

San Juan River Watershed: Fish Passage Assessments - January 2011

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**San Juan River Watershed: Fish Passage Assessments
Project No. 4031504**



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Strait of Georgia Business Area
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Executive Summary

The San Juan River watershed, managed by BC Timber Sales, Timber West Forest Corp. and Teal Cedar Products Ltd., was identified as a candidate watershed for fish passage assessment funding through the Forest Investment Account (FIA). M. C. Wright & Associates Ltd. conducted fish passage assessments throughout the watershed from July 23rd to December 17th, 2010. Mainlines and major branch roads including Hemmingsen Creek Mainline, Harris Creek Mainline, Lens Creek Mainline, Fleet River Mainline, and Granite (Renfrew) Creek Mainline were targeted first for field assessment followed by accessible spurs and then deactivated roads. A total of 987 crossings were visited; 953 crossings did not qualify for full assessments and 34 were fully assessed. Of the 953 non-assessed crossings, 136 were open-bottomed structures (bridges, wooden box culverts, etc.) and 817 were closed bottom structures (cross-drains, round culverts with no fish habitat, etc.). UTM and photographic data were collected for all structures visited.

Of the 34 assessed crossings, 32 were determined, using scoring criteria, to be barriers or potential barriers to fish passage and proposed solutions were developed for each site. Habitat gained index (HGI), channel gradient (>20%) and the potential existence of downstream crossing barriers were used to eliminate 18 crossings from the immediate candidate list for restoration. For the 16 crossings recommended as candidates for restoration two replacement options were provided for each crossing, with pricing calculation estimates based upon span and price per unit for each replacement structure. Also, the recommended crossings were put through a cost benefit analysis and given a priority rating between 1 and 3 based on habitat value upstream (high to low respectively). One priority 1 site was identified, followed by 11 priority 2 sites and 4 priority 3 sites.

1.0 Introduction

The San Juan River watershed, managed under Pacific TSA/TFL 46 by BC Timber Sales, and Teal Cedar Products Ltd., and private lands by Timber West Forest Corp. was identified as a candidate watershed for fish-passage assessment funding through the Forest Investment Account (FIA). Funding was provided to BC Timber Sales to assess fish passage barriers throughout the watershed. The funding for this initiative was used to target closed-bottomed structures (CBS), and identify which structures were potential fish barriers and qualify for future restoration/replacement.

1.1 Background

The San Juan River watershed is valued both commercially for timber and for conservation of plant, bird, fish species and their associated habitats. The region, located east of Port Renfrew, on Vancouver Island (see Map 1) covers an area of roughly 646, 910 km² and includes a number of small lakes, the San Juan River and several of its major tributaries. The watershed has been logged extensively since the mid to late 1950s, most of which concentrated along the bottoms of the San Juan and Harris valleys, to an extent of roughly 25% in the 1980s (NHC, 1994). Sport fisheries in the area saw a decline in the mid 1980s likely due to habitat degradation resulting from increased sediment production from roads and clear-cut blocks (NHC, 1994). The potential exists that fish passage barriers have been created, either directly or indirectly through infrastructure development in the watershed.

There are two main ecological reserves in the watershed: the San Juan River Estuary Ecological Reserve and the San Juan Ridge Ecological Reserve. The San Juan River Estuary Ecological Reserve, located at the mouth of the San Juan River, was established in 1996 and serves as a benchmark for forest research and protects early seral flood plain communities especially the tooth-leaved monkey flower, *Mimulus dentatus* (BC MoE, 2003b). The San Juan Ridge Ecological Reserve, established in 1977, drains primarily into Three Arms Creek and serves to protect rare and isolated populations of the white glacier lily, *Erythronium montanum*, sub-alpine mountain hemlock vegetation and sub-alpine wetlands (BC MoE, 2003a). The reserves are also valued for providing habitat to local wildlife including: black bears, river otters, elk and deer. Although there is limited knowledge of the cultural values of these reserves, it is known that the area is home to the Pacheedaht First Nations who have been involved in many projects within the watershed.

Fish species that utilize the San Juan River and have access to its tributaries include resident and anadromous coastal cutthroat trout (*Oncorhynchus clarki*), brook trout (*Salvelinus fontinalis*), rainbow and steelhead trout (*Oncorhynchus mykiss*), chinook (*Oncorhynchus tshawytscha*), coho (*Oncorhynchus kisutch*), pink (*Oncorhynchus gorbuscha*), sockeye (*Oncorhynchus nerka*) and chum (*Oncorhynchus keta*) salmon, as well as various species of sculpins and lampreys (FISS data - BC MoE, 2011). Three Arm River located in the east of the watershed is known to contain an abundant, isolated population of Dolly Varden (*Salmo Malma*) (MC Wright, 2007; H.Dunn, pers. comm. September 5th, 2007).

1.2 Study Area

The San Juan River culvert assessments took place in mostly the western half of the San Juan River Watershed, with an emphasis on well-established roads along known fish bearing waterways. Geo-referenced digitized map data of the region and background ecological studies/reports were referenced to plan and establish target assessment areas within the watershed. In the initial stages of the project, private lands were excluded from the field assessments. For this reason, some crossings within the Gordon watershed were assessed following completion of all priority areas within the San Juan. Once all San Juan priority areas were completed (excluding private lands), the scope of the project was widened to include all crossings within the San Juan watershed regardless of ownerships or jurisdiction (Price Waterhouse Coopers, 2010).

The San Juan River and its main tributaries were targeted first, including: Hemmingsen Creek, Harris Creek, Lens Creek, Fleet River, and Granite (Renfrew) Creek. Branch roads and spurs were assessed where slope gradients were <30% and vehicle access was possible. Deactivated roads in low gradient areas were attempted to the best of ability.

1.3 Scope

The scope of the San Juan River watershed fish-passage barrier determination project includes:

- GPS locations for all structures (including open-bottomed, and cross drain CBS structures) and corresponding GIS map points.
- Quick functionality assessment and photo record of all non-assessed structures.
- Full assessment of all qualifying closed-bottomed structures.
- Habitat Gained Index assigned or estimated for each fully assessed structure.
- Production of a prioritized list of fully assessed structures based on fish passage barrier status.
- Recommended treatments for restoration of fully assessed structures.
- Cost-benefit analysis for each recommended treatment.

1.4 Assumptions

The following assumptions have been made in the planning, field data collection, and analysis phases of the culvert assessment project in the San Juan River watershed.

1. It is assumed that the GIS map layers (i.e., fish-observed crossings, fish-inferred crossings, road layers, fish value TRIM clips, etc.) provided for the planning and data collection phases of the project by the client, BC Timber Sales, and obtained from various sources including the BC Ministry of Environment are reasonably accurate and up to date. These map layers have been used to navigate field crews and determine priority assessment areas of the watershed as well as to assign replacement priority scores to candidate closed-bottomed structures.
2. It is assumed that the methods outlined in BC MOE 2009b for determining fish passage barriers are reasonably accurate and effective for assessing and prioritizing the replacement or removal of candidate closed-bottomed structures.
3. It is assumed that the prescription phase of the project will involve further assessment of the habitat upstream and downstream of any candidate crossing to determine whether

natural fish barriers exist and how much upstream quality habitat could be made available (which could potentially affect the priority of the candidate crossing).

4. It is assumed that there are more crossing structures in the San Juan watershed than were recorded during the data collection phase of the project. As well, condition or degradation of structures, dense vegetation/infilling of relic channels, presence of wind throw and/or cut block debris may have resulted in some structures (i.e., cross-drains, wood box culverts and other non-candidate structures) having eluded detection along assessed roads.
5. It is assumed that the existing state of channel crossings identified in the field supersedes GIS map layer data. Tributaries appearing on GIS map layers that were not detected during the data collection phase may have changed course or structure, particularly through recent cut blocks, and may no longer exist. Similarly, some crossings were detected in the field that did not exist in the map layer data. Assessments were based upon condition and the presence/absence of defined surface flow at the time that each crossing was inspected.

1.5 Limitations

A number of limitations exist within the scope of the project. Access to some roads was limited at the time of the assessments; due to deactivation, overgrowth, locked gates, bridges out and active use for logging. These areas are discussed further in section 5.0.

The data collected for each crossing during phase two of the project reflects the condition and state of each crossing at the time of collection. Natural storm events, road upgrades or works performed after assessments were completed may have altered roads, crossings and/or structural conditions at any of the crossings examined (both assessed and non-assessed). The priority of replacement and/or removal of structures at any of the assessed crossings are subject to review and/or changes, during the implementation phase of the project. Data collection methods, recommendations and conclusions are confined within the parameters described by governing agencies, the project scope and professional judgment.

1.6 Project Schedule

The planning phase of the project included a reconnaissance trip to the watershed on July 19, 2010. Planning activities also included: preparing field maps for target areas of the watershed, field assessment work plans, briefing field teams and packing required field gear. Planning activities were executed prior to each field visit until the last field visit on Dec. 17, 2010. Data entry and analysis formed a large component of the project, due to the large number of crossings and the specified template submission requirements for data and photos (BC MOE 2009a).

2.0 Methods

The methods used throughout the project followed the format outlined in the document *Protocol for Planning and Prioritizing Culverted Sites for Fish Passage Assessment and Remediation* and *Fish Passage – Culvert Inspection Procedures* (BC MoE, 2009c and Parker, 2000). The

multi-phase approach was used to structure the culvert assessments into three phases: Planning, Data Collection and Analysis.

2.1 Phase 1: Planning

GIS data with road, stream and contour layers for the San Juan River region were acquired from BC Timber Sales. Crossing locations, observed fish presence, inferred fish presence and unlikely fish presence map layers were provided by the BC Ministry of Environment. Sections of the watershed were prioritized for assessment based upon available digitized map data.

Maps scaled to 1:20,000 were created in Arc GIS to magnify sections of the watershed and highlight areas of greater significance for assessment. Higher priority areas demonstrated high concentrations of road/stream crossings, crossings with known fish presence, high quality and quantity of habitat to be gained and continued future access plans for roads.

A reconnaissance trip was conducted to examine crossings along Bear Creek, Three Rivers Arm Creek and Lens Creek mainlines on July 19, 2009. The trip revealed a much greater number of crossings than the digitized map data revealed. Most of the additional crossings not indicated in digital maps were closed-bottom culverts functioning as drainage ditch connectors (cross-drains) between opposite sides of the road. Of the additional structures discovered, some of the structures were associated with a channel that could be utilized by fish. For planning purposes, it was presumed that other mainline roads also had a greater number of crossings than indicated in maps.

2.1.1 Priority of Assessment

Based upon the map data provided and available funding, efforts were made to address crossings at streams with the strongest likelihood of fish presence first. In order to maximize efficiency, the criteria outlined in Table 1 were used to select sections of the San Juan River watershed sequentially for assessment. Once priority areas were completed, spurs and branches lower in priority were assessed.

Table 1. Phase 1 Planning Criteria Used to Prioritize Watershed Roads for Assessment.

Criterion	Rationale
Regions with a high density per unit area of crossings at fish-confirmed or fish-inferred streams. (Generally these intersected mainline roads).	Reduced travel time between crossings; allowed for a greater number of assessments to be conducted per day.
Regions estimated by map contour lines (or field observation) to have low to moderate topographical barriers <i>and</i> recorded fish-confirmed or fish-inferred streams.	Steep changes in topography (>30% gradients) were considered lower priority due to the reduced likelihood of fish access to the crossing and reduced quality of upstream habitat.
Regions in close proximity to the San Juan River or its main tributaries.	The likelihood of fish presence in a channel is higher at crossings nearest the mainstem.

2.2 Phase 2: Data Collection

Culvert assessments were conducted over 20 field days from July 23rd to December 17th 2010 with 1-2 field crews. Accessible sites were visited systematically along each mainline and crossings that had some potential for fish-bearing status were fully assessed. Crossings were assessed based upon current standards and prescribed guidelines outlined in the following documents:

- *Data Submission Standards for Closed Bottom Culvert Assessment Projects 2009-10* (BC MoE, 2009a)
- *Field Assessment for Fish Passage Determination of Closed Bottomed Structures* (BC MoE, 2009b)
- *Protocol for Planning and Prioritizing Culverted Sites for Fish Passage Assessment and Remediation* (BC MoE, 2009c)
- *Fish Passage – Culvert Inspection Procedures* (Parker, 2000)
- *Fish Stream Identification Guidebook: Second Edition Version 2.1 – Forest Practices Code of BC* (MFR, 1998)

Figure 1 demonstrates the general approach that was used.

Non-qualifying structures were defined as follows:

1. Bridges – Open bottom structure; does not qualify for full assessment.
2. Wood Box Culverts (WBC) - Open bottom structure; does not qualify for full assessment.
3. Other Open-Bottomed Structures (CBC- Cement Box Culvert) - Open bottom structure; does not qualify for full assessment.
4. Cross-Drains (XD) – Closed bottom culvert (CBS) structure. Typically these structures connect drainage ditches on opposite sides of the road. The default classification for non-candidate CBS structures (Figure 1 – Rationale for candidate crossings selection).

2.2.1 Numbering System

Unique crossing numbers were assigned to each crossing. Crossings were coded with the watershed abbreviation, mainline abbreviation and an additional sequential 3 or 4-digit numeric code. Some exceptions apply where road signs and/or codes did not match GIS map layer road codes or where adjustments were made during data correction and analysis.

2.2.2 Geo-referencing

All structures were geo-referenced using a Trimble ProXR GPS unit with a roof-mounted antenna. (UTM zone 10N; NAD83)

2.2.3 Culvert and Stream Parameters

All crossing parameters were measured and pictures were taken according to MoE guidelines (2009b) and submission standards (MoE, 2009a). Culvert measurements were taken with a tape measure and slopes and gradients were determined using rod and level in most cases. In extremely steep channels a clinometer was used to determine slope gradient. In some cases access downstream was limited and elevations of the downstream bed were taken at 3 m instead of the recommended 6 m.

2.2.4 Determination of Habitat Value for Fish

Habitat quality was determined by examining several parameters at each crossing in conjunction with methods outlined in the guidelines (BC MoE 2009b). Gradient, flow, channel width, bed material composition, presence of features such as LWD, cut banks, pools, riparian vegetation, etc. were considered when assessing quality of habitat. High and moderate quality sites generally had a number of the above-mentioned features present while low (or marginal) quality sites were generally higher in gradient, low-flow or relic channels that were aggraded and/or dry at the time of the assessments. Table 2 provides an outline of the MoE criteria used to determine upstream habitat quality. Professional judgment was used in determination of habitat value.

Table 2: MoE Criteria for determination of upstream habitat quality.

	Fish Habitat Criteria
High	The presence of high-value spawning or rearing habitat (e.g. locations with abundance of suitably sized gravels deep pools, undercut banks, or stable debris, which are critical to the fish population downstream of the subject crossing
Moderate	Important migration corridor Presence of suitable spawning habitat Habitat with moderate rearing potential for the fish species present
Low	The absence of suitable spawning habitat, and habitat with low rearing potential (e.g. locations with distinct absence of deep pools, undercut banks, or stable debris, and with little or no suitably sized spawning gravels for the fish species present

2.3 Phase 3: Data Analysis

Crossing codes and photographs were correlated for all crossings (both assessed and non-assessed crossings). Digital map layers were created for all crossings after compiling and editing GPS data. Map layers were added to the pre-existing digital data for spatial comparison and correlation. Data from assessed structures were evaluated to determine fish passage barrier scores as outlined in MoE, 2009b (Table 5 and Appendix 3). The potential fish habitat to be gained upstream of each crossing was determined from pre-existing MoE data or estimated (Section 2.3.1) and crossings were given priority of remediation (Section 2.3.2). For those that were recommended for replacement individual prescriptions were developed and a cost-benefit analysis performed (Tables 7 and 9).

2.3.1 Habitat Gained Index (HGI)

For each of the assessed crossings, a habitat gained index (HGI) was determined from the pre-existing digitized GIS map data provided by MoE. Map layers provided fish-bearing status of tributary and road intersections as fish-observed, fish-inferred or fish-unlikely. Numerous

assessed crossings did not have a corresponding HGI value because they failed to correlate with the existing map data or the map base showed a null value; in such cases an estimation method was used to calculate a HGI value. Methods for determination of HGI are outlined in Table 3.

Table 3. Determination of Habitat Gained Index for Assessed Crossings

Correlation Between Crossing Spatial Location and Digital GIS Map Data	Habitat Gained Index Obtained From
Crossing location matched existing map data	HGI provided in existing map data (or estimated where null values existed)
Crossing location fell within 30 m of a crossing on existing map data	HGI obtained from existing map data (nearest crossing within 30 m radius was used)
Crossing associated with a tributary on existing map but fish-bearing status absent	HGI obtained by measuring distance upstream on digitized map (to gradient of 30%)
Crossing not associated with any water body on existing map	HGI obtained by measuring distance upstream (to gradient of 30%) on digitized map following map contours to estimate the stream path

2.3.2 Selection of Recommended Crossings for Replacement

Crossings were recommended for restoration were identified and separated from the NR-designated crossings. Crossings were recommended if habitat value upstream was high or HGI was greater than 100 m, there are no downstream crossings and channel slope is less than 20%. Where habitat value appeared very unsuitable for fish habitat, HGI was less than 100 m, potential downstream crossings exist, or the channel gradient was 20% or greater, crossings were designated NR (no action recommended) until further investigation can provide the data necessary to support the need for restorative action at the crossing in question (see Table 8).

Two options for restoration were then provided for each crossing that was recommended for replacement with pricing calculations based on span and price per unit for each replacement structure.

The downstream crossings of certain NR structures were found to be good, working, open bottom structures and therefore posed no barrier to fish passage. In such cases, HGIs obtained from the Culvert/Fish Passage Upstream Model were not altered, however, upon further review it was determined that some of these structures should be recommended for restoration as the listed downstream crossings do not pose barriers to fish passage. These recommended structures are discussed in Section 6.0.

Candidate crossings recommended for restoration were then assigned a priority of 1-3, based upon habitat quality. High, medium and low quality habitat values were scored as priority 1, 2 and 3, respectively. Cost benefit analyses were conducted for each candidate crossing.

3.0 Results

All data for assessed crossings are summarized and detailed in Appendix 1. Appendix 2 contains a list of non-assessed structures by crossing code with type and UTM data as required

by BC MoE (Parker, 2000). Digital photos were taken at each crossing and named by crossing code.

The total number of crossings visited was 987. In total, 953 sites were not considered candidates for full assessments (Table 4 provides a breakdown of structures). Thirty four crossings were closed-bottomed structures that qualified for full assessments. Sixteen of those were further recommended for restoration.

Table 4. Summary of All Crossings Visited and Mapped in the San Juan River Watershed

Crossing Type	Total No. Identified
Full Assessment	
Closed-Bottomed Structures (RC)	34
OBS or Not Assessed	
Bridges	67
Cement Box Culvert (CBC)	1
Wood Box Culvert (WBC)	68
Cross-Drain (RC)	817
Total Sites Visited	987

3.1 Fish Barrier Scores and Habitat Gained Results

Fish barrier calculations revealed that of the 34 crossings assessed, 2 crossings were found to be passable to fish (SJ-HCM-0088 and SJ-RED-5007) and the 32 remaining structures were barriers or potential barriers to fish passage. Detailed barrier score calculations are located in Appendix 3. Habitat gained was estimated or obtained from pre-existing digitized map data and summarized with fish barrier scores and habitat value (Table 5). Upstream habitat gained ranged from 25 to 2055 m.

Table 5. Fish Barrier Score, HGI and Habitat Value Results for all Assessed Crossings

No.	Cross ID	Barrier Score	Result	Habitat Value	Habitat Gained Index (m)
1	SJ-CAM-3086	31	Barrier	Low	47
2	SJ-FLT-0050	36	Barrier	Moderate	379
3	SJ-FLT-0058	39	Barrier	Low	110
4	SJ-GRA-364	36	Barrier	Low	64
5	SJ-HCM-0003	26	Barrier	Moderate	100
6	SJ-HCM-0004	24	Barrier	Moderate	140
7	SJ-HCM-0019	24	Barrier	Low	40
8	SJ-HCM-0022	16	Potential Barrier	Moderate	539
9	SJ-HCM-0075	29	Barrier	Moderate	200
10	SJ-HCM-0078	29	Barrier	Moderate	197.5
11	SJ-HCM-0088	11	Passable	Low	70
12	SJ-HCM-0092	24	Barrier	Moderate	107
13	SJ-HCM-0109	29	Barrier	Moderate	30
14	SJ-HCM-0111	26	Barrier	Low	65
15	SJ-HCM-0116	36	Barrier	High	166.5
16	SJ-HCM-1025	31	Barrier	Moderate	90
17	SJ-HEM-271	36	Barrier	Low	123
18	SJ-HEM-340	26	Barrier	Low	152.5
19	SJ-LEN-065	36	Barrier	Low	55
20	SJ-LEN-3055	16	Potential Barrier	Moderate	2055
21	SJ-LEN-4010	20	Barrier	Low	25
22	SJ-LEN-4018	16	Potential Barrier	Low	25
23	SJ-LEN-4035	26	Barrier	Low	118
24	SJ-MCB-0006	26	Barrier	Moderate	358
25	SJ-RED-5001	36	Barrier	Moderate	500
26	SJ-RED-5004	29	Barrier	Moderate	75
27	SJ-RED-5007	10	Passable	Low	225
28	SJ-RED-5008	21	Barrier	Low	200
29	SJ-RED-5009	26	Barrier	Moderate	115
30	SJ-RED-5010	23	Barrier	Low	65
31	SJ-RED-5012	26	Barrier	Low	85
32	SJ-RED-5013	26	Barrier	Moderate	250
33	SJ-RED-5015	31	Barrier	Low	300
34	SJ-TAC-005	31	Barrier	Low	51

3.2 Restoration Prescriptions and Selection Criteria for Recommendations

Prescriptions were developed for each of the 34 assessed crossings, using cost estimates derived from various sources and approved by BCTS (Table 6). Structure spans and prices were estimated, and will likely require further assessment with a biologist and a Professional Engineer for approval prior to crossing restoration.

