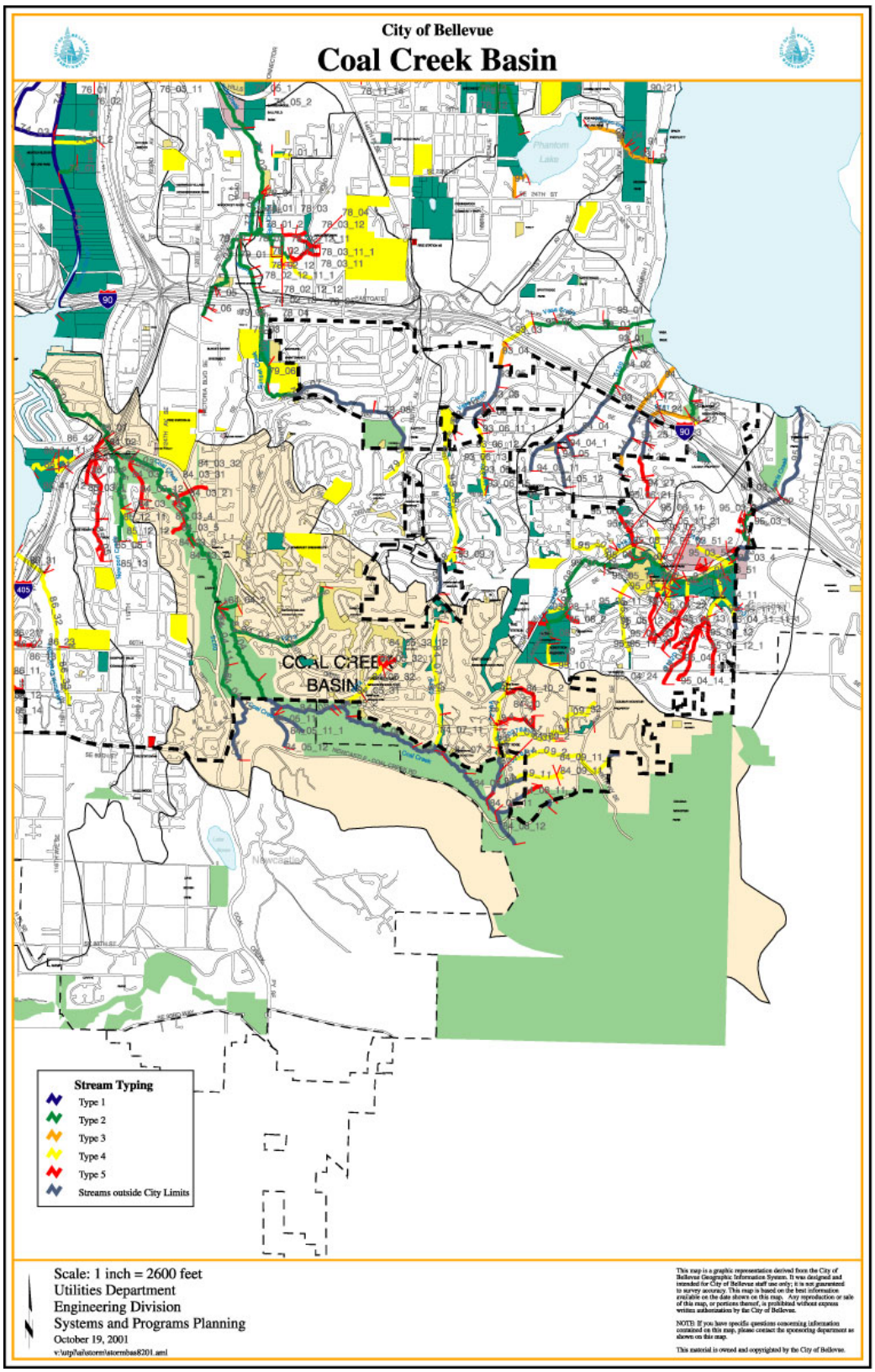
Map 13: Coal Creek Basin



Newport Creek Basin (#85)

Overview:

The Newport Drainage Area includes two tributaries to Coal Creek near I-405 in southwest Bellevue. The westernmost stream flows through residential neighborhoods west of 119th Avenue SE, before running underneath I-405 into its confluence with Coal Creek. The more productive stream to the east, known as Newport Creek, flows mostly through publicly owned green space in a forested ravine.

Fish Use:

Survey efforts at the downstream end of the west stream (85_01) revealed a seasonal stream with no surface water and a muddy, organic channel through good riparian habitat. Based on the downstream hydrology, the entire length upstream is considered to be seasonal as well.

On the other hand, Newport Creek, to the east, contains significant streamflow and an abundance of cutthroat trout. A brief survey effort at the upstream end of segment 85_12 found cutthroat trout present in multiple age classes. Previous Bellevue data also indicated the presence of lamprey along this stretch. Moving upstream to 85_13, a cutthroat trout confirmed results obtained in 1997 by The Watershed Company that showed numerous trout in and a juvenile coho salmon in segment 85_13 (Johnston 4 May 1998). The log weirs along upper Newport Creek have created significant barriers to upstream migration and have resulted in several isolated pools.

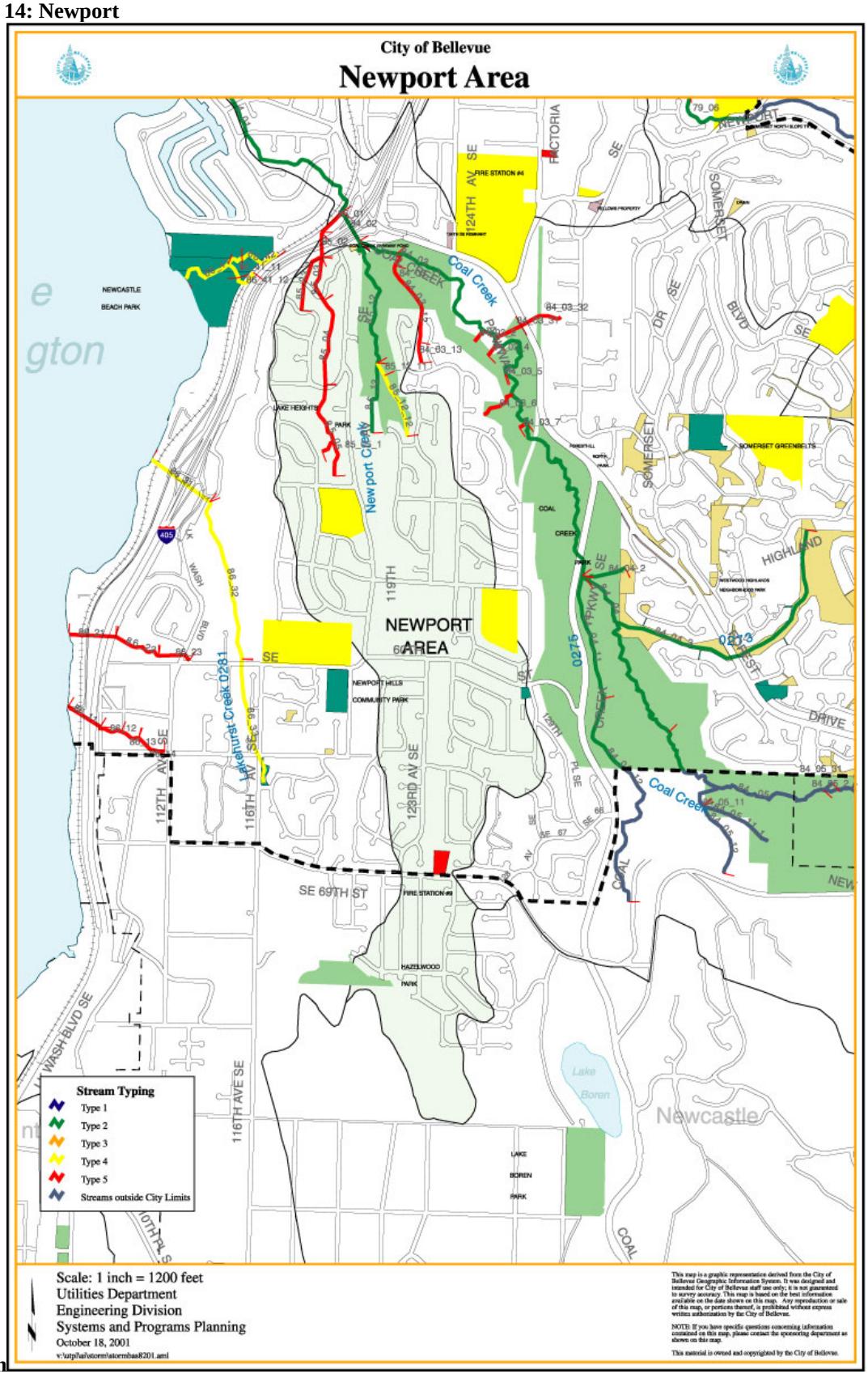
The small tributary to the east (85_12_11) cascades down a steep slope, carrying limited flow at the time of observation. Along this segment that features a 40 percent gradient, no pools deeper than 2 inches were found during the survey. No fish were encountered, making this a Type 4 stream.

