ADDENDUM B **JUNE 10, 2008**

SKAGIT
DRAINAGE AND FISH INITIATIVE

DRAINAGE MAINTENANCE PLAN

By and between

WASHINGTON DEPARTMENT OF FISH AND WILDLIFE
and
SKAGIT COUNTY
DRAINAGE AND IRRIGATION IMPROVEMENT DISTRICT #19

A. DISTRICT OVERVIEW

A1. Location

Skagit County Drainage and Irrigation Improvement District #19, hereafter referred to as DID #19, is located within the Skagit River Delta of Skagit County west of the City of Burlington, east of the City of Anacortes, south of the Town of Bayview and north of the Town of LaConner (Figure 1).

A2. Boundaries

The jurisdictional boundaries of DID #19 are illustrated in Figure 2. DID #19 is approximately bordered by Padilla Bay and the Swinomish Channel to the west, WDOT Highway 20, Ovenell Road and Peterson Road to the north, Downey Road, Mclean Road and Donnelly Road to the south, and Avon Allen Road, Pulver Road to the east.

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A3. Area

DID #19 encompasses approximately 8762 acres within its jurisdictional boundaries (Figure 2).

A4. Predominant Land Uses

Commercial agriculture is the predominant land use in DID #19. Hobby farms, residential housing, retail businesses, commercial businesses, Port of Skagit Airport and industrial complexes are scattered within the districts boundaries. Residential housing and industrial development are expected to expand in the future on and adjacent to Bayview Ridge with a consequent increase in stormwater discharge to the district's watercourses (reference Skagit County Drainage Study). It is anticipated that the district's existing drainage system and associated infrastructure will need to be expanded and modified in the future to accommodate the

increase in stormwater discharged to the district's watercourses. Separate permits will be required for the expansion and modification of the district's existing drainage infrastructure.

A5. Watercourse Classifications

The watercourse classifications used in this drainage management plan are defined in Part III-(A) of the Drainage Maintenance Agreement. Figure 2 illustrates the watercourse classifications in DID #19. An 1887 U.S. Coast and Geodetic Survey Map (Figure 3) was used to determine the extent of the *Natural Watercourses* (blue), *Managed Watercourses With Headwaters* (green), *Managed Watercourses Without Headwaters* (magenta), and *Artificial Watercourse* (yellow) in DID #19. In total, DID #19 includes approximately 45.99 miles of watercourses covered by this agreement. These include the following classifications:

a) Artificial Watercourses (yellow): 106,070 feet, 20.09 miles.
b) Managed Watercourses Without Headwaters (magenta): 118948 feet, 22.5 miles.
c) Managed Watercourse With Headwaters (green): 17716 feet, 3.4 miles.
d) Natural Watercourses (blue): 0 feet, 0 miles.

Historically Big Indian Slough was a blind channel separate from the Higgens Slough watershed and drainage. In the recent past, Big Indian Slough was connected to the Upper Higgens Slough watershed via a manmade channel that parallels SR20 between culverts #604 and #593 (Figure 2). For the purpose of this Drainage Maintenance Plan, Big Indian Slough includes Reaches 1, 2, 3, and 4 as illustrated in Figure 6. The Drainage Maintenance Plan for DID #19 classifies Big Indian Slough as a *Managed Watercourse With Headwaters* (green) (Figure 2).

At the same time Big Indian Slough was connected to the Upper Higgens Slough watershed, Lower Higgens Slough was disconnected from the Upper Higgens Slough watershed via a flood flow bypass culvert (#592). For the purpose of this Drainage Maintenance Plan, Upper Higgens Slough includes the watercourse upstream of culvert #662 (Figure 2). Given the absence of spawning habitat in Upper Higgens Slough, the single historic documented observation of a juvenile Coho salmon (Table 4, Figure 5) in Upper Higgens Slough and the fact that no juvenile salmonids were observed in Upper Higgens Slough during 3 sampling events in 2008 (Table 4a), the parties to this Drainage Maintenance Agreement and Plan, in consultation with the SRSC, agree to classify Upper Higgens Slough as a *Managed Watercourse Without Headwaters* (magenta) (Figure 2).

Lower Higgens Slough south of SR20 and downstream of the flood bypass culvert #592 has been classified as a *Managed Watercourse Without Headwaters* (magenta) (Figure 2). Telegraph Slough south of SR20 has been classified as a Managed Watercourse Without Headwaters (magenta) (Figure 2). Little Indian Slough north of SR20 and upstream of tidegate #611 has also been classified as a *Managed Watercourse Without Headwaters* (magenta) (Figure 2).

The parties to this Drainage Maintenance Plan, in consultation with the SRSC, agree to review the fish utilization data that is collected in Big Indian Slough (Reaches 1-4) (Figure 6) over the next 5 years and to revisit the watercourse classification for Big Indian Slough in 2012.

A6. Drainage Infrastructure

The drainage from DID #19 is primarily discharged into Padilla Bay and the Swinomish Channel via conventional gravity flow culvert/tidegate infrastructure. The tidegates are typically equipped with top hinged "flap style" lids. DID #19 also uses pump station #61 to discharge drainage into Padilla Bay and pump station #62 to discharge drainage into the Swinomish Channel. The drainage infrastructure within the jurisdictional boundaries of DID #19 includes 90 culverts and bridges (Figure 2) (Table 1). Forty two (42) of the culverts and bridges within the jurisdictional boundaries of DID #19 are maintained by Skagit County and Washington State Department of Transportation (WDOT) (Table 2). The remaining forty-eight culverts and bridges are maintained by DID #19 (Table 3). The drainage infrastructure within the jurisdictional boundaries of DID #19 that is maintained by the district also includes 7 tidegate sites, 2 pump stations, 6 floodgate sites and associated trash racks (Table 4).

TABLE 1. CULVERT & BRIDGE INVENTORY – DID #19

Culvert Number	Culvert Shape	Culvert Material	Culvert Coating	Culvert Span/Dia (M)	Culvert Rise	Culvert Length (M)	Stream Name
73	RND	CST	NON	0.9	0.9	27	unnamed
74	OTH						unnamed
552	OTH/RND	CPC/CST	GAL	12.5	3.5	0.7	
570	RND	CST	NON	0.46	0.46	16.7	unnamed
571	BOX	CPC	NON	1.2	1.5	9.8	unnamed
572	RND	PCC	NON	0.61	0.61	16.8	unnamed
573	RND	CST	NON	0.61	0.61	10.3	unnamed
574	OTH	WOOD	NON				unnamed
575	RND	PCC	NON	0.46	0.46	29.9	unnamed
576	RND	PCC	NON	0.46	0.46	6	unnamed
577	RND	CST	GAL	1.53	1.53	24.5	unnamed
578	RND	CST		1.22	1.22	4.5	unnamed
579	RND	CST		0.46	0.46	7.5	unnamed
580	RND	PCC	NON	0.61	0.61	20.8	unnamed
581	RND	PCC	NON	1.53	1.53	25.6	unnamed
582	RND	PCC	NON	1.22	1.22	24.2	unnamed
583	RND	PCC	NON				unnamed
588	ARCH	CST	GAL	2.8	2	13.4	Indian Slough
589	OTH	CPC	NON				Indian Slough
590	SQSH	CST	GAL	3.66	3	19	Indian Slough
591	OTH	CPC	NON				Indian Slough
592	OTH	CPC	NON	15.8	2.3	12.2	Indian Slough
593	OTH	CPC	NON				Indian Slough
594	RND	PCC	NON	1.22	1.22	17	unnamed
595	RND	PCC	NON	1.22	1.22	17	unnamed
596	RND	CST	NON	1.22	1.22	6	unnamed
597	OTH		NON				Indian Slough
598	OTH		NON				Indian Slough
599	OTH	CPC	NON	16	3.7	9.3	Indian Slough
600	OTH		NON				Indian Slough
601	OTH		NON				Indian Slough
602	SQSH	CST	GAL	5.2	2.9	29.7	Indian Slough
603	BOX	PCC	NON	1.52	1.22	0	Joe Leary Slough
604	OTH	WOOD	unknown	9	3	4	Indian Slough

605	OTH	WOOD	unknown	30	4	4	Indian Slough
606	OTH	PCC	unknown	23	5	11	Indian Slough
611	RND	CST	UNK	1.2	1.2	16	Little Indian Slough
648	RND	PCC	unknown	1.2	1.2	12	unnamed
649	SQSH	CPC	unknown	1.2	2.5	11	unnamed
650	RND	PCC	unknown	1.5	1.5	15	Indian Slough
651	RND	PCC	unknown	1.2	1.2	9	Indian Slough
652	RND	CST	GAL	0.8	0.8	18	unnamed
653	RND	CST	GAL	0.8	0.8	18	unnamed
654	SQSH	CST	BIT	1.7	1.2	35	unnamed
655	RND	CST	BIT	1.8	1.8	20	unnamed
656	SQSH	CST	BIT	2.1	1.3	15	unnamed
657	SQSH	CST	BIT	1.4	1	30	unnamed
658	SQSH	CST	BIT	1.4	1	40	unnamed
659	SQSH	CST	BIT	1.75	1.3	105	unnamed
660	RND	CST	GAL	1	1	6	Indian Slough
661	RND	CST	GAL	1.3	1.3	6	Indian Slough
662	RND	PCC	NON	1.1	1.1	7	Indian Slough
663	RND	PCC	NON	0.9	1.1	6	Indian Slough
664	RND	CST	UNK	0.9	0.9	6	Indian Slough
665	RND	CST	UNK	1.2	1.2	6	Indian Slough
666	RND	CST	GAL	1.2	1.2	6	Indian Slough
667	RND	PCC	NON	1.2	1.2	5.5	Indian Slough
668	RND	PCC	NON	1.2	1.2	5.5	Indian Slough
669	RND	PCC	NON	0.45	0.45	25	unnamed
670	RND	PCC	NON	0.45	0.45	8	unnamed
671	RND	PCC	NON	0.45	0.45	12	unnamed
672	RND	CST	GAL	1.3	1.3	6	unnamed
673	RND	CST	GAL	0.9	0.9	9	unnamed
674	RND	PCC	NON	0.45	0.45	9	unnamed
675	RND	PCC	NON	0.45	0.45	9	unnamed
676	RND	CST	GAL	0.6	0.6	6	unnamed
677	RND	PCC	NON	0.8	0.8	165	unnamed
678	RND	CAT	unknown	0.9	0.9	6	unnamed
679	RND	CST	GAL	0.9	0.9	12	unnamed
680	RND	PCC	NON	0.45	0.45	8	unnamed
681	RND	CST	BIT	0.9	0.9	17	unnamed
682	RND	CST	BIT	0.9	0.9	17	unnamed
683	RND	PCC	NON	0.9	0.9	6	unnamed
684	RND	PCC	NON	0.9	0.9	6	unnamed
685	RND	CST	GAL	1.2	1.2	6	unnamed
686	RND	CST	BIT	1.5	1.5	60	unnamed
687	BOX	CPC	NON	2.5	2	12	unnamed
688	RND	CST	unknown	0.4	0.4	20	unnamed
689	RND	CST	unknown	0.9	0.9	6	unnamed
692	RND	CST	BIT	1.5	1.5	30	Higgins Slough
693	RND	CST	BIT	1.5	1.5	30	Higgins Slough
694	RND	CST	BIT	1.5	1.5	30	Higgins Slough
695	OTH	WOOD	NON	20	4	1	Higgins Slough
696	OTH						unnamed
697	RND	SST	unknown	0.9	0.9	20	unnamed
698	OTH						unnamed

702	OTH						Blind Slough
704	OTH						unnamed
705	OTH						Telegraph Slough
1671	RND	CST		1.22	1.22	4.5	unnamed

TABLE 2. CULVERTS & BRIDGES MAINTAINED BY SKAGIT COUNTY & WDOT

Culvert Number	Culvert Shape	Culvert Material	Culvert Coating	Culvert Span/Dia (M)	Culvert Rise	Culvert Length (M)	Stream Name
570	RND	CST	NON	0.46	0.46	16.7	unnamed
572	RND	PCC	NON	0.61	0.61	16.8	unnamed
573	RND	CST	NON	0.61	0.61	10.3	unnamed
575	RND	PCC	NON	0.46	0.46	29.9	unnamed
576	RND	PCC	NON	0.46	0.46	6	unnamed
577	RND	CST	GAL	1.53	1.53	24.5	unnamed
580	RND	PCC	NON	0.61	0.61	20.8	unnamed
581	RND	PCC	NON	1.53	1.53	25.6	unnamed
583	RND	PCC	NON				unnamed
588	ARCH	CST	GAL	2.8	2	13.4	Indian Slough
589	OTH	CPC	NON				Indian Slough
591	OTH	CPC	NON				Indian Slough
592	OTH	CPC	NON	15.8	2.3	12.2	Indian Slough
593	OTH	CPC	NON				Indian Slough
594	RND	PCC	NON	1.22	1.22	17	unnamed
595	RND	PCC	NON	1.22	1.22	17	unnamed
596	RND	CST	NON	1.22	1.22	6	unnamed
597	OTH		NON				Indian Slough
598	OTH		NON				Indian Slough
599	OTH	CPC	NON	16	3.7	9.3	Indian Slough
600	OTH		NON				Indian Slough
601	OTH		NON				Indian Slough
604	OTH	WOOD	unknown	9	3	4	Indian Slough
606	OTH	PCC	unknown	23	5	11	Indian Slough
611	RND	CST	UNK	1.2	1.2	16	Little Indian Slough
648	RND	PCC	unknown	1.2	1.2	12	unnamed
649	SQSH	CPC	unknown	1.2	2.5	11	unnamed
650	RND	PCC	unknown	1.5	1.5	15	Indian Slough
654	SQSH	CST	BIT	1.7	1.2	35	unnamed
655	RND	CST	BIT	1.8	1.8	20	unnamed
656	SQSH	CST	BIT	2.1	1.3	15	unnamed
658	SQSH	CST	BIT	1.4	1	40	unnamed
659	SQSH	CST	BIT	1.75	1.3	105	unnamed
681	RND	CST	BIT	0.9	0.9	17	unnamed
682	RND	CST	BIT	0.9	0.9	17	unnamed
686	RND	CST	BIT	1.5	1.5	60	unnamed
687	BOX	CPC	NON	2.5	2	12	unnamed
688	RND	CST	unknown	0.4	0.4	20	unnamed
689	RND	CST	unknown	0.9	0.9	6	unnamed
702	OTH						Blind Slough
704	OTH						unnamed
705	OTH						Telegraph Slough