Table 6. Pricing and Cost Summary for Restorations

Structure or Treatment	Est. Cost (\$K per m)	Notes/Considerations
Arch Culvert	6.0	Open bottom culvert; does not include concrete footings. Depth of road fill and required span will influence cost.
Permanent Bridge (Composite Steel)	7.6	(Priced from BCTS)
Permanent Slab Bridge	9.4	Non-Composite slab girder bridge. Recommended for permanent crossings 10m and under. Spans exceeding 10m can increase cost significantly. (Priced from BCTS)
Portable Steel Bridge	7.2	Does not include installation. Recommended as an alternative to removal where road deactivations are planned in the future. (Priced from BCTS)
Streambed Simulation CSP	4.45-5.10	Cost estimated based on a modified 3300 mm Embedded Culvert.
Removal	0.5	Recommended for deactivated roads.

Prices are estimates based on 2009-2010 rates and are subject to change. The intent of this table is to provide a crude estimate for each treatment type. Actual costs should be confirmed prior to restoration. Costs will vary between sites. Prices from BCTS were obtained by personal communication with Steve Williams, Engineering Technician, November 29, 2010.

Crossings that are recommended for restoration are listed alphabetically in Table 7. Map locations are provided with the cost benefit results (Table 9.) Crossings that were designated NR are listed alphabetically in Table 8 with corresponding site-specific rationale for the NR designation. Two restoration options were provided for each recommended crossing; an attempt was made to give a broad range of pricing/restoration options for each. As a general rule, moderate and high-value fish habitat were not prescribed closed-bottomed structures (MFR, 1998). Figure 2 provides a broad rationale for structure selection.

Though non-recommended crossings will require additional data prior to being considered for restoration, they were tabulated and presented in Table 8 in the event that additional data becomes available for HGI score, fish presence or downstream crossing status (potentially opening upstream fish access to one of the candidate crossings).

Table 7. Prescriptions for Recommended Priority 1-3 Candidate Crossings.

Cross ID	Habitat Value	Priority	GIS info HGI (m)	Est. Habitat Gained (m)	SWR	DS slope gradient (%)	DS Bankfull Width (Wb) (m)	Road Depth of Fill (DOF) (m)	Est. Existing Structure Span (m)	Option 1	Est. Cost (\$K/m)	Units Required (m)	Total Cost (\$K)	Option 2	Est. Cost (\$K/m)	Units Required (m)	Total Cost (\$K)	Rationale
SJ-HCM-0003	Moderate	2		100	6.83	1.9	4.1	0.75	14	Permanent Bridge (Composite Steel)	7.6	12	91.20	Permanent Slab Bridge	9.4	12	112.80	Gradient < 4%, Wb > 4m
SJ-HCM-0004	Moderate	2		140	2.50	3.3	4.0	0.75	15	Permanent Bridge (Composite Steel)	7.6	12	91.20	Permanent Slab Bridge	9.4	12	112.80	Gradient < 4%, crossing is on main highway
SJ-HCM-0022	Moderate	2	539		10.00	4.2	9.0	1.50	13.5	Permanent Bridge (Composite Steel)	7.6	15	114.00	Permanent Slab Bridge	9.4	15	141.00	Gradient > 4%
SJ-HCM-0075	Moderate	2		200*	3.75	1.5	3.0	0.50	15	Permanent Slab Bridge	9.4	9	84.60	Arch Culvert	6.0	15	90.00	Crossing is on main highway
SJ-HCM-0078	Moderate	2	197.5*		3.75	4.1	3.0	3.00	16	Permanent Bridge (Composite Steel)	7.6	16	121.60	Permanent Bridge (Composite Steel)	7.6	16	121.60	Gradient > 4%
SJ-HCM-0092	Moderate	2	107*		2.00	9.7	2.0	2.00	16	Permanent Bridge (Composite Steel)	7.6	14	106.40	Permanent Slab Bridge	9.4	14	112.80	Gradient > 4%
SJ-HCM-0111	Low	3		65	2.86	5.8	2.0	1.00	12	Permanent Bridge (Composite Steel)	7.6	14	106.40	Permanent Slab Bridge	9.4	14	112.80	Gradient > 4%
SJ-HCM-0116	High	1	166.5*		2.67	8.1	5.3	1.75	12	Permanent Bridge (Composite Steel)	7.6	12	91.20	Permanent Slab Bridge	9.4	12	112.80	Gradient > 4%
SJ-LEN-3055	Moderate	2	2055*		1.50	11.5	3.0	1.00	11	Permanent Bridge (Composite Steel)	7.6	12	75.20	Permanent Slab Bridge	9.4	12	112.80	Gradient > 4%
SJ-LEN-4035	Low	3	118*		1.67	17.0	1.5	1.50	8	Permanent Slab Bridge	9.4	8	75.20	Permanent Bridge (Composite Steel)	7.6	8	60.80	Gradient > 4%
SJ-RED-5001	Moderate	2		500	18.50	10.0	15	1.50	11	Removal**	0.5	11	5.50	Portable Steel Bridge	7.2	24	172.80	Road appears overgrown and unused
SJ-RED-5004	Moderate	2		75	1.94	3.1	1.2	2.00	16	Removal**	0.5	16	8.00	Portable Steel Bridge	7.2	8	57.60	Road appears overgrown and unused
SJ-RED-5008	Low	3		200	0.97	6.1	2.0	3.00	12	Removal**	0.5	12	6.00	Portable Steel Bridge	7.2	8	57.60	Road appears overgrown and unused
SJ-RED-5009	Moderate	2		115	1.43	7.7	2.0	3.00	14	Removal**	0.5	14	7.00	Portable Steel Bridge	7.2	8	57.60	Road appears overgrown and unused
SJ-RED-5013	Moderate	2		250	2.50	0.9	2.0	1.50	11	Removal**	0.5	11	5.50	Portable Steel Bridge	7.2	8	57.60	Road appears overgrown and unused
SJ-RED-5015	Low	3		300	1.43	5.1	2.0	0.50	14	Removal**	0.5	14	7.00	Portable Steel Bridge	7.2	8	57.60	Road appears overgrown and unused
	Habitat Gained was approximated if HGI and/or crossing data did not exist in 2010 GIS map layers - further investigation required prior to considering replacement action.																	

* Careful review of model provided indicates the number of crossings downstream is inaccurate and so these numbers have been decreased from that given by GIS to include the missing crossings.

** Removal suggested only if road is to be deactivated.

Table 8. Non-Recommended (NR) Crossings and Rationale.

Cross ID	Priority	Habitat Value	GIS info HGI (m)	Est. Habitat Gained (m)	Potential DS crossings	SWR	DS slope gradient (%)	DS Bankfull Width (Wb) (m)	Road Depth of Fill (DOF) (m)	Est. Existing Structure Span (m)	Rationale
SJ-CAM-3086	NR	Low	47		0	3.10	12	3.1	1.5	12.0	Low HGI
SJ-FLT-0050	NR	Moderate	379**		3	1.4	11	2.5	2.00	12.0	At least one downstream crossing of unknown type exists
SJ-FLT-0058	NR	Low	110**		3	2.2	37	2.0	3.00	15.0	At least one downstream crossing of unknown type exists
SJ-GRA-364	NR	Low	64		2	3.60	5.0	3.6	0.75	10.0	At least one downstream crossing of unknown type exists; low HGI
SJ-HCM-0019	NR	Low		40	0	2.13	0.9	1.7	1.00	17.5	Low HGI
SJ-HCM-0088	NR	Low	70**		2	1.00	17.8	2.0	1.00	16.0	Scored passable so no action required
SJ-HCM-0109	NR	Moderate		30	6	1.67	-3.5	2.0	1.75	17.0	At least one downstream crossing of unknown type exists; low HGI
SJ-HCM-1025	NR	Low		90**	3	2.50	3.1	3.0	0.50	10	Low HGI
SJ-HEM-271	NR	Low	123**		2	3.39	8.1	6.1	1.00	10	At least one downstream crossing of unknown type exists
SJ-HEM-340	NR	Low	152.5**		2	2.13	4.3	3.4	0.8	9	At least one downstream crossing of unknown type exists
SJ-LEN-065	NR	Low		55	1	4.50	13.3	3.6	1.00	11	Low HGI
SJ-LEN-4010	NR	Low	24.5**		2	0.77	9.2	1.0	0.30	11	Low HGI
SJ-LEN-4018	NR	Low		25	2	3.75	15.2	3.0	0.15	9	Low HGI
SJ-MCB-0006	NR	Moderate	358		1	1.88	0.3	3.2	0.30	10.0	At least one downstream crossing of unknown type exists
SJ-RED-5007	NR	Low		225	0	0.97	20.4	1.2	3.00	14.0	Scored passable so no action required, road appears overgrown and unused
SJ-RED-5010	NR	Low		65	0	1.25	7.1	1.0	1.00	11	Low HGI, road appears overgrown and unused
SJ-RED-5012	NR	Low		85	0	1.88	-0.8	1.5	2.00	12	Low HGI, road appears overgrown and unused
SJ-TAC-005*	NR	Low	51**		3	4.13	28.2	3.3	0.65	9.0	At least one downstream crossing of unknown type exists; low HGI

	Gradient ≥20%, therefore No Action Recommended
	Habitat Gained is <100m;
	At least one potential downstream crossing exists and may restrict fish access; further investigation required prior to considering replacement action.
	Habitat Gained was approximated if HGI and/or crossing data did not exist in 2010 GIS map layers - further investigation required prior to considering replacement action.

* Gradient is 28.2 % downstream but Three Arms Creek is a known Dolly Varden Habitat.
** GIS models missed some key crossings downstream in HGI calculations and therefore the HGI has been lowered accordingly.

3.3 Priority of Candidate Crossings

Although factors including habitat quality, potential upstream habitat gained from restoration and fish barrier scores were part of the priority assignment process, habitat quality was considered the most important influence in this particular watershed. Priority 1 crossings were identified for channels with high value fish habitat. Priority 2 crossings were assigned to channels with moderate value fish habitat and sites with lower-value fish habitat was classified as the lowest priority (priority 3). Detailed rationale for the priority designation is given in Section 4.0.

3.4 Cost Benefit Analysis Results

A cost benefit analysis was conducted as recommended in BC MoE, 2009c for candidate crossings for restoration. Ratios of potential upstream habitat gained were obtained by dividing HGI by the projected costs for each restoration option. The two options for each crossing restoration outlined in Table 6 were summarized according to highest cost benefit ratio (Table 9).

Large differences between option 1 and option 2 cost benefit ratios were most obvious on Red Creek Mainline where differences in ratios were a direct function of the differences in cost between structure removal and other options, especially bridge installations. Lower HGI scores for priority 1 and 2 crossings, where streambed simulation culverts (closed-bottomed) were not a restoration option, lowered the cost benefit ratio in favor of selecting an open-bottomed restoration option.

Table 9. Cost Benefit Analysis Results for Crossings Recommended for Restoration.

Priority	Map Ref #	Habitat Value	Crossing	HGI (m)	Proposed Solution 1	Span (m)	Cost Estimate 1 (\$K)	Proposed Solution 2	Span (m)	Cost Estimate 2 (\$K)	Cost Benefit 1	Cost Benefit 2
2	8	Moderate	SJ-HCM-0003	100	Permanent Bridge (Composite Steel)	12	7.6	Permanent Slab Bridge	12	9.4	1.10	0.89
2	8	Moderate	SJ-HCM-0004	140	Permanent Bridge (Composite Steel)	12	7.6	Permanent Slab Bridge	12	9.4	1.54	1.24
2	8	Moderate	SJ-HCM-0022	539	Permanent Bridge (Composite Steel)	15	7.6	Permanent Slab Bridge	15	9.4	4.73	3.82
2	9	Moderate	SJ-HCM-0075	200	Permanent Slab Bridge	9	9.4	Arch Culvert	15	6	2.36	2.22
2	9	Moderate	SJ-HCM-0078	197.5	Permanent Bridge (Composite Steel)	16	7.6	Permanent Bridge (Composite Steel)	16	7.6	1.62	1.62
2	9&10	Moderate	SJ-HCM-0092	107	Permanent Bridge (Composite Steel)	14	7.6	Permanent Slab Bridge	14	9.4	1.01	0.81
3	10	Low	SJ-HCM-0111	65	Permanent Bridge (Composite Steel)	14	7.6	Permanent Slab Bridge	14	9.4	0.61	0.49
1	10	High	SJ-HCM-0116	166.5	Permanent Bridge (Composite Steel)	12	7.6	Permanent Slab Bridge	12	9.4	1.83	1.48
2	5	Moderate	SJ-LEN-3055	2055	Permanent Bridge (Composite Steel)	12	7.6	Permanent Slab Bridge	12	9.4	22.53	18.22
3	6	Low	SJ-LEN-4035	118	Permanent Slab Bridge	8	9.4	Permanent Bridge (Composite Steel)	8	7.6	1.57	1.94
2	2	Moderate	SJ-RED-5001	500	Removal*	11	0.5	Portable Steel Bridge	24	7.2	90.91	2.89
2	2	Moderate	SJ-RED-5004	75	Removal*	16	0.5	Portable Steel Bridge	8	7.2	9.38	1.30
3	2	Low	SJ-RED-5008	200	Removal*	12	0.5	Portable Steel Bridge	8	7.2	33.33	3.47
2	2	Moderate	SJ-RED-5009	115	Removal*	14	0.5	Portable Steel Bridge	8	7.2	16.43	2.00
2	2	Moderate	SJ-RED-5013	250	Removal*	11	0.5	Portable Steel Bridge	8	7.2	45.45	4.34
3	2	Low	SJ-RED-5015	300	Removal*	14	0.5	Portable Steel Bridge	8	7.2	42.86	5.21

* Removal is recommended if the road will be deactivated in the future.

Note: Consultation with a Professional Engineer will be required for pricing and structure options.

Note: Prices do not include installation.

4.0 Rationale for Priority Designations of Recommended Crossings

The 16 prioritized crossings for restoration have been summarized with rationale of priority designations and can be found in Maps 2-13 using the reference table (Table 10.)

Table 10. Map Index for Crossings Recommended for Restoration

Crossing ID	Map No.	Crossing ID	Map No.
SJ-HCM-0003	8	SJ-LEN-3055	5
SJ-HCM-0004	8	SJ-LEN-4035	6
SJ-HCM-0022	8	SJ-RED-5001	2
SJ-HCM-0075	9	SJ-RED-5004	2
SJ-HCM-0078	9	SJ-RED-5008	2
SJ-HCM-0092	9&10	SJ-RED-5009	2
SJ-HCM-0111	10	SJ-RED-5013	2
SJ-HCM-0116	10	SJ-RED-5015	2

4.1 High Priority (#1) Crossings Recommended for Replacement

The following crossing was identified as a high priority crossing for replacement. Ranking rationale is given below.

- **SJ-HCM-0116** – This crossing was recommended as the highest priority for replacement within the San Juan watershed because of the high quality habitat upstream of the crossing, high barrier score, and the fact that all downstream crossings are known OBS in good condition. As well, this crossing is given highest priority because of the channel gradient and its proximity to Lens Creek, a known fish habitat (FISS data - BC MoE, 2011).

In the GIS layers provided, this crossing was given an HGI of 222 with three downstream crossings potentially acting as barriers. Careful evaluation of the maps shows an additional crossing downstream located at the crossing of Bear/Lens Mainline and Lens Creek. This would reflect the HGI we provide in Tables 7 and 9. However, it is known that the four downstream structures of this crossing are bridges in good working order and are unlikely to be barriers to fish passage to this crossing. Therefore, the HGI could be a lot higher.

It was decided that the quality of habitat upstream of this crossing is high because, based on our visual assessment, it looks like it would provide good quality habitat for spawning and rearing. Refer to photos on the Information Summary for Closed-Bottom Structures sheet (Appendix 4).

At the outlet there is a large pool with plenty of large woody debris and overhanging vegetation which would provide excellent rearing and overwintering habitat for juvenile fish. Upstream there is lots of overhanging vegetation on the left bank and a mixture of cobble and gravel make up the substrate. Boulders throughout the channel provide velocity shadows for juveniles.

At a later visit it was noticed that the road around the inlet of this crossing is starting to erode under the snow fall. If this continues the road, which is a main highway into Port Renfrew, may be entirely washed away.

4.2 Moderate Priority (#2) Crossings Recommended for Replacement

The following crossings were identified as moderate priority crossings for replacement. Ranking rationale is given below for each structure.

- **SJ-HCM-0003** – This crossing has suitable spawning habitat but it is a narrow stream that splits upstream of crossing. There are no downstream crossings and the immediate downstream slope is less than the 20% gradient cut off. There is also a moderate amount of potential habitat to be gained by replacing this culvert.
- **SJ-HCM-0004** – There is larger cobble upstream in a narrow channel which may not be suitable spawning medium; however, there are no known barriers downstream and the slope of the channel is less than 20% with a moderate amount of potential habitat to be gained upstream.
- **SJ-HCM-0022** – This crossing has a lot of potential habitat to be gained upstream and is very near an S2 classed stream and fish observed habitat in the model; however, the channel upstream contains a lot of large woody debris that may be blocking flow as it appears that downstream is heavily backwatered.
- **SJ-HCM-0075** – This crossing has the potential for a lot of habitat to be gained upstream but because the HGI was estimated, due to a lack of information provided by the model, the recommended priority of this crossing has been lowered. Also there is another crossing located downstream which is unlikely to be a barrier to fish passage.
- **SJ-HCM-0078** – This crossing has a moderate amount of habitat to be gained upstream but the substrate is made up of larger cobble and is unsuitable for spawning habitat. Also, it appears to narrow just upstream of the culvert. Downstream is Harris Creek, a known fish habitat (FISS data - BC MoE, 2011).
- **SJ-HCM-0092** – This crossing has a lot of habitat to be gained potentially, however, the channel flows down to the crossing through a cut block. All downstream crossings are known OBS in good condition and therefore are not potential barriers. However, downstream looks to be very poor habitat and had very little water at the time of the survey.
- **SJ-LEN-3055** – This crossing has the highest habitat gained index in our study and could be even higher since the crossings downstream are all known OBS in good condition. But the habitat immediately upstream looks to be poor (flood ground with no defined channel). Further investigation should be conducted to determine the actual area and habitat value to be gained upstream of the crossing.
- **SJ-RED-5001** – This crossing is located close to the San Juan River and potentially has a great deal of habitat to be gained upstream, but because the HGI was estimated due to lack of given information from the model this crossing is receiving a moderate priority. Also, the invert inlet is filled in and likely to be crushed and so this culvert should be removed.
- **SJ-RED-5004** – There was not a great amount of habitat to be gained from this crossing but it is located just upstream of the San Juan River and therefore is highly likely to be fish bearing. Downstream habitat appears to be very suitable for fish passage.

- **SJ-RED-5009** – There is a moderate amount of habitat to be gained here and this crossing is just upstream of the San Juan River. However, the channel does not appear to be very wide and may lack suitable substrate for fish spawning. Also, the HGI was estimated due to lack of information from the model.
- **SJ-RED-5013** – This crossing is similar to SJ-RED-5009; there is a moderate amount of habitat to be gained here and this crossing is just upstream of the San Juan River. However, the channel appears to be poorly defined and may lack suitable substrate for fish spawning. Also, the HGI was estimated due to lack of information from the model.

4.3 Low Priority (#3) Crossings Recommended for Replacement

The following crossings were identified as low priority crossings for replacement. Ranking rationale is given below for each structure.

- **SJ-HCM-0111** – This crossing has a low estimated HGI but the crossings downstream are unlikely to be barriers to fish passage and so the true HGI may actually be higher. However, upstream habitat is very narrow and the channel is likely to have little to no flow in the summer.
- **SJ-LEN-4035** – This crossing has a moderate amount of habitat to be gained and the downstream crossings are unlikely to be barriers to fish passage but the channel upstream is narrow and contains a lot of fallen trees.
- **SJ-RED-5008** – This crossing was given low priority because upstream habitat looks unsuitable for fish habitat. There is no defined channel and lots of fallen trees and large woody debris filling the channel. But it is recommended for restoration as the San Juan River is just downstream and according to the HGI there is the potential that a significant length of habitat may be gained.
- **SJ-RED-5015** – This crossing also has the potential for a lot of habitat to be gained, however it was given a low priority because of the poorly defined channel both upstream and downstream. This crossing is recommended for replacement because the San Juan River is just downstream and the existing culvert is too small for the channel.

5.0 Recommendations

- The 16 crossings recommended for restoration should be addressed prior to conducting any further investigation on the other 18 non-recommended crossings.
- Should any of the 18 non-recommended crossings be considered for restoration, further data collection and investigation/analysis is strongly recommended for the crossing prior to pursuing any restoration plans.
- Priority 1 and 2 crossings should be addressed prior to considering priority 3 crossings for restoration.

- The cost-benefit analysis results, though important, should not be the sole determining factor when selecting among candidate replacement/restoration projects. Fish habitat value should have significant influence in the decision-making process.
- The condition of candidate crossings for restoration projects may be altered over time; it is strongly encouraged that a candidate site visit be conducted prior to proceeding with the restoration implementation phase of the project. This is of particular importance if several years have elapsed since the time of the initial assessment.
- It is recommended that the most *current* road and tributary GIS maps be compiled with the crossing spatial data (GIS shapefiles) collected during this assessment.

5.1 General Recommendations for Fish Passage Watershed Assessments

The following recommendations have been made for future fish passage assessments of this nature.