Table 14: Newport Drainage Fish Data

Segment ID #	Cutthroat	Coho	Other	Interim Type	Permanent Type	Date Sampled
85_01	–	–	–	5	Ns	7/3/01
85_02				5	Ns	
85_03				5	Ns	
85_03_1				5	Ns	
85_04				5	Ns	
85_05				5	Ns	
85_05_1				5	Ns	
85_11			Sockeye	2	F	1990[2]
85_12			Lamprey	2	F	1996[1]
	10 (6 age 0+, 4 age 1+)					7/3/01
85_12_11	–	–	–	4	Np	7/3/01
85_12_12	–	–	–	4	Np	6/6/01
85_13	30	1	–	2	F	4/30/98[3]

1- Ludwa et al. 2- Stream Team. 3- Johnston, Greg.

Map 14: Newport



Basin

Lakehurst Drainage Basin (#86)

Overview:

The Lakehurst Drainage Basin contains four short streams that flow directly into Lake Washington in the southwest corner of the City limits. Land use throughout the basin is predominantly residential, with a large park at the north end. The three southernmost streams flow through steep culverts beneath I-405 before entering Lake Washington. The northernmost stream is located almost entirely within Newcastle Beach Park, but collects drainage from residential areas to the north. In-stream habitat is characterized by a lack of sufficient flow at the time of observation, although the stream corridors have suffered less encroachment by development than most other Bellevue streams.

Fish Use:

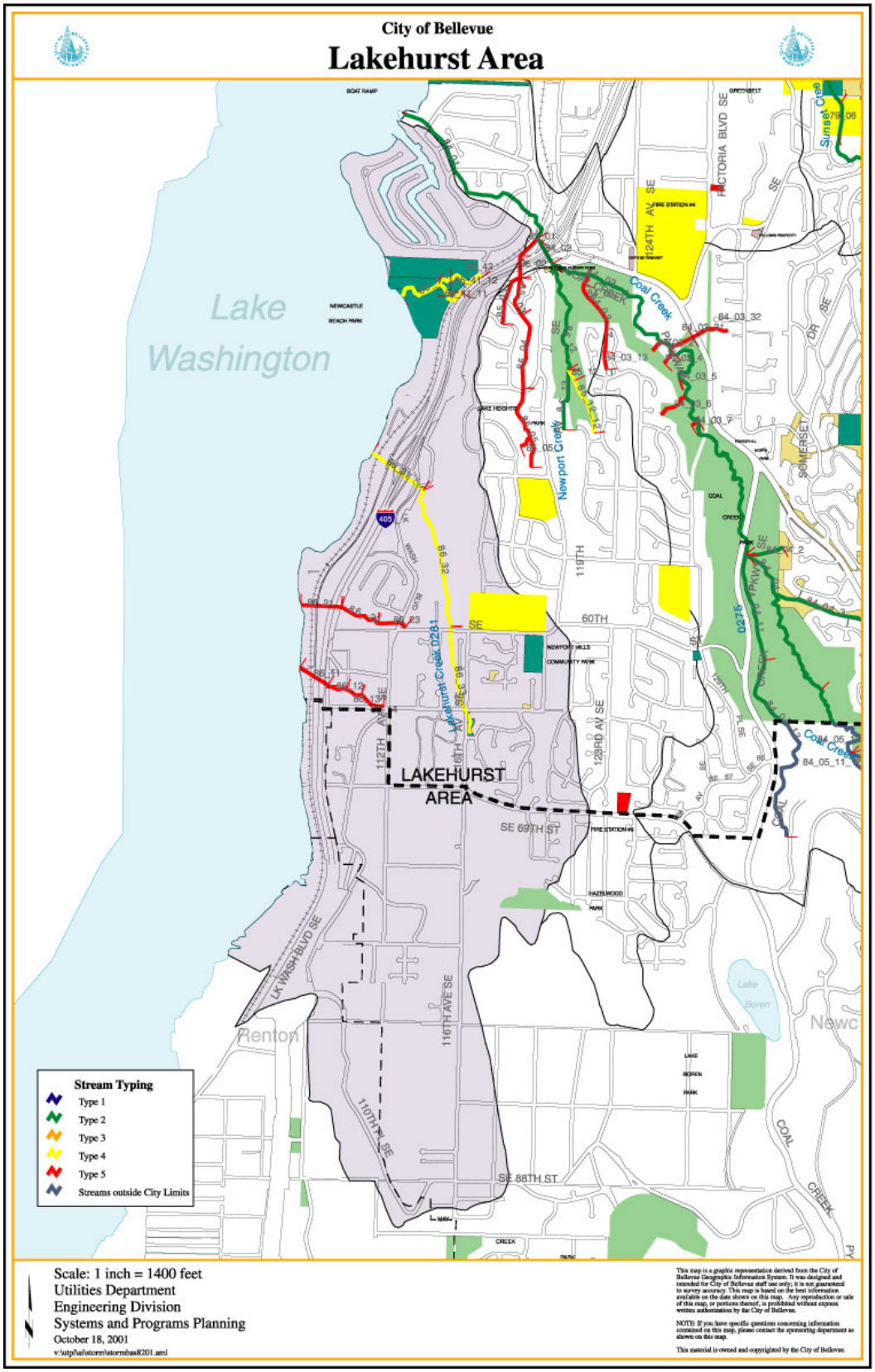
No fish were observed in the Lakehurst drainage. The two southern streams were found to be completely or nearly dry during this study (segments 86_12, 86_14, and 86_22). Lakehurst Creek (segment 86_32), accessed from the Park & Ride off I-405, has perennial flow through pool sequences, though evidently still insufficient to provide suitable fish habitat. Most pools were no more than 3 inches deep, and only two reached a depth of 6 inches within the survey length. The culvert beneath I-405 is an effective fish barrier for Lakehurst Creek, preventing any upstream migration from Lake Washington.

The northern stream, located in Newcastle Beach Park, flows sluggishly through the lower portion of the park. It is a low-gradient stream with thick, sandy sediment. Sufficient streamflow to support fish use was present, but no apparent outflow into Lake Washington could be found. At the time of observation, Lake Washington was at full pool elevation. During low pool elevation (winter), a direct outfall into the lake may be visible. However, during this survey a transitional wetland, lacking surface flow, was found to prevent upstream migration by fish. Although no fish were found, a few crawfish were stirred by the electrofisher.

Table 15: Lakehurst Drainage Fish Data

Segment ID #	Cutthroat	Coho	Other	Interim Type	Permanent Type	Date Sampled
86_11	–	–	–	5	Ns	
86_12	–	–	–	5	Ns	6/29/01
86_13				5	Ns	
86_14	–	–	–	5	Ns	6/29/01
86_21				5	Ns	
86_22	–	–	–	5	Ns	6/29/01
86_23				5	Ns	
86_31	–	–	–	4	Np	6/29/01
86_32	–	–	–	4	Np	6/29/01
86_33	–	–	–	4	Np	6/29/01
86_41	–	–	–	4	Np	6/8/01
86_41_11	–	–	–	4	Np	6/8/01
86_41_12				4	Np	
86_42	–	–	–	4	Np	6/8/01

Map 15: Lakehurst Basin



Ardmore Drainage Basin (#87)

Overview:

The upstream area of the Ardmore Drainage Basin has two headwater streams, which begin within the City of Bellevue and continue through the City of Redmond where they discharge into the north end of Lake Sammamish. The majority of the basin is residential neighborhoods with moderate amounts of forested area in Ardmore Park (the headwater for streams 87_2 and 87_3). The northernmost stream (87_1) lies along the north City limit adjacent to Bellevue-Redmond Road. Although it is essentially a roadside ditch at the point of our site investigation, the channel (87_11) does contain a significant amount of suitable habitat features and has a relatively gentle slope.

The headwaters of the southern streams (87_2 and 87_3) are located in Ardmore Park. Although 87_2 was not flowing, segment 87_3 was in very good condition. A forested riparian cover provided extremely good habitat through segment 87_32, which included large woody debris, gravel and cobble substrate, and pool-riffle sequences. The pools generally were not large enough to meet the sampling protocol criteria, but unless there is a considerable fish barrier downstream, fish should be able to utilize these segments based on habitat value. It is recommended that a new segment for 87_31 begin at the City boundary.