TABLE 3. CULVERTS & BRIDGES MAINTAINED BY DID #19

Culvert Number	Culvert Shape	Culvert Material	Culvert Coating	Culvert Span/Dia (M)	Culvert Rise	Culvert Length (M)	Stream Name
73	RND	CST	NON	0.9	0.9	27	unnamed
74	OTH						unnamed
552	OTH/RND	CPC/CST	GAL	12.5	3.5	0.7	
571	BOX	CPC	NON	1.2	1.5	9.8	unnamed
574	OTH	WOOD	NON				unnamed
578	RND	CST		1.22	1.22	4.5	unnamed
579	RND	CST		0.46	0.46	7.5	unnamed
582	RND	PCC	NON	1.22	1.22	24.2	unnamed
590	SQSH	CST	GAL	3.66	3	19	Indian Slough
602	SQSH	CST	GAL	5.2	2.9	29.7	Indian Slough
603	BOX	PCC	NON	1.52	1.22	0	Joe Leary Slough
605	OTH	WOOD	unknown	30	4	4	Indian Slough
651	RND	PCC	unknown	1.2	1.2	9	Indian Slough
652	RND	CST	GAL	0.8	0.8	18	unnamed
653	RND	CST	GAL	0.8	0.8	18	unnamed
657	SQSH	CST	BIT	1.4	1	30	unnamed
660	RND	CST	GAL	1	1	6	Indian Slough
661	RND	CST	GAL	1.3	1.3	6	Indian Slough
662	RND	PCC	NON	1.1	1.1	7	Indian Slough
663	RND	PCC	NON	0.9	1.1	6	Indian Slough
664	RND	CST	UNK	0.9	0.9	6	Indian Slough
665	RND	CST	UNK	1.2	1.2	6	Indian Slough
666	RND	CST	GAL	1.2	1.2	6	Indian Slough
667	RND	PCC	NON	1.2	1.2	5.5	Indian Slough
668	RND	PCC	NON	1.2	1.2	5.5	Indian Slough
669	RND	PCC	NON	0.45	0.45	25	unnamed
670	RND	PCC	NON	0.45	0.45	8	unnamed
671	RND	PCC	NON	0.45	0.45	12	unnamed
672	RND	CST	GAL	1.3	1.3	6	unnamed
673	RND	CST	GAL	0.9	0.9	9	unnamed
674	RND	PCC	NON	0.45	0.45	9	unnamed
675	RND	PCC	NON	0.45	0.45	9	unnamed
676	RND	CST	GAL	0.6	0.6	6	unnamed
677	RND	PCC	NON	0.8	0.8	165	unnamed
678	RND	CAT	unknown	0.9	0.9	6	unnamed
679	RND	CST	GAL	0.9	0.9	12	unnamed
680	RND	PCC	NON	0.45	0.45	8	unnamed
683	RND	PCC	NON	0.9	0.9	6	unnamed
684	RND	PCC	NON	0.9	0.9	6	unnamed
685	RND	CST	GAL	1.2	1.2	6	unnamed
692	RND	CST	BIT	1.5	1.5	30	Higgins Slough
693	RND	CST	BIT	1.5	1.5	30	Higgins Slough
694	RND	CST	BIT	1.5	1.5	30	Higgins Slough
695	OTH	WOOD	NON	20	4	1	Higgins Slough
696	OTH						unnamed
697	RND	SST	unknown	0.9	0.9	20	unnamed
698	OTH						unnamed
1671	RND	CST		1.22	1.22	4.5	unnamed

TABLE 4. TIDEGATE & PUMP FACILITY INVENTORY – DID #19

Number	Type	Location	Description
1	Open Tube	Downey Dam	7-48” tubes, not in service
46	Tidegate	Boat Basin	1-36” tidegate
52	Floodgate	Higgins Slough/Mickey Jensen	1-24” pipe
53	Tidegate	Higgins Slough/Swinomish Channel	1- 48” bypass tidegate
54	Tidegate	Swinomish Channel/C.Knutsen	1-24” tidegate
55	Floodgate	Indian Slough/Scalehouse	2-30” flap gates
56	Floodgate	Indian Slough/Under Hwy 20	2-36” flap gates
59	Floodgate	Indian Slough/Dahlstedt Farm SW	1-24” tidegate & manual screw gate
60	Tidegate	Indian Slough/Dam	7-48” tidegates
61	Pump Station	Indian Slough	2-24” tubes and gates
62	Pump Station	Higgins Slough/Mickey Jensen	1-pump, private
76	Tidegate	Higgins Slough/Swinomish Channel	5-60” tidegates
78	Floodgate	Indian Slough/Jones 3	1-30” floodgate
79	Tidegate	Indian Slough @ Ben Welton	2-30” tidegates
82	Tidegate	Little Indian Slough	2-48” tidegates
102	Floodgate	Indian Slough	1 floodgate

A7. Drainage Maintenance Activities – General Description

A7-1. Trash Racks

Trash racks are systems designed to prevent foreign material from entering into a pump facility or tide gate. Foreign material is defined as any man made or natural material that could be carried by water and become lodged in the system or accumulate and cause flow disruption or prevent a pump or tide gate from functioning properly. Normal maintenance of trash racks includes removal of accumulated debris as necessary, replacement of worn or damaged trash rack components or replacement of the structure. Typical design of a trash rack includes a constructed lumber unit with vertically spaced 2-inch dimensional boards spaced approximately 3-5 inches apart. The unit is usually set in the water at an incline down to or near the bottom of the drainage ditch. The incline allows for cleaning debris by raking it to the top and removing it from the ditch.

A7-2. Pump Facilities

Pump facilities are typically electric pump installations. Pumps are mounted on permanent structures with a suction pipe extending into the drainage ditch. Pumps are typically set to function on a remotely activated basis dependant upon water level in the ditch. Typical maintenance includes routine mechanical servicing of a pump and its electrical connections, as well as removal of any accumulated debris that may prevent or interfere with normal operation.

A7-3. Culverts

Culverts must be maintained to ensure normal flow passes through the culvert consistent with its design specifications. This typically includes dredging of a ditch adjacent to culvert openings and occasional cleaning-out of the culvert interior. Cleaning is usually performed through the use of high-pressure water, mechanical dredging or by hand. Repair or replacement is necessary when

incidental damage occurs to the culvert that would prevent optimum water flow or an unsafe crossing situation.

A7-4. Floodgates

Floodgates are one-way check valves that allow accumulated water to flow from a field into a drainage system during and after a high water event. The maintenance of such structures is the same as for tide gates and must include debris removal in order to allow the structure to function properly. Necessary repair and replacement must be performed as needed.

A7-5. Tidegates

Tide gates are one-way check valves located at the end of a drainage system to allow water to flow outward from within the system to salt water areas during a low tide cycle and then close to prevent saltwater from entering the drainage system when the tide rises. Under the district's Drainage Maintenance Agreement, the district can only conduct minor repair of the tidegates. In the context of the district's Drainage Maintenance Agreement, minor maintenance is defined as the replacement of damaged or worn hinge pins, nuts and bolts necessary to keep the tidegate or floodgate in good operating condition, and also includes removal of logs and debris to ensure gates are able to open and close properly. Major repairs and replacement of tidegates is not covered by this agreement and will be addressed by application for and issuance of separate HPAs.

A7-6. Channel In-Water Bucket Mowing

Channel in-water bucket mowing is a technique that employs a hydraulically operated sickle bar mower mounted on the front edge of a dredging bucket. The machine mows vegetative material below the water line, with the mowed material accumulated in the bucket. The material is then deposited on the ground away from the ditch. This type of mowing provides removal of vegetative material but does not remove vegetative root systems or soil.

A7-7. Channel Out-of-Water Mowing

Channel out-of-water mowing involves the routine removal of vegetative material above the water line to the top of the bank. It is completed using various types of mechanical mowers (rotary or flail designs) and reduces vegetative material during normal growing periods.

A7-8. Dredging

Dredging is completed, as needed, by utilizing a hydraulically operated boom-type excavator. The excavator has a wide, flat-bottomed bucket that scrapes down one side of a watercourse, rounds out the bottom and comes up the opposite side in one continuous motion. Thus the result leaves the ditch with inclined sides and a round bottom feature that minimizes side sloughing and erosion into the bottom of a ditch. All dredged material is deposited landward of the ditch so that it will not return to the water and can later be moved back into the adjoining field or be hauled away when and where necessary. When work is completed in ditches that are too large for a boom-type excavator, a dragline-type excavator is utilized. The process is typically the same, except that a dragline excavator works from the middle of the ditch to one side and then works the opposite side in a separate similar manner.

A7-9. Bridges

Bridges must be properly maintained in order to ensure normal flow under the bridge while also continuing to provide equipment or foot access across a watercourse. Repair or replacement is necessary when incidental damage occurs to a bridge that prevents optimum water flow or results in an unsafe crossing situation. Repair or replacement activities typically occur above the high water line.

A8. General Fish and Fish Habitat Information

For the purpose of this Drainage Maintenance Plan, the term "fish" includes all species of native cold-water fishes. However, particular emphasis is placed on salmonid species that are managed by WDFW as commercially and recreationally important fisheries. These include Pink salmon, Chum salmon, Sockeye salmon, Coho salmon, Chinook salmon, Rainbow trout (including Steelhead), Cutthroat trout, and native Char. Pink salmon, Chum salmon, Sockeye salmon, Coho salmon, and Chinook salmon are Anadromous, in that they return to freshwater habitats to spawn after spending the majority of their lives in salt-water environments. Rainbow trout, Cutthroat trout, and native Char can either be freshwater resident or anadromous.

A8-1. Fish Passage

Fish passage to and from the district waterways is restricted by several features within the drainage infrastructure. A dike system protecting the district from flood and tidal flows generally blocks the passage of adult and juvenile fish. In those cases where waterways intersect the levee system, passage is restricted by a culvert fitted with some sort of tide regulating mechanism or is blocked entirely by the dike system. Either of these features strictly limits the access of fish to and from the system except in those instances where floodwaters top or breach the system. In some cases, waterways that intersect the dike system are fitted with pump stations that facilitate the export of water over and through the dike. These pump stations are often used as backup mechanisms to conventional gravity discharge so that heavy storm related flows can be managed more effectively. Adult and juvenile fish can be entrained into the pumps during their downstream migration where they can be injured or killed. The majority of drainage pump facilities are associated with culvert/tide gate complexes through which upstream and downstream passage of adult and juvenile fish is possible, though limited.

The primary point of access for fish to and from the system is located at those intersections where the gravity flow drainage is managed by a culvert fitted with some sort of tide regulating feature. Though tide gates do not completely block the upstream passage of adult and juvenile fish, upstream passage is restricted to very narrow windows of the tide cycles during which the tide gate is open and the discharge velocity does not exceed the upstream swimming capabilities of the individual fish. The window for upstream passage is greater for adult fish than for juvenile fish because of their stronger swimming capabilities. Tide gates do not completely block the downstream passage of adult and juvenile fish though downstream passage is limited to the low tide cycles when the water surface elevation upstream of the tide gate is sufficiently greater than the water surface elevation downstream of the tide gate to create the head differential to open the tide gate.

A8-2. Fish Habitat Distribution -general

Watercourses With Headwaters (green) typically include suitable spawning, rearing and migration habitats for Coho salmon and Cutthroat trout. Spawning habitats typically occur in those reaches that have gradients between 1-3% and are fed by flowing water and a steady supply of suitable sediments. These reaches tend to be found at the junction between low gradient tidally influenced reaches and the steeper gradient headwater reaches of the system.

Rearing habitats can be distributed throughout these watercourses but are primarily located where there is sufficient channel complexity, riparian canopy, water quality and invertebrate productivity (fish prey/forage). Though upstream and downstream fish migration typically occurs throughout these watercourses, both natural and manmade barriers can and do restrict or block fish passage.

Watercourses Without Headwaters (magenta) can provide suitable rearing habitat immediately upstream of the terminal culvert/tide gates for a variety of fish species that immigrate into the watercourse from the estuary to forage on available prey. The accessibility of this rearing habitat to fish depends on the type of tide gate present and the degree to which it allows upstream fish passage and the exchange of key habitat forming processes, such as hydrology and sediment. The suitability of this habitat for rearing depends largely on water quality and prey/forage production factors which in part is governed by the interaction of hydrology, sediment, woody debris, riparian processes and other natural forces. Spawning habitat is typically not present in this watercourse type.

Artificial Watercourses (yellow) are wholly manmade systems constructed to convey water from a local surface or subsurface area for the purpose of improving the soil conditions for agriculture. Typically these watercourses are seasonal and do not have the habitat characteristics or natural processes necessary to support the rearing and spawning requirements of native cold water fishes.

A8-3. Fish Distribution - General

Fish survey data is primarily available for only the headwater reaches of the *Watercourses With Headwaters* (green) within the drainage districts. Very limited fish survey data is available for the lowland reaches of the *Watercourses With Headwaters* (green) and for *Watercourses Without Headwaters* (magenta). Fish survey data has not been collected for *Artificial Watercourses* (yellow).

Watercourses With Headwaters (green) typically support reproducing populations of Coho salmon and Cutthroat trout. The reproducing populations of Cutthroat trout can be either anadromous or resident. Anadromous adult Coho and Cutthroat typically enter the lower reaches of the watercourse to begin their upstream migration to the spawning habitats in late fall. Spawning occurs in the upper reaches of the watercourse where suitable spawning substrate is present and accessible. Coho spawn in the late fall and Cutthroat spawn in early spring. Coho adults die after spawning whereas Cutthroat can survive to spawn in successive years. Anadromous adult Cutthroat that survive spawning out migrate the watercourse from mid to late spring. After hatching from gravel nests (redds), emerging juvenile Coho and Cutthroat will

distribute themselves to suitable rearing habitats in the watercourse. Anadromous juvenile Coho and Cutthroat generally spend 22 to 18 months rearing in freshwater before migrating to the marine environment. Generally, juvenile anadromous Coho and Cutthroat are present in the accessible reaches of the watercourse throughout the year. Resident adult and juvenile Cutthroat are typically present in the upper reaches of the watercourses throughout the year.