1. Digitized watershed map data should be the most accurate, current and up-to-date available. The planning phase of the project relies heavily on the accuracy of the maps, for navigation and for time and cost projections. If tributary locations and road codes/locations are not current, this further complicates both the data collection and analysis phases of the assessment process. Alternatively, if area maps are found to lack data or be inaccurate or poorly-mapped, additional time and resources should be allocated for data collection and analysis in such watersheds.
2. The guidelines for determining which closed-bottomed structures qualify for full assessments should be modified to consider topographic features or upstream and downstream gradients in the qualification process. As the guidelines stand, any crossing where defined surface flow exists and a CBS is present, qualifies for a full assessment (BC MoE, 2009a). There are numerous examples of crossings that are indisputably non-fish-bearing due to gradient and/or natural downstream barriers. Obtaining fish-presence data by species from reliable sources (ie. Fish Wizard or FISS) should provide gradient parameters (for each species), within which, field crews can narrow the scope of criteria used to determine which crossings should have full assessments. This simple step could cut the costs of assessments significantly, particularly in large, steep watersheds with high numbers of CBS structures. The implementation of more refined selection criteria for full assessment candidate crossings could free up additional funding for more detailed surveys of upstream fish habitat (see no. 3).
3. Under the current guidelines (BC MoE, 2009b), there is very little detail given for determining fish habitat quality. Guidelines should specify that additional measurements should be collected upstream of the crossing (ie. gradient, channel width, approximated distance of available habitat, etc.) when the field crew determines conditions and fish habitat quality merit. Downstream barrier determination should also be considered and investigated in steeper watersheds. Map data provide some indication of the amount of habitat gained but in many cases provide crude estimates that necessitate field investigation (see no. 4).
4. When incorporating GPS field data into existing GIS map data, there may often be large discrepancies between map and actual locations of tributaries or crossings. If this is the case, HGI (habitat gained index) can not be accurately obtained or estimated from map

data. This is problematic for the cost benefit analysis phase of the assessment process, which suggests that prioritization of candidate restoration sites should be based upon the ratio of habitat gained to cost (cost benefit analysis). When moderate and high-value fish habitats are identified upstream of a potential fish barrier, additional time and funds should be allocated for field crews to collect basic data upstream of the crossing.

5. In many cases, wood bridges or wood box culvert are good solutions for open-bottomed structures at restoration sites. These structures should be acceptable replacement structures for restorations on branches and spurs that are less frequently used; they are cost-efficient, more fish-friendly and require less maintenance than streambed simulation culverts.

6.0 Further Work Required

- A field visit to any crossing being considered for restoration is required prior to the implementation of any of the proposed solutions recommended in this report.
- Consultation with a Professional Engineer is recommended in all cases, to approve sizes, dimensions, suitability and costs of any of the prescribed solutions recommended.
- It is strongly recommended that a biologist conduct a field visit to the candidate site to assess the upstream and downstream habitat conditions at the site, to determine whether natural barriers to fish migration are present.
- Certain areas of the watershed were not assessed due to limitations. These areas include:
 - The northwest extent of Hemmingsen Mainline – due to active logging and falling.
 - The east extent of Mosquito Mainline – due to bridge removal and deactivation.
 - The area east of Fleet Main – due to budgetary and time constraints.

7.0 Conclusions and Discussion

Fish passage assessments conducted throughout the San Juan River watershed from July 23rd to December 17th, 2010 revealed that numerous structures were acting as barriers to fish passage, and are candidate crossings for restoration. A total of 987 crossings were visited during the assessment phase of the project. Nine hundred and fifty three did not qualify for full assessments; of these, 136 were open-bottomed structures (bridges, wooden box culverts, etc.) and 817 crossings were cross-drains and other round culverts with natural barriers. One crossing, SJ-MOS-139, was not included in the full assessment process because it was found to have been recently replaced and determined that the crossing was not a fish bearing stream (deVisser and Wright, 2009). Of the 34 assessed structures, 16 were identified as candidates for restoration and two crossings were passable to fish. Factors such as steep topography and gradient, the presence of natural and downstream crossing barriers, and a lack of data on available upstream habitat were used to eliminate the 18 remaining (non-recommended) crossings from the candidate list until further data and/or investigation can provide supporting rationale to recommend them for restoration.

There were some crossings originally designated NR based upon the above criteria, however, upon a careful look at the data obtained and the models provided, it was decided that the crossings needed to be reevaluated based on other factors. For example: SJ-TAC-005 was given NR status based upon the fact that the downstream slope measurements were greater than 20%. After further investigation it was identified that Three Arms River sustains a substantial isolated population of Dolly Varden, *Salvelinus malma* (MC Wright, 2007; H.Dunn,

pers. comm. September 5th, 2007). Based on this evidence, the NR status of the crossing was derived from the existence of potential downstream crossings and not from the channel gradient. As well, SJ-HCM-0075 and a number of other assessed structures have downstream crossings listed in the GIS model database which influence the HGI calculations provided by the model, however, from field observations it is known that these downstream crossings are good, working order bridges not posing any barriers to fish passage. Based this knowledge, it was decided that the actual HGI of such crossings is greater than the model predicts and therefore these crossings were given a recommended status based on the additional upstream habitat to be gained.

A comprehensive set of maps was created as a result of this project as well as a database of structure types, UTM data and photos for all sites visited. The topography of the watershed and the absence of Dolly Varden char (*S. malma*), other than in the Three Arms River area (See Map 3) (FISS, 2009; MC Wright, 2007; H.Dunn, pers. comm. September 5th, 2007), supported the rationale to focus restoration recommendations on channels with gradients less than 20% (MFR, 1998). The analysis phase of the project was complicated by the lack of correlation between actual crossing/tributary locations and existing GIS map data. Estimates were made using all available data and professional judgment. Potential flow dynamics and upstream habitat features were given serious consideration during the assessment process. Low-quality habitat was often the default designation for small, steep channels that likely dry out seasonally and would make poor candidates for restoration on the grounds that fish could only access them for part of the year or become trapped and isolated from the mainstem.

Cost-benefit analyses revealed that numerous crossings with low-value habitat had high cost benefit ratios. Cost benefit ratios may give inaccurate summaries of crossing eligibility for restoration. As well, the limitations of the GIS map data provided for planning and assessment phases of the project should be examined more closely or considered a smaller component of the decision-making process when selecting among candidate crossings for restoration. A field visit should be conducted prior to the prescription implementation phase to verify upstream habitat distance and quality. The high and moderate habitat value crossings (first and second priority) are recommended to be the best investment for providing fish access to upstream spawning and/or rearing habitat, in the San Juan River watershed.

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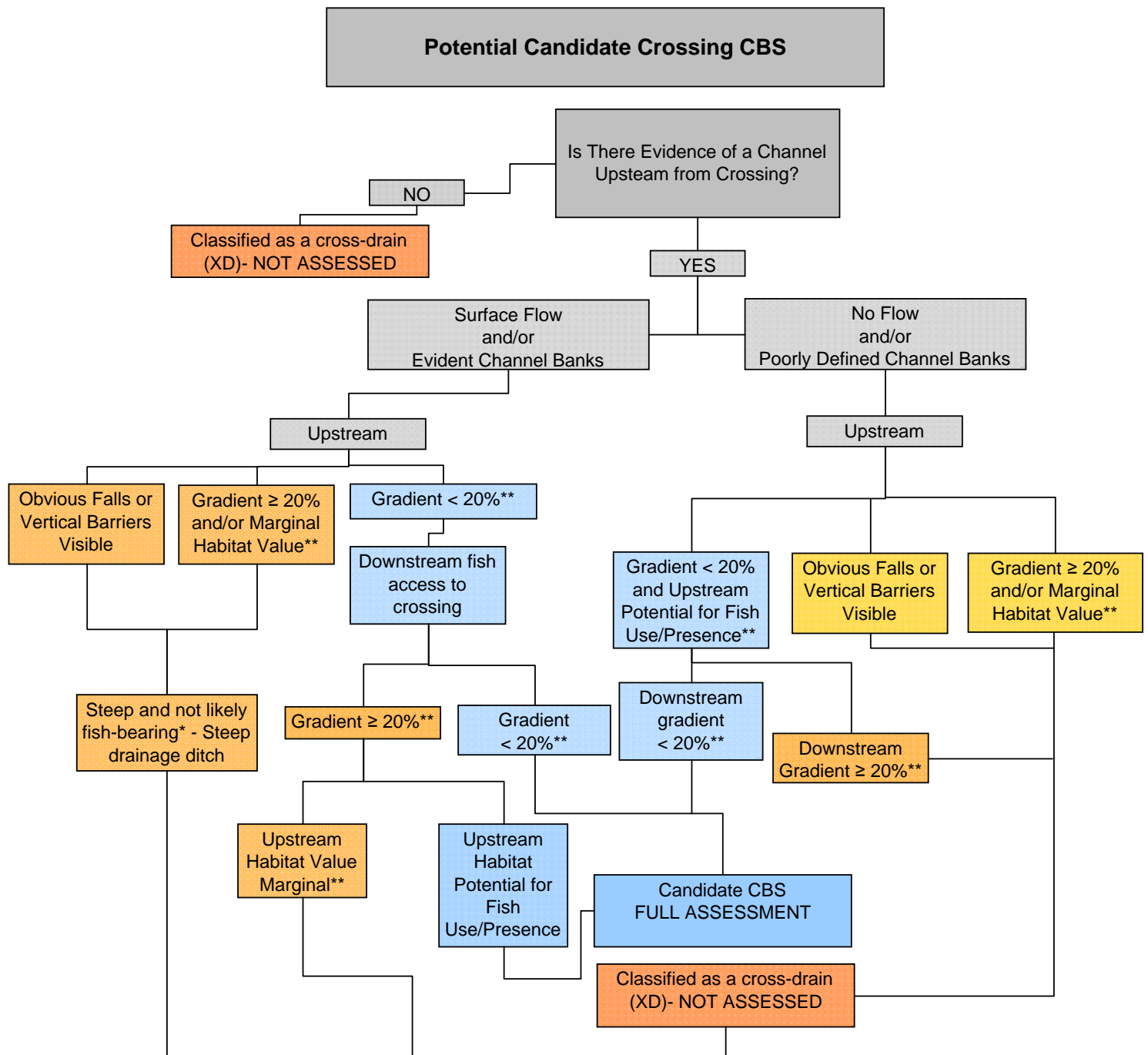
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Steve Williams, Engineering Technician. BC Timber Sales. E-mail on November 29, 2010.

Figures



* Professional judgment was used in determining likelihood of fish-bearing status.

** 20% gradient value derived from MFR, 1998.

Figure 1. Rationale for selecting candidate closed-bottomed structures for full assessment.

Source: Saraga et al., 2010.

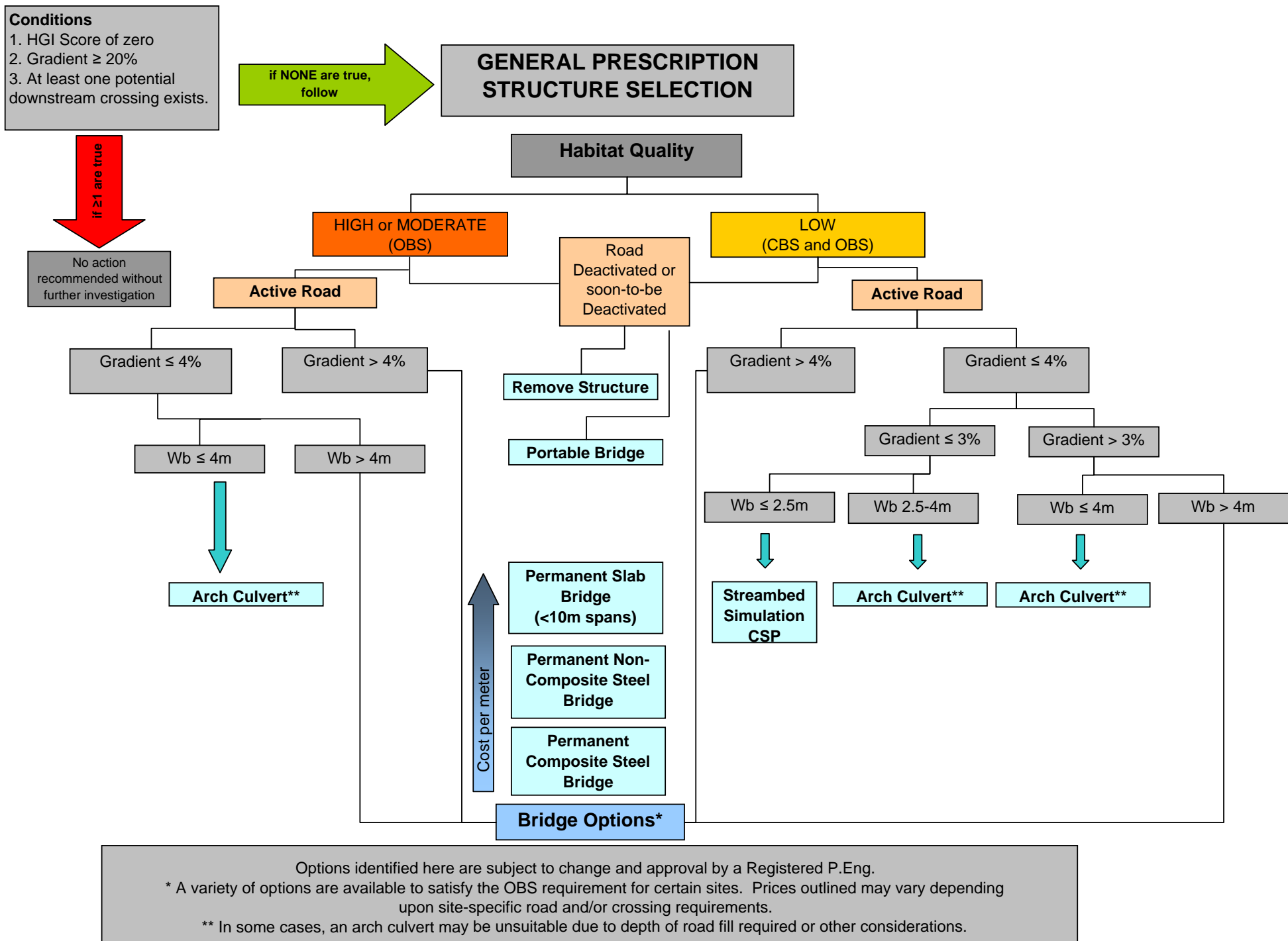
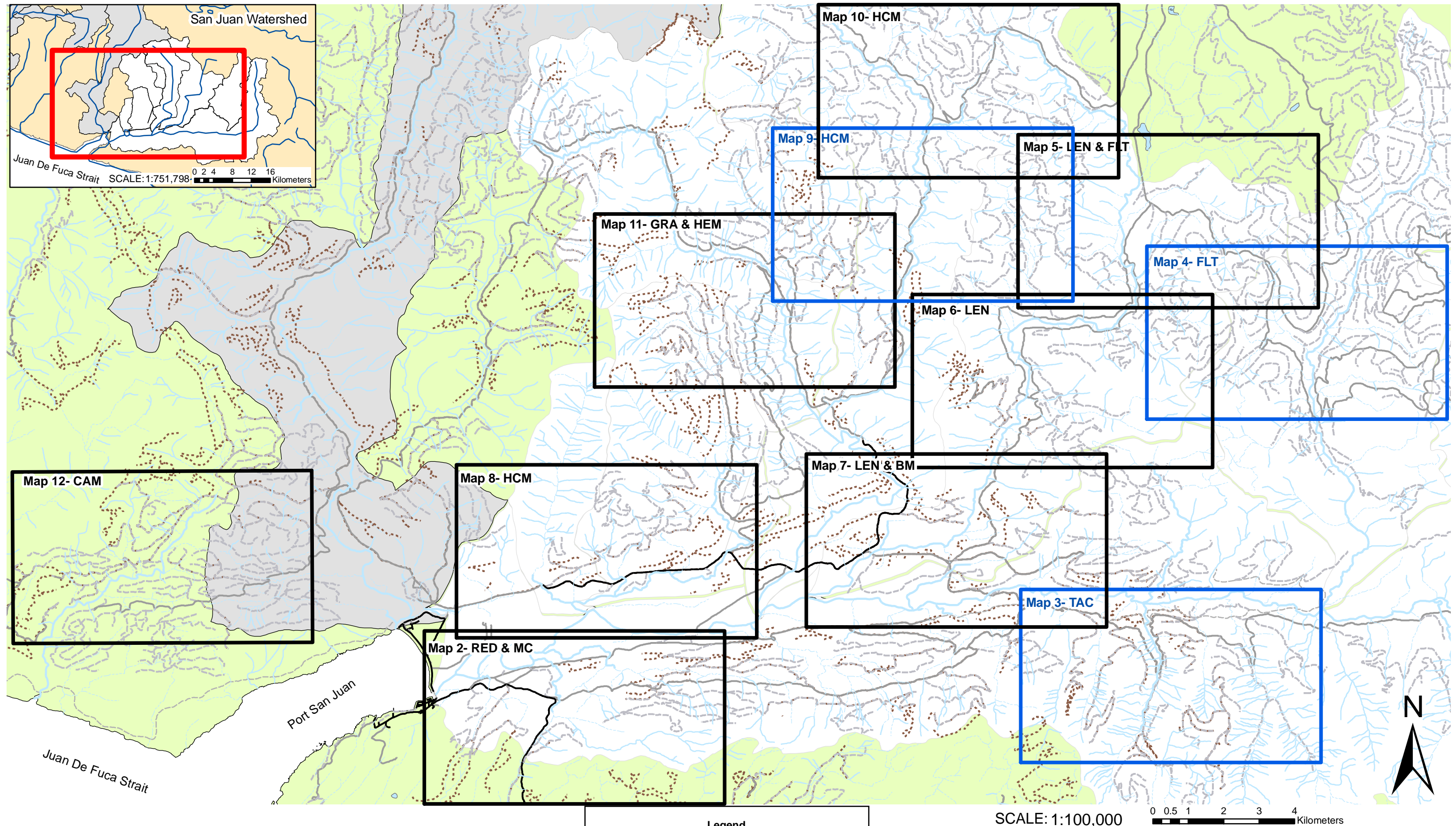


Figure 2. General rationale flow chart for recommended structures at prioritized crossings.
Source: Saraga et al., 2010.




Maps









Overview Map of Figures 2-12





Survey Datum: NAD 83, UTM Z10 Map Base: Developed from digital TRIM & CHS Coastline. Crossing locations recorded with a Trimble Pro XR GPS.

Legend

 CHS Coastline
  Assessments Complete
  San Juan Watershed

Roads

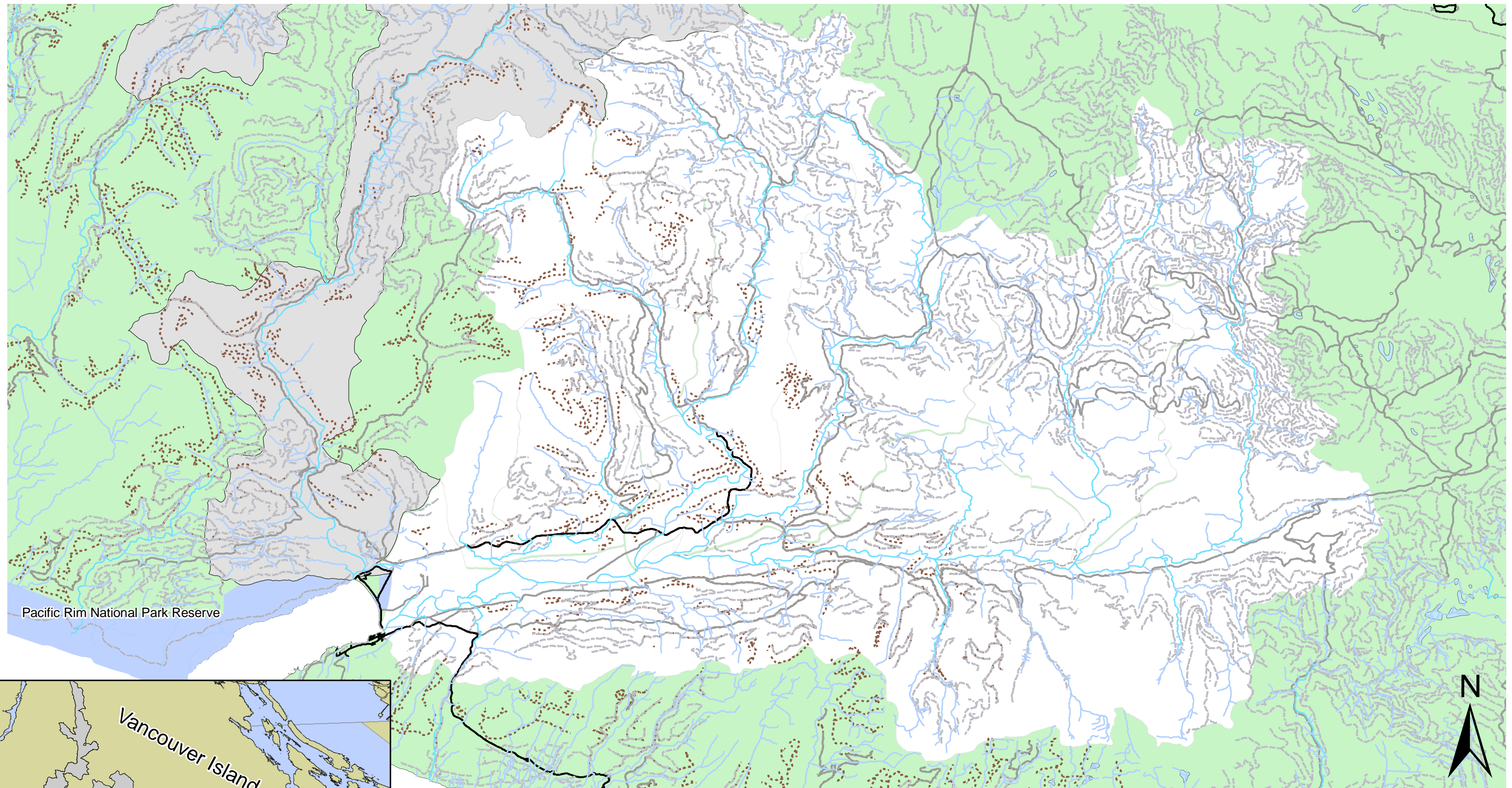
 Unknown
  Fish - Inferred
  Fish - Observed
  Gravel
  Unknown
  Paved