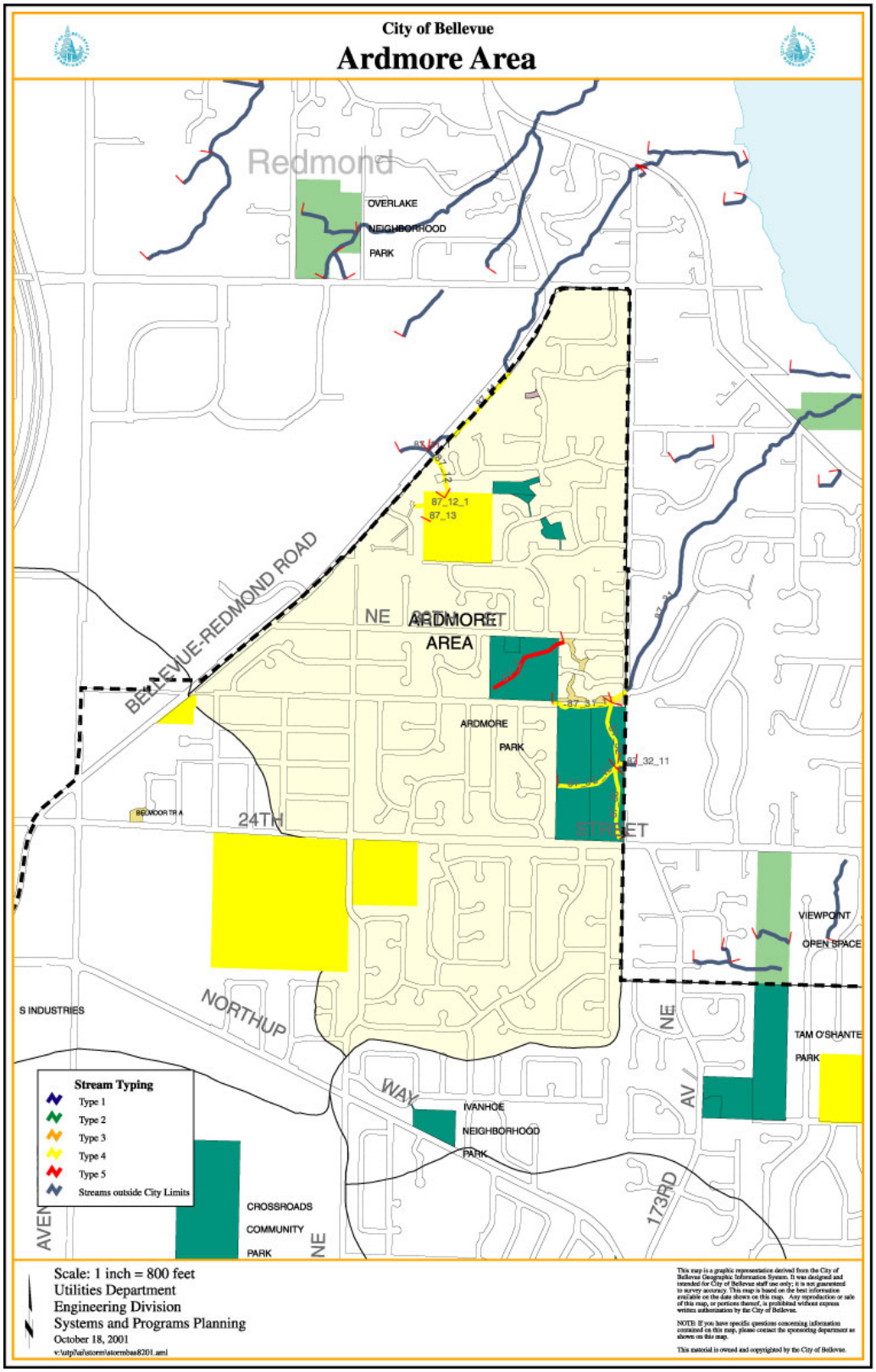
Fish Use:

No stream segments sampled in the Ardmore Drainage Basin during this study were found to have fish. A lack of water was apparently the limiting factor in most of the stream segments. Although water was flowing in segment 87_11 at the time of sampling, water level was insufficient to follow the electrofishing protocol. Habitats were less than 2 inches deep, with many areas less than 1 inch in depth. Segment 87_2, located in the north part of Ardmore Park, was completely dry. Based on extensive vegetative growth and the lack of a significantly defined channel, considering this segment a stream would be questionable. Segments 87_31 and above were found to have sufficient flow to theoretically support fish (although they lacked the proper size and number of pools to follow the sampling protocol). Electrofishing was conducted on segments 87_31 and 87_32. Segment 87_31_1 did not have enough flow to sample (less than 1 inch). Downstream barriers within the City of Redmond prevent fish passage. The City of Redmond is currently planning the reconstruction of this system to improve fish passage. Until this project is complete, these segments would be considered perennial, non-fish-bearing streams.

Table 16: Ardmore Drainage Fish Data

Segment ID #	Cutthroat	Coho	Other	Interim Type	Permanent Type	Date Sampled
87_11	–	–	–	4	Np	6/12/01
87_12				4	Np	
87_12_1				4	Np	
87_13				4	Np	
87_2	–	–	–	5	Ns	6/12/01
87_31	–	–	–	4	Np	6/12/01
87_31_1				4	Np	
87_32	–	–	–	4	Np	6/12/01
87_32_11				4	Np	
87_32_12				4	Np	
87_33				4	Np	

Map 16: Ardmore Basin



Wilkins Creek Basin (#89)

Overview:

Wilkins Creek flows into Lake Sammamish through a culvert below West Lake Sammamish Parkway. The short stream passes through a relatively steep, wooded ravine surrounded by residential development. This basin had been previously investigated for fish use and was not visited during this study.

Fish Use:

No fish were observed in Wilkins Creek during a qualitative electrofishing survey by The Watershed Company in 1997 (Johnston, 13 May 1997). Segments 89_02 and 89_03 were accessed from NE 10th Street and West Lake Sammamish Parkway. Available habitat of shallow step pool sequences and cascades is limited by steep gradient, limited hydrological conditions, and barriers to fish migration from Lake Sammamish.

Table 17: Wilkins Creek Fish Data

Segment ID #	Cutthroat	Coho	Other	Interim Type	Permanent Type	Date Sampled
89_02	–	–	–	4	Np	5/12/97[1]
89_03	–	–	–	4	Np	5/12/97[1]

1- Johnston, Greg.

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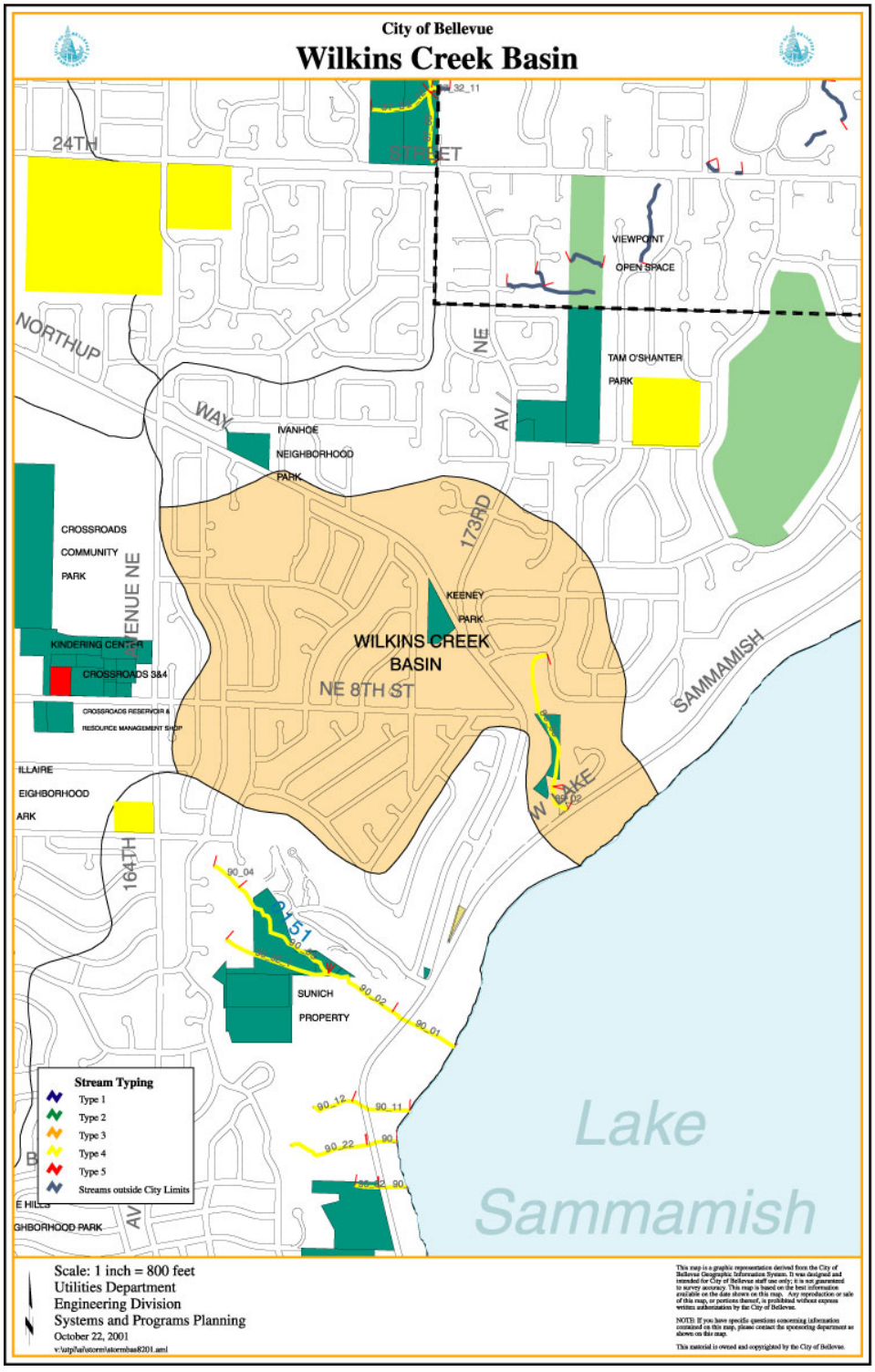
Map 17: Wilkins Creek Basin