In addition to fish originating from this watercourse type, it is generally assumed that between February and July, fish from other watercourses may immigrate from the estuary into the lower reaches of the watercourse via the culvert/tide gates to forage on available prey. It is generally assumed that the upstream distribution and duration of residence for these immigrating fish is limited by water quality, prey availability and their physiological affinity for salt water. In addition to salmonid species, forage fish species such as surf smelt and sand lance also use the estuary habitats for rearing and could potentially immigrate into the lower reaches of the watercourse. Adult native char and cutthroat could also be expected to immigrate into the lower reaches of the watercourse in pursuit of juvenile salmon and forage fish species. Generally elevated water temperatures found in these low land systems have also led to colonization by exotic species of fish that prefer warm water habitats. Surveys have identified Pumpkinseed, Crappie, and Smallmouth Bass, among others, as being year around residents in the lower reaches of these systems. Many of these warm water species are voracious predators and could be considered deleterious to salmonid productivity.

Watercourses Without Headwaters (magenta) generally do not support resident populations of cold-water game fish. This is largely attributed to the presence of drainage infrastructure that limits the exchange of tidal hydrology and/or connection to riverine hydrology. It is generally assumed that between January and July, fish from other watercourses may immigrate from the estuary into the lower reaches of this watercourse type via the culvert/tide gates to forage on available prey. It is generally assumed that the upstream distribution and duration of residence for these immigrating fish is limited by water quality, prey availability and their physiological affinity for salt water.

Artificial Watercourses (yellow) are manmade and designed to convey water from local surface and subsurface areas in order to improve the soil conditions for agriculture. These watercourses are typically dry in the summer. Water quality and quantity can negatively affect the suitability of the potential rearing habitat. The habitat characteristics and natural processes required by native cold water fish for rearing and spawning are not supported by these artificial watercourses. It is therefore assumed that the presence of native cold water fish is either very limited or absent in this watercourse type.

A8-4. Fish Survey Data - DID #19

Fish survey data has been historically collected only in Reach 4 of Big Indian Slough (Figure 6) and in Upper Higgens Slough. The fish survey data for Big Indian Slough indicate the presence of Chinook salmon and Coho salmon (Figure 4) (Table 4). Cutthroat trout were also been observed in Reach 4 of Big Indian Slough on one occasion (personal communication with Kurt Buchanan, 2007). The fish survey data for Upper Higgens Slough (Data No. 5) indicate the presence of Coho salmon (Figure 4) (Table 4).

TABLE 4. DID #19 – FISH SURVEY DATA

Data No.	Watercourse	Fish Species	Observer	Observations
1	Unnamed	Coho, Chinook	KB	1
2	Unnamed	Coho	KB	1
3	Unnamed	Coho	KB	3
4	Unnamed	Coho	KB	3
5	Unnamed	Coho	KB	3
6	Unnamed	Coho	BB	1

Table 4 Observation Key
1 = Presence/Migration 2 = Known Spawning 3 = Known Juvenile Rearing

In addition to the historical fish data presented above in Table 4, the following fish data was collected in Big Indian Slough and Upper Higgens Slough in 2007:

TABLE 4A. DID #19 – 2008 FISH SURVEY DATA

Observer	Site	Date	Observations
WSDT	Big Indian Slough between culverts 590 - 591	July	No juvenile salmonids
SRSC	Upper Higgens Slough in the vicinity of bridge 600	August	No juvenile salmonids
SRSC	Upper Higgens Slough between culverts 662-650	October	No juvenile salmonids
SRSC	Upper Higgens Slough between culverts 662-650	November	No juvenile salmonids
SRSC	Big Indian Slough in the vicinity of culvert 552	December	One juvenile Coho
WDFW	Big Indian Slough in the vicinity of Ovenelle Road and Higgens Way	November - December	One Coho redd

A8-5. Fish Distribution And Utilization - DID #19

A8-5a Lower Higgens Slough, Telegraph Slough and Little Indian Slough:
DID #19 includes Lower Higgens Slough, Telegraph Slough and Little Indian Slough, which have all been identified as *Watercourses Without Headwaters* (magenta) (Figure 2). The presence of salmonids and char is very limited in these *Watercourses Without Headwaters* (magenta) for the following reasons:

a. The district's *Watercourses Without Headwaters* (magenta) do not support spawning habitats suitable for salmonids or char.

b. The upstream passage of adult and juvenile salmonids and char through the tidegates in the district's *Watercourses Without Headwaters* (magenta) is restricted to very narrow

windows of the tide cycles during which the tide gate is open and the discharge velocity does not exceed the upstream swimming capabilities of the individual fish.

c. The upstream distribution and duration of residence of fish immigrating upstream of the tidegates in the district's *Watercourses Without Headwaters* (magenta) is limited by water quality, prey availability and their physiological affinity for salt water.

A8-5b Upper Higgens Slough:
DID #19 includes Upper Higgens Slough (upstream of culvert #662), which has also been identified as a *Watercourse Without Headwaters* (magenta) (Figure 2). Though fish can access Upper Higgens Slough via Big Indian Slough, fish utilization in Upper Higgens Slough appears to be extremely limited. Historically, juvenile Coho were observed in Upper Higgens Slough on one occasion (Table 4 Figure 5). Salmonids were not observed during three surveys conducted between August and November 2007 (Table 4a). It is reasonable to assume that the presence of salmonids and char in Upper Higgens Slough is currently limited for the following reasons:

a. Upper Higgens Slough does not support spawning habitats suitable for salmonids or char.

b. Rearing habitat for juvenile salmonids and char is very limited.

c. The distribution and duration of residence of juvenile salmonids and char is limited by water quality and prey availability.

d. The limited number of salmonids that have been observed.

A8-5c Big Indian Slough:
DID #19 includes Big Indian Slough (Reaches 1-4, Figure 6), which has been identified as a *Managed Watercourse With Headwaters* (green). As noted in section A8-4, with the exception of fish survey data point number 5 (Table 4, Figure 5), all of the fish observed in DID #19 have occurred in Reach 4 of Big Indian Slough. The fish observed in Reach 4 of Big Indian Slough include Cutthroat trout, Chinook salmon and Coho salmon.

Cutthroat Trout
Cutthroat trout were observed on one occasion in Reach 4 of Big Indian Slough (personal communication with Kurt Buchanan, 2007). Given that the historic watershed of Upper Higgens Slough, which historically included Reach 4 of present day Big Indian Slough, encompassed an area of sufficient size and gradient to support cutthroat spawning habitat, it is reasonable to assume that cutthroat trout historically reproduced in the watershed. However, it is also reasonable to assume that the presence of cutthroat trout in Big Indian Slough is currently limited for the following reasons:

a. Rearing habitat for juvenile and adult cutthroat trout is very limited.

b. The distribution and duration of residence of adult and juvenile cutthroat trout is limited by water quality and prey availability.

c. The limited number of cutthroat that have been observed in Big Indian Slough.

Chinook Salmon

Adult Chinook salmon were observed in Reach 4 of Big Indian Slough (Figure 6) on one occasion (Table 4, Figure 5). All of the observed adult Chinook salmon were marked with an adipose fin clip and coded wire tag indicating that the observed Chinook salmon originated from a fish hatchery. The coded wire tags were recovered from the observed Chinook salmon and verified that the observed Chinook salmon were of hatchery origin (personal communication with Kurt Buchanan, 2007). Given that a small percentage of returning adult salmon are prone to stray, it is reasonable to assume that the adult Chinook salmon observed in the Big Indian Slough were from WDFW's Skagit River hatchery, Samish River hatchery and/or WDFW's Fidalgo Bay net pens. It is also reasonable to assume that Big Indian Slough does not currently support a reproducing population of Chinook salmon for the following reasons:

a. Chinook salmon have only been observed in Big Indian Slough on one occasion.

b. The only observed Chinook salmon were of hatchery origin.

c. The available spawning habitat in Big Indian Slough is very limited and not characteristic of spawning habitat preferred by Chinook salmon.

Coho Salmon

It is apparent from the Reach 4 fish survey data (Table 4, Table 4a) that Big Indian Slough (Reaches 1-4, Figure 6) currently supports a reproducing population of Coho salmon. Coho salmon are always anadromous. Coho salmon distribution and behavior in Big Indian Slough is assumed to be typical of a Managed Watercourse With Headwaters (green) as described above in section A8-3. Suitable Coho salmon spawning habitat is only available in Reach 4. Adult Coho that enter Big Indian Slough from Padilla Bay migrate through Reaches 1, 2 and 3 to access the spawning habitat available in Reach 4. Juvenile Coho salmon originating from the spawning habitat in Reach 4 utilize Reaches 1, 2, 3, and 4 for rearing and migration to Padilla Bay. The fish utilization data and fish passage barrier data presented in Figure 4 is from WDFW's Salmonscape database.

Historically, Upper Higgens Slough included Reaches 3 and 4 of Big Indian Slough. Given that the historic watershed of Upper Higgens Slough included an area of sufficient size and gradient to support Coho salmon spawning habitat, it is reasonable to assume that Coho salmon historically reproduced in the watershed. However, it is impossible to determine whether the Coho salmon observed in Reach 4 of Big Indian Slough (Table 4, Table 4a) are a remnant of a historically reproducing population, the result of 20 years of WDFW and Swinomish Tribe Coho plants in the Swinomish Channel and at the mouth of Big Indian Slough, or a combination of the two. The historic fish planting records for the Swinomish Tribe and WDFW pertinent to Big Indian Slough are summarized below in Table 5.

TABLE 5. SWINOMISH TRIBE AND WDFW FISH PLANTING HISTORY

Year	Species	Fish/Lb.	Release Date	Release Location	Party Releasing Fish
1977	Chum	1300	6/8/77	Swinomish Channel	Swinomish Tribe
1978	Chum	1050	4/21/78	Swinomish Channel	Swinomish Tribe
1979	Chum	1000	4/1/79	Swinomish Channel	Swinomish Tribe
1980	Chum	1000	3/30/80	Swinomish Channel	Swinomish Tribe
1985	Coho	15	6/14/85	Swinomish Channel	Swinomish Tribe
1986	Coho	18	5/13/86	Swinomish Channel	Swinomish Tribe
1987	Coho	17	5/15/87	Swinomish Channel	Swinomish Tribe
1988	Coho	14	6/15/88	Swinomish Channel	Swinomish Tribe
1989	Coho	17	5/19/89	Swinomish Channel	Swinomish Tribe
1990	Coho	17	6/8/90	Swinomish Channel	Swinomish Tribe
1991	Coho	17	6/4/91	Swinomish Channel	Swinomish Tribe
1992	Coho	8-14	5/7/92, 6/1/92	Swinomish Channel	Swinomish Tribe
1992	Chum	349	5/21/92	Swinomish Channel	Swinomish Tribe
1992	Chinook	70	6/26/92	Swinomish Channel	Swinomish Tribe
1993	Coho	32	2/26/93	Padilla Bay/Big Indian Slough	Swinomish Tribe
1993	Chum	309-325	5/27/93, 6/7/93	Swinomish Channel	Swinomish Tribe
1994	Coho	27	3//294	Padilla Bay/Big Indian Slough	Swinomish Tribe
1994	Chum	?	5/22/94	Swinomish Channel	Swinomish Tribe
1995	Chum	381	5/25/95	Swinomish Channel	Swinomish Tribe
1995	Coho	23	3/1/99	Big Indian Slough	WDFW
1996	Coho	25	2/12/96	Big Indian Slough	WDFW
1999	Coho	23	2/17/99	Big Indian Slough	WDFW
2000	Coho	30	2/16/00	Big Indian Slough	WDFW
2001	Coho	24	2/25/01	Big Indian Slough	WDFW
2003	Coho	24	2/17/03	Big Indian Slough	WDFW
2004	Coho	24	2/12/04	Big Indian Slough	WDFW
2005	Coho	24	2/16/05	Big Indian Slough	WDFW
2006	Coho	24	2/27/06	Big Indian Slough	WDFW
2007	Coho	?	2/12/07	Big Indian Slough	WDFW

Based on the following observations, it is reasonable to assume that the existing reproducing population of Coho salmon in Big Indian Slough has been and is substantially supported and augmented by the WDFW and the Swinomish Tribe 20 year program of planting juvenile Coho in the Swinomish Channel and at the mouth of Big Indian Slough.

1. The existing spawning habitat in Big Indian Slough is limited to Reach 4 (Figure 6).

2. Access to the available spawning habitat in Reach 4 by adult Coho salmon is impaired during low flows.

3. The available spawning habitat in Reach 4 (Figure 6) is degraded by fines, reed canary grass and crushed quarry rock from the adjacent roadways. Consequently, it is reasonable to assume that the spawning success of Coho salmon in Big Indian Slough is limited.

4. The existing rearing habitat in the Big Indian Slough is limited and significantly degraded. Suitable summer rearing habitat for juvenile Coho salmon is limited to Reach 4. Consequently, it is reasonable to assume that juvenile Coho salmon survival is limited.

5. Adult Coho will to return to the general area where they are released as juveniles (Swinomish Channel, Big Indian Slough) in search of spawning habitat.

In addition to limited and degraded spawning and rearing habitats in the Big Indian Slough, Coho salmon presence in Big Indian Slough is also presumed to be limited by the following factors:

1. The upstream passage of adult and juvenile Coho salmon through the district's tidegate complex #60 is restricted to narrow windows of the tide cycles during which the tide gate is open and the discharge velocity does not exceed the upstream swimming capabilities of the individual fish.

2. The distribution and duration of residence of juvenile Coho salmon immigrating upstream of the district's tidegate complex #60 is limited by water quality, prey availability and their physiological affinity for salt water.

At the request of DID#19, WDFW and the local tribes (Swinomish, Upper Skagit, Suak-Suiattle) have agreed to discontinue planting Coho juveniles at the mouth of Big Indian Slough. Beginning in 2008, Coho juveniles originating from the WDFW's Marble Mount hatchery will be planted to the west of Big Indian Slough at pump station #706 (Figure 2) which is located within the jurisdictional boundaries of DID#12. The future of this planting practice will be further reviewed in 2008 by the fisheries managers of WDFW and the local tribes.

B. MANAGED WATERCOURSE WITH HEADWATERS

DID #19 include Big Indian Slough, which satisfies the criteria of a *Watercourse With Headwaters* (green) (Figure 2).

B1. Reach Assessments

That portion of Big Indian Slough within the jurisdictional boundaries of DID #19 was partitioned into 4 reaches (Figure 5) to facilitate the following detailed reach assessments.

REACH 1

Reach Description - Figure 6
Reach 1 begins at the tidegate complex #60 and ends at floodgate #55.