 Fish - Unknown
  Fish - Inferred
  Fish - Observed
  Tenured Roads

**2010 FIA Fish Passage
Culvert Assessments
San Juan Watershed**

Map Created January 12, 2011
Created by:





SCALE: 1:133,333 0 0.5 1 2 3 4 Kilometers



Legend

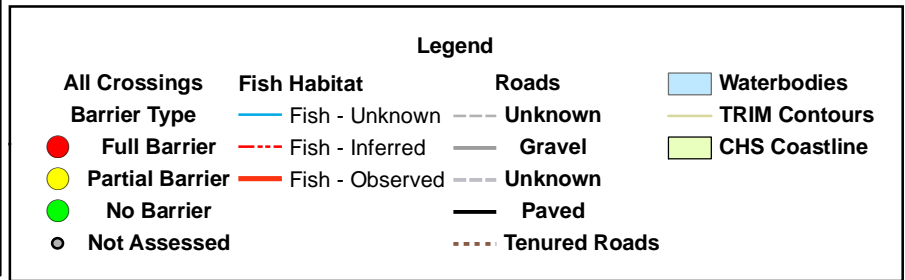
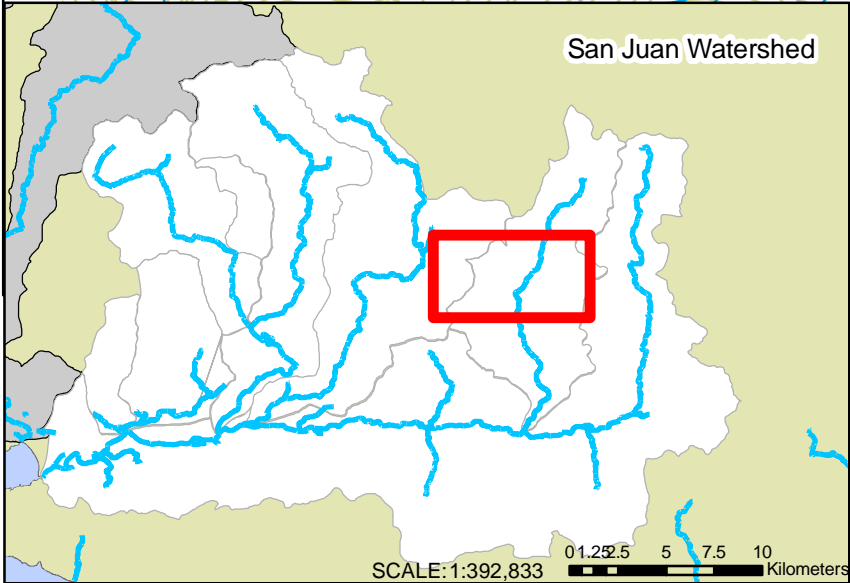
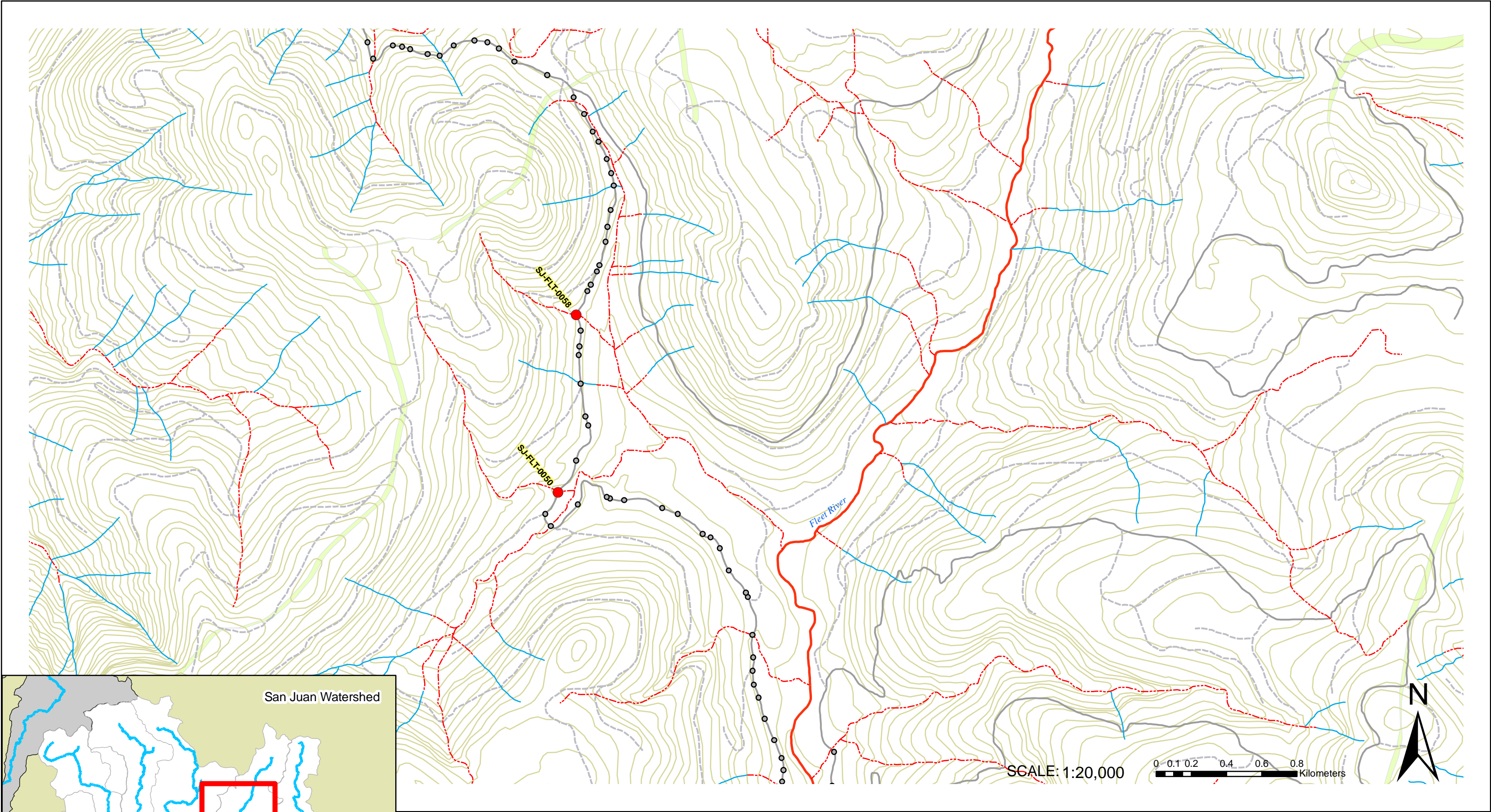
Fish Habitat	Roads	Waterbodies	Priority Watersheds
FISH_HABITAT	--- Unknown	Waterbodies	Complete
— FISH HABITAT - INFERRED	— Gravel	CHS Coastline	San Juan Watershed
— FISH HABITAT - OBSERVED	--- Unknown		SJ National Parks
	— Paved		
	--- Tenured Roads		

2010 FIA Fish Passage Culvert Assessments San Juan Watershed

Map 1: San Juan Watershed
Map Created January 12, 2011
Created by:

Survey Datum: NAD 83, UTM Z10 Map Base: Developed from digital TRIM & CHS Coastline. Crossing locations recorded with a Trimble Pro XR GPS.





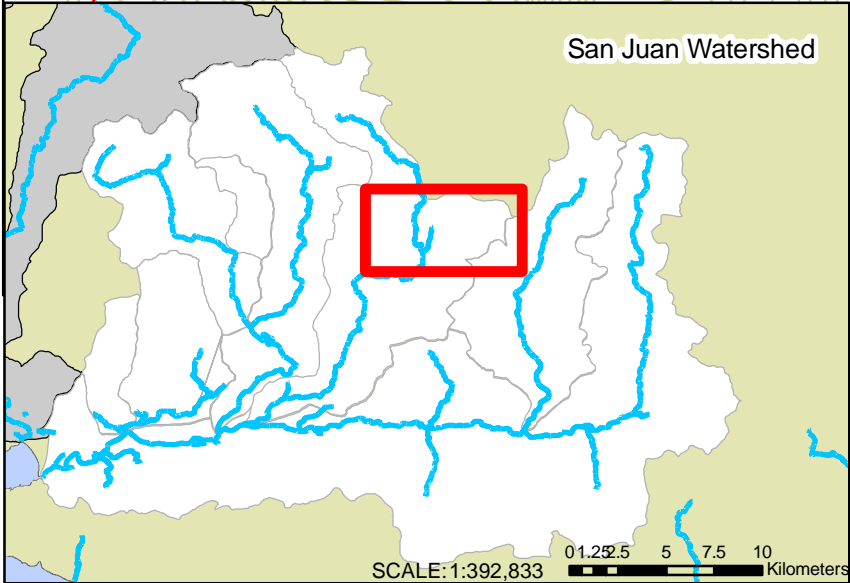
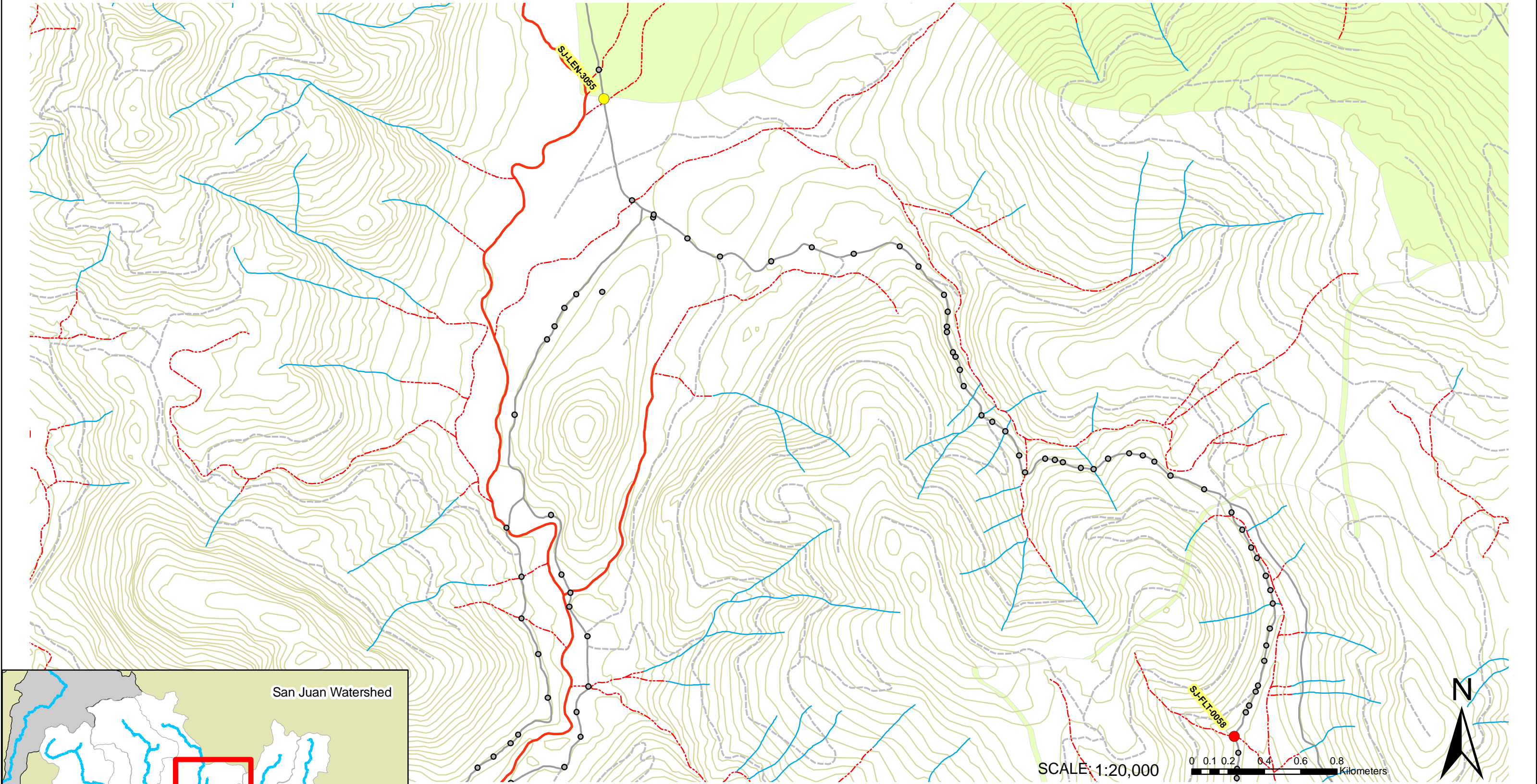
**2010 FIA Fish Passage
Culvert Assessments
San Juan Watershed**

**Map 4: West Fleet
Mainline**

Map Created January 27, 2011
Created by:

Survey Datum: NAD 83, UTM Z10 Map Base: Developed from digital TRIM & CHS Coastline. Crossing locations recorded with a Trimble Pro XR GPS.





Legend			
All Crossings	Fish Habitat	Roads	Waterbodies
Barrier Type	Fish - Unknown	Unknown	TRIM Contours
● Full Barrier	--- Fish - Inferred	— Gravel	— CHS Coastline
● Partial Barrier	— Fish - Observed	--- Unknown	
● No Barrier		— Paved	
○ Not Assessed		--- Tenured Roads	

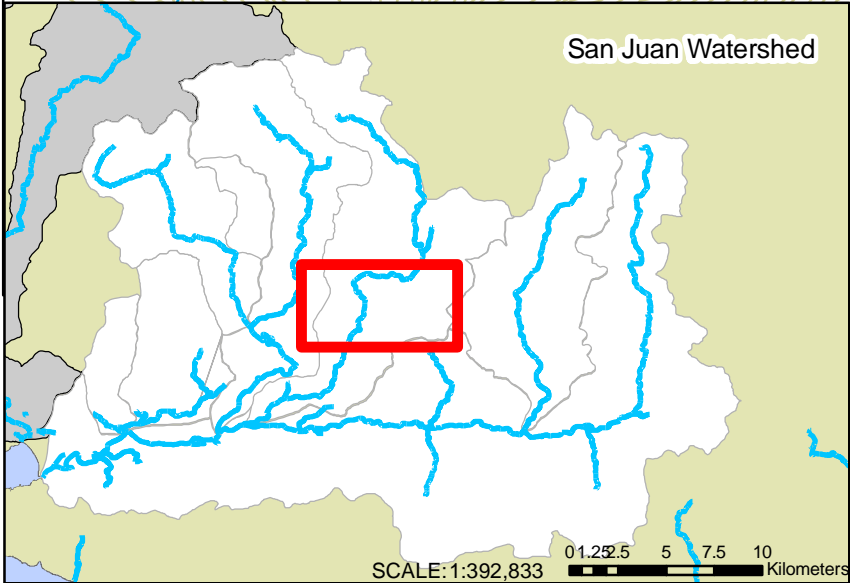
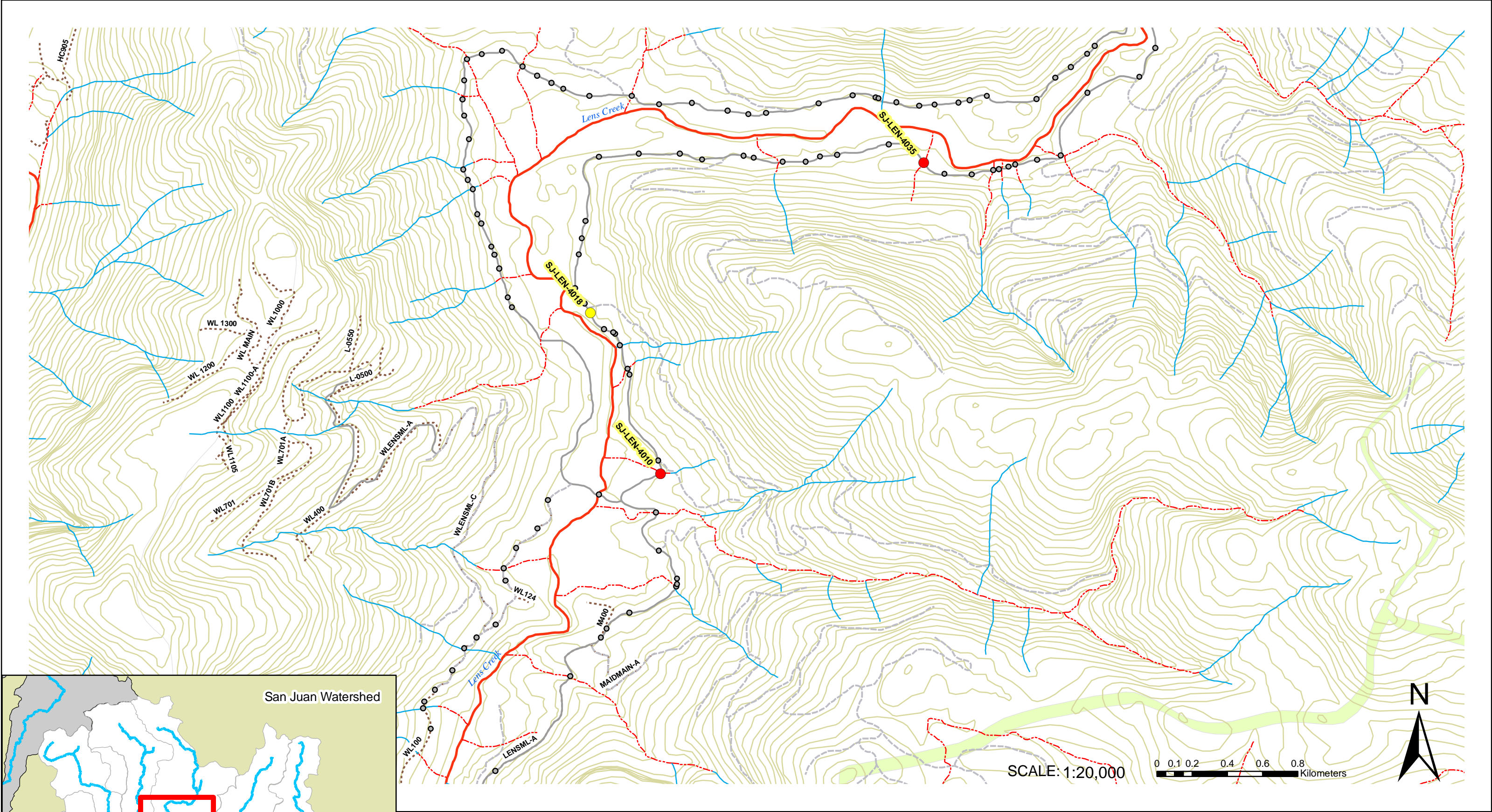
2010 FIA Fish Passage Culvert Assessments

San Juan Watershed

Survey Datum: NAD 83, UTM Z10 Map Base: Developed from digital TRIM & CHS Coastline. Crossing locations recorded with a Trimble Pro XR GPS.

Map 5: Lens and Fleet Mainlines

Map Created January 27, 2011
Created by:



Legend

All Crossings	Fish Habitat	Roads	Waterbodies
● Full Barrier	— Fish - Unknown	— Unknown	— TRIM Contours
● Partial Barrier	— Fish - Inferred	— Gravel	— CHS Coastline
● No Barrier	— Fish - Observed	— Unknown	
○ Not Assessed		— Paved	
		— Tenured Roads	

2010 FIA Fish Passage Culvert Assessments

San Juan Watershed

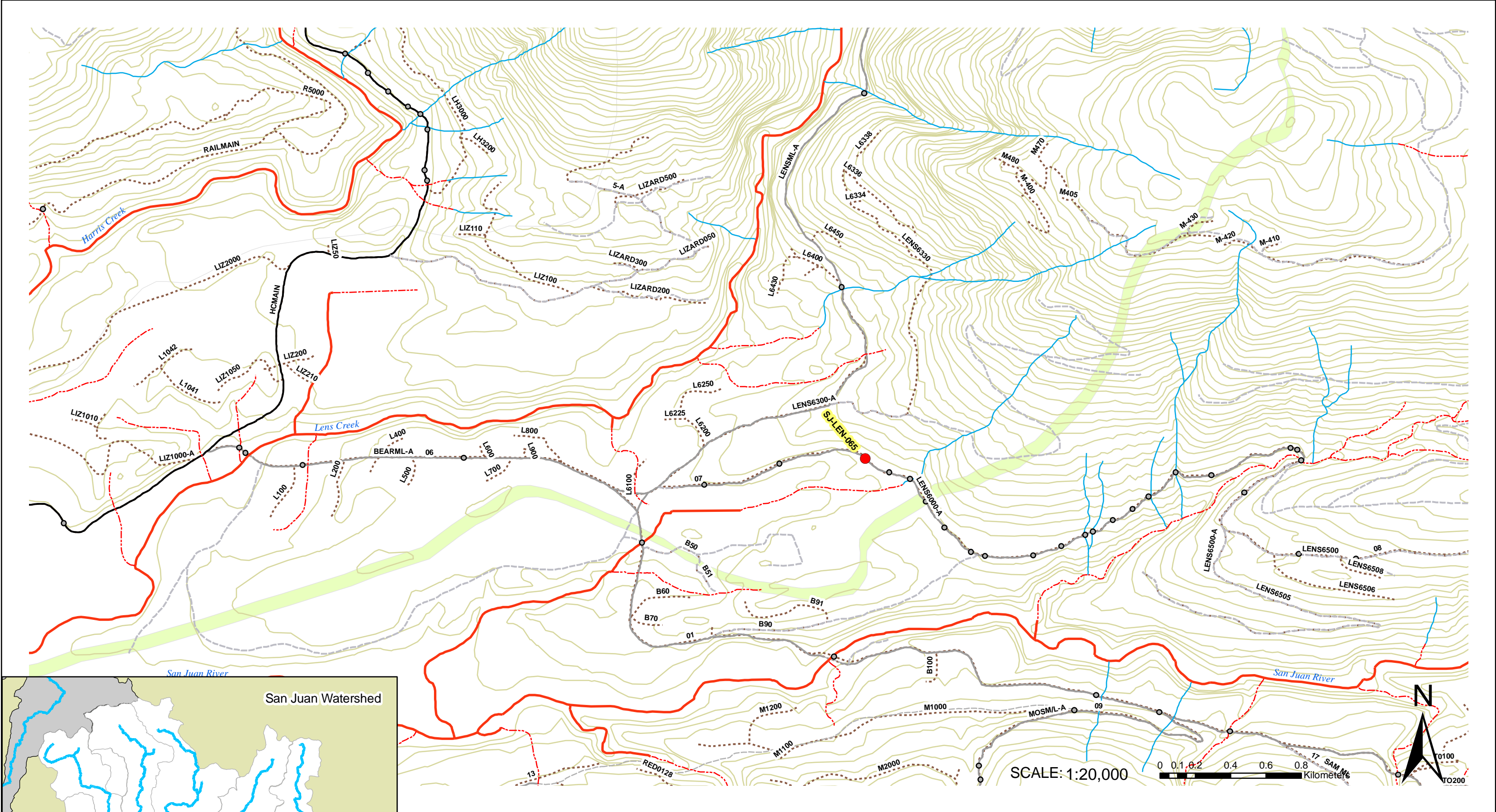
Survey Datum: NAD 83, UTM Z10 Map Base: Developed from digital TRIM & CHS Coastline. Crossing locations recorded with a Trimble Pro XR GPS.