North Sammamish Drainage Basin (#90)

Overview:

The North Sammamish Drainage Basin consists of four short streams within a six-block radius at the east end of Bellevue. Their headwaters begin in deep ravines where steep slopes have prevented development. All four streams flow through culverts beneath West Lake Sammamish Parkway before entering Lake Sammamish. In terms of habitat, these four streams are nearly identical. All are perennial streams through steep, forested ravines, but lack enough flow to create well-formed pools or provide fish habitat. In addition to the four streams recognized by City of Bellevue maps, numerous other non-fish-bearing streams have carved through the west slope along West Lake Sammamish Parkway.

Fish Use:

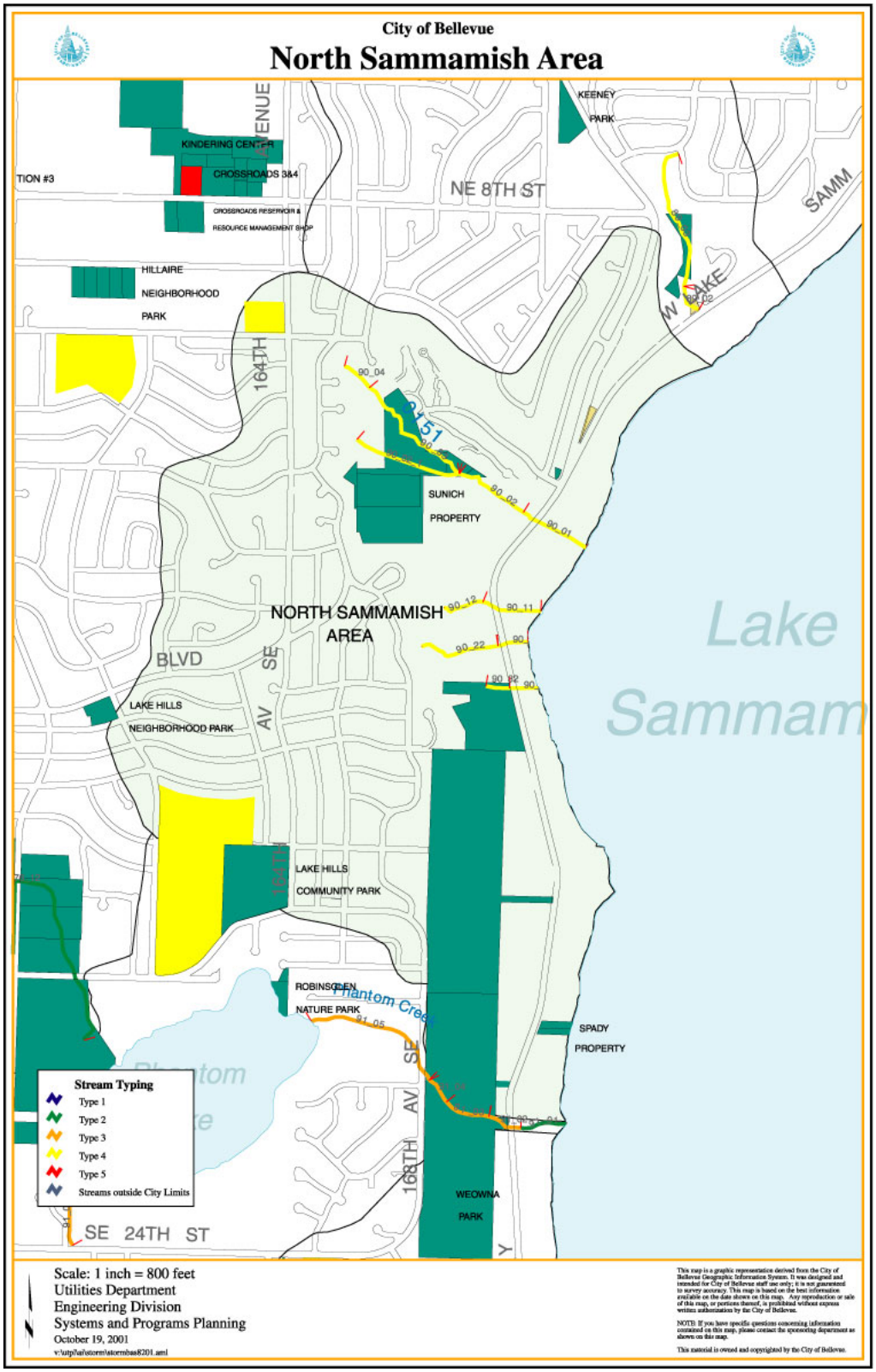
No fish were observed in these four streams. Hydrology and steep gradients are limiting factors. The northernmost stream had the most significant flow of the group. Nevertheless, upstream of West Lake Sammamish Parkway (segment 90_02), the largest pools were only 2 inches deep, barely enough flow to allow fish sampling. The outflow from a small sediment catch basin into the culvert under West Lake Sammamish Parkway constitutes a 5-foot fish barrier. Downstream of the culvert (90_01), the stream flows through an elaborate residential landscape with artificial pools and shallow concrete channels. The outfall into Lake Sammamish, a long, steep concrete culvert, represents a significant fish barrier.

The other three streams have essentially the same features, each less than 2 inches deep and featuring significant fish barriers as they flow below West Lake Sammamish Parkway. Encroaching vegetation within the channels has caused organic substrates to accumulate, and emergent vegetation thrives in places. Each of these channels is no more than 1 to 2 feet wide at bank-full width upstream of West Lake Sammamish Parkway.

Table 18: North Sammamish Drainage Fish Data

Segment ID #	Cutthroat	Coho	Other	Interim Type	Permanent Type	Date Sampled
90_01	–	–	–	4	Np	7/2/01
90_02	–	–	–	4	Np	7/2/01
90_02_1				4	Np	
90_03				4	Np	
90_04				4	Np	
90_11				4	Np	
90_12	–	–	–	4	Np	7/2/01
90_21				4	Np	
90_22	–	–	–	4	Np	7/2/01
90_31				4	Np	
90_32	–	–	–	4	Np	7/2/01

Map 18: North Sammamish Basin



Phantom Creek Basin (#91)

Overview:

Phantom Creek flows from Phantom Lake into Lake Sammamish. This basin, located in east Bellevue, contains Weowna Park and predominately single-family housing. Historically, Phantom Lake drained into Kelsey Creek. However, near the turn of the century, a man-made outfall from Phantom Lake diverted flow into Lake Sammamish, creating Phantom Creek. Today Phantom Creek rushes through Weowna Park down a steep slope, featuring cascade and step-pool habitats. Downstream of Phantom Lake, the stream flows though a wooded ravine and downed trees have aided pool formation. Upstream of Phantom Lake, habitat is much different, being confined to a narrow sediment-filled channel with little to no flow during the summer months.