Reach Length
Reach 1 is approximately .56 miles in length.

Reach Drainage Infrastructure – Figure 2
DID #19 is responsible for maintaining pump station #60, tidegate complex #61 and floodgates #78 and #55 in Reach 1.

Reach Drainage Maintenance Activities
Dredging
DID #19 dredges this reach approximately every 3 years or as needed. Dredging is conducted from both the right and left banks to maintain a stable shoreline profile.

Channel Out Of Water Mowing
DID #19 mows the right and left banks of this reach from water line to top of bank every year.

Culvert Maintenance
The culverts and tidegates that are owned by the district in this reach are maintained by DID #19 as needed. Debris and logs are removed from the tidegates and culverts as needed. The culverts under SR20 are owned and maintained by WDOT as needed. The culverts under the county roads are owned and maintained by Skagit County as needed.

Pump Facility Maintenance
DID #19 conducts routine maintenance as needed.

Trash Rack
DID #19 conducts routine maintenance of the trash rack at tidegate facility #60 as needed.

Floodgates
DID #19 maintains floodgates #78 and #55 as needed.

Herbicide Spraying
DID #19 does not currently use herbicides to control the channel vegetation in this reach. However, in the future, DID #19 may begin using herbicides annually in this reach to control channel vegetation and to prolong the time interval between maintenance dredging events.

Bridge Maintenance
DID #19 does not own or maintain bridges in this reach.

Beaver Dam Removal
Though beaver dams are typically not a problem in this reach, they are removed by the district as needed.

Tidegates
The district conducts minor repairs of the tidegates at complex #60 as needed. Under the district's Drainage Maintenance Agreement, the district can only conduct minor repair of the tidegates. In the context of the district's Drainage Maintenance Agreement, minor maintenance is defined as the replacement of damaged or worn hinge pins, nuts and bolts necessary to keep

the tidegates in good operating condition. Minor maintenance also includes removal of logs and debris to ensure the tidegates are able to open and close properly.

Current Reach Habitat Conditions

The channel in Reach 1 has been modified and simplified via historic maintenance dredging and diking activities. The right and left banks of Reach 1 are earthen dikes with approximately 1:1 side slopes and a top elevation 6-10 feet above the adjacent farm fields. The dikes are dominated by reed canary grass with scattered areas of cattails along the ordinary high water line. Tree and shrub vegetation is absent along Reach 1. The channel width ranges from 20 feet to 40 feet in width. Large woody debris in the channel is absent. Silts and fines dominate the channel substrate. Suitable salmonid spawning substrate is absent. Elevated water temperatures would be expected during the summer due to the broad channel width and the absence riparian cover.

Riparian Characteristics

The right and left bank of Reach 1 have been steepened by dike construction and are dominated by reed canary grass with scattered areas of cattails along the ordinary high water line. Trees and shrubs are absent along Reach 1.

Riparian Habitat Observations Associated With Channel Cross Sections	
Channel Cross Section 1a	**Channel Cross Section 1b**
RC and other grasses along stream bed	RC and other grasses along stream bed
Individual cattails	Isolated trees, small cattail patches

Fish Passage Barriers & Obstacles – Figure 4

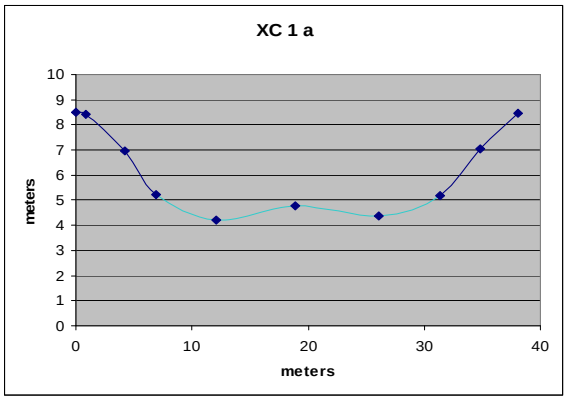
The primary point of access for salmonids to Big Indian Slough is the district's tidegate complex #60 where the district's drainage is discharged into Padilla Bay. Though WDFW's Salmonscape database identifies tidegate complex #60 as a fish passage barrier (Figure 4), it is not a complete fish passage barrier. Passage of adult and juvenile salmonids through tidegate complex #60 is restricted to periods of the tide cycle when the water surface elevation upstream of the tidegates is sufficiently greater than the water surface elevation downstream of the tidegates to create a head differential sufficient to open the tidegates. Upstream passage of adult and juvenile salmonids is also limited by the downstream discharge velocity through the tidegates, which can exceed the upstream swimming capabilities of the salmonids. The window for upstream passage is greater for adult salmonids than for juvenile salmonids because of their stronger swimming capabilities. Elevated water temperatures in Reach 1 and low dissolved oxygen levels, especially during the summer are expected to limit the upstream and downstream migration of salmonids.

Spawning Habitat

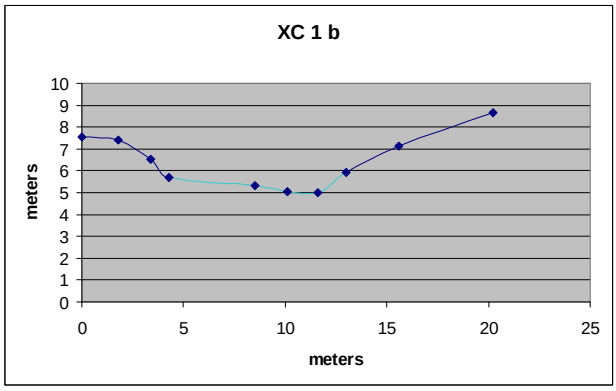
Silts and fines dominate the channel substrate in Reach 1. Spawning habitat for salmonid species is not present.

Channel Cross Section

Lower Section



Upper Section



Reach Fish Utilization – Figure 4 and Figure 5
Salmonids have not been observed in Reach 1. Reach 1 is primarily a migration corridor for adult and juvenile salmonids between Padilla Bay and Big Indian Slough. Juvenile salmonid rearing in Reach 1 is limited by the absence on large woody debris in the channel and the absence of riparian habitat. Elevated water temperatures and low dissolved oxygen levels during the summer limit salmonid rearing and migration in Reach 1.

Reach Fish Habitat Improvement Opportunities – Figure 7

- Remove 10 vertical boards from the existing trash rack at tidegate complex #60 to improve fish passage through the trash rack. A deflector log between the existing concrete dam and trash rack adjacent to the pump station (#61) may need to be installed to restrict floating trash from entering the pump during operation.

Reach Photographs – Figure 8

REACH 2

Reach Description - Figure 6
Reach 2 begins at the floodgate #55 and ends at bridge #593.

Reach Length
Reach 2 is approximately 1.27 miles in length.

Reach Drainage Infrastructure – Figure 2
DID #19 is responsible for maintaining floodgate #56 in Reach 2.

Reach Drainage Maintenance Activities

Dredging

DID #19 dredges this reach approximately every 3 years or as needed. Dredging is typically conducted from the right bank though occasionally dredging occurs from the left bank to maintain a stable shoreline profile.

Channel Out Of Water Mowing

DID #19 mows the right and left banks of this reach from water line to top of bank every year.

Channel In-Water Bucket Mowing

DID #19 conducts channel in-water bucket mowing as needed to prolong the time interval between maintenance dredging events.

Culvert Maintenance

The culverts that are owned by the district in this reach are maintained by DID #19 as needed. Debris and logs are removed from the culverts as needed. The culverts under SR20 are owned and maintained by WSDOT as needed. The culverts under the county roads are owned and maintained by Skagit County as needed.

Pump Facility Maintenance

There are no pump facilities in this reach.

Trash Rack

There are no trash racks in this reach.

Floodgates

Floodgate #56 is maintained by the district as needed.

Herbicide Spraying

DID #19 does not currently use herbicides to control the channel vegetation in this reach. However, in the future, DID #19 may begin using herbicides annually in this reach to control channel vegetation and to prolong the time interval between maintenance dredging events.

Bridge Maintenance

DID #19 does not own or maintain bridges in this reach.

Beaver Dam Removal

Though beaver dams are typically not a problem in this reach, they are removed by the district as needed.

Current Reach Habitat Conditions

Reach 2 was excavated in the recent past so that drainage from the Upper Higgens Slough watershed could be discharged to Padilla Bay via Big Indian Slough rather than to the Swinomish Channel via Lower Higgens Slough. At the same time Big Indian Slough was connected to the Upper Higgens Slough watershed via Reach 2, Lower Higgens Slough was

disconnected from the Upper Higgens Slough watershed via culvert (592) which currently only allows flood flows from Upper Higgens Slough to discharge into Lower Higgens Slough. The channel in Reach 2 has been modified and simplified via historic maintenance dredging activities. The channel width ranges from 15 to 20 feet in width. The right and left banks of the channel are dominated by reed canary grass. Riparian vegetation is limited to a few scattered mature deciduous and evergreen trees. Large woody debris in the channel is absent. Silts and fines dominate the channel substrate. Suitable salmonid spawning substrate is absent. Elevated water temperatures would be expected during the summer due to the absence riparian cover.

Riparian Characteristics

The watercourse channel and the shoreline along the right and left banks are dominated by reed canary grass. Riparian vegetation is limited to 6 mature deciduous and evergreen trees that are scattered along the right and left bank.

Riparian Habitat Observations Associated With Channel Cross Sections	
Channel Cross Section 2a	**Channel Cross Section 2b**
RC and other grasses along stream bed	RC and other grasses along stream bed
	Several isolated trees

Fish Passage Barriers & Obstacles – Figure 4

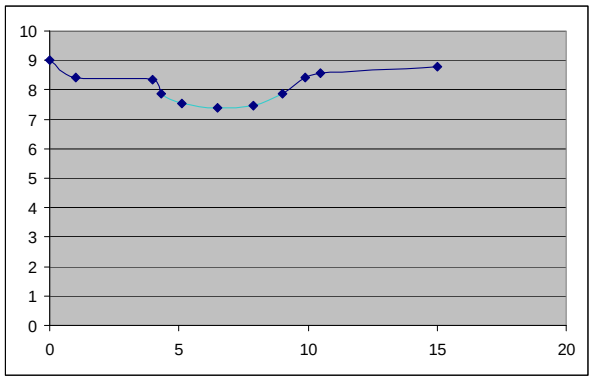
There are no known fish passage barriers in Reach 2. However, low flow conditions, elevated water temperatures, and low dissolved oxygen conditions could limit fish migration in the summer and early fall.

Spawning Habitat

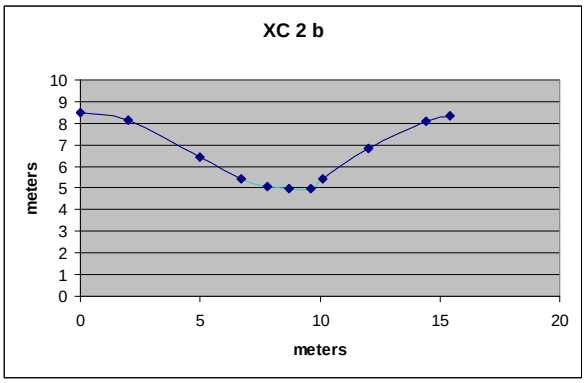
Silts and fines dominate the channel substrate in Reach 2. Spawning habitat for salmonid species is not present.

Channel Cross Section

Lower Section



Upper Section



Reach Fish Utilization – Figure 4 and Figure 5
Salmonids have not been observed in Reach 2. Reach 2 is primarily a migration corridor for adult and juvenile salmonids between Padilla Bay and upper Big Indian Slough. Juvenile salmonid rearing in Reach 2 is limited by the absence on large woody debris in the channel, the absence of riparian habitat and poor water quality. Elevated water temperatures and low dissolved oxygen levels during the summer will limit salmonid rearing and migration.

Reach Fish Habitat Improvement Opportunities – Figure 7

- Create a 10-30 foot wide band of riparian habitat along the left bank (south) of Reach 2 west of the Farm To Market Road. Native trees and shrubs would be used to create the riparian habitat. The riparian habitat could be strategically planted (gaps and plant species) to allow equipment access for future maintenance dredging. The toe of the south bank may need to be reshaped before the riparian habitat is planted.

Reach Photographs – Figure 8

REACH 3

Reach Description - Figure 6
Reach 3 begins at bridge #593 and ends at culvert #662.

Reach Length
Reach 3 is approximately .90 miles in length.

Reach Drainage Infrastructure – Figure 2
DID #19 is responsible for maintaining culverts #590, #663, #664, and #665 in Reach 3.

Reach Drainage Maintenance Activities
Dredging
DID #19 dredges this reach approximately every 3 years or as needed. Dredging is conducted from the right bank and left banks to maintain a stable shoreline profile.

Channel Out Of Water Mowing
DID #19 mows the right and left banks of this reach from water line to top of bank every year.

Channel In-Water Bucket Mowing
DID #19 conducts channel in-water bucket mowing as needed to prolong the time interval between maintenance dredging events.

Culvert Maintenance
The culverts that are owned by the district in this reach are maintained by DID #19 as needed. Debris and logs are removed from the culverts as needed. The culverts under SR20 are owned and maintained by WSDOT as needed. The culverts under the county roads are owned and maintained by Skagit County as needed.

Pump Facility Maintenance
There are no pump facilities in this reach.

Trash Rack
There are no trash racks in this reach.

Floodgates
There are no floodgates in this reach.

Herbicide Spraying
DID #19 does not currently use herbicides to control the channel vegetation in this reach. However, in the future, DID #19 may begin using herbicides annually in this reach to control channel vegetation and to prolong the time interval between maintenance dredging events.

Bridge Maintenance
DID #19 does not own or maintain bridges in this reach.

Beaver Dam Removal
Though beaver dams are typically not a problem in this reach, they are removed by the district as needed.

Current Reach Habitat Conditions
The channel in Reach 3 has been modified and simplified via historic maintenance dredging activities. The channel width ranges from 10 to 20 feet in width. The right and left banks of the channel are dominated by reed canary grass. Mature deciduous and evergreen riparian habitat is absent along the majority of Reach 3. There is approximately 600 lineal feet of mature deciduous and evergreen riparian habitat along the right bank (west) of Reach 3 immediately downstream of culvert # 590. There is also approximately 900 lineal feet of mature deciduous and evergreen riparian habitat along the left bank (south) of Reach 3 between bridge #598 and culvert #662. However, the benefits of these riparian habitats is limited by the maintenance of a 20 foot wide area of reed canary grass between the top of the channel bank and the mature riparian vegetation for the purpose of maintaining equipment access to the channel. Large woody debris in the channel is absent. Silts and fines dominate the channel substrate. Suitable salmonid spawning substrate is absent. Elevated water temperatures would be expected during the summer due to the limited riparian habitat.