Map 6: East and West Lens Mainline

Map Created January 27, 2011

Created by:





Legend

All Crossings	Fish Habitat	Roads	Waterbodies
● Full Barrier	— Fish - Unknown	--- Unknown	— TRIM Contours
● Partial Barrier	--- Fish - Inferred	— Gravel	— CHS Coastline
● No Barrier	— Fish - Observed	--- Unknown	
○ Not Assessed		— Paved	
		--- Tenured Roads	

2010 FIA Fish Passage Culvert Assessments

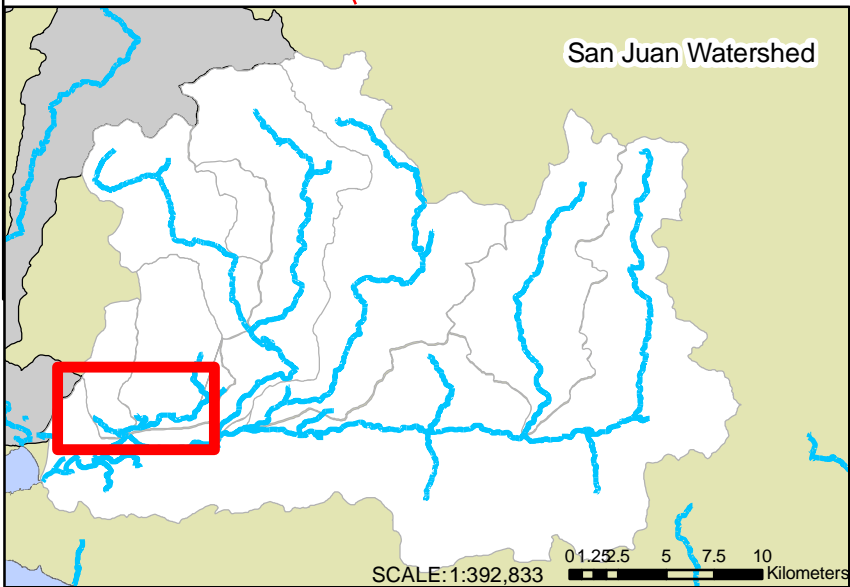
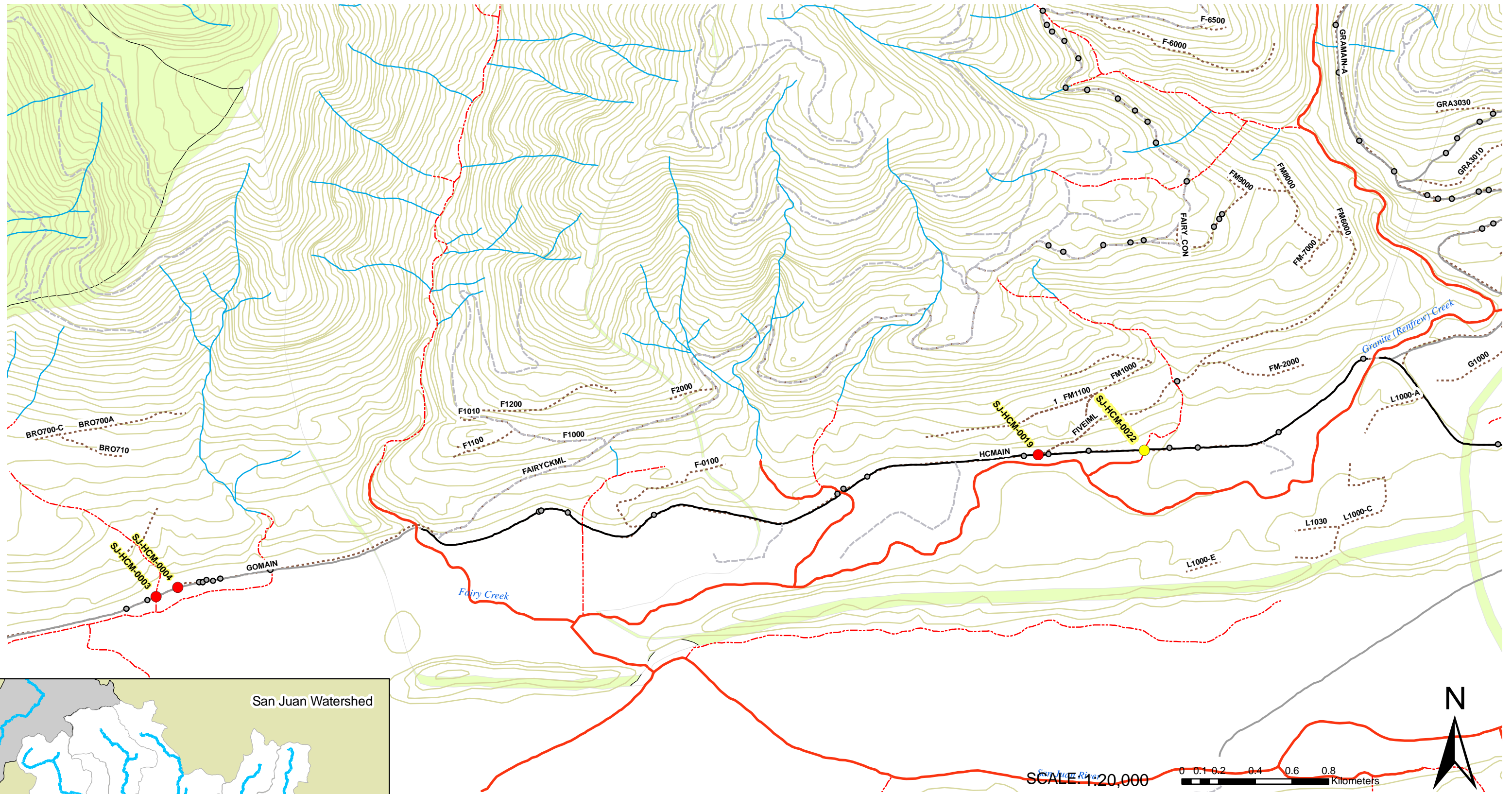
San Juan Watershed

Survey Datum: NAD 83, UTM Z10 Map Base: Developed from digital TRIM & CHS Coastline. Crossing locations recorded with a Trimble Pro XR GPS.

Map 7: Bear and Lens Mainlines

Map Created January 27, 2011
Created by:





Legend			
All Crossings	Fish Habitat	Roads	Waterbodies
Barrier Type	Fish - Unknown	Unknown	TRIM Contours
● Full Barrier	--- Fish - Inferred	--- Gravel	--- CHS Coastline
● Partial Barrier	— Fish - Observed	--- Unknown	
● No Barrier		— Paved	
○ Not Assessed		--- Tenured Roads	

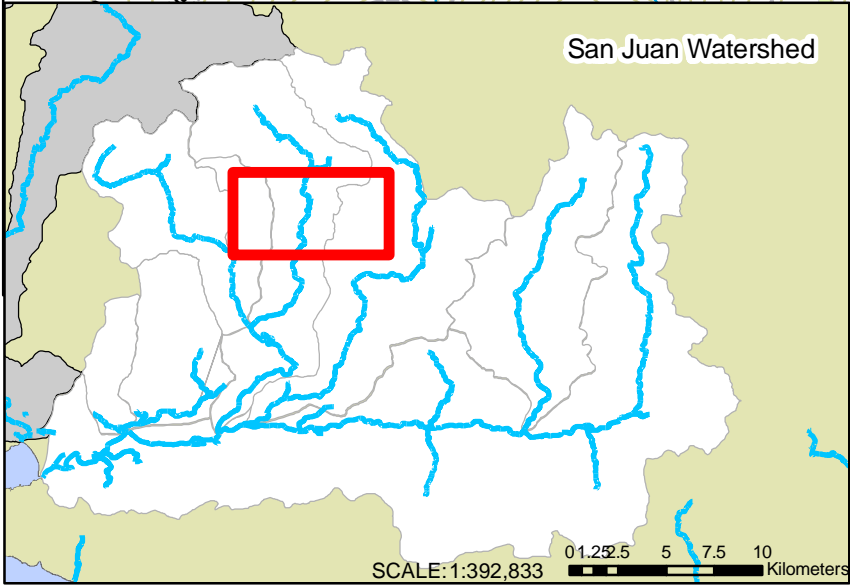
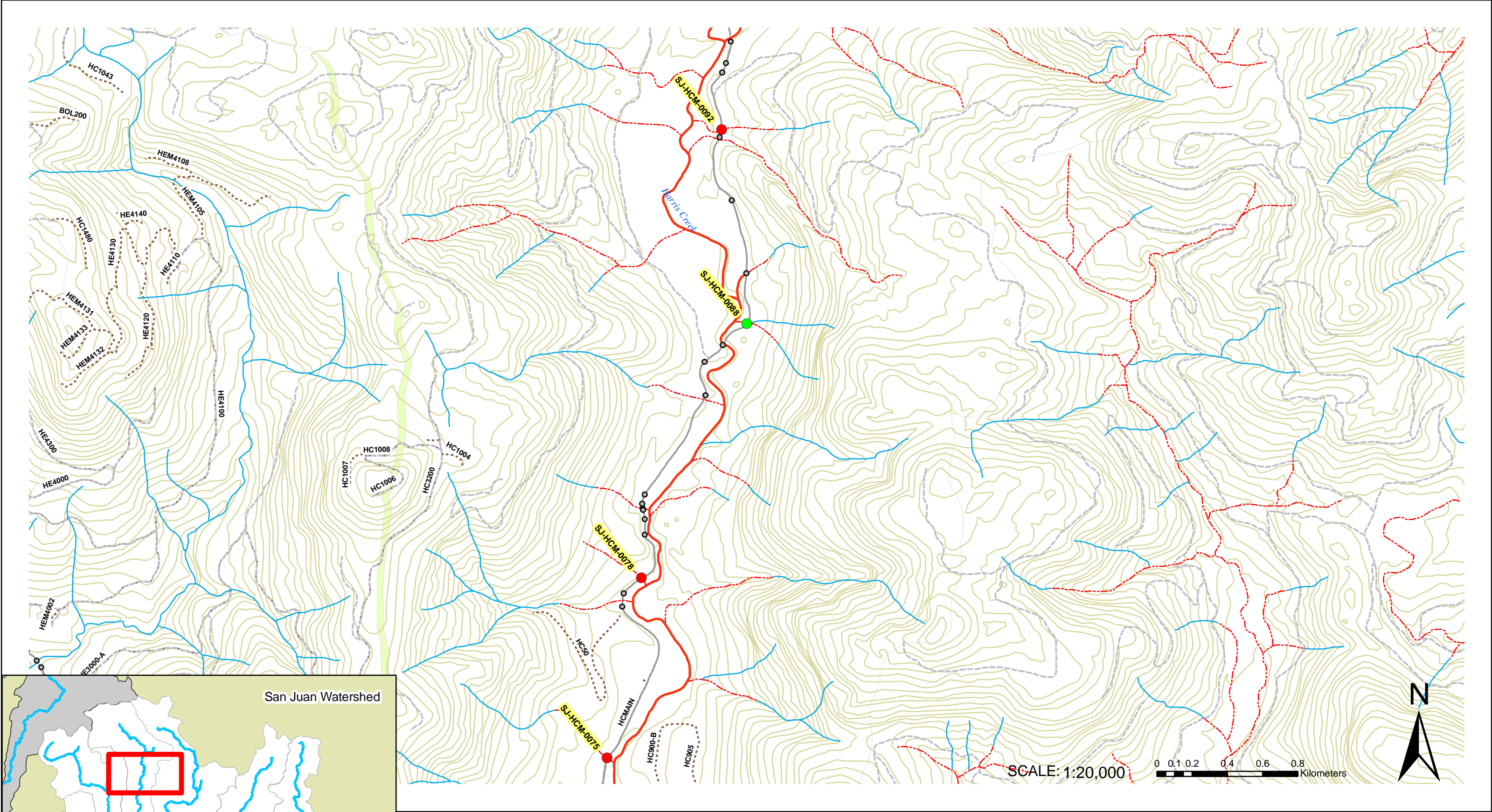
2010 FIA Fish Passage Culvert Assessments San Juan Watershed

Survey Datum: NAD 83, UTM Z10 Map Base: Developed from digital TRIM & CHS Coastline. Crossing locations recorded with a Trimble Pro XR GPS.

Map 8: Harris Creek Mainline

Map Created January 27, 2011
Created by:





Legend			
All Crossings	Fish Habitat	Roads	Waterbodies
Barrier Type	Fish - Unknown	Unknown	TRIM Contours
● Full Barrier	--- Fish - Inferred	— Gravel	— CHS Coastline
● Partial Barrier	— Fish - Observed	— Unknown	
● No Barrier		— Paved	
○ Not Assessed		--- Tenured Roads	

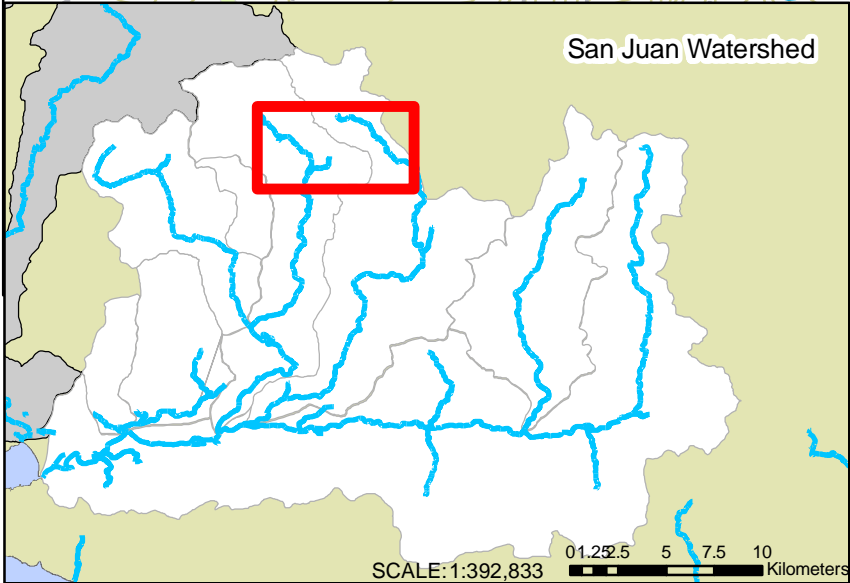
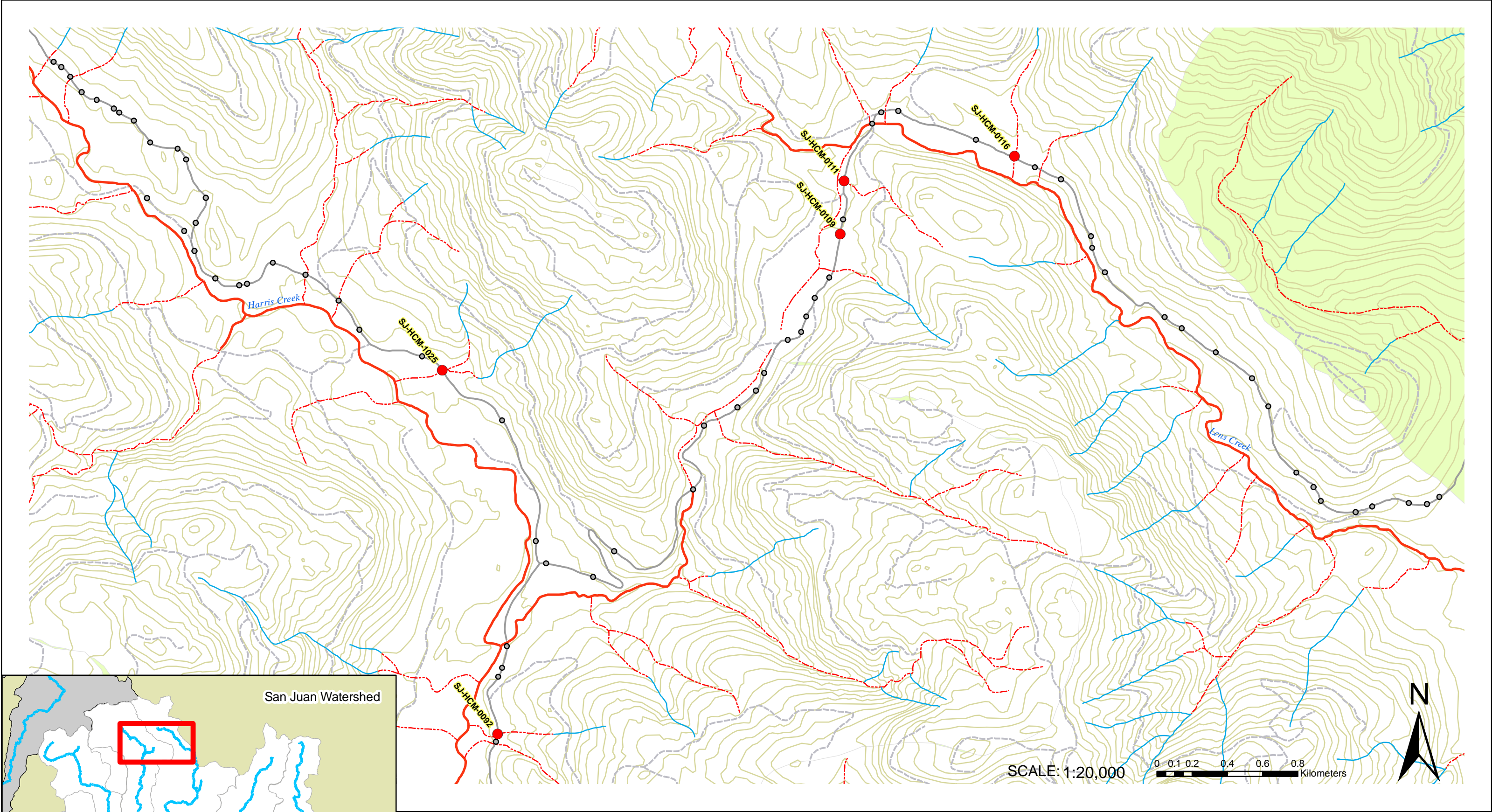
**2010 FIA Fish Passage
Culvert Assessments
San Juan Watershed**

**Map 9: Harris Creek
Mainline**

Map Created January 27, 2011
Created by:

Survey Datum: NAD 83, UTM Z10 Map Base: Developed from digital TRIM & CHS Coastline. Crossing locations recorded with a Trimble Pro XR GPS.