Fish Use:

Previously existing data for the downstream segment of Phantom Creek (91_01) indicates the presence of coho salmon and possibly sockeye as well (Williams et al 1975). Further upstream, electrofishing surveys by The Watershed Company in 1997 and 2001 did not find any fish (Johnston, 14 May 1997). The upper segment (91_07) had dried into isolated pools, which were inhabited by at least two bullfrogs.

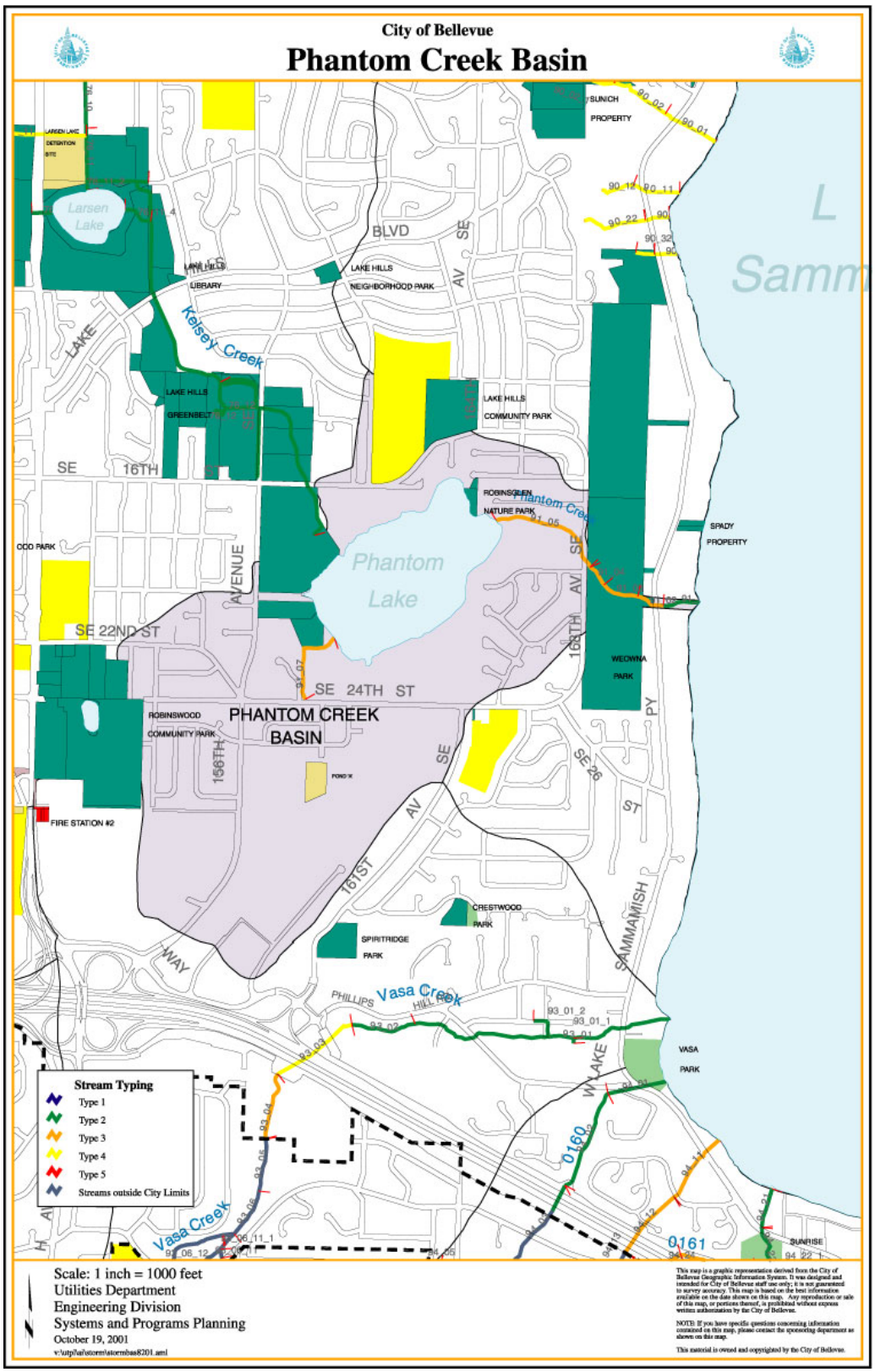
Despite absence of fish during electrofishing surveys, all segments of Phantom Creek upstream of 91_01 are considered to have slight fish use due to their connectivity with Phantom Lake. Phantom Lake is known to contain warm-water fish species. The discovery of small bass in some of the pools at Weowna Park during a Watershed Company-designed restoration project confirms this classification (Way, A. William 2001). These fish had evidently washed downstream from Phantom Lake, since cascades and gradients greater than 25 percent prevent upstream migration in Phantom Creek.

Table 19: Phantom Creek Fish Data

Segment ID #	Cutthroat	Coho	Other	Interim Type	Permanent Type	Date Sampled
91_01		Present	Sockeye Possible	2	F	1975[1]
91_02	–	–	–	3	Np	5/13/97[2]
91_03	–	–	–	3	Np	5/13/97[2]
91_04	–	–	–	3	Np	5/13/97[2]
91_05				3	Np	
91_07	–	–	–	3	Np	7/2/01

1- Williams et al. 2- Johnston, Greg.

Map 19: Phantom Creek Basin


City of Bellevue
Phantom Creek Basin
Larsen Lake
Phantom Lake
Kelsey Creek
Vasa Creek
PHANTOM CREEK BASIN
LAKE HILLS LIBRARY
LAKE HILLS NEIGHBORHOOD PARK
LAKE HILLS GREENBELT
LAKE HILLS COMMUNITY PARK
ROBINSWOOD COMMUNITY PARK
ROBINSGLEN NATURE PARK
CRESTWOOD PARK
SPIRITRIDGE PARK
VASA PARK
WEOWNA PARK
SUNRISE
SPADY PROPERTY
SUNICH PROPERTY
FIRE STATION #2
SE 16TH ST
SE 22ND ST
SE 24TH ST
SE 26 ST
BLVD
LAKE SAMMAMISH PY
Stream Typing
Type 1
Type 2
Type 3
Type 4
Type 5
Streams outside City Limits
Scale: 1 inch = 1000 feet
Utilities Department
Engineering Division
Systems and Programs Planning
October 19, 2001

Vasa Creek Basin (#93)

Overview:

Vasa Creek flows through southeast Bellevue, passing briefly outside of City limits through the Eastgate area. Land use along the creek consists primarily of residential neighborhoods upstream of I-90 and commercial and residential use downstream. Habitat through Vasa Creek experiences some interesting transitions. The headwaters flow through steep bedrock reaches. As the stream flows through the Eastgate area, the bedrock gives way to a well-defined gravel channel, where flow continues below surface during the summer months. Above I-90, the stream flows through public greenways containing well-vegetated riparian buffers. The stream then continues through a fish-barring culvert beneath I-90. Downstream of the culvert, Vasa Creek has a low gradient and abundant surface flow through a riparian corridor into Lake Sammamish.

Fish Use:

The City of Bellevue provided fish use information for the main stem of Vasa Creek downstream of I-90. According to Washington Department of Fish and Wildlife information (Downen 2000), this area (segments 93_01 and 93_02) contains cutthroat trout and late run kokanee, as well as coho and sockeye salmon. The first small tributary (93_01_1) is entirely within the influence of the main channel and presumed to have similar fish use. The other small tributary (93_01_2) flows through a restored corridor along 167th Avenue SE. Numerous juvenile cutthroat trout were visible in the downstream pools. However, several installed weirs with 18-inch plunges possibly hinder upstream migration. The survey effort did not discover any fish in the upper portion of this tributary, located in a ditch parallel to SE 35th Street.

Segment 93_04, located above an impassible fish barrier, consists of a sedimentation pond at I-90 and a gravel-filled channel that lacks perennial surface flow (Figure 3). Surface flow was observed both upstream and downstream of this segment and thus flow must go sub-surface through a thick gravelly substrate during summer months. Although no fish were present in the sedimentation pond, the possibility of a resident population in Eastgate, outside of City limits, cannot be ruled out without field verification. Due to the significant channel characteristics, segment 93_04 should be presumed to support moderate fish activity until fish absence upstream can be verified.

Figure 3: Vasa Creek, just upstream of I-90.