Riparian Characteristics
The right and left banks of the channel are dominated by reed canary grass. Mature deciduous and evergreen riparian habitat is absent along the majority of Reach 3. There is approximately 600 lineal feet of mature deciduous and evergreen riparian habitat along the right bank (west) of Reach 3 immediately downstream of culvert # 590. There is also approximately 900 lineal feet of mature deciduous and evergreen riparian habitat along the left bank (south) of Reach 3 between bridge #598 and culvert #662. However, the benefits of these riparian habitats is limited by the maintenance of a 20 foot wide area of reed canary grass between the top of the

channel bank and the mature riparian vegetation for the purpose of maintaining equipment access to the channel.

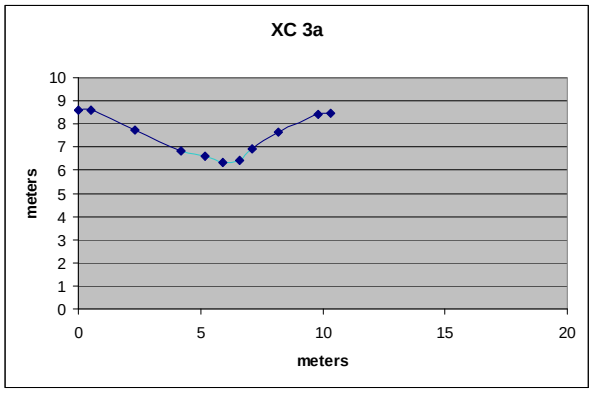
Riparian Habitat Observations Associated With Channel Cross Sections	
Channel Cross Section 3a	**Channel Cross Section 3b**
RC and other grasses along stream bed	RC and other grasses along stream bed
Cottonwood grove runs along small portion of creek	A few adult trees and shrubs, set back from bank top

Fish Passage Barriers & Obstacles – Figure 4
WDFW's Salmonscape database identifies culvert #662 as a fish passage barrier. DID #19 removed culvert #662 from the channel in 2007 as partial mitigation for conducting maintenance dredging in Upper Higgens Slough. There are no other known fish passage barriers in Reach 3. However, low flow conditions and/or elevated water temperatures could limit fish migration in the summer and early fall.

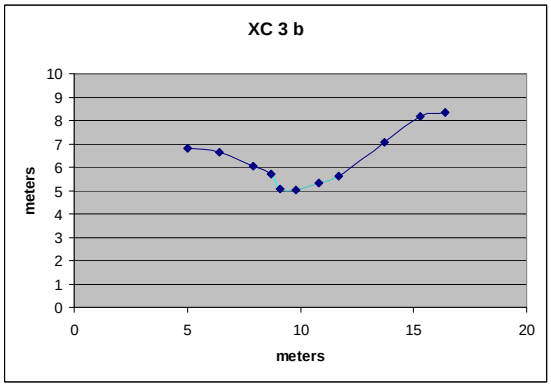
Spawning Habitat
Silts and fines dominate the channel substrate in Reach 3. Spawning habitat for salmonid species is not present.

Channel Cross Section

Lower Section



Upper Section



Reach Fish Utilization – Figure 4 and Figure 5
Salmonids have not been observed in Reach 3. Reach 3 is primarily a migration corridor for adult and juvenile salmonids between Padilla Bay and upper Big Indian Slough. Juvenile salmonid rearing in Reach 3 is limited by the absence on large woody debris in the channel and the absence of riparian habitat. Elevated water temperatures and low dissolved oxygen levels during the summer also limit salmonid rearing and migration.

Reach Fish Habitat Improvement Opportunities – Figure 7

- Create a 10-30 foot band of riparian habitat along the left bank (south side) of the watercourse between bridge #592 and culvert #590. Native trees and shrubs would be used to create the riparian habitat. The riparian habitat could be strategically planted (gaps and plant species) to allow future equipment access to the channel for maintenance dredging.

- Create a 10-30 wide foot band of riparian habitat along the left bank (south) of the watercourse from bridge #598 to culvert #662. Native trees and shrubs would be used to create the riparian habitat. The riparian habitat could be strategically planted (gaps and plant species) to allow future equipment access to the channel for maintenance dredging.

Reach Photographs – Figure 8

REACH 4

Reach Description - Figure 6
Reach 4 begins at culvert 662 and ends approximately 500 feet upstream of Ovenell Road at the south end of the Port of Skagit's stormwater facility.

Reach Length
Reach 4 is approximately 1.11 miles in length.

Reach Drainage Infrastructure – Figure 2
DID #19 is only responsible for maintaining the channel in Reach 4.

Reach Drainage Maintenance Activities
Dredging
DID #19 does not conduct maintenance dredging in this reach.

Channel Out Of Water Mowing
DID #19 does not mow the banks along this reach.

Channel In-Water Bucket Mowing
DID #19 does not conducts channel in-water bucket mowing in this reach.

Culvert Maintenance
The culverts in this reach are now owned or maintained by DID #19.
Pump Facility Maintenance
There are no pump facilities in this reach.

Trash Rack
There are no trash racks in this reach.

Floodgates
There are no floodgates in this reach.

Herbicide Spraying
DID #19 does not use herbicides to control the channel vegetation in this reach.

Bridge Maintenance
DID #19 does not own or maintain bridges in this reach.

Beaver Dam Removal
DID #19 does not manage beaver dams in this reach.

Current Reach Habitat Conditions
The channel in Reach 4 has been modified and simplified via historic maintenance dredging activities. The channel width ranges from 4 to 16 feet in width. Though Reach 4 is within the jurisdictional boundaries of DID #19 (Figure 6), it primarily conveys drainage from the Port of Skagit County airport properties and non-agriculture lands to the north. As such, DID #19 does not currently dredge, mow or conduct other drainage maintenance activities in and along this reach. Consequently, the channel and riparian habitats in and along Reach 4 have not been routinely disturbed in recent years and have been allowed to develop naturally. In addition, the Port of Skagit has recently enhanced the spawning habitat along Higgens Way and has enhanced and/or retained the riparian habitats on Port property. The channel in Reach 4 is diverse and is therefore described through the following channel section descriptions:

Section A: The 300 foot long channel section immediately upstream from the confluence with Upper Higgens Slough is characterized by a 4-6 foot wide channel dominated by reed canary grass. Silts and fines dominate the channel substrate and as a consequence spawning habitat is not present. Riparian habitat and large woody debris are absent along this section. Elevated water temperatures are expected during the summer due to the limited riparian habitat and low flows. Upstream fish passage through this channel section is restricted during low flow periods.

Section B: The channel section upstream of the degraded channel section at the confluence of Upper Higgens Slough (Section A) extends north to Ovenell Road and is characterized by a 6-10 foot wide incised channel with steepened banks. The substrate is a mix of fines and gravels. Pockets of suitable salmonid spawning habitat are present. The riparian habitat along the right bank (west) and left bank (east) of the downstream half (south) of this channel section is composed of a narrow band of mature deciduous trees, shrubs and black berries. The riparian habitat along right bank (west) of the upstream half (north) of this section is composed of, with the exception of a gas line crossing, a broad band of mature deciduous trees and shrubs. The riparian habitat along the left bank (east) of the upstream half of this section (north) is composed of a narrow band of mature deciduous trees and shrubs that has been enhanced by a sparse planting of immature evergreen trees. The riparian habitat along the majority of Section B provides sufficient canopy coverage over the channel to prevent the invasion and dominance of reed canary grass. A few large wood elements are present in the channel. Pool habitat is also present in Section B though limited. Though areas of this section can go dry during the summer,

upwell from the adjacent wetlands appears to be adequate to keep the pool habitat sufficiently watered to support juvenile salmonid rearing. It is reasonable to assume that the upwell water from the wetlands in combination with the riparian canopy cover maintains the water temperature in the summer pool habitat within the tolerance range of juvenile salmonids. Adult and juvenile salmonid migration is severely restricted in this channel section during low flow periods. Culverts #652 and #653 are barrier to upstream migration during low flow periods. Culvert # 654 is perched and completely blocks upstream salmonid migration (Figure 4).

Section C: The channel section that forks east to culvert #657 under Higgens Road is very similar to Section B and is characterized by a 6-8 foot wide channel with steepened banks. The substrate is a mix of fines and gravels. Pockets of suitable salmonid spawning habitat are present. A narrow band of mature deciduous tree/shrub riparian habitat is continuous along the north (right) bank and south (left) bank of the channel. The riparian habitat along the north (right) bank of the channel has been enhanced with some sparse evergreen trees on the Port of Skagit property. The riparian habitat provides sufficient canopy coverage over the channel to prevent the invasion and dominance of reed canary grass. A few large wood elements are present in the channel. Pool and riffle habitats are also present though limited. Though areas of this section can go dry during the summer, upwell from the adjacent wetlands appears to be adequate to keep the pool habitat sufficiently watered to support juvenile salmonid rearing. It is reasonable to assume that the upwell water from the wetlands in combination with the riparian canopy cover maintains the water temperature in the summer pool habitat within the tolerance range of juvenile salmonids. Adult and juvenile salmonid upstream passage is restricted by culverts #652, #653 and #654. Adult and juvenile salmonid migration is also severely restricted in this channel section during low flow periods.

Section D: The channel section that extends due north along Higgens Way to Ovenell Road is characterized by a 10-12 foot wide channel. The crushed rock/gravel shoulder of Higgens Way constitutes the east (left) bank of the channel. Fill associated with a narrow bench and public trail berm on Port of Skagit property constitute the west (right) bank of the channel. The public trail berm separates the channel from a large wetland. In the recent past, the Port of Skagit enhanced the channel with large rocks and gravels to create spawning and rearing habitats. Spawning and rearing habitats are still present in this section though they have been significantly degraded by fines, crushed rock from the shoulder of Higgens Way and the invasion of reed canary grass. Riparian vegetation is absent along the shoulder of Higgens Way. Though the bench along the west (right) bank has been sparsely planted with evergreen trees, the planting density and the current size of the trees do not shade the channel. Large wood elements are absent in this section. Pool and riffle habitats are present though very limited. Upwell from the adjacent wetlands does not appear to be adequate to keep the pool habitat sufficiently watered to support juvenile salmonid summer rearing. Given the limited riparian habitat, elevated water temperatures would be expected during the summer. Adult and juvenile salmonid migration is severely restricted in this channel section during low flow periods. Rock armoring associated with the pipeline crossing also restricts upstream passage of adult and juvenile salmonids in this section.

Section E: The channel section that extends due north along Higgens way upstream of Ovenell Road for approximately 500 feet is characterized by a 12-16 foot wide channel. The crushed rock/gravel shoulder of Higgens Way constitutes the east (left) bank of the channel. A narrow bench constitutes the west (right) bank of the channel for approximately 200 feet and separates the channel from a public parking lot. A wider bench and hillside constitutes the remainder of the west (right) bank of this channel section. The public parking lot separates the channel from a large wetland on Port of Skagit property. In the recent past, the Port of Skagit enhanced the channel with large rocks and gravels to create spawning and rearing habitats. Suitable salmonid spawning and rearing habitats are still present in this section. Fines, crushed rock from the shoulder of Higgens Way and the invasion of reed canary grass has not degraded the spawning and rearing habitat in this section to the degree that they have been degraded in channel section D. Riparian vegetation is absent along the shoulder of Higgens Way. Though the bench and hillside along the west (right) bank has been sparsely planted with evergreen trees, the planting density and the current size of the trees do not shade the channel. Large wood elements are absent in this section. Though shallow pool habitat is still present, upwell from the adjacent wetland does not appear to be adequate to keep the pool habitat sufficiently watered to support juvenile salmonid summer rearing. Given the limited riparian habitat, elevated water temperatures would be expected during the summer. Adult and juvenile salmonid upstream passage is restricted by the culvert under Ovenell Road (#658) during low flow periods. Adult and juvenile salmonid migration is also severely restricted in this channel section during low flow periods.

Section F: The channel section that forks to the east of Higgens Way via culvert # 657 has been modified and simplified via historic maintenance dredging activities. The channel is characterized by a 8-10 foot wide channel with steepened banks. The channel is dominated by reed canary grass and cattails. The right and left banks of the channel are dominated by reed canary grass, black berries, wild rose and a scattering of mature deciduous trees. Large woody debris in the channel is absent. Silts and fines dominate the channel substrate. Suitable salmonid spawning substrate is absent. Elevated water temperatures would be expected during the summer due to the limited riparian habitat. The migration of adult and juvenile salmonid is restricted in Section F by low flows and by the culvert under Higgens Way (#657).

Riparian Characteristics

The riparian habitat in Reach 4 is diverse. See the riparian habitat descriptions for each of the Reach 4 sub-sections above in the *Current Reach Habitat Conditions* section.

Riparian Habitat Observations Associated With Channel Cross Sections		
Channel Cross Section 4a	**Channel Cross Section 4b**	**Channel Cross Section 4c**
Roadside ditch, small trees and shrubs on west side	Heavily modified area, RC and other grasses adjacent to creek	Heavily modified, runoff from airport
Road on east side	Several young and adult trees are set along top of west bank	Mostly grasses with cattails along stream bed

Fish Passage Barriers & Obstacles – Figure 4

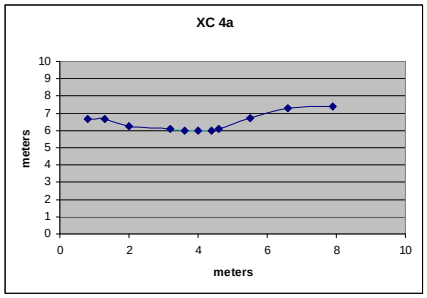
Though WDFW's Salmonscape Database only identifies culvert #354 as a fish passage barrier in Reach 4, culverts #652, #653, #657 and #658 are also barriers to fish passage during low flow

periods. See the fish passage descriptions above in the Current Reach Habitat Conditions section.