Legend			
All Crossings	Fish Habitat	Roads	Waterbodies
Barrier Type	Fish - Unknown	Unknown	TRIM Contours
Full Barrier	Fish - Inferred	Gravel	CHS Coastline
Partial Barrier	Fish - Observed	Unknown	
No Barrier		Paved	
Not Assessed		Tenured Roads	

2010 FIA Fish Passage Culvert Assessments

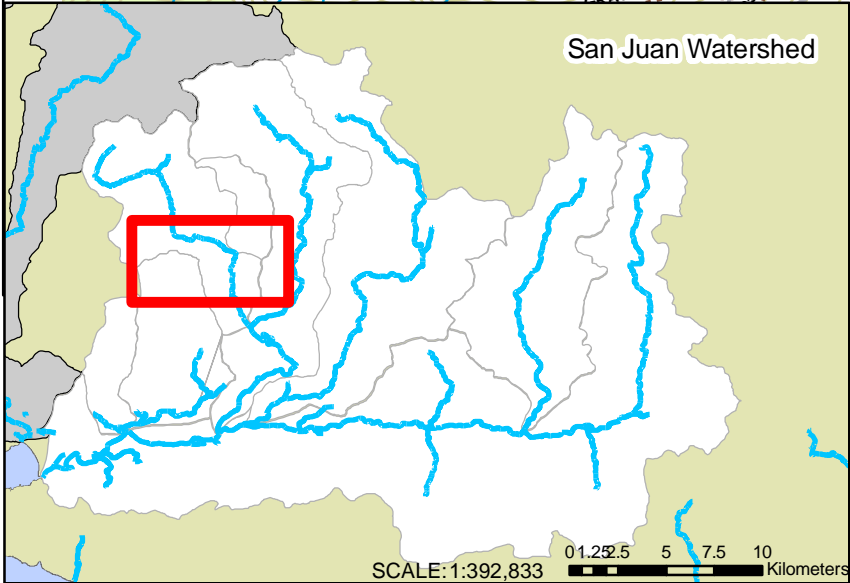
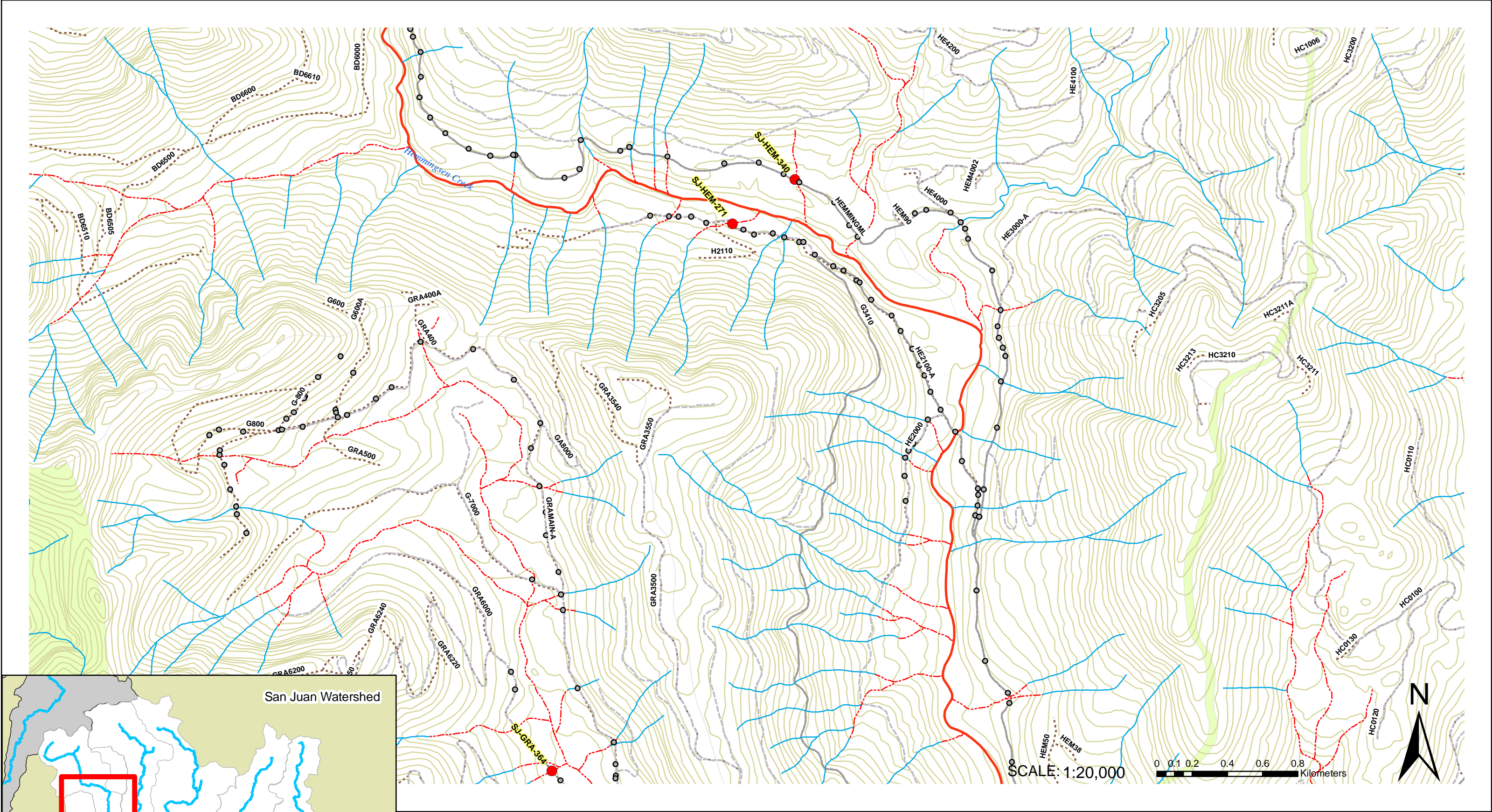
San Juan Watershed

Map 10: Harris Creek and Hillcrest Mainlines

Map Created January 27, 2011
Created by:

Survey Datum: NAD 83, UTM Z10 Map Base: Developed from digital TRIM & CHS Coastline. Crossing locations recorded with a Trimble Pro XR GPS.





Legend			
All Crossings	Fish Habitat	Roads	Waterbodies
Barrier Type	Fish - Unknown	Unknown	TRIM Contours
● Full Barrier	--- Fish - Inferred	— Gravel	— CHS Coastline
● Partial Barrier	— Fish - Observed	— Unknown	
● No Barrier		— Paved	
○ Not Assessed		--- Tenured Roads	


2010 FIA Fish Passage Culvert Assessments

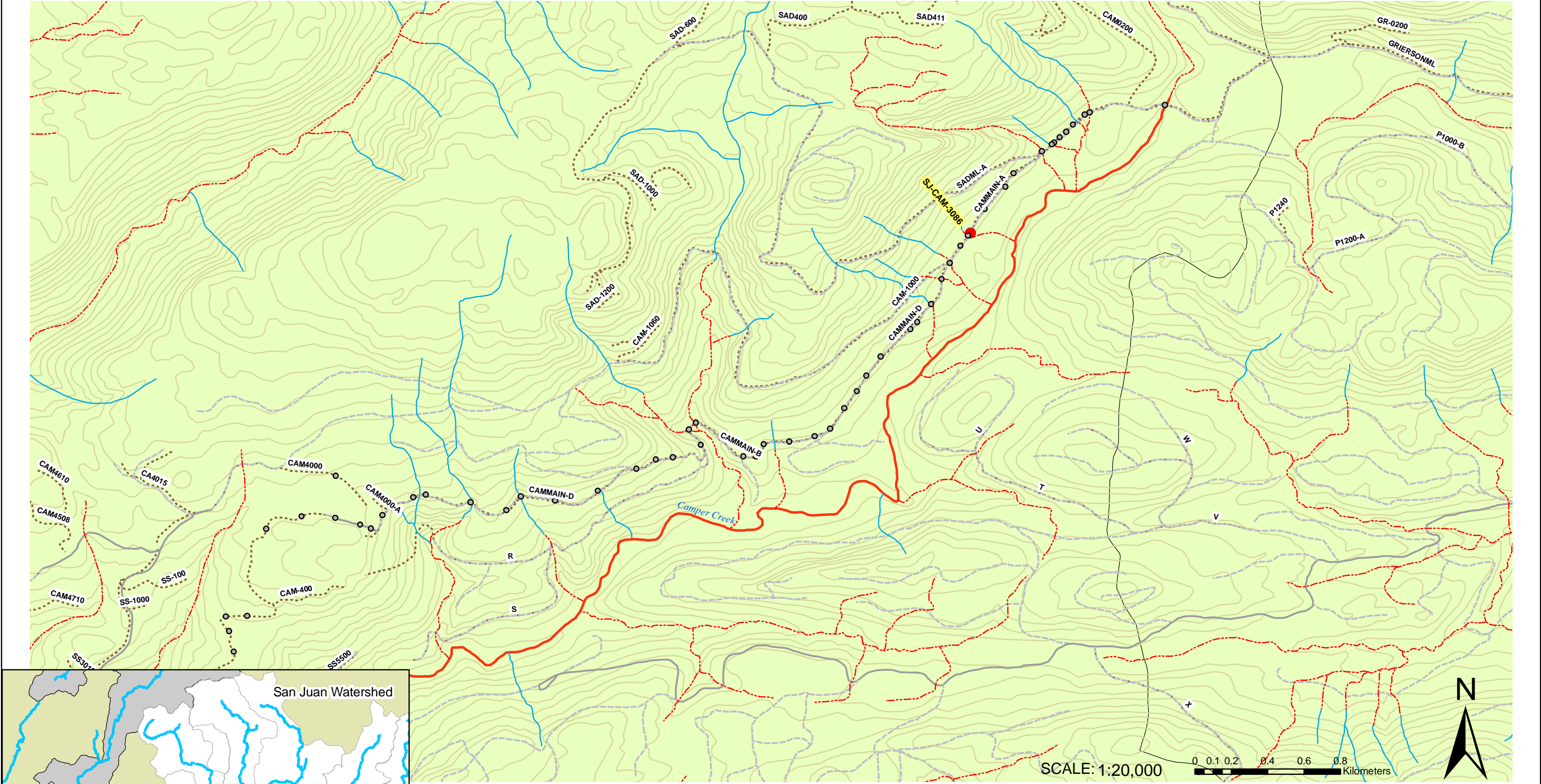
San Juan Watershed

Survey Datum: NAD 83, UTM Z10 Map Base: Developed from digital TRIM & CHS Coastline. Crossing locations recorded with a Trimble Pro XR GPS.

Map 11: Granite and Hemmingsen Mainlines

Map Created January 27, 2011
Created by:





Legend

All Crossings	Fish Habitat	Roads	Waterbodies
● Full Barrier	— Fish - Unknown	--- Unknown	— TRIM Contours
● Partial Barrier	--- Fish - Inferred	— Gravel	— CHS Coastline
● No Barrier	— Fish - Observed	— Unknown	
○ Not Assessed		— Paved	
		--- Tenured Roads	

2010 FIA Fish Passage Map 12: Camper Mainline Culvert Assessments

San Juan Watershed

Map Created January 27, 2011
Created by:

Survey Datum: NAD 83, UTM Z10 Map Base: Developed from digital TRIM & CHS Coastline. Crossing locations recorded with a Trimble Pro XR GPS.

M. C. Wright and Associates Ltd.
Biological Consultants

Appendix 1. Assessed Structures – List and Detailed Data Submission Form

San Juan River Culvert Assessments 2010
Appendix 1: Fully Assessed Structures

No.	Cross ID	GPS Date	Northing	Easting	Type	Zone
1	SJ-CAM-3086	13/08/2010	5384393	389531	RC	10N
2	SJ-FLT-0050	13/12/2010	5389432	420100	RC	10N
3	SJ-FLT-0058	17/12/2010	5390443	420205	RC	10N
4	SJ-GRA-364	11/08/2010	5388654	404390	RC	10N
5	SJ-HCM-0003	13/10/2010	5382228	398405	RC	10N
6	SJ-HCM-0004	13/10/2010	5382261	398483	RC	10N
7	SJ-HCM-0019	13/10/2010	5382984	403170	RC	10N
8	SJ-HCM-0022	13/10/2010	5383023	403755	RC	10N
9	SJ-HCM-0075	02/11/2010	5391326	410024	RC	10N
10	SJ-HCM-0078	02/11/2010	5392224	410117	RC	10N
11	SJ-HCM-0088	02/11/2010	5393674	410727	RC	10N
12	SJ-HCM-0092	02/11/2010	5394773	410586	RC	10N
13	SJ-HCM-0109	03/11/2010	5397609	412534	RC	10N
14	SJ-HCM-0111	03/11/2010	5397944	412559	RC	10N
15	SJ-HCM-0116	03/11/2010	5398061	413499	RC	10N
16	SJ-HCM-1025	03/11/2010	5396769	410325	RC	10N
17	SJ-HEM-271	09/08/2010	5391769	405420	RC	10N
18	SJ-HEM-340	10/08/2010	5392002	405763	RC	10N
19	SJ-LEN-065	25/07/2010	5383453	412577	RC	10N
20	SJ-LEN-3055	14/12/2010	5393957	416732	RC	10N
21	SJ-LEN-4010	15/12/2010	5388027	413797	RC	10N
22	SJ-LEN-4018	15/12/2010	5388938	413400	RC	10N
23	SJ-LEN-4035	15/12/2010	5389789	415291	RC	10N
24	SJ-MCB-0006	12/10/2010	5376998	398986	RC	10N
26	SJ-RED-5001	01/11/2010	5380166	398993	RC	10N
27	SJ-RED-5004	01/11/2010	5380435	400629	RC	10N
28	SJ-RED-5007	01/11/2010	5380787	401920	RC	10N
29	SJ-RED-5008	01/11/2010	5380788	402031	RC	10N
30	SJ-RED-5009	01/11/2010	5380773	402086	RC	10N
31	SJ-RED-5010	01/11/2010	5380767	402234	RC	10N
32	SJ-RED-5012	02/11/2010	5380795	402341	RC	10N
33	SJ-RED-5013	02/11/2010	5380823	402412	RC	10N
34	SJ-RED-5015	02/11/2010	5380915	402712	RC	10N
35	SJ-TAC-005	23/07/2010	5378907	416757	RC	10N

Location and Overview Information						Field Observations and Measurements																																
Date of Inspection	Crossing ID No.	Crew Name	UTM Co-ordinates			Stream Name	Road Name	Road km mark	Forest Service Road	MoFR District	Crossing Type				Jert Dimensions		Embedded? Yes / No	If NO, to what % is it embedded?	Resemble Channel? Yes / No	Backwatered? Percentage	Depth of Fill (cm)	Outlet Drop (cm)	Culvert Slope (%)	Inlet drop Yes / No	Outlet residual Pool depth (cm)	Downstream Channel Width (nearest 0.1m)	Downstream Stream Slope (%)	Valley Fill		Beaver Activity Yes / No	Habitat Value Low / Mod / High	Fish Sighted? Yes / No / FPC	Culvert Fix				Length and/or span? (m)	Comments
			RC	PA	EC						EA	Other	Diameter	Length	DF	SF												BR	RM				OBS	SS	EM	BW		
13-Aug-10	SJ-CAM-3086	DR/UJ	10N	389531	5384393	Trib to Camper Creek	Camper ML	5km		n/a	South Coast	RC	1000	12	NO	0	NO	0	150	21	7.5	NO	20	3.1	12.0	DF	NO	Low	NO	OBS	12	Channel is overgrown with terrestrial vegetation; US mossy cobble. Dry at time of assessment. Lacks desired elements such as LWD, pools, cutbanks. US has coarse material, no good spawning gravels. Channel could be very low in summer. Downstream is cascade type flow, lots of boulder material. Culvert A is camp side and has water flowing all the way through. Culvert B is bush side and has no flow at time of survey. Flow through A is high. Measurements are from Culvert A.						
13-Dec-10	SJ-FLT-0050	JP/BM/SH	10N	420100	5389432	Trib to Fleet River	Fleet Mainline West	n/a	n/a	South Coast	RC	800, 1000	12	NO	0	NO	0	200	47	8.1	YES	63	2.5	10.7	SF	NO	Moderate	NO	OBS	12	DS has a pool at outlet and goes to riffle. Mostly cobbles, some woody debris. Overhanging vegetation present. Bit of step pools forming. US is narrow and shallow. Substrate is mix of gravel and small cobble. Woody debris and overhanging vegetation present. Steep farther US.							
17-Dec-10	SJ-FLT-0058	JP/SH	10N	420205	5390443	Trib to Fleet River	Fleet Mainline West	n/a	n/a	South Coast	RC	900	15	NO	0	NO	0	3	78	13.9	NO	62	2	37.2	DF	NO	Low	NO	OBS	15	DS channel forks into two directions; US one cutbank area but otherwise cobble. Gradient climbs to 15-20% US. Water found only in outlet pool, may be subsurface flow.							
11-Aug-10	SJ-GRA-364	RS/MC	10N	404390	5388654	Trib to Renfrew Creek	Granite 6000	n/a	n/a	South Coast	RC	1000	10	NO	0	NO	0	70	41	4.1	YES	33	3.6	5.0	DF	NO	Low	NO	RM	10								
13-Oct-10	SJ-HCM-0003	BM/SH	10N	398405	5382228	Trib to Harris Creek	Harris Creek Mainline	n/a	n/a	South Coast	RC	600	14	NO	0	NO	100	75	-63	4.1	NO	64	4.1	1.9	DF	NO	Moderate	NO	OBS	14								
13-Oct-10	SJ-HCM-0004	BM/SH	10N	398483	5382261	Trib to Harris Creek	Harris Creek Mainline	n/a	n/a	South Coast	RC	800 (x2)	15	NO	0	YES	0	75	7	1.6	NO	33	4.0	3.3	DF	NO	Moderate	NO	OBS	15								
13-Oct-10	SJ-HCM-0019	BM/SH	10N	403170	5382984	Trib to Harris Creek	Harris Creek Mainline	n/a	n/a	South Coast	RC	800	17.5	NO	0	YES	50	100	-4	2.3	NO	18	1.7	0.9	DF	NO	Low	NO	SS	17.5								
13-Oct-10	SJ-HCM-0022	BM/SH	10N	403755	5383023	Trib to Harris Creek	Harris Creek Mainline	n/a	n/a	South Coast	RC	900	13.5	NO	0	NO	50	150	-19	0.6	NO	116	9.0	4.2	SF	NO	Moderate	NO	OBS	13.5								
2-Nov-10	SJ-HCM-0075	BM/SH	10N	410024	5391326	Trib to Harris Creek	Harris Creek Mainline	n/a	n/a	South Coast	RC	800	15	NO	0	YES	0	50	20	1.5	NO	85	3.0	1.5	DF	NO	Moderate	NO	OBS	15								
2-Nov-10	SJ-HCM-0078	BM/SH	10N	410117	5392224	Trib to Harris Creek	Harris Creek Mainline	n/a	n/a	South Coast	RC	800	16	NO	0	NO	0	300	-7	12.0	NO	44	3.0	4.1	DF	NO	Moderate	NO	OBS	16								
2-Nov-10	SJ-HCM-0088	BM/SH	10N	410727	5393674	Trib to Harris Creek	Harris Creek Mainline	n/a	n/a	South Coast	RC	1000 (x2)	16	NO	100	YES	100	100	-1	0.9	NO	102	2.0	17.8	SF	NO	Low	NO		16	Pipe on camp side is embedded partially 100% along it length; no outlet control-keeps getting deeper. Scored passable.							
2-Nov-10	SJ-HCM-0092	BM/SH	10N	410586	5394773	Trib to Harris Creek	Harris Creek Mainline	n/a	n/a	South Coast	RC	1000	16	NO	25	YES	0	200	-2	2.0	NO	59	2.0	9.7	SF	NO	Moderate	NO	OBS	16	Upstream is a cut block							
3-Nov-10	SJ-HCM-0109	BM/SH	10N	412534	5397609	Trib to Harris Creek	Hillcrest Mainline	n/a	n/a	South Coast	RC	1200	17	NO	0	YES	0	175	3	5.8	NO	82	2.0	-3.5	DF	NO	Moderate	NO	OBS	17								
3-Nov-10	SJ-HCM-0111	BM/SH	10N	412559	5397944	Trib to Harris Creek	Hillcrest Mainline	n/a	n/a	South Coast	RC	700	12	NO	0	YES	0	100	22	2.1	NO	54	2.0	5.8	DF	NO	Low	NO	OBS	12								
3-Nov-10	SJ-HCM-0116	BM/SH	10N	413499	5398061	Trib to Harris Creek	Hillcrest Mainline	n/a	n/a	South Coast	RC	2000	12	NO	0	YES	0	175	115	5.4	NO	60	5.3	8.1	DF	NO	High	NO	OBS	12	Road is eroding away around inlet.							
3-Nov-10	SJ-HCM-1025	BM/SH	10N	410325	5396769	Trib to Harris Creek	Harris Creek Mainline/Truck Road 7	2km	n/a	South Coast	RC	1200	10	NO	0	YES	0	50	28	6.3	NO	57	3.0	3.1	SF	NO	Low	NO	OBS	10								
9-Aug-10	SJ-HEM-271	RS/DR	10N	405420	5391769	Trib to Hemmingsen Creek	Hemmingson ML	n/a	n/a	South Coast	RC	900 (x2)	10	NO	0	NO	0	100	85	4.7	NO	50	6.1	8.1	DF	NO	Low	NO	OBS	0	US habitat has larger cobble and wanders along roadside as a ditch for 30 m. No flow at time of assessment. Lacks desired elements such as LWD, pools, cutbanks.							
10-Aug-10	SJ-HEM-340	RS/DR/JJ	10N	405763	5392002	Trib to Hemmingsen Creek	Hemmingson ML	6km	n/a	South Coast	RC	800 (x2)	9	NO	0	NO	0	80	11	6.3	YES	15	3.4	4.3	DF	NO	Low	NO	OBS	0	DS habitat has larger cobble and is overgrown with terrestrial vegetation, poorly-defined and somewhat braided. US cobble bed; lacks desired elements such as LWD, pools, cutbanks. Little flow at time of assessment.							
25-Jul-10	SJ-LEN-065	RS/DR	10N	412577	5383453	Trib to San Juan River	Lens 6000A	n/a	n/a	South Coast	RC	800	11	NO	0	NO	0	100	55	6.0	YES	36	3.6	13.3	DF	NO	Low	NO	OBS	11	No flow at time of survey. US habitat quality is low due mainly to gradient and heavy wind throw from cutlook boundary (on left bank) and heavily eroded left bank.							
14-Dec-10	SJ-LEN-3055	JP/SH	10N	416732	5393957	Trib to Lens River	Lens Mainline West	n/a	n/a	South Coast	RC	1000 (x2)	10	YES		NO	0	100	-68	1.4	NO	64	3	11.5	DF	NO	Moderate	NO	OBS	10	Culvert A is camp side DS habitat has good defined cutbanks, suitable spawning substrate. US has no defined channel, water comes in several places including the ditch. Looks like US is flooded area due to high flow. Measurements are of Culvert A, the lower elevation of the two.							
15-Dec-10	SJ-LEN-4010	JP/SH	10N	413797	5388027	Trib to Lens River	Lens Mainline East	n/a	n/a	South Coast	RC	1300	11	NO	0	YES	0	30	-2	5.2	NO	31	1	9.2	DF	NO	Low	NO	OBS	11	US is a riffle turning into a cascade approximately 15m US. Substrate is mostly cobble, not a lot of gravel. Good overhanging vegetation. DS is a riffle with large substrate, debris jams and not very wide. Contains good overhanging vegetation.							
15-Dec-10	SJ-LEN-4018	JP/SH	10N	413400	5388938	Trib to Lens River	Lens Mainline East	n/a	n/a	South Coast	RC	800	9	NO	0	YES	0	15	6	-0.5	NO	41	3	15.2	DF	NO	Low	NO	OBS	9	DS looks good with cobble and gravel substrate, no debris jams, fast moving riffles and a plung pool at outlet. US has good gravel and cobble substrate and good overhanging vegetation but lots of woody debris jams. Stream splits into two to go around an island in the middle of US.							
15-Dec-10	SJ-LEN-4035	JP/SH	10N	415291	5389789	Trib to Lens River	Lens Mainline East	n/a	n/a	South Coast	RC	900	8	NO	0	NO	0	150	-5	9.2	NO	61	1.5	17.0	SF	NO	Low	NO	OBS	8	Poor US habitat full of woody debris jams, flow could get low in summer. Bedrock showing, no real channel definition. DS riffle/cascade, good mix of substrate from boulder to gravel, overhanging vegetation almost 100%							
12-Oct-10	SJ-MCB-0006	BM/SH	10N	398986	5376998	Trib to San Juan River	Minute Creek Brach 01	n/a	FSR 9290	South Coast	RC	1700	10	NO	0	NO	0	30	-1	7.4	NO	79	3.2	0.3	DF	NO	Moderate	NO	OBS	10								
1-Nov-10	SJ-RED-5001	BM/SH	10N	398993	5380166	Trib to San Juan River	Red Mainline	n/a	n/a	South Coast	RC	800	11	NO	0	NO	100	150	112	11.1	YES	71	15.0	10.0	DF	NO	Moderate	NO	RM	11	Inlet crushed. No distiction between outlet pool and San Juan. Pool too deep to survey the deepest part and no outlet control visible.							
1-Nov-10	SJ-RED-5004	BM/SH	10N	400629	5380435	Trib to San Juan River	Red Mainline	n/a	n/a	South Coast	RC	600	16	NO	0	YES	0	200	9	9.0	NO	59	1.2	3.1	DF	NO	Moderate	NO	RM	16	Steep upstream of this crossing							
1-Nov-10	SJ-RED-5007	BM/SH	10N	401920	5380787	Trib to San Juan River	Red Mainline	n/a	n/a	South Coast	RC	1200	14	NO	0	YES	0	300	-7	0.8	NO	35	1.2	20.4	DF	NO	Low	NO	RM	14	Scored Passable however the DS slope is quite steep >20%.							
1-Nov-10	SJ-RED-5008	BM/SH	10N	402031	5380788	Trib to San Juan River	Red Mainline	n/a	n/a	South Coast	RC	800	12	NO	0	YES	0	300	-10	1.5	NO	7	2.0	6.1	DF	NO	Low	NO	RM	12								
1-Nov-10	SJ-RED-5009	BM/SH	10N	402086	5380773	Trib to San Juan River	Red Mainline	n/a	n/a	South Coast	RC	1400	14	NO	0	YES	0	300	26	2.1	NO	31	2.0	7.7	DF	NO	Moderate	NO	RM	14								
1-Nov-10	SJ-RED-5010	BM/SH	10N	402234	5380767	Trib to San Juan River	Red Mainline	n/a	n/a	South Coast	RC	800	11	NO	0	YES	0	100	-7	5.5	NO	13	1.0	7.1	DF	NO	Low	NO	RM	11	inlet crushed , small stream							
2-Nov-10	SJ-RED-5012	BM/SH	10N	402341	5380795	Trib to San Juan River	Red Mainline	n/a	n/a	South Coast	RC	800	12	NO	0	YES	0	200	5	4.2	NO	38	1.5	0.8	DF	NO	Low	NO	RM	12								
2-Nov-10	SJ-RED-5013	BM/SH	10N	402412	5380823	Trib to San Juan River	Red Mainline	n/a	n/a	South Coast	RC	800	11	NO	0	YES	0	150	-16	6.3	NO	26	2.0	0.9	DF	NO	Moderate	NO	RM	11								
2-Nov-10	SJ-RED-5015	BM/SH	10N	402712	5380915	Trib to San Juan River	Red Mainline	n/a	n/a	South Coast	RC	1400	14	NO	0	NO	0	50	24	8.8	YES	58	2.0	5.1	DF	NO	Low	NO	RM	14								
23-Jul-10	SJ-TAC-005	RS/DR	10N	416757	5378907	Trib to Three Arm Creek	Three Rivers Mainline	n/a	n/a	South Coast	RC	800	9	NO	0	NO	0	65	21	9.4	YES	8	3.3	28.2	DF	NO	Low	NO	RM	0	Channel lacks desired features such as LWD, pools, cutbanks. Low flow at time of survey.							