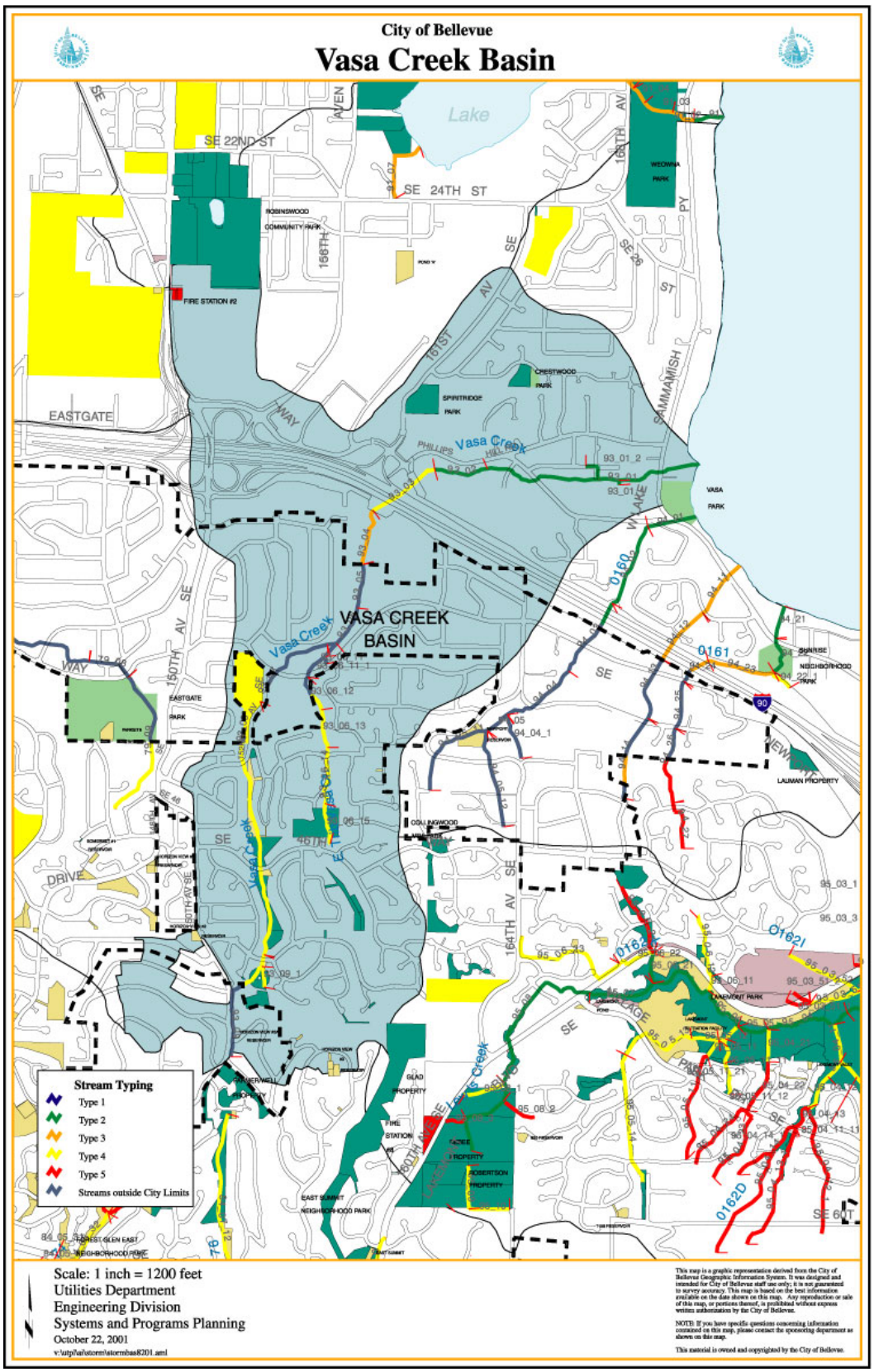
The headwaters of Vasa Creek (segments 93_08, 93_06_12, and upstream areas) cascade through small pools carved directly into bedrock. Hardly any gravel substrate is available. Sampling in these segments only resulted in one Pacific giant salamander. A survey conducted by The Watershed Company in 1999 between SE 45th Street and SE 46th Way along segment 93_08 confirms fish absence (Johnston 21 July 1999).

Table 20: Vasa Creek Fish Data

Segment ID #	Cutthroat	Coho	Other	Interim Type	Permanent Type	Date Sampled
93_01	Present	Present	Sockeye and late run Kokanee	2	F	2000[1]
93_01_1				2	F	
93_01_2	7 (0+)	–	–	2	F	7/11/01
93_02	Present	Present	Sockeye and late run Kokanee	2	F	2000[1]
93_03				4	Np	
93_04	–	–	–	3	F	6/26/01
93_06_12	–	–	–	4	Np	6/26/01
93_06_13				4	Np	
93_06_14				4	Np	
93_06_15				4	Np	
93_08	–	–	–	4	Np	6/26/01
93_09				4	Np	
93_09_1				4	Np	

1- Downen, Mark.

Map 20: Vasa Creek Basin



South Sammamish Drainage Basin (#94)

Overview:

The South Sammamish Drainage Basin includes three streams that flow through southeast Bellevue, under I-90, and into Lake Sammamish. Upstream of I-90, the South Sammamish streams flow outside of City limits. However, the headwaters of the two easternmost streams begin within the City of Bellevue. Land use within the basin is mainly residential, with two City parks on the north side of I-90.

Fish Use:

According to City of Bellevue data, most of the stream segments in the South Sammamish Basin purportedly support cutthroat trout (Morgenroth 1999). However, no specific locations or population estimates have been documented. In an effort to verify the City of Bellevue's information, the three streams were evaluated for available habitat[5]. This verification was necessary to differentiate between Type 2 and Type 3 streams.

In the westernmost stream, only the three lower segments are within the City of Bellevue boundary. Despite a 716-foot long culvert (94_01), which discharges into Lake Sammamish, and a culvert under I-90, Morgenroth (1999) has cited cutthroat presence in all three segments. Our reconnaissance of the area above the lower culvert noted a large sedimentation pond, above which are suitable pool-riffle and step pool sequences. With an average bankfull width of greater than 10 feet and suitable pool habitat, the two segments (94_02 and 94_03) would likely support significant cutthroat populations.

The middle stream, beginning with segment 94_11, also contains step pool sequences. However, steep cascades, between 3 and 5 feet tall, contribute to isolation among many of the pools, which averaged less than 4 inches in depth. Morgenroth (1999) has documented the presence of cutthroat through all four segments, one of which (94_13) flows outside of the City boundary. However, due to barriers, steep gradients up to 19%, and a lack of sufficient stream flow, fish use in this stream should be considered possible but unlikely. Thus, these segments are Type 3.

The easternmost stream contains gentle riffles and suitable 8-inch-deep pools through the lower segments (94_21 and 94_22), where fish use is expected. Upstream, at the beginning of segment 94_23, the gradient increases and stream flow becomes insufficient to support fish, although there remains the possibility of

[5] The WDFW sampling window for electrofishing by July 15th had passed.