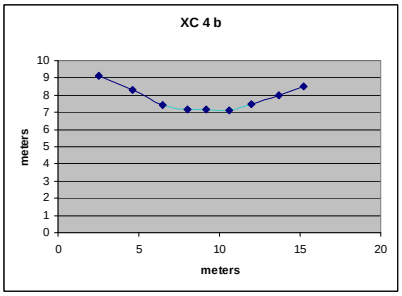
Spawning Habitat
Spawning habitat in Reach 4 is diverse. See the spawning habitat descriptions above in the Current Reach Habitat Conditions section.

Channel Cross Section

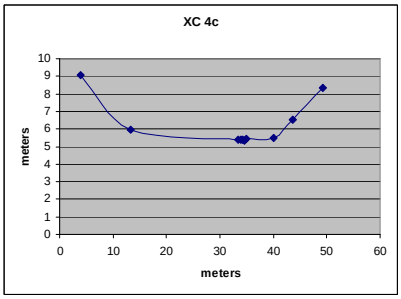
Lower Section



Middle Section



Upper Section



Reach Fish Utilization – Figure 4 and Figure 5
Utilization of Reach 4 is diverse. See the salmonid rearing, migration and spawning descriptions above in the Current Reach Habitat Conditions section.

Reach Fish Habitat Improvement Opportunities – Figure 7

- Enhance fish passage and flood flow conveyance in Reach 4 at and immediately upstream of the confluence with Reach 3.

- Enhance juvenile fish rearing habitat between culvert #662 and culvert #657. Modify the channel profile to provide flood flow conveyance and create a low flow channel. Incorporate LOD into the low flow channel. Enhance the riparian habitat with native plant species along the left bank (south and east).

- Improve fish passage through culverts #652 and #653.
- Improve fish passage through the culvert #654.
- Enhance fish passage and spawning habitat in Reach 4 from culvert #657 north along Higgens-Airport Way to the downstream outfall of the Port of Skagit's stormwater detention ponds. Remove sediment deposits and reed canary grass. Enhance the substrate with suitable gravel materials. Enhance fish passage over the concrete blanket protecting the gas pipeline. Improve fish passage through the culvert #658.

- Enhance the riparian habitat with native plant species along the right bank of the watercourse from culvert #657 north along Airport Way to the Port of Skagit's stormwater detention ponds north of Ovenell Road.

Reach Photographs – Figure 8

B2. Watercourse Reach Prescriptions

The parties to this Drainage Maintenance Agreement, in consultation with SRSC, have cooperatively integrated their respective needs regarding agriculture drainage and fish habitat improvement through the development of "Reach Prescriptions" for each of the four Big Indian Slough reaches. The "Reach Prescriptions" are presented here.

Reach 1 Prescription

Drainage Maintenance:

Dredging

DID #19 dredges this reach approximately every 5 years or as needed. Dredging is conducted from both the right and left banks to maintain a stable shoreline profile.

Channel Out Of Water Mowing

DID #19 mows the right and left banks of this reach from water line to top of bank every year.

Culvert Maintenance

The culverts and tidegates that are owned by the district in this reach are maintained by DID #19 as needed. Debris and logs are removed from the tidegates and culverts as needed. The culverts under SR20 are owned and maintained by WDOT as needed. The culverts under the county roads are owned and maintained by Skagit County as needed.

Pump Facility Maintenance

DID #19 conducts routine maintenance as needed.

Trash Rack

DID #19 conducts routine maintenance of the trash rack at tidegate facility 60 as needed.

Floodgates

DID #19 maintains floodgates #78 and #55 as needed.

Herbicide Spraying

DID #19 does not currently use herbicides to control the channel vegetation in this reach. However, in the future, DID #19 may begin using herbicides annually in this reach to control channel vegetation and to prolong the time interval between maintenance dredging events.

Bridge Maintenance

DID #19 does not own or maintain bridges in this reach.

Beaver Dam Removal

Though beaver dams are typically not a problem in this reach, they are removed by the district as needed.

Tidegates

The district conducts minor repairs of the tidegates at facility 60 as needed. Under the district's Drainage Maintenance Agreement, the district can only conduct minor repair of the tidegates. In the context of the district's Drainage Maintenance Agreement, minor maintenance is defined as the replacement of damaged or worn hinge pins, nuts and bolts necessary to keep the tidegate or floodgate in good operating condition. Minor

maintenance also includes removal of logs and debris to ensure gates are able to open and close properly.

Drainage and Habitat Improvements:

- Remove 10 vertical boards from the existing trash rack at tidegate complex #60 to improve fish passage through the trash rack. A deflector log between the existing concrete dam and trash rack adjacent to the pump station (#61) may need to be installed to reduce floating trash from entering the pump during operation.

Reach 2 Prescription

Drainage Maintenance:

Dredging

DID #19 dredges this reach approximately every 5 years or as needed. Dredging is typically conducted from the right bank though occasionally dredging occurs from the left bank to maintain a stable shoreline profile.

Channel Out Of Water Mowing

DID #19 mows the right and left banks of this reach from water line to top of bank every year.

Channel In-Water Bucket Mowing

DID #19 conducts channel in-water bucket mowing as needed to prolong the time interval between maintenance dredging events.

Culvert Maintenance

The culverts that are owned by the district in this reach are maintained by DID #19 as needed. Debris and logs are removed from the culverts as needed. The culverts under SR20 are owned and maintained by WSDOT as needed. The culverts under the county roads are owned and maintained by Skagit County as needed.

Pump Facility Maintenance

There are no pump facilities in this reach.

Trash Rack

There are no trash racks in this reach.

Floodgates

Floodgate #56 is maintained by the district as needed.

Herbicide Spraying

DID #19 does not currently use herbicides to control the channel vegetation in this reach. However, in the future, DID #19 may begin using herbicides annually in this reach to control channel vegetation and to prolong the time interval between maintenance dredging events.

Bridge Maintenance

DID #19 does not own or maintain bridges in this reach.

Beaver Dam Removal

Though beaver dams are typically not a problem in this reach, they are removed by the district as needed.

Drainage and Habitat Improvements:

- Create a 10-30 foot wide band of riparian habitat along the left bank (south) of Reach 2 west of the Farm To Market Road. Native trees and shrubs would be used to create the riparian habitat. The riparian habitat could be strategically planted (gaps and plant species) to allow equipment access for future maintenance dredging. The toe of the south bank may need to be reshaped before the riparian habitat is planted.

Reach 3 Prescription

Drainage Maintenance:

Dredging

DID #19 dredges this reach approximately every 5 years or as needed. Dredging is conducted from the right bank and left banks to maintain a stable shoreline profile.

Channel Out Of Water Mowing

DID #19 mows the right and left banks of this reach from water line to top of bank every year.

Channel In-Water Bucket Mowing

DID #19 conducts channel in-water bucket mowing as needed to prolong the time interval between maintenance dredging events.

Culvert Maintenance

The culverts that are owned by the district in this reach are maintained by DID #19 as needed. Debris and logs are removed from the culverts as needed. The culverts under SR20 are owned and maintained by WSDOT as needed. The culverts under the county roads are owned and maintained by Skagit County as needed.

Pump Facility Maintenance

There are no pump facilities in this reach.

Trash Rack

There are no trash racks in this reach.

Floodgates

There are no floodgates in this reach.

Herbicide Spraying

DID #19 does not currently use herbicides to control the channel vegetation in this reach. However, in the future, DID #19 may begin using herbicides annually in this reach to control channel vegetation and to prolong the time interval between maintenance dredging events.

Bridge Maintenance

DID #19 does not own or maintain bridges in this reach.

Beaver Dam Removal

Though beaver dams are typically not a problem in this reach, they are removed by the district as needed.

Drainage and Habitat Improvements:

- Create a 10-30 foot band of riparian habitat along the left bank (south side) of the watercourse between bridge #592 and culvert #590. Native trees and shrubs would be used to create the riparian habitat. The riparian habitat could be strategically planted

(gaps and plant species) to allow future equipment access to the channel for maintenance dredging.

- Create a 10-30 wide foot band of riparian habitat along the left bank (south) of the watercourse from bridge #598 to culvert #662. Native trees and shrubs would be used to create the riparian habitat. The riparian habitat could be strategically planted (gaps and plant species) to allow future equipment access to the channel for maintenance dredging.

Reach 4 Prescription

Drainage Maintenance:

Dredging

DID #19 does not conduct maintenance dredging in this reach.

Channel Out Of Water Mowing

DID #19 does not mow the banks along this reach.

Channel In-Water Bucket Mowing

DID #19 does not conducts channel in-water bucket mowing in this reach.

Culvert Maintenance

The culverts in this reach are now owned or maintained by DID #19.

Pump Facility Maintenance

There are no pump facilities in this reach.

Trash Rack

There are no trash racks in this reach.

Floodgates

There are no floodgates in this reach.

Herbicide Spraying

DID #19 does not use herbicides to control the channel vegetation in this reach.

Bridge Maintenance

DID #19 does not own or maintain bridges in this reach.

Beaver Dam Removal

DID #19 does not manage beaver dams in this reach.

Drainage and Habitat Improvements:

- Enhance fish passage and flood flow conveyance in Reach 4 at and immediately upstream of the confluence with Reach 3.

- Enhance juvenile fish rearing habitat between culvert #662 and culvert #657. Modify the channel profile to provide flood flow conveyance and create a low flow channel. Incorporate LOD into the low flow channel. Enhance the riparian habitat with native plant species along the left bank (south and east).

- Improve fish passage through culverts #652 and #653.

- Improve fish passage through the culvert #654.

- Enhance fish passage and spawning habitat in Reach 4 from culvert #657 north along Higgens-Airport Way to the downstream outfall of the Port of Skagit's stormwater detention ponds. Remove sediment deposits and reed canary grass. Enhance the substrate with suitable gravel materials. Enhance fish passage over the concrete blanket protecting the gas pipeline. Improve fish passage through the culvert #658.

- Enhance the riparian habitat with native plant species along the right bank of the watercourse from culvert #657 north along Airport Way to the Port of Skagit's stormwater detention ponds north of Ovenell Road.

B3. Drainage and Habitat Improvement Implementation Measures

Through mutual agreement between the parties to this Drainage Maintenance Agreement and in consultation with SRSC, DID #19 and WDFW commit to achieve the 5- year target goals as specified for each of the drainage and habitat improvement projects described below (Figure 7). Though it is the intent of the parties to work collaboratively for a period of 5 years to achieve the stated 5-year target goals, the parties acknowledge that in some circumstances the successful achievement of the identified target goals may depend of factors outside of the control of the parties. At the end of year 5, it is the intent of the parties to review the progress that has been made towards achieving the identified 5-year target goals and to determine whether sufficient commitment has been made by the parties to justify renewal of the Drainage Maintenance Agreement and General 5-year HPA.

Project 1

Project Description: Telegraph Slough/Lower Higgens Slough - Support a feasibility assessment of the Telegraph Slough/Lower Higgens Slough channel complex that identifies opportunities to restore native marsh habitat, restore tidal connectivity between Padilla Bay and the Swinomish Channel and enhance fish passage.

5-Year Target Goals:

Secure landowner permission in 2008.
Secure feasibility assessment funding in 2009.
Initiate feasibility assessment in 2010.
Continue feasibility assessment in 2011
Complete feasibility assessment in 2012

Timeline: Phase 1 - 2008 to 2012

DID #19 Commitments

- Commits to assist WDFW to make the landowner contacts necessary to implement the feasibility assessment project.
- Commits to support the work of WDFW to secure the funding necessary to implement the feasibility assessment project.
- Commits to support the efforts of WDFW to conduct the feasibility assessment project.

WDFW Commitments:

- Commits to assist DID#19 to make the landowner contacts necessary to implement the feasibility assessment project.
- Commits to work with DID#19 to ensure that the district's interests are represented during the feasibility assessment project.

Project 2

Project Description: Reach 1 - Remove 10 vertical boards from the existing trash rack at tidegate complex #60 to improve fish passage through the trash rack. A deflector log between the existing concrete dam and trash rack adjacent to the pump station (#61) may need to be installed to prevent floating trash from entering the pump during operation.

5-Year Target Goals:

Remove 10 vertical boards from the trash rack - 2008
Evaluate the effectiveness of the trash rack to prevent trash from entering the pump and determine whether additional vertical boards can be removed from the trash rack - 2009
Remove additional vertical boards if feasible – 2010

Timeline: Phase 1 - 2008 to 2012

DID #19 Commitments

- Commits to remove 10 vertical boards from the trash rack in 2008.
- Commits to work with WDFW to evaluate the effectiveness of the trash rack to prevent trash from entering the pump after the vertical boards have been removed.
- Commits to work with WDFW to determine whether additional vertical boards can be removed from the trash rack.
- Commits to remove additional vertical boards from the trash rack if feasible.

WDFW Commitments:

- Commits to support the efforts of DID#19 to remove 10 vertical boards from the trash rack in 2008.
- Commits to work with DID#19 to evaluate the effectiveness of the trash rack to prevent trash from entering the pump after the vertical boards have been removed.
- Commits to work with DID#19 to determine whether additional vertical boards can be removed from the trash rack.
- Commits to support the efforts of DID#19 to remove additional vertical boards from the trash rack if feasible.

Project 3

Project Description: Reach 2 - Create a 10-30 foot wide band of riparian habitat along the left bank (south) of Reach 2 west of the Farm To Market Road. Native trees and shrubs would be used to create the riparian habitat. The riparian habitat could be strategically planted (gaps and plant species) to allow equipment access for future maintenance dredging. The toe of the left bank (south) may need to be reshaped before the riparian habitat is planted.

5-Year Target Goals:
Secure landowner permission in 2010.
Secure project funding in 2011.
Implement project in 2012.

Timeline: Phase 1 - 2008 to 2012

DD#19 Commitments

- Commits to assist WDFW to make the landowner contacts needed for the purpose of securing the ownership of or easements to the land base necessary to implement the project.
- Commits to support the work of WDFW to secure the ownership of or easement to all or part of the land base necessary to implement the project.
- Commits to work with WDFW to develop a preferred project design.
- Commits to support the work of WDFW to secure the funding necessary to implement the project.
- Commits to support the work of WDFW to implement the project.

WDFW Commitments:

- Commits to work with DID #19 to make the landowner contacts needed for the purpose of securing the ownership of or easements to the land base necessary to implement the project.
- Commits to work with DID #19 to secure the ownership of or easement to all or part of the land base necessary to implement the project.
- Commits to work with DID #19 to develop a preferred project design.
- Commits to work with DID #19 to implement the project.