Appendix 2. Non-Assessed Structures - List

Appendix 2: San Juan River Watershed Non-assessed Crossings

No.	Cross ID	GPS Date	Type	Northing	Easting	Zone	No.	Cross ID	GPS Date	Type	Northing	Easting	Zone
1	SJ-BM-010	23/07/2010	Bridge	5381147	418506	10N	51	SJ-CAM-3097	12/08/2010	RC	5383428	388838	10N
2	SJ-BM-011	23/07/2010	RC	5381224	418357	10N	52	SJ-CAM-3098	13/08/2010	RC	5383317	388760	10N
3	SJ-BM-012	23/07/2010	RC	5381413	418052	10N	53	SJ-CAM-3099	13/08/2010	RC	5383275	388675	10N
4	SJ-BM-013	23/07/2010	RC	5381551	417018	10N	54	SJ-CAM-3100	13/08/2010	RC	5383245	388537	10N
5	SJ-BM-014	24/07/2010	RC	5381373	417002	10N	55	SJ-CAM-3101	13/08/2010	WBC	5383231	388396	10N
6	SJ-BM-015	24/07/2010	RC	5381130	417150	10N	56	SJ-CAM-3102	13/08/2010	RC	5383165	388353	10N
7	SJ-BM-016	24/07/2010	RC	5381062	417151	10N	57	SJ-CAM-3103	13/08/2010	RC	5383165	388284	10N
8	SJ-BM-017	24/07/2010	RC	5380884	417171	10N	58	SJ-CAM-3104	13/08/2010	Bridge	5383349	388023	10N
9	SJ-BM-018	24/07/2010	RC	5380617	417295	10N	59	SJ-CAM-3105	13/08/2010	WBC	5383312	387984	10N
10	SJ-BM-019	24/07/2010	RC	5380455	417302	10N	60	SJ-CAM-3106	13/08/2010	RC	5383227	388051	10N
11	SJ-BM-020	24/07/2010	RC	5380344	417278	10N	61	SJ-CAM-3107	13/08/2010	RC	5383160	387897	10N
12	SJ-BM-021	24/07/2010	RC	5380194	417242	10N	62	SJ-CAM-3108	13/08/2010	RC	5383147	387803	10N
13	SJ-BM-022	24/07/2010	Bridge	5380102	417146	10N	63	SJ-CAM-3109	13/08/2010	RC	5383097	387697	10N
14	SJ-BM-023	24/07/2010	RC	5380279	417101	10N	64	SJ-CAM-3110	13/08/2010	RC	5382976	387486	10N
15	SJ-BM-024	24/07/2010	RC	5380445	417091	10N	65	SJ-CAM-3111	13/08/2010	RC	5382920	387249	10N
16	SJ-BM-025	24/07/2010	RC	5380521	417022	10N	66	SJ-CAM-3112	13/08/2010	WBC	5382945	387061	10N
17	SJ-BM-026	24/07/2010	RC	5380706	416906	10N	67	SJ-CAM-3113	13/08/2010	RC	5382868	386982	10N
18	SJ-BM-027	24/07/2010	RC	5380918	416797	10N	68	SJ-CAM-432	12/08/2010	WBC	5382093	385491	10N
19	SJ-BM-028	24/07/2010	RC	5380999	416741	10N	69	SJ-CAM-433	12/08/2010	WBC	5382213	385469	10N
20	SJ-BM-029	24/07/2010	RC	5381290	416628	10N	70	SJ-CAM-434	12/08/2010	RC	5382307	385438	10N
21	SJ-BM-030	24/07/2010	RC	5381378	416195	10N	71	SJ-CAM-435	12/08/2010	RC	5382299	385559	10N
22	SJ-BM-031	24/07/2010	RC	5381381	416081	10N	72	SJ-CAM-436	12/08/2010	RC	5382766	385663	10N
23	SJ-BM-032	24/07/2010	Bridge	5381660	415590	10N	73	SJ-CAM-437	12/08/2010	RC	5382833	385861	10N
24	SJ-BM-033	24/07/2010	Bridge	5381905	414638	10N	74	SJ-CAM-438	12/08/2010	RC	5382830	386043	10N
25	SJ-BM-034	24/07/2010	RC	5382014	414238	10N	75	SJ-CAM-439	12/08/2010	RC	5382790	386180	10N
26	SJ-BM-035	24/07/2010	RC	5382110	413881	10N	76	SJ-CAM-440	12/08/2010	RC	5382771	386240	10N
27	SJ-BM-036	24/07/2010	Bridge	5382329	412398	10N	77	SJ-CAM-441	12/08/2010	RC	5382845	386294	10N
28	SJ-BM-037	24/07/2010	Bridge	5382973	411315	10N	78	SJ-CAM-442	12/08/2010	WBC	5383116	386080	10N
29	SJ-CAM-3074	12/08/2010	Bridge	5385095	390598	10N	79	SJ-CAM-443	12/08/2010	WBC	5382908	386363	10N
30	SJ-CAM-3075	12/08/2010	WBC	5385055	390185	10N	80	SJ-CAM-444	12/08/2010	RC	5382940	386470	10N
31	SJ-CAM-3076	12/08/2010	RC	5385042	390159	10N	81	SJ-CAM-445	12/08/2010	RC	5382954	386540	10N
32	SJ-CAM-3077	12/08/2010	RC	5384987	390095	10N	82	SJ-CAM-446	12/08/2010	RC	5382922	386788	10N
33	SJ-CAM-3078	12/08/2010	RC	5384948	390057	10N	83	SJ-ELM-0001	12/10/2010	RC	5379352	398622	10N
34	SJ-CAM-3079	12/08/2010	RC	5384917	390021	10N	84	SJ-ELM-0002	12/10/2010	RC	5378728	398092	10N
35	SJ-CAM-3080	12/08/2010	RC	5384888	389990	10N	85	SJ-FL500-0001	13/12/2010	Bridge	5387421	421773	10N
36	SJ-CAM-3081	12/08/2010	RC	5384878	389977	10N	86	SJ-FL500-0002	13/12/2010	RC	5387769	421658	10N
37	SJ-CAM-3082	12/08/2010	WBC	5384841	389923	10N	87	SJ-FL500-0003	13/12/2010	RC	5387963	421670	10N
38	SJ-CAM-3083	12/08/2010	RC	5384719	389767	10N	88	SJ-FL600-0001	13/12/2010	RC	5387167	421430	10N
39	SJ-CAM-3084	12/08/2010	RC	5384646	389723	10N	89	SJ-FL600-0002	13/12/2010	RC	5387532	421758	10N
40	SJ-CAM-3085	12/08/2010	RC	5384523	389611	10N	90	SJ-FL600-0003	13/12/2010	RC	5387210	421445	10N
41	SJ-CAM-3087	12/08/2010	RC	5384377	389517	10N	91	SJ-FL600-0004	13/12/2010	Bridge	5387273	421458	10N
42	SJ-CAM-3088	12/08/2010	RC	5384320	389477	10N	92	SJ-FLT-0001	13/12/2010	Bridge	5385967	422526	10N
43	SJ-CAM-3089	12/08/2010	RC	5384226	389416	10N	93	SJ-FLT-0002	13/12/2010	RC	5386001	422398	10N
44	SJ-CAM-3090	12/08/2010	RC	5384138	389373	10N	94	SJ-FLT-0003	13/12/2010	RC	5386017	422335	10N
45	SJ-CAM-3091	12/08/2010	WBC	5384001	389316	10N	95	SJ-FLT-0004	13/12/2010	RC	5386031	422282	10N
46	SJ-CAM-3092	12/08/2010	RC	5383903	389240	10N	96	SJ-FLT-0005	13/12/2010	RC	5386057	422200	10N
47	SJ-CAM-3093	12/08/2010	RC	5383865	389200	10N	97	SJ-FLT-0006	13/12/2010	RC	5386160	422120	10N
48	SJ-CAM-3094	12/08/2010	WBC	5383713	389038	10N	98	SJ-FLT-0007	13/12/2010	RC	5386200	422094	10N
49	SJ-CAM-3095	12/08/2010	RC	5383608	388959	10N	99	SJ-FLT-0008	13/12/2010	RC	5386265	422053	10N
50	SJ-CAM-3096	12/08/2010	RC	5383522	388907	10N	100	SJ-FLT-0009	13/12/2010	RC	5386442	421980	10N

No.	Cross ID	GPS Date	Type	Northing	Easting	Zone	No.	Cross ID	GPS Date	Type	Northing	Easting	Zone
101	SJ-FLT-0010	13/12/2010	RC	5386478	421958	10N	151	SJ-FLT-0062	17/12/2010	RC	5390725	420332	10N
102	SJ-FLT-0011	13/12/2010	RC	5386526	421898	10N	152	SJ-FLT-0063	17/12/2010	RC	5390860	420364	10N
103	SJ-FLT-0012	13/12/2010	RC	5386638	421827	10N	153	SJ-FLT-0064	17/12/2010	RC	5390940	420388	10N
104	SJ-FLT-0013	13/12/2010	RC	5386807	421796	10N	154	SJ-FLT-0065	17/12/2010	RC	5391035	420402	10N
105	SJ-FLT-0014	13/12/2010	RC	5386882	421789	10N	155	SJ-FLT-0066	17/12/2010	RC	5391180	420417	10N
106	SJ-FLT-0015	13/12/2010	RC	5386950	421782	10N	156	SJ-FLT-0067	17/12/2010	RC	5391249	420401	10N
107	SJ-FLT-0016	13/12/2010	RC	5387104	421724	10N	157	SJ-FLT-0068	17/12/2010	RC	5391328	420376	10N
108	SJ-FLT-0017	13/12/2010	RC	5387134	421720	10N	158	SJ-FLT-0069	17/12/2010	RC	5391427	420329	10N
109	SJ-FLT-0018	13/12/2010	Bridge	5387223	421643	10N	159	SJ-FLT-0070	17/12/2010	RC	5391480	420280	10N
110	SJ-FLT-0019	13/12/2010	RC	5387346	421511	10N	160	SJ-FLT-0071	17/12/2010	RC	5391583	420249	10N
111	SJ-FLT-0020	13/12/2010	RC	5387447	421487	10N	161	SJ-FLT-0072	17/12/2010	RC	5391677	420192	10N
112	SJ-FLT-0021	13/12/2010	RC	5387501	421464	10N	162	SJ-FLT-0073	17/12/2010	RC	5391805	420037	10N
113	SJ-FLT-0022	13/12/2010	RC	5387588	421453	10N	163	SJ-FLT-0074	17/12/2010	RC	5391878	419854	10N
114	SJ-FLT-0023	13/12/2010	RC	5387709	421402	10N	164	SJ-FLT-0075	17/12/2010	RC	5391955	419762	10N
115	SJ-FLT-0024	13/12/2010	RC	5387739	421391	10N	165	SJ-FLT-0076	17/12/2010	RC	5391996	419697	10N
116	SJ-FLT-0025	13/12/2010	RC	5387764	421371	10N	166	SJ-FLT-0077	17/12/2010	RC	5392001	419628	10N
117	SJ-FLT-0026	13/12/2010	RC	5387792	421373	10N	167	SJ-FLT-0078	17/12/2010	RC	5391977	419511	10N
118	SJ-FLT-0027	13/12/2010	RC	5387859	421378	10N	168	SJ-FLT-0079	17/12/2010	RC	5391920	419428	10N
119	SJ-FLT-0028	13/12/2010	RC	5387925	421367	10N	169	SJ-FLT-0080	17/12/2010	RC	5391925	419360	10N
120	SJ-FLT-0029	13/12/2010	RC	5388028	421326	10N	170	SJ-FLT-0081	17/12/2010	RC	5391959	419261	10N
121	SJ-FLT-0030	13/12/2010	RC	5388150	421274	10N	171	SJ-FLT-0082	17/12/2010	RC	5391967	419215	10N
122	SJ-FLT-0031	13/12/2010	RC	5388270	421239	10N	172	SJ-FLT-0083	17/12/2010	RC	5391975	419158	10N
123	SJ-FLT-0032	13/12/2010	RC	5388342	421211	10N	173	SJ-FLT-0084	17/12/2010	RC	5391898	419051	10N
124	SJ-FLT-0033	13/12/2010	RC	5388422	421206	10N	174	SJ-FLT-0085	17/12/2010	RC	5391992	419019	10N
125	SJ-FLT-0034	13/12/2010	RC	5388500	421210	10N	175	SJ-FLT-0086	17/12/2010	RC	5392125	418943	10N
126	SJ-FLT-0035	13/12/2010	Bridge	5388625	421204	10N	176	SJ-FLT-1001	17/12/2010	RC	5392891	416723	10N
127	SJ-FLT-0036	13/12/2010	RC	5388841	421177	10N	177	SJ-FLT-1002	17/12/2010	RC	5393302	417004	10N
128	SJ-FLT-0037	13/12/2010	RC	5388866	421165	10N	178	SJ-FLT-1003	17/12/2010	RC	5393314	417007	10N
129	SJ-FLT-0038	13/12/2010	RC	5388991	421070	10N	179	SJ-FLT-1004	17/12/2010	RC	5393190	417195	10N
130	SJ-FLT-0039	13/12/2010	RC	5389118	421018	10N	180	SJ-FLT-1005	17/12/2010	RC	5393090	417371	10N
131	SJ-FLT-0040	13/12/2010	RC	5389184	420967	10N	181	SJ-FLT-1006	17/12/2010	RC	5393061	417653	10N
132	SJ-FLT-0041	13/12/2010	RC	5389200	420920	10N	182	SJ-FLT-1007	17/12/2010	RC	5393134	417876	10N
133	SJ-FLT-0042	13/12/2010	RC	5389313	420780	10N	183	SJ-FLT-1008	17/12/2010	RC	5393104	418105	10N
134	SJ-FLT-0043	13/12/2010	RC	5389348	420693	10N	184	SJ-FLT-1009	17/12/2010	RC	5393144	418365	10N
135	SJ-FLT-0044	13/12/2010	RC	5389380	420746	10N	185	SJ-FLT-1010	17/12/2010	RC	5393028	418462	10N
136	SJ-FLT-0045	13/12/2010	RC	5389402	420394	10N	186	SJ-FLT-1011	17/12/2010	RC	5392881	418612	10N
137	SJ-FLT-0046	13/12/2010	RC	5389409	420376	10N	187	SJ-FLT-1012	17/12/2010	RC	5392784	418619	10N
138	SJ-FLT-0047	13/12/2010	RC	5389370	420209	10N	188	SJ-FLT-1013	17/12/2010	RC	5392698	418617	10N
139	SJ-FLT-0048	13/12/2010	Bridge	5389248	420056	10N	189	SJ-FLT-1014	17/12/2010	RC	5392675	418622	10N
140	SJ-FLT-0049	13/12/2010	RC	5389313	420027	10N	190	SJ-FLT-1015	17/12/2010	RC	5392565	418658	10N
141	SJ-FLT-0051	17/12/2010	RC	5389620	420197	10N	191	SJ-FLT-1016	17/12/2010	RC	5392539	418680	10N
142	SJ-FLT-0052	17/12/2010	RC	5389816	420271	10N	192	SJ-FLT-1017	17/12/2010	RC	5392464	418694	10N
143	SJ-FLT-0053	17/12/2010	RC	5389868	420258	10N	193	SJ-FLT-1018	17/12/2010	RC	5392376	418720	10N
144	SJ-FLT-0054	17/12/2010	RC	5390053	420226	10N	194	SJ-FLT-1019	17/12/2010	RC	5392213	418812	10N
145	SJ-FLT-0055	17/12/2010	RC	5390215	420217	10N	195	SJ-FLT-1020	17/12/2010	RC	5392178	418871	10N
146	SJ-FLT-0056	17/12/2010	RC	5390265	420220	10N	196	SJ-FM-210	05/08/2010	WBC	5385395	403200	10N
147	SJ-FLT-0057	17/12/2010	RC	5390354	420226	10N	197	SJ-FM-211	05/08/2010	RC	5385324	403217	10N
148	SJ-FLT-0059	17/12/2010	RC	5390575	420269	10N	198	SJ-FM-212	05/08/2010	RC	5385287	403246	10N
149	SJ-FLT-0060	17/12/2010	RC	5390612	420289	10N	199	SJ-FM-213	05/08/2010	RC	5385234	403314	10N
150	SJ-FLT-0061	17/12/2010	RC	5390690	420318	10N	200	SJ-FM-214	05/08/2010	RC	5385138	403384	10N