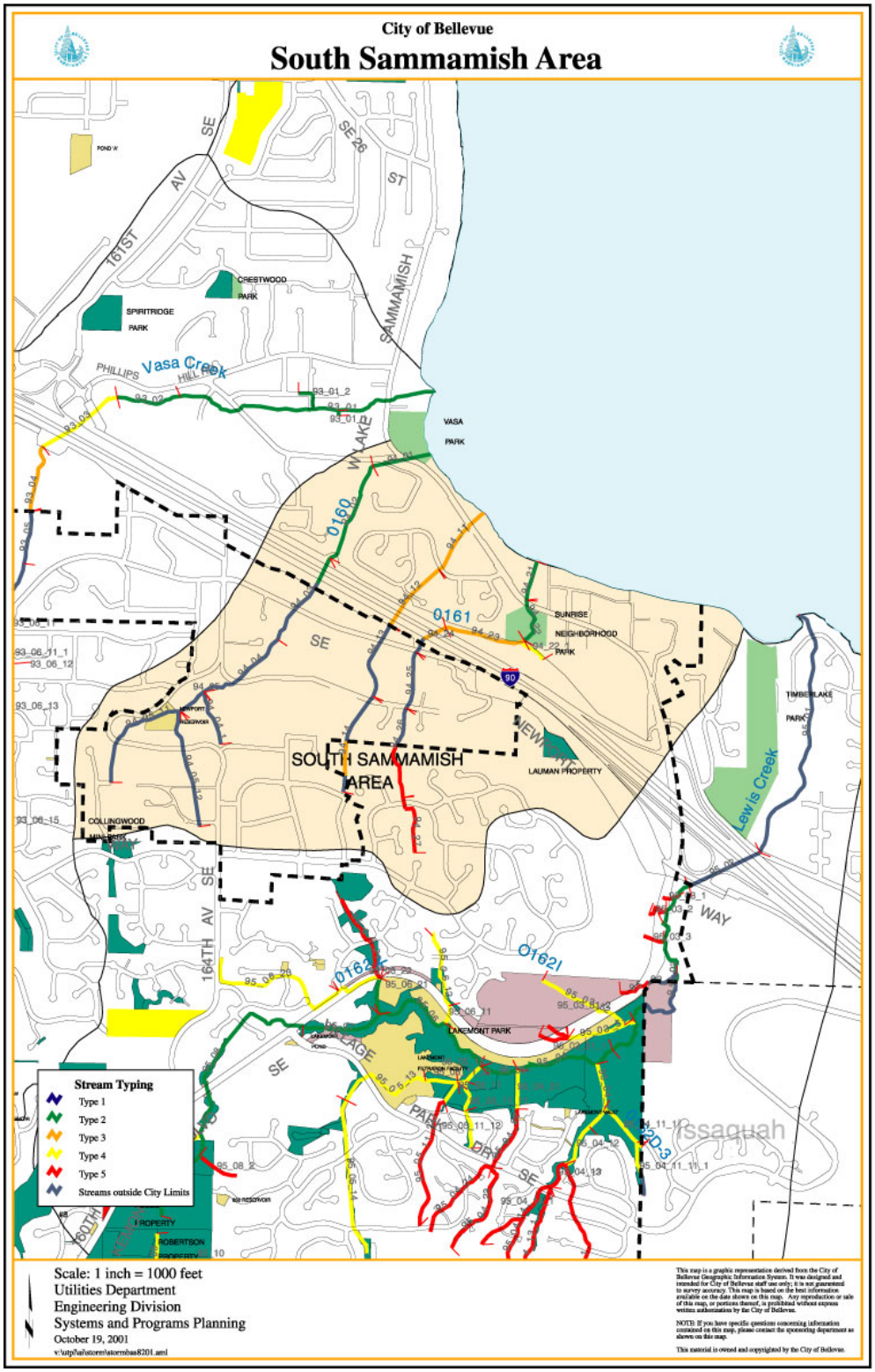
incidental or slight fish use (Morgenroth 1999). A field survey of the headwater segments (94_26 and 94_27) found poorly defined channels with apparent seasonal flow. These segments are incapable of supporting fish and are thus Type 5. One tributary (94_22_1) flows into the main stream channel near the beginning of segment 94_23. Stream flows through this tributary is confined to a narrow, poorly defined channel (approximately 1-2 feet in average bank-full width) that is incapable of supporting fish.

Table 21: South Sammamish Drainage Fish Data

Segment ID #	Cutthroat	Coho	Other	Interim Type	Permanent Type	Date Sampled
94_01	Present			2	F	1999[1]
94_02	Present			2	F	1999[1]
94_03	Present			2	F	1999[1]
94_11	Present			3	F	1999[1]
94_12	Present			3	F	1999[1]
94_14	Present			3	F	1999[1]
94_21	Present			2	F	1999[1]
94_22	Present			2	F	1999[1]
94_22_1	–	–	–	4	Np	8/1/01
94_23	Present			3	F	1999[1]
94_24	Present			3	F	1999[1]
94_26	–	–	–	5	Ns	6/26/01
94_27	–	–	–	5	Ns	6/26/01

1- Morgenroth, Brian.

Map 21: South Sammamish Basin



Lewis Creek Basin (#95)

Overview:

From its headwaters near Cougar Mountain in southeast Bellevue, Lewis Creek flows through a steep ravine along Lakemont Boulevard before leaving City limits and reaching Lake Sammamish. Lewis Creek is the most significant of Bellevue's streams that drain into Lake Sammamish. Most of the main stem has been protected as parkland, while the upper tributaries drain from residential neighborhoods. In general, the creek flows swiftly, with pool-riffle sequences transitioning into step pools farther upstream. The headwater portion flows along the top of a flat hill, through low-gradient ditches in pastureland. Most of Lewis Creek's tributaries are steep, flashy channels, with gradients over 20 percent.

Fish Use:

Lewis Creek supports fish populations along the main stem up to the lower half of segment 95_08, where cutthroat trout have been found in large numbers. Coho salmon, lamprey, and sculpin also inhabit downstream areas of Lewis Creek (The Watershed Company 1992). The upper half of segment 95_08, located on the BeBee property, flows through a shallow, muddy channel that did not contain any fish during field investigations. All areas upstream of segment 95_08 contain similar or worse habitat, and they are considered to be Type 4.

Of the many tributaries to Lewis Creek, fish were found in only one, segment 95_06_21. This segment contained several cutthroat trout in multiple age classes. Although these fish were found in the relatively low-gradient, downstream half of the segment, their presence qualifies the entire segment for Type 2 status. Upstream to the north along SE 47th Way the stream (95_06_21_1) was dry, and through a culvert to the west it was barely perennial, with no fish (95_06_23).

All other tributary segments clearly lacked fish, and only a handful carried enough water to sample. The first four tributaries from the downstream end, branching from segment 95_03, were dry and incised into steep channels. The fifth tributary from segment 95_03 was perennial, but lacked fish due to a steep gradient and minimal flow.

The three tributaries from the south along segments 95_04 and 95_05 were flowing at their confluences with Lewis Creek. Steep gradients well above 20 percent negate fish use for these tributaries. Their upstream segments as they crossed Village Park Drive were completely dry. The westernmost branch (95_05_13) was the only exception; it likely retains minimal flow year-round.

Segment 95_06_11 is also perennial, but too steep to support fish. Just upstream of this segment, survey efforts encountered a small non-fish-bearing tributary to Lewis Creek extending to the south, which does not appear on the Bellevue maps. Of the three tributaries to segment 95_08, only segment 95_08_1 is perennial.

Table 22: Lewis Creek Fish Data

Segment ID #	Cutthroat	Coho	Other	Interim Type	Permanent Type	Date Sampled
95_03	33	–	–	2	F	5/22/92[1]
95_03_1	–	–	–	5	Ns	6/14/01
95_03_2	–	–	–	5	Ns	6/14/01
95_03_3	–	–	–	5	Ns	6/14/01
95_03_4	–	–	–	5	Ns	6/14/01
95_03_51	–	–	–	4	Np	6/14/01
95_03_51_1	–	–	–	5	Ns	6/14/01
95_03_51_2	–	–	–	5	Ns	6/14/01
95_03_52	–	–	–	4	Np	6/14/01
95_04				2	F	
95_04_11				4	Np	
95_04_11_11				4	Np	
95_04_11_11_1				4	Np	
95_04_12				4	Np	
95_04_12_1	–	–	–	5	Ns	6/26/01
95_04_13	–	–	–	5	Ns	6/26/01
95_04_13_1	–	–	–	5	Ns	6/26/01
95_04_14	–	–	–	5	Ns	6/26/01
95_04_14_1				5	Ns	
95_04_21				4	Np	
95_04_22	–	–	–	5	Ns	6/26/01
95_04_23				5	Ns	
95_04_24				5	Ns	
95_05				2	F	
95_05_11	–	–	–	4	Np	6/26/01
95_05_11_11				4	Np	
95_05_11_12				4	Np	
95_05_11_21				4	Np	
95_05_11_22	–	–	–	5	Ns	6/26/01
95_05_12				4	Np	
95_05_13				4	Np	
95_05_14				4	Np	
95_06				2	F	
95_06_11	–	–	–	4	Np	6/14/01
95_06_12				4	Np	
95_06_21	7 (5 age 0+, 2 age 1+)	–	–	2	F	6/14/01
95_06_21_1	–	–	–	5	Ns	6/14/01
95_06_22	–	–	–	4	Np	6/26/01
95_06_23	–	–	–	4	Np	6/26/01

Segment ID #	Cutthroat	Coho	Other	Interim Type	Permanent Type	Date Sampled
95_07				2	F	
95_08	95	–	–	2	F	5/29/92[1]
	–	–	–			6/14/01
95_08_1	–	–	–	4	Np	6/14/01
95_08_2	–	–	–	5	Ns	6/26/01
95_08_3	–	–	–	5	Ns	6/14/01
95_09				4	Np	
95_10				4	Np	

1- The Watershed Company.