Project 4

Project Description: Reach 3 - Create a 10-30 foot band of riparian habitat along the left bank (south side) of the watercourse between bridge #592 and culvert #590. Native trees and shrubs would be used to create the riparian habitat. The riparian habitat could be strategically planted (gaps and plant species) to allow future equipment access to the channel for maintenance dredging.

5-Year Target Goals: No target goals - Phase 2 project

Timeline: Phase 2 - 2013 to 2017

Project 5

Project Description: Reach 3 - Create a 10-30 wide foot band of riparian habitat along the left bank (south) of the watercourse from bridge #598 to culvert #662. Native trees and shrubs would be used to create the riparian habitat. The riparian habitat could be strategically planted (gaps and plant species) to allow future equipment access to the channel for maintenance dredging.

5-Year Target Goals: No target goals - Phase 2 project

Timeline: Phase 2 - 2013 to 2017

Project 6

Project Description: Reach 4 - Enhance fish passage and flood flow conveyance in Reach 4 at and immediately upstream of the confluence with Reach 3 .

5-Year Target Goals:

Secure landowner permission in 2009.
Secure project funding in 2010.
Implement project in 2011.

Timeline: Phase 1 - 2008 to 2012

DID #19 Commitments

- Commits to assist WDFW to make the landowner contacts needed for the purpose of securing the ownership of or easements to the land base necessary to implement the project.
- Commits to support the work of WDFW to secure the ownership of or easement to all or part of the land base necessary to implement the project.
- Commits to work with WDFW to develop a preferred project design.
- Commits to support the work of WDFW to secure the funding necessary to implement the project.
- Commits to support the work of WDFW to implement the project.

WDFW Commitments:

- Commits to work with DID #19 to make the landowner contacts needed for the purpose of securing the ownership of or easements to the land base necessary to implement the project.
- Commits to work with DID #19 to secure the ownership of or easement to all or part of the land base necessary to implement the project.
- Commits to work with DID #19 to develop a preferred project design.
- Commits to work with DID #19 to implement the project.

Project 7

Project Description: Reach 4 - Enhance juvenile fish rearing habitat between culvert #662 and culvert #657. Modify the channel profile to provide flood flow conveyance and create a low flow channel. Incorporate LOD into the low flow channel. Enhance the riparian habitat with native plant species along the left bank (south and east).

5-Year Target Goals: No target goals - Phase 2 project

Timeline: Phase 2 - 2013 to 2016

Project 8

Project Description: Reach 4 - Improve fish passage through culverts #652 and #653.

5-Year Target Goals:

Secure landowner permission in 2008.
Secure project funding in 2009.
Design and Permits in 2010.
Implement project in 2011.

Timeline: Phase 1 - 2008 to 2012

DID #19 Commitments

- Commits to assist WDFW to make the landowner contacts needed for the purpose of securing the ownership of or easements to the land base necessary to implement the project.
- Commits to support the work of WDFW to secure the ownership of or easement to all or part of the land base necessary to implement the project.
- Commits to work with WDFW to develop a preferred project design.
- Commits to support the work of WDFW to secure the funding necessary to implement the project.
- Commits to support the work of WDFW to implement the project.

WDFW Commitments:

- Commits to work with DID #19 to make the landowner contacts needed for the purpose of securing the ownership of or easements to the land base necessary to implement the project.
- Commits to work with DID #19 to secure the ownership of or easement to all or part of the land base necessary to implement the project.
- Commits to work with DID #19 to develop a preferred project design.
- Commits to work with DID #19 to implement the project.

Project 9

Project Description: Reach 4 - Improve fish passage through the culvert #654.

5-Year Target Goals: No target goals - Phase 2 project

Timeline: Phase 2 - 2013 to 2017

Project 10

Project Description: Reach 4 - Enhance fish passage and spawning habitat in Reach 4 from culvert #657 north along Higgens-Airport Way to the downstream outfall of the Port of Skagit's stormwater detention ponds. Remove sediment deposits and reed canary grass. Enhance the

substrate with suitable gravel materials. Enhance fish passage over the concrete blanket protecting the gas pipeline. Improve fish passage through the culvert #658.

5-Year Target Goals:

Secure landowner permission in 2009.
Secure project funding in 20010.
Design and Permits in 2011.
Implement project in 2012.

Timeline: 2008 to 2012

DID #19 Commitments

- Commits to assist WDFW to make the landowner contacts needed for the purpose of securing the ownership of or easements to the land base necessary to implement the project.
- Commits to support the work of WDFW to secure the ownership of or easement to all or part of the land base necessary to implement the project.
- Commits to work with WDFW to develop a preferred project design.
- Commits to support the work of WDFW to secure the funding necessary to implement the project.
- Commits to support the work of WDFW to implement the project.

WDFW Commitments:

- Commits to work with DID #19 to make the landowner contacts needed for the purpose of securing the ownership of or easements to the land base necessary to implement the project.
- Commits to work with DID #19 to secure the ownership of or easement to all or part of the land base necessary to implement the project.
- Commits to work with DID #19 to develop a preferred project design.
- Commits to work with DID #19 to implement the project.

Project 11

Project Description: Reach 4 - Enhance the riparian habitat with native plant species along the right bank of the watercourse from culvert #657 north along Airport Way to the Port of Skagit's stormwater detention ponds north of Ovenell Road.

5-Year Target Goals: No target goals - Phase 2 project

Timeline: Phase 2 - 2013 to 2017

B4. 5-Year Incremental Maintenance Dredging Strategy

Reach Length Estimates
Reach 1 = .56 miles
Reach 2 = 1.27 miles
Reach 3 = .90 miles
Reach 4 = 1.11 miles
Big Indian Slough Total = 3.84 miles

The parties to the district's Drainage Maintenance Agreement, in consultation with the SRSC, agree that it is necessary to limit the district's maintenance dredging in Big Indian Slough in any give year in order to ensure that sufficient undisturbed habitat is maintained to support the needs of the fish that may be present. The parties also acknowledge that the maintenance dredging conducted by DID #19 is different from the other Skagit County drainage districts that include a Watercourse With Headwaters (green) for the following reasons:

1. Given the ever increasing amount of stormwater discharged to the district's Watercourse With Headwaters (green), DID #19 currently implements their maintenance dredging on a 3 year cycle rather than a 5 year cycle that is typical of the other drainage districts.

2. Reach 4 is approximately 1.11 miles in length and represents approximately 29% of the total length of the district's Watercourse With Headwaters (green). Though Reach 4 is within the jurisdictional boundaries of DID #19 (Figure 6), it primarily conveys drainage from the Port of Skagit County airport properties and non-agriculture lands. As such, DID #19 does not dredge, mow or conduct other drainage maintenance activities along this reach. Consequently, the bed and riparian habitats in and along Reach 4 are not routinely disturbed and are allowed to develop naturally.

The parties to this Drainage Maintenance Agreement, in consultation with the SRSC, agree to the following 5-***Year Incremental Maintenance Dredging Strategy*** for Big Indian Slough. The ***5-Year Incremental Maintenance Dredging Strategy*** for Big Indian Slough takes into account the unique characteristics of the district noted above.

1. Prioritizes the district's maintenance dredging activities.

2. Limits the district's maintenance dredging in any given year to approximately 33% (3-year cycle) of the total length of Big Indian Slough (Reaches 1-4) (Figure 6) minus the length of Reach 4 (3.84 – 1.11) or .90 miles.

3. Limits the district's maintenance dredging in any given year to a total of 3 different sites.

4. Couples the district's authorization to conduct maintenance dredging in any given year to the successful completion of the annual drainage/habitat improvement project benchmarks listed below which are based on the drainage/habitat improvement project priorities established in Section B3 of the district's Drainage Maintenance Plan.

5. Acknowledges that in some circumstances, the successful completion of the annual drainage/habitat improvement project benchmarks listed below are subject to landowner cooperation. For those projects where a landowner critical to a specific drainage/habitat improvement project is unwilling to participate, the annual bench marks listed below will be modified to include the next priority drainage/habitat improvement project established in Section B3 of the district's Drainage Maintenance Plan.

6. Allows .90 miles of maintenance dredging credit for each year that the annual drainage/habitat improvement benchmarks are successfully completed.

7. Allows the district to bank maintenance dredging credit for the successful completion of the annual drainage/habitat improvement benchmarks for a given year in advance of implementing maintenance dredging and allows the banked maintenance dredging credits to be used in future years.

8. Allows the district to extend the total channel length of .90 miles noted above in item 2 that can be dredged in any given year by a maximum distance of 10% or .09 miles (479 feet). Under this scenario, the district can dredge a total of .99 miles or 36% of the total length of Big Indian Slough minus the length of Reach 4 (3.84 – 1.11) in any given year contingent upon the district having successful completed the annual drainage/habitat improvement project benchmarks listed below.

9. Provides that the district will fund the implementation of the salmon removal BMPS required of the district in Addendum A3 of the district's Drainage Maintenance Agreement for all maintenance dredging in excess of ½ mile.

10. Provides that the district's successful completion of the annual drainage/habitat improvement benchmarks will be agreed to by the parties to the district's Drainage Maintenance Agreement, in consultation with SRSC, will be recorded in writing by WDFW and will be included in the *Supplements To The Plan* section of the district's Drainage Maintenance Plan.

11. Provides that the district's maintenance dredging credits will be accounted for in the *Supplements To The Plan* section of the district's Drainage Maintenance Plan and will be reviewed by the parties to the district's Drainage Maintenance Agreement, in consultation with SRSC, during the annual meetings required by Part III (H) of the district's Drainage Maintenance Agreement.

B5. Annual Drainage/Habitat Improvement Project Benchmarks

Year 1 (2008)

1. DID#19 will work with Skagit County Public Works to complete a longitudinal bed elevation survey of Big Indian Slough (Reaches 1, 2, and 3).

2. DID#19 shall use the longitudinal bed elevation survey of Big Indian Slough (Reaches 1, 2, and 3) to identify the district's maintenance dredging priorities.

3. Project #1
Project Description: Telegraph Slough/Lower Higgens Slough - Support a feasibility assessment of the Telegraph Slough/Lower Higgens Slough channel complex that identifies opportunities to restore native marsh habitat, restore tidal connectivity between Padilla Bay and the Swinomish Channel and enhance fish passage.

- Support feasibility assessment.

4. Project #2
Project Description: Remove 10 vertical boards from the existing trash rack at tidegate complex #60 to improve fish passage through the trash rack. A deflector log between the existing concrete dam and trash rack adjacent to the pump station (#61) may need to be installed to reduce floating trash from entering the pump during operation.

- Implement removal of 10 vertical slates.

5. Project #8
Project Description: Improve fish passage through culverts #652 and #653.

- Secure landowner permission.

Year 2 (2009)

1. Project #1
Project Description: Telegraph Slough/Lower Higgens Slough - Support a feasibility assessment of the Telegraph Slough/Lower Higgens Slough channel complex that identifies opportunities to restore native marsh habitat, restore tidal connectivity between Padilla Bay and the Swinomish Channel and enhance fish passage.

- Support feasibility assessment.

2. Project #2
Project Description: Remove 10 vertical boards from the existing trash rack at tidegate complex #60 to improve fish passage through the trash rack. A deflector log between the existing concrete dam and trash rack adjacent to the pump station (#61) may need to be installed to reduce floating trash from entering the pump during operation.

- Evaluate effectiveness of modified trash rack to prevent floating trash from entering the pump and determine if additional vertical boards can be removed.

3. Project #8
Project Description: Improve fish passage through culverts #652 and #653.
- Secure funding.

4. Project #6
Project Description: Enhance fish passage and flood flow conveyance in Reach 4 at and immediately upstream of the confluence with Reach 3.
- Support Feasibility Assessment.

5. Project #10
Project Description: Enhance fish passage and spawning habitat in Reach 4 from culvert #657 north along Higgens-Airport Way to the downstream outfall of the Port of Skagit's stormwater detention ponds. Remove sediment deposits and reed canary grass. Enhance the substrate with suitable gravel materials. Enhance fish passage over the concrete blanket protecting the gas pipeline. Project Description: Reach 4 - Improve fish passage through the culvert #658.
- Secure landowner permission.

Year 3 (2010)
1. Project #1
Project Description: Telegraph Slough/Lower Higgens Slough - Support a feasibility assessment of the Telegraph Slough/Lower Higgens Slough channel complex that identifies opportunities to restore native marsh habitat, restore tidal connectivity between Padilla Bay and the Swinomish Channel and enhance fish passage.
- Support feasibility assessment.

2. Project #2
Project Description: Remove 10 vertical boards from the existing trash rack at tidegate complex #60 to improve fish passage through the trash rack. A deflector log between the existing concrete dam and trash rack adjacent to the pump station (#61) may need to be installed to reduce floating trash from entering the pump during operation.
- Remove additional vertical boards if feasible.

3. Project #8
Project Description: Improve fish passage through culverts #652 and #653.
- Complete project design and secure the necessary permits.

4. Project #6
Project Description: Enhance fish passage and flood flow conveyance in Reach 4 at and immediately upstream of the confluence with Reach 3.
- Secure project funding.

5. Project #10
Project Description: Enhance fish passage and spawning habitat in Reach 4 from culvert #657 north along Higgens-Airport Way to the downstream outfall of the Port of Skagit's stormwater detention ponds. Remove sediment deposits and reed canary grass. Enhance the substrate with suitable gravel materials. Enhance fish passage over the concrete blanket protecting the gas pipeline. Project Description: Reach 4 - Improve fish passage through the culvert #658.

- Secure project funding.

6. Project #3
Project Description: Create a 10-30 foot wide band of riparian habitat along the left bank (south side) of Reach 2 west of the Farm To Market Road. Native trees and shrubs would be used to create the riparian habitat. The riparian habitat could be strategically planted (gaps and plant species) to allow equipment access for future maintenance dredging. The toe of the south bank will need to be removed before the riparian habitat is planted.

- Secure landowner permission.

Year 4 (2011)

1. Project #1
Project Description: Telegraph Slough/Lower Higgens Slough - Support a feasibility assessment of the Telegraph Slough/Lower Higgens Slough channel complex that identifies opportunities to restore native marsh habitat, restore tidal connectivity between Padilla Bay and the Swinomish Channel and enhance fish passage.

- Support feasibility assessment.

2. Project #8
Project Description: Improve fish passage through culverts #652 and #653.

- Implement project.

3. Project #6
Project Description: Enhance fish passage and flood flow conveyance in Reach 4 at and immediately upstream of the confluence with Reach 3.

- Implement project.

4. Project #10
Project Description: Enhance fish passage and spawning habitat in Reach 4 from culvert #657 north along Higgens-Airport Way to the downstream outfall of the Port of Skagit's stormwater detention ponds. Remove sediment deposits and reed canary grass. Enhance the substrate with suitable gravel materials. Enhance fish passage over the concrete blanket protecting the gas pipeline. Project Description: Reach 4 - Improve fish passage through the culvert #658.

- Complete project design and secure project permits.

6. Project #3
Project Description: Create a 10-30 foot wide band of riparian habitat along the left bank (south side) of Reach 2 west of the Farm To Market Road. Native trees and shrubs would be

used to create the riparian habitat. The riparian habitat could be strategically planted (gaps and plant species) to allow equipment access for future maintenance dredging. The toe of the south bank will need to be removed before the riparian habitat is planted.

- Secure project funding.

Year 5 (2012)

1. Project #1

Project Description: Telegraph Slough/Lower Higgens Slough - Support a feasibility assessment of the Telegraph Slough/Higgens Slough Complex that identifies opportunities to restore native marsh habitat, restore tidal connectivity between Padilla Bay and the Swinomish Channel and enhance fish passage.

- Support feasibility assessment.

2. Project #10

Project Description: Enhance fish passage and spawning habitat in Reach 4 from culvert #657 north along Higgens-Airport Way to the downstream outfall of the Port of Skagit's stormwater detention ponds. Remove sediment deposits and reed canary grass. Enhance the substrate with suitable gravel materials. Enhance fish passage over the concrete blanket protecting the gas pipeline. Project Description: Reach 4 - Improve fish passage through the culvert #658.

- Implement project.

3. Project #3

Project Description: Create a 10-30 foot wide band of riparian habitat along the left bank (south side) of Reach 2 west of the Farm To Market Road. Native trees and shrubs would be used to create the riparian habitat. The riparian habitat could be strategically planted (gaps and plant species) to allow equipment access for future maintenance dredging. The toe of the south bank will need to be removed before the riparian habitat is planted.

- Implement project.

C. OTHER ASSESSMENTS WITHIN DID #14

1. House Bill 1418 Report: Tidegates and Intertidal Salmon Habitat in the Skagit Basin, Carol Smith and Ed Manary, 2004.
2. Skagit Chinook Recovery Plan, Skagit River System Cooperative and Washington Department of Fish and Wildlife, 2005.
3. Preliminary Assessment Of Historic Conditions Of The Skagit River In The Fir Island Area: Implications For Salmonid Habitat Restoration, Brian Collins, 1998.
4. Priority Fish and Wildlife Projects Identified by Washington Department of Fish and Wildlife within the Greater Skagit River Ecosystem Planning Area, WDFW, 2002.
5. Application Of The Skagit Watershed Council's Strategy: River Basin Analysis of the Skagit and Samish Basins, Skagit Watershed Council, 1999.
6. Skagit County Baseline Monitoring Project, 2001-2003.
7. Skagit County Bayview Ridge Stormwater Management Assessment.

D. BEST MANAGEMENT PRACTICES - DISTRICT UNIQUE CIRCUMSTANCES

D1. General

DID #19 is typical of a drainage district in Skagit County that includes a Watercourse With Headwaters (green) with the exception noted below. The drainage infrastructure and maintenance activities in DID #19 are typical of the infrastructure and maintenance activities contemplated in the development of the Drainage Maintenance Agreement and the Best Management Practices (Addendum A). Therefore, for the above reasons and consistent with Part III (C) of the Drainage Maintenance Agreement for DID #19, the Best Management Practices identified in Addendum A of the Drainage Maintenance Agreement for Watercourses With Headwaters, Watercourses Without Headwaters, and Artificial Watercourses will apply as written and without modification with only the one following exception.

EXCEPTION: As noted above in Section B4, DID #19 in Big Indian Slough DID #19 currently conducts maintenance dredging in Big Indian Slough (Reaches 1 – 3) on a 3-year cycle rather than a 5 year cycle which is typical of the other Skagit County drainage districts that include a Watercourse With Headwaters (green). The parties to this Drainage Maintenance Agreement, in consultation with the SRSC, have agreed to support the district's 3-year dredging cycle for the following reasons:

- An ever increasing amount of stormwater is being discharged to Big Indian Slough (Reaches 1-4) from Bayview Ridge.

- Reach 4 is approximately 1.11 miles in length and represents approximately 29% of the total length of the district's Watercourse With Headwaters (green). Though Reach 4 is within the jurisdictional boundaries of DID #19 (Figure 6), it primarily conveys drainage from the Port of Skagit County airport properties and non-agriculture lands. As such, DID #19 does not dredge, mow or conduct other drainage maintenance activities along

this reach. Consequently, the bed and riparian habitats in and along Reach 4 are not routinely disturbed and are allowed to develop naturally.

D2. Beaver Dam Management

Best Management Practices (BMPs) for beaver dam management were not included with the BMPs in Addendum A of the Drainage Maintenance Agreement and are therefore included here as part of the Drainage Maintenance Plan. Consistent with Part III – (E) of the Drainage Maintenance Agreement, the following beaver dam management BMPs, where appropriate, will be included in the Hydraulic Project Approval issued for the district's general drainage maintenance activities.

Artificial Watercourses – Yellow

1. TIMING LIMITATIONS: When water is present in the channel, beaver dam removal/modifications below the waterline and within 300 feet of a confluence with a marine water body, natural watercourse or an managed watercourse with headwaters, the removal/modification of beaver a dam will only occur from August 1 through October 15 of any year for the protection of migrating juvenile and adult salmon.

2. The general HPA provisions for Artificial Watercourses (Addendum A) will apply.

3. Work will only be conducted during low flow conditions.

4. Under no circumstances will explosives be used to remove the beaver dam.

5. The beaver dam will be removed or modified gradually to provide for a controlled, slow release of the impounded water.

6. Removal or modification of the beaver dam will be accomplished by hand, with hand tools, winches and/or motorized equipment.

7. The woody materials removed from the beaver dam will be deposited landward of the top of the channel bank.

8. A list of beaver dam removal/modification activities will be included in the district's annual Drainage Maintenance Activity Report as specified in Part III- (H) of the districts Drainage Maintenance Agreement.

Watercourses Without Headwaters – Magenta

1. TIMING LIMITATIONS: When water is present in the channel, beaver dam removal or modification below the waterline and within 300 feet of a confluence with a marine water body, natural watercourse or an managed watercourse with headwaters, the removal or

modification of a beaver dam shall only occur from August 1 through October 15 of any year for the protection of migrating juvenile and adult salmon.

2. When water is present in the channel and the removal or modification of a beaver dam within 300 feet of a confluence with a marine water body, natural watercourse or an managed watercourse with headwaters out side of the above referenced August 1 through October 15 window is necessary, modifications to the provisions below may be required to adequately protect fish.

3. The general HPA Provisions for a Managed Watercourse Without Headwaters (Addendum A) shall apply.

4. Work shall only be conducted during low flow conditions.

5. Under no circumstances shall explosives be used to remove the beaver dam.

6. The beaver dam shall be removed or modified gradually to provide for a controlled, slow release of the impounded water.

7. Removal or modification of the beaver dam may be accomplished by hand, with hand tools, winches and/or motorized equipment.

8. Existing large woody material embedded in the channel bank or streambed shall be left undisturbed and intact.

9. The woody materials removed from the beaver dam shall be deposited landward of the top of the channel bank.

10. The removal of and damage to existing woody stem riparian vegetation within 200 feet of the channel shall be held to the absolute minimum necessary to remove the beaver dam.

11. Beaver dam removal activities within 300 feet of a confluence with a marine water body, natural watercourse or an managed watercourse with headwaters shall be included in the districts' annual Drainage Maintenance Activity Report as specified in Part III- (H) of the districts Drainage Maintenance Agreement. The district's annual record of beaver dam removal or modification activities shall include the following information for each beaver dam site: location, reason for removal/modification, removal/modification start date, removal/modification end date, method of removal/modification, removal/modification problems, future removal/modification recommendations, are beaver dams at the site a reoccurring problem, before and after photographs.

Watercourses With Headwaters – Green

Consistent with Section III – (F) of the district's Drainage Maintenance Agreement, for purposes of implementing the Drainage Maintenance Agreement entered into between WDFW and a District, the goal and intent will be to offset direct and/or indirect impacts to fish and fish habitat by incorporating the following BMP's as conditions associated with a General HPA issued for beaver dam removal.

In those instances where, during the development of the district's Drainage Maintenance Plan, beaver dam removal activities are determined by the Parties, in consultation with SRSC, to warrant the need for additional measures to offset otherwise unavoidable impacts to fish and/or fish habitat, WDFW and the appropriate District's Commissioners will work collaboratively and cooperatively to identify and implement appropriate and acceptable Habitat Improvement Projects. The goals, objectives and obligations necessary to implement the mutually agreed upon habitat improvement projects will be clearly identified in each district's Drainage Maintenance Plan.

1. TIMING LIMITATIONS: When water is present in the channel, the removal or modification of a beaver dam shall only occur from August 1 through October 15 of any year for the protection of migrating juvenile and adult salmon.

2. When water is present in the channel and the removal or modification of a beaver dam out side of the above referenced August 1 through October 15 window is necessary, modifications to the provisions below may be required to adequately protect fish.

3. Additional mitigation, beyond what is specified in the districts Drainage Maintenance Plan, may also be required.

4. A WDFW Area Habitat Biologist shall survey each beaver dam removal or modification site prior to the start of removal or modification activities. A district commissioner shall contact the Skagit County WDFW Area Habitat Biologist (AHB) prior to the start of removal or modification activities to arrange for a WDFW survey of the beaver dam site.

5. The general HPA Provisions for a Managed Watercourse With Headwaters (Addendum A) shall apply.

6. Work shall only be conducted during low stream flow conditions.

7. Under no circumstances shall explosives be used to remove the beaver dam.

8. The beaver dam shall be removed or modified gradually to provide for a controlled, slow release of the impounded water. Removal of the beaver dam shall not exceed 1 foot vertical elevation of the dam during a 24 hour period.

9. Removal or modification of the beaver dam shall primarily be accomplished by hand or

with hand tools, such as shovels, rakes, pitch forks, chain saws, and pevees. Winches may be used to dislodge some of the beaver dam material, provided that the not more than 1 vertical foot of the dam is removed in a 24 hour period as specified above in provision 4.

10. Equipment may be used to remove the beaver dam provided that the not more than 1 vertical foot of the dam is removed in a 24 hour period as specified above in provision 4. Equipment shall only be operated from the top of the channel bank. Equipment shall not cross the channel.

11. Large wordy material 6 feet or longer and 4 inches or greater in diameter embedded in the channel bank or streambed shall be left undisturbed and intact.

12. As determined during the WDFW site survey specified in provision 3, large woody material 6 feet or longer and 4 inches or greater in diameter shall either be placed or anchored in the channel to provide stable, functional fish habitat or shall be set aside in a secure location for use in future habitat improvement projects.

13. The smaller limbs and woody materials removed from the beaver dam shall be deposited landward of the top of the channel bank.

14. The removal of and damage to existing woody stem riparian vegetation within 200 feet of the channel shall be held to the absolute minimum necessary to remove the beaver dam.

15. Existing woody stem riparian vegetation within 200 feet of the channel that is removed or damaged during removal of the beaver dam shall be replaced with native species during the spring or fall immediately following beaver dam removal.

16. For reoccurring or persistent beaver dams, the district shall work with WDFW to investigate the merits of installing a flexible leveler or beaver deceiver.

17. All beaver dam removal or modification activities shall be included in the district' annual Drainage Maintenance Activity Report as specified in Part III- (H) of the district's Drainage Maintenance Agreement. The district's annual record of beaver dam removal or modification activities shall include the following information for each beaver dam site: location, reason for removal/modification, date of site survey with WDFW, removal/modification start date, removal/modification end date, method of removal/modification, removal/modification problems, future removal/modification recommendations, are beaver dams at the site a reoccurring problem, before and after photographs.

18. An individual Hydraulic Project Approval shall be required for beaver dam removal or modification activities within the boundaries of the wetland creation/enhancement, estuary creation/enhancement, alluvial fan creation/enhancement and side channel

creation/enhancement projects identified in the Drainage and Habitat Improvement Implementation Measures section (B3) of the district's Drainage Maintenance Plan.

D3. Pumps

For the purpose of this Drainage Maintenance Plan, fish bearing waters shall be defined as any part of a natural watercourse, marine water body, managed watercourse with headwaters (green) and that part of a managed watercourse without headwaters (magenta) or artificial watercourse (yellow) that is within 300 feet of a functioning tidegate or floodgate confluence with a natural watercourse, marine water body or managed watercourse with headwaters (green).

Surface water pumps in fish bearing waters as defined above shall be fitted with a screen or otherwise be approved by WDFW per RCW 77.55.040, 77.55.070, 77.55.310 and 77.55.320. Within five years from the effective date of the Drainage Maintenance Agreement, incorporating the provisions of this Drainage Maintenance Plan, each pump facility in fish bearing waters as defined above that is owned, operated and maintained by DID #16 shall be in compliance with the pump screening provisions stipulated in the General Hydraulic Project Approval (GHPA) issued to the district specific to the Drainage Maintenance Agreement and this Drainage Maintenance Plan.

In the event that the established pump screen criteria cannot be met, the Drainage Maintenance Plan shall be modified within 5 years from the effective date of the district's Drainage Maintenance Agreement to identify a mutually acceptable alternative technology that meets or exceeds these criteria and a mutually acceptable strategy and timeline for implementation.

E. HYDRAULIC PROJECT APPROVALS - COMPLIANCE

DID #19 is bound to comply with the provisions and conditions of any and all Hydraulic Project Approvals (HPA's) issued pursuant to this Agreement. Failure to do so can result in revocation of the General Hydraulic Project Approval (GHPA) and may result in other penalties as provided by law. In the event a General Five-Year HPA issued pursuant to this Agreement is revoked or rescinded, DID #19 will henceforth be required to secure a individual site and/or project specific HPA for each drainage maintenance activity that will occur below the ordinary high water line in watercourses (other than those that are wholly artificial) within the legally established boundaries of the District. Unavoidable impacts to fish and fish habitat occurring as a result of these individually permitted activities will be mitigated on a case-by-case basis.