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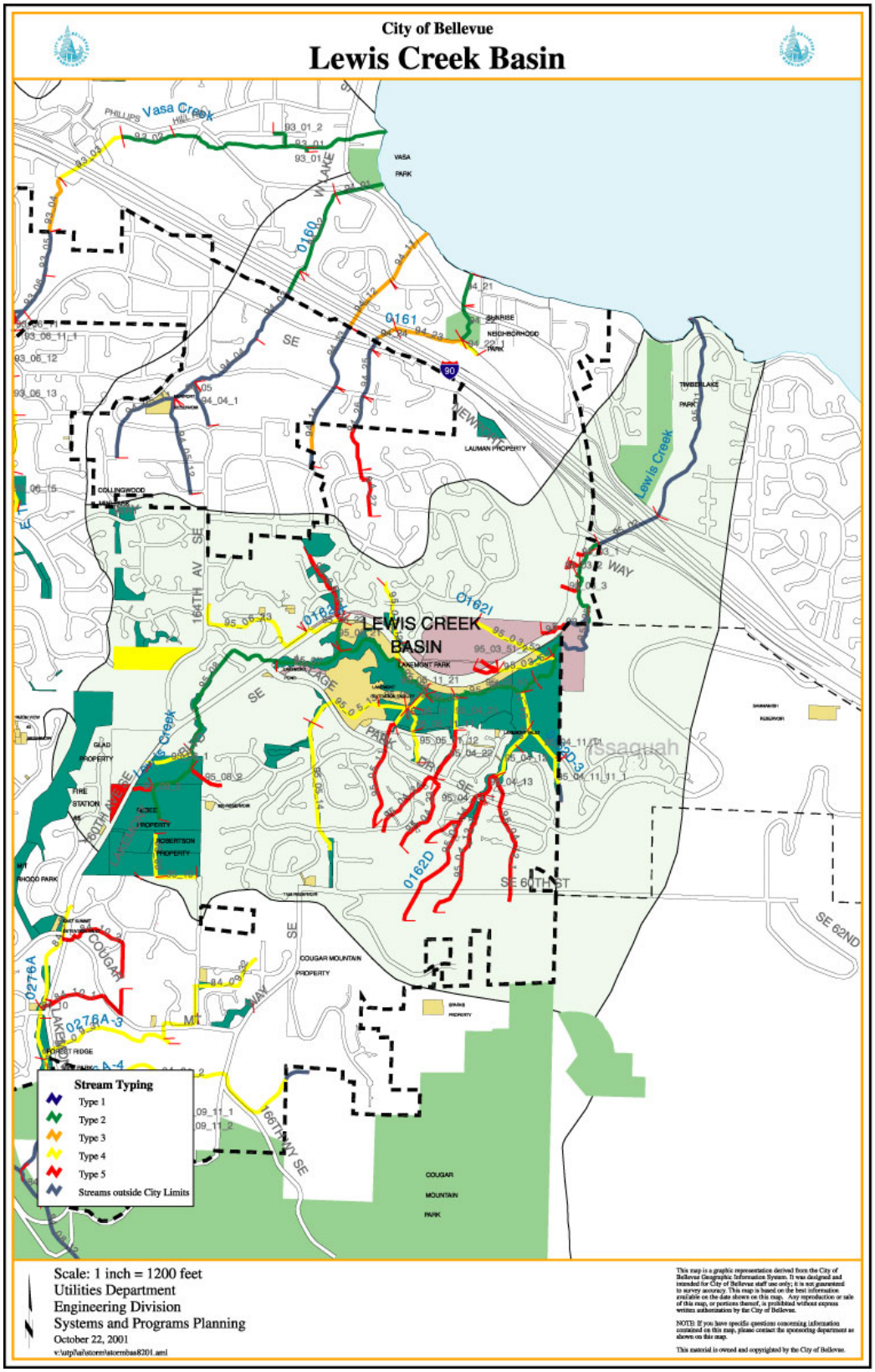
Map 22: Lewis Creek Basin



4. Summary

This study finds that the majority of streams within the City of Bellevue continue to be productive areas for fish spawning and rearing, extending up to many of the headwater segments. Many areas with previously unidentified fish use were found to support fish, sometimes in spite of the environmental condition of the stream. Of the 64 total miles of inventoried stream within the City limits, approximately 35 miles (52%) support fish. Most of these stream miles fall within the three major systems: Coal Creek, Kelsey Creek, and Lewis Creek.

Prior to this study, approximately 40 miles (232 segments) of stream had undetermined fish use according to the City of Bellevue. This study has found that 11 of those 40 miles (28%) support fish use. Results from some of these streams were not surprising, such as the main stem of Yarrow Creek, areas along East Creek, and some of the tributaries to major streams. However, fish use was documented in some areas that were not anticipated to contain fish, such as Sears Creek, small tributaries to Goff and Valley Creeks, as well as upper Richards Creek next to the Factoria Mall. Surprisingly, upper Richards Creek supports spawning-size (>7 inch) cutthroat trout.

Stream typing according to the DNR protocol has been completed for all identified segments within the City of Bellevue. See Appendix A for a data summary of all stream segments. The interim protocol for typing streams according to high, moderate, or slight fish use is vague, making the determination between Type 2 and Type 3 streams somewhat ambiguous. For this study, most streams with documented fish use were considered Type 2, and streams perceived to have potential fish use or very minimal observed fish presence were considered Type 3. Excluding the Mercer Slough which was already designated as a “shoreline of the state” or a Type 1 water, approximately 31 miles were designated as Type 2.

The classification of Type 4 and Type 5 waters was also somewhat ambiguous due to the unusually dry conditions during 2001. The total precipitation to date for the 2001 water year was well below normal, although rainfall during the spring was just below normal. This makes the determination between seasonal and perennial streams more difficult, because a perennial stream may stop flowing during especially dry years. To make the determination between Type 4 and Type 5, any stream without fish (with the exception of those with significant subsurface flows), which was dry or very nearly dry, was considered Type 5.

Previous stream typing by DNR included approximately 23 miles of stream within City limits. However, this information is more than 20 years old and is not considered a reliable source. For example, DNR maps included a Type 1 stream connecting Phantom Lake to the Kelsey Creek drainage even though this

connection was eliminated during the early 1900s when the discharge from Phantom Lake was routed to Lake Sammamish. All streams previously typed by DNR were reviewed for accuracy and modified as necessary. In general, the ability of young fish to survive in the smaller streams invalidated the old DNR maps. During the study, fish were found in many segments that DNR had classified as Type 4 or Type 5, including Sunset Creek, Newport Creek, and upper Yarrow Creek. Most of the 23 miles of stream typed by DNR were streams previously identified by the City of Bellevue for fish use and thus did not necessitate field exploration.

Areas of questionable fish use, which were problematic in using the interim stream typing protocol, were identified during field exploration for the following stream segments: Yarrow Creek tributary 70_03_11, Sturtevant Creek, Vasa Creek, and Phantom Creek. For the Yarrow Creek tributary, Sturtevant Creek, and Phantom Creek, fish use was not documented during electrofishing. However, each of these areas is either directly connected to fish-bearing streams (i.e. no gradient changes) or downstream of fish-bearing lakes such that fish use is likely. Vasa Creek's unusual subsurface flow upstream of I-90 does not preclude its use by fish. Resident populations of cutthroat trout may exist upstream in areas that are outside of City limits, and thus a complete determination of fish absence could not be made.

Several stream segments were also identified as areas in which future fish use could be anticipated. The City of Redmond is currently planning on restoring fish passage to stream segment 87_31 in the Ardmore drainage. A downstream barrier near Lake Sammamish currently inhibits fish use in the upper segments lying in the City of Bellevue. Currently, the upstream segments are considered non-fish-bearing. However, if the fish passage barrier is removed, the stream type would possibly change to a Type 2 or 3. Other streams which have the potential for fish use improvements are upper Meydenbauer Creek, Sturtevant Creek, and the upper West Tributary. None of these stream segments had documented fish use although with improved water quality, fish use would be considered possible. Each of these streams flows through heavy commercial development, subject to a variety of chemical influences from surface water runoff as well as numerous physical barriers. However, each of these three streams was carrying a significant amount of flow at the time of observation and would likely support fish with improved water quality. Of these creeks, at least Sturtevant Creek probably has intolerable current velocities during storm events and no appreciable velocity refuge, evidenced by large scour holes below perched culverts.

Recommendations

Several changes are recommended for segmenting streams to improve the stream typing system for the City of Bellevue. First, it is recommended that new stream segments begin at City boundaries. In several instances, it was not possible to determine downstream fish use when the segment extended outside City limits (Ardmore drainage 87_31 and Coal Creek tributaries 84_05_31 and 84_07_11). For this reason, all segments which cross City boundaries should be terminated at the boundary line. Second, some segments were too long. Segmentation was originally derived based on topography (gradient differences) and significant physical features (e.g. culverts). However, some segments identified during fieldwork should be further segmented if stream typing is revisited in the future. The following segments could benefit from further segmentation: 76_11, 76_12, 78_04, and 84_04_3. For the latter two segments, more details can be found in the basin descriptions. Segments 76_11 and 76_12 are too complex to be considered single segments.

Additional reconnaissance may be necessary for the upper Ardmore Drainage (above segment 87_31) if the City of Redmond completes the anticipated removal of a fish passage barrier near Lake Sammamish. This would require re-typing the upper stream segments if fish use is determined.

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