No.	Cross ID	GPS Date	Type	Northing	Easting	Zone	No.	Cross ID	GPS Date	Type	Northing	Easting	Zone
201	SJ-FM-215	05/08/2010	WBC	5384982	403319	10N	251	SJ-GRA-198	05/08/2010	RC	5385120	406711	10N
202	SJ-FM-216	05/08/2010	RC	5384972	403437	10N	252	SJ-GRA-199	05/08/2010	RC	5385105	406635	10N
203	SJ-FM-217	05/08/2010	RC	5384927	403608	10N	253	SJ-GRA-200	05/08/2010	RC	5385065	406513	10N
204	SJ-FM-218	05/08/2010	RC	5384855	403698	10N	254	SJ-GRA-201	05/08/2010	RC	5385083	406191	10N
205	SJ-FM-219	05/08/2010	RC	5384794	403763	10N	255	SJ-GRA-202	05/08/2010	RC	5385077	406174	10N
206	SJ-FM-220	05/08/2010	RC	5384681	403815	10N	256	SJ-GRA-203	05/08/2010	RC	5384937	406075	10N
207	SJ-FM-221	05/08/2010	RC	5384473	403973	10N	257	SJ-GRA-204	05/08/2010	RC	5384894	405947	10N
208	SJ-FM-222	05/08/2010	RC	5384149	403744	10N	258	SJ-GRA-205	05/08/2010	RC	5384879	405811	10N
209	SJ-FM-223	05/08/2010	RC	5384137	403672	10N	259	SJ-GRA-206	05/08/2010	RC	5384838	405649	10N
210	SJ-FM-224	05/08/2010	RC	5384125	403525	10N	260	SJ-GRA-207	05/08/2010	RC	5384795	405574	10N
211	SJ-FM-225	05/08/2010	RC	5384088	403306	10N	261	SJ-GRA-208	05/08/2010	RC	5384706	405452	10N
212	SJ-FM-226	05/08/2010	RC	5384123	403226	10N	262	SJ-GRA-209	05/08/2010	RC	5384629	405389	10N
213	SJ-FM-227	05/08/2010	RC	5384231	404114	10N	263	SJ-GRA-3001	11/08/2010	RC	5389998	402644	10N
214	SJ-FM-228	05/08/2010	RC	5384279	404139	10N	264	SJ-GRA-3002	11/08/2010	RC	5390103	402593	10N
215	SJ-FM-229	05/08/2010	RC	5384308	404155	10N	265	SJ-GRA-3003	11/08/2010	WBC	5390150	402590	10N
216	SJ-FM-230	05/08/2010	Bridge	5383383	403925	10N	266	SJ-GRA-3004	11/08/2010	RC	5390242	402566	10N
217	SJ-GOR-3048	12/08/2010	Bridge	5392331	394636	10N	267	SJ-GRA-3005	11/08/2010	RC	5390383	402526	10N
218	SJ-GOR-414	12/08/2010	Bridge	5395788	394543	10N	268	SJ-GRA-3006	11/08/2010	WBC	5390440	402499	10N
219	SJ-GOR-415	12/08/2010	RC	5395778	394572	10N	269	SJ-GRA-3007	11/08/2010	RC	5390467	402495	10N
220	SJ-GOR-416	12/08/2010	RC	5395688	394570	10N	270	SJ-GRA-3008	11/08/2010	RC	5390553	402441	10N
221	SJ-GOR-417	12/08/2010	RC	5395512	394578	10N	271	SJ-GRA-3009	11/08/2010	RC	5390572	402497	10N
222	SJ-GOR-418	12/08/2010	RC	5395268	394589	10N	272	SJ-GRA-3010	11/08/2010	RC	5390570	402633	10N
223	SJ-GOR-419	12/08/2010	RC	5395103	394655	10N	273	SJ-GRA-3011	11/08/2010	WBC	5390579	402835	10N
224	SJ-GOR-420	12/08/2010	RC	5395074	394660	10N	274	SJ-GRA-3012	11/08/2010	RC	5390583	402853	10N
225	SJ-GOR-421	12/08/2010	RC	5394991	394554	10N	275	SJ-GRA-3013	11/08/2010	RC	5391000	403188	10N
226	SJ-GOR-422	12/08/2010	RC	5394788	394616	10N	276	SJ-GRA-3014	11/08/2010	RC	5390872	403067	10N
227	SJ-GOR-423	12/08/2010	RC	5394768	394639	10N	277	SJ-GRA-3015	11/08/2010	RC	5390768	402989	10N
228	SJ-GOR-424	12/08/2010	RC	5394655	394637	10N	278	SJ-GRA-3016	11/08/2010	RC	5390759	402985	10N
229	SJ-GOR-425	12/08/2010	RC	5394612	394662	10N	279	SJ-GRA-3017	11/08/2010	RC	5390678	402924	10N
230	SJ-GOR-426	12/08/2010	RC	5394551	394676	10N	280	SJ-GRA-3018	11/08/2010	RC	5390646	402880	10N
231	SJ-GOR-427	12/08/2010	RC	5394449	394701	10N	281	SJ-GRA-3019	11/08/2010	RC	5390604	402970	10N
232	SJ-GOR-428	12/08/2010	RC	5394439	394692	10N	282	SJ-GRA-3020	11/08/2010	RC	5390655	403170	10N
233	SJ-GOR-429	12/08/2010	RC	5394379	394675	10N	283	SJ-GRA-3021	11/08/2010	RC	5390901	403277	10N
234	SJ-GOR-430	12/08/2010	RC	5394258	394698	10N	284	SJ-GRA-3022	11/08/2010	RC	5390696	403182	10N
235	SJ-GOR-431	12/08/2010	RC	5394048	394652	10N	285	SJ-GRA-3023	11/08/2010	RC	5390680	403178	10N
236	SJ-GRA-183	05/08/2010	RC	5386563	406516	10N	286	SJ-GRA-3024	11/08/2010	WBC	5390670	403219	10N
237	SJ-GRA-184	05/08/2010	RC	5386434	406518	10N	287	SJ-GRA-3025	11/08/2010	RC	5390756	403389	10N
238	SJ-GRA-185	05/08/2010	RC	5386353	406493	10N	288	SJ-GRA-3026	11/08/2010	WBC	5390819	403478	10N
239	SJ-GRA-186	05/08/2010	RC	5386116	406593	10N	289	SJ-GRA-3027	11/08/2010	RC	5391080	403640	10N
240	SJ-GRA-187	05/08/2010	RC	5386049	406655	10N	290	SJ-GRA-3028	11/08/2010	RC	5391040	403940	10N
241	SJ-GRA-188	05/08/2010	RC	5385931	406721	10N	291	SJ-GRA-3029	11/08/2010	RC	5390866	404168	10N
242	SJ-GRA-189	05/08/2010	RC	5385844	406881	10N	292	SJ-GRA-3030	11/08/2010	WBC	5390621	404320	10N
243	SJ-GRA-190	05/08/2010	RC	5385835	407088	10N	293	SJ-GRA-3031	11/08/2010	RC	5390478	404267	10N
244	SJ-GRA-191	05/08/2010	RC	5385698	407150	10N	294	SJ-GRA-3032	11/08/2010	WBC	5390263	404315	10N
245	SJ-GRA-192	05/08/2010	RC	5385575	407226	10N	295	SJ-GRA-3033	11/08/2010	RC	5390116	404350	10N
246	SJ-GRA-193	05/08/2010	RC	5385497	407168	10N	296	SJ-GRA-3034	11/08/2010	RC	5389983	404353	10N
247	SJ-GRA-194	05/08/2010	RC	5385295	407107	10N	297	SJ-GRA-3035	11/08/2010	RC	5389775	404423	10N
248	SJ-GRA-195	05/08/2010	RC	5385224	407003	10N	298	SJ-GRA-3036	11/08/2010	WBC	5389732	404272	10N
249	SJ-GRA-196	05/08/2010	RC	5385169	406895	10N	299	SJ-GRA-3037	11/08/2010	RC	5389648	404437	10N
250	SJ-GRA-197	05/08/2010	RC	5385157	406824	10N	300	SJ-GRA-3038	11/08/2010	WBC	5389560	404449	10N

No.	Cross ID	GPS Date	Type	Northing	Easting	Zone	No.	Cross ID	GPS Date	Type	Northing	Easting	Zone
301	SJ-GRA-3039	11/08/2010	RC	5389116	404532	10N	351	SJ-GRA-401	11/08/2010	RC	5384243	405648	10N
302	SJ-GRA-3040	11/08/2010	WBC	5388810	404736	10N	352	SJ-GRA-402	11/08/2010	RC	5384216	405586	10N
303	SJ-GRA-3041	11/08/2010	RC	5388685	404747	10N	353	SJ-GRN-3049	12/08/2010	Bridge	5389229	389623	10N
304	SJ-GRA-3042	11/08/2010	RC	5388621	404748	10N	354	SJ-GRN-3050	12/08/2010	RC	5389125	389507	10N
305	SJ-GRA-3043	11/08/2010	RC	5388605	404747	10N	355	SJ-GRN-3051	12/08/2010	Bridge	5389044	389517	10N
306	SJ-GRA-3044	11/08/2010	Bridge	5384862	407922	10N	356	SJ-GRN-3052	12/08/2010	RC	5389018	389557	10N
307	SJ-GRA-3045	11/08/2010	Bridge	5384567	407733	10N	357	SJ-GRN-3053	12/08/2010	RC	5388951	389642	10N
308	SJ-GRA-3046	11/08/2010	Bridge	5383900	405888	10N	358	SJ-GRN-3054	12/08/2010	RC	5388940	389659	10N
309	SJ-GRA-358	11/08/2010	RC	5389207	404156	10N	359	SJ-GRN-3055	12/08/2010	RC	5388925	389683	10N
310	SJ-GRA-359	11/08/2010	RC	5389110	404166	10N	360	SJ-GRN-3056	12/08/2010	RC	5388907	389712	10N
311	SJ-GRA-360	11/08/2010	Bridge	5388891	404176	10N	361	SJ-GRN-3057	12/08/2010	RC	5388875	389764	10N
312	SJ-GRA-361	11/08/2010	RC	5388829	404235	10N	362	SJ-GRN-3058	12/08/2010	RC	5388852	389803	10N
313	SJ-GRA-362	11/08/2010	RC	5388796	404267	10N	363	SJ-GRN-3059	12/08/2010	RC	5388814	389845	10N
314	SJ-GRA-363	11/08/2010	RC	5388701	404341	10N	364	SJ-GRN-3060	12/08/2010	RC	5388801	389860	10N
315	SJ-GRA-365	11/08/2010	RC	5388595	404434	10N	365	SJ-GRN-3061	12/08/2010	WBC	5388783	389876	10N
316	SJ-GRA-366	11/08/2010	RC	5388506	404573	10N	366	SJ-GRN-3062	12/08/2010	RC	5388717	389947	10N
317	SJ-GRA-367	11/08/2010	Bridge	5388519	404632	10N	367	SJ-GRN-3063	12/08/2010	WBC	5388673	389988	10N
318	SJ-GRA-368	11/08/2010	RC	5388495	404709	10N	368	SJ-GRN-3064	12/08/2010	WBC	5388588	390058	10N
319	SJ-GRA-369	11/08/2010	RC	5388432	404875	10N	369	SJ-GRN-3065	12/08/2010	WBC	5388555	390081	10N
320	SJ-GRA-370	11/08/2010	RC	5388248	404879	10N	370	SJ-GRN-3066	12/08/2010	WBC	5388492	390119	10N
321	SJ-GRA-371	11/08/2010	RC	5388177	404922	10N	371	SJ-GRN-3067	12/08/2010	WBC	5388467	390129	10N
322	SJ-GRA-372	11/08/2010	RC	5388048	404930	10N	372	SJ-GRN-3068	12/08/2010	WBC	5388450	390135	10N
323	SJ-GRA-373	11/08/2010	Bridge	5387905	404862	10N	373	SJ-GRN-3069	12/08/2010	WBC	5388430	390145	10N
324	SJ-GRA-374	11/08/2010	RC	5387817	404965	10N	374	SJ-GRN-3070	12/08/2010	WBC	5388375	390165	10N
325	SJ-GRA-375	11/08/2010	RC	5387749	404983	10N	375	SJ-GRN-3071	12/08/2010	Bridge	5387784	390348	10N
326	SJ-GRA-376	11/08/2010	RC	5387662	404992	10N	376	SJ-GRN-3072	12/08/2010	Bridge	5386581	390811	10N
327	SJ-GRA-377	11/08/2010	RC	5387590	405021	10N	377	SJ-GRN-3073	12/08/2010	WBC	5386520	391089	10N
328	SJ-GRA-378	11/08/2010	RC	5387389	405050	10N	378	SJ-HCM-0001	13/10/2010	RC	5382143	398204	10N
329	SJ-GRA-379	11/08/2010	RC	5387194	405068	10N	379	SJ-HCM-0002	13/10/2010	RC	5382190	398320	10N
330	SJ-GRA-380	11/08/2010	RC	5387107	405085	10N	380	SJ-HCM-0005	13/10/2010	RC	5382288	398601	10N
331	SJ-GRA-381	11/08/2010	RC	5386924	405108	10N	381	SJ-HCM-0006	13/10/2010	WBC and R	5382289	398621	10N
332	SJ-GRA-382	11/08/2010	RC	5386866	405117	10N	382	SJ-HCM-0007	13/10/2010	RC	5382300	398641	10N
333	SJ-GRA-383	11/08/2010	RC	5386715	405175	10N	383	SJ-HCM-0008	13/10/2010	RC	5382296	398677	10N
334	SJ-GRA-384	11/08/2010	RC	5386675	405169	10N	384	SJ-HCM-0009	13/10/2010	RC	5382308	398716	10N
335	SJ-GRA-385	11/08/2010	RC	5386563	405193	10N	385	SJ-HCM-0010	13/10/2010	Bridge	5382357	398989	10N
336	SJ-GRA-386	11/08/2010	RC	5386088	405153	10N	386	SJ-HCM-0011	13/10/2010	RC	5382674	400451	10N
337	SJ-GRA-387	11/08/2010	RC	5385821	405104	10N	387	SJ-HCM-0012	13/10/2010	RC	5382679	400464	10N
338	SJ-GRA-388	11/08/2010	RC	5385691	405014	10N	388	SJ-HCM-0013	13/10/2010	RC	5382668	400608	10N
339	SJ-GRA-389	11/08/2010	WBC	5385563	404931	10N	389	SJ-HCM-0014	13/10/2010	RC	5382655	401079	10N
340	SJ-GRA-390	11/08/2010	RC	5385323	404785	10N	390	SJ-HCM-0015	13/10/2010	Bridge	5382771	402077	10N
341	SJ-GRA-391	11/08/2010	RC	5385064	404806	10N	391	SJ-HCM-0016	13/10/2010	Bridge	5382798	402109	10N
342	SJ-GRA-392	11/08/2010	RC	5384688	404914	10N	392	SJ-HCM-0017	13/10/2010	RC	5382864	402240	10N
343	SJ-GRA-393	11/08/2010	RC	5384525	405106	10N	393	SJ-HCM-0018	13/10/2010	RC	5382976	403091	10N
344	SJ-GRA-394	11/08/2010	RC	5384397	405289	10N	394	SJ-HCM-0020	13/10/2010	RC	5382999	403227	10N
345	SJ-GRA-395	11/08/2010	RC	5384381	405348	10N	395	SJ-HCM-0021	13/10/2010	RC	5383004	403445	10N
346	SJ-GRA-396	11/08/2010	RC	5384381	405422	10N	396	SJ-HCM-0023	13/10/2010	RC	5383020	403885	10N
347	SJ-GRA-397	11/08/2010	RC	5384416	405568	10N	397	SJ-HCM-0024	13/10/2010	RC	5383027	404040	10N
348	SJ-GRA-398	11/08/2010	RC	5384423	405623	10N	398	SJ-HCM-0025	13/10/2010	RC	5383112	404473	10N
349	SJ-GRA-399	11/08/2010	RC	5384433	405849	10N	399	SJ-HCM-0026	13/10/2010	Bridge	5383505	404941	10N
350	SJ-GRA-400	11/08/2010	RC	5384308	405789	10N	400	SJ-HCM-0027	13/10/2010	RC	5383048	405673	10N

No.	Cross ID	GPS Date	Type	Northing	Easting	Zone	No.	Cross ID	GPS Date	Type	Northing	Easting	Zone
401	SJ-HCM-0028	13/10/2010	RC	5383019	405897	10N	451	SJ-HCM-0080	02/11/2010	RC	5392564	410161	10N
402	SJ-HCM-0029	13/10/2010	RC	5383015	405929	10N	452	SJ-HCM-0081	02/11/2010	RC	5392621	410147	10N
403	SJ-HCM-0030	13/10/2010	RC	5383132	406268	10N	453	SJ-HCM-0082	02/11/2010	RC	5392621	410151	10N
404	SJ-HCM-0031	13/10/2010	RC	5383161	406373	10N	454	SJ-HCM-0083	02/11/2010	RC	5392648	410140	10N
405	SJ-HCM-0032	13/10/2010	Bridge	5382992	406918	10N	455	SJ-HCM-0084	02/11/2010	RC	5392703	410152	10N
406	SJ-HCM-0033	13/10/2010	RC	5383150	407386	10N	456	SJ-HCM-0085	02/11/2010	RC	5393267	410491	10N
407	SJ-HCM-0034	13/10/2010	RC	5383192	407764	10N	457	SJ-HCM-0086	02/11/2010	RC	5393463	410484	10N
408	SJ-HCM-0035	13/10/2010	RC	5383084	408039	10N	458	SJ-HCM-0087	02/11/2010	Bridge	5393556	410588	10N
409	SJ-HCM-0036	13/10/2010	RC	5385021	410073	10N	459	SJ-HCM-0089	02/11/2010	RC	5393959	410724	10N
410	SJ-HCM-0037	13/10/2010	RC	5385082	410076	10N	460	SJ-HCM-0090	02/11/2010	RC	5394372	410652	10N
411	SJ-HCM-0038	13/10/2010	RC	5385124	410082	10N	461	SJ-HCM-0091	02/11/2010	RC	5394731	410579	10N
412	SJ-HCM-0039	13/10/2010	RC	5385312	410094	10N	462	SJ-HCM-0093	03/11/2010	RC	5395098	410589	10N
413	SJ-HCM-0040	13/10/2010	RC	5385392	410039	10N	463	SJ-HCM-0094	03/11/2010	RC	5395152	410603	10N
414	SJ-HCM-0041	13/10/2010	RC	5385450	409992	10N	464	SJ-HCM-0095	03/11/2010	Bridge	5395272	410643	10N
415	SJ-HCM-0042	13/10/2010	RC	5385535	409882	10N	465	SJ-HCM-0096	03/11/2010	RC	5395737	410862	10N
416	SJ-HCM-0043	13/10/2010	RC	5385630	409754	10N	466	SJ-HCM-0097	03/11/2010	RC	5395662	411127	10N
417	SJ-HCM-0044	13/10/2010	RC	5385745	409633	10N	467	SJ-HCM-0098	03/11/2010	RC	5395806	411242	10N
418	SJ-HCM-0045	13/10/2010	RC	5386026	409376	10N	468	SJ-HCM-0099	03/11/2010	CBC	5396161	411698	10N
419	SJ-HCM-0046	13/10/2010	Bridge	5386267	409218	10N	469	SJ-HCM-0100	03/11/2010	RC	5396529	411749	10N
420	SJ-HCM-0047	13/10/2010	RC	5386744	408833	10N	470	SJ-HCM-0101	03/11/2010	RC	5396628	411947	10N
421	SJ-HCM-0048	13/10/2010	RC	5386783	408783	10N	471	SJ-HCM-0102	03/11/2010	RC	5396721	412053	10N
422	SJ-HCM-0049	13/10/2010	RC	5386795	408746	10N	472	SJ-HCM-0103	03/11/2010	RC	5396821	412103	10N
423	SJ-HCM-0050	13/10/2010	RC	5386846	408598	10N	473	SJ-HCM-0104	03/11/2010	RC	5397008	412234	10N
424	SJ-HCM-0051	13/10/2010	RC	5386882	408501	10N	474	SJ-HCM-0105	03/11/2010	RC	5397055	412308	10N
425	SJ-HCM-0052	13/10/2010	Bridge	5387629	407941	10N	475	SJ-HCM-0106	03/11/2010	RC	5397146	412330	10N
426	SJ-HCM-0053	13/10/2010	RC	5387868	407750	10N	476	SJ-HCM-0107	03/11/2010	RC	5397245	412388	10N
427	SJ-HCM-0054	13/10/2010	RC	5387844	407813	10N	477	SJ-HCM-0108	03/11/2010	RC	5397362	412472	10N
428	SJ-HCM-0055	13/10/2010	WBC	5387899	408275	10N	478	SJ-HCM-0110	03/11/2010	RC	5397692	412547	10N
429	SJ-HCM-0056	13/10/2010	RC	5387938	408556	10N	479	SJ-HCM-0112	03/11/2010	Bridge	5398237	412719	10N
430	SJ-HCM-0057	13/10/2010	RC	5387931	408623	10N	480	SJ-HCM-0113	03/11/2010	RC	5398306	412759	10N
431	SJ-HCM-0058	13/10/2010	RC	5387990	408969	10N	481	SJ-HCM-0114	03/11/2010	RC	5398296	412853	10N
432	SJ-HCM-0059	13/10/2010	RC	5388363	409387	10N	482	SJ-HCM-0115	03/11/2010	RC	5398139	413296	10N
433	SJ-HCM-0060	13/10/2010	RC	5388531	409487	10N	483	SJ-HCM-0117	03/11/2010	WBC	5397984	413633	10N
434	SJ-HCM-0061	13/10/2010	RC	5388696	409642	10N	484	SJ-HCM-0118	03/11/2010	RC	5397915	413779	10N
435	SJ-HCM-0062	13/10/2010	RC	5388856	409771	10N	485	SJ-HCM-0119	03/11/2010	RC	5397595	413949	10N
436	SJ-HCM-0063	13/10/2010	RC	5389251	409964	10N	486	SJ-HCM-0120	03/11/2010	RC	5397531	413954	10N
437	SJ-HCM-0064	13/10/2010	RC	5389479	409965	10N	487	SJ-HCM-0121	03/11/2010	RC	5397395	414033	10N
438	SJ-HCM-0065	13/10/2010	RC	5389845	409743	10N	488	SJ-HCM-0122	03/11/2010	RC	5397142	414373	10N
439	SJ-HCM-0066	13/10/2010	RC	5389897	409727	10N	489	SJ-HCM-0123	03/11/2010	RC	5397074	414468	10N
440	SJ-HCM-0067	13/10/2010	RC	5389994	409695	10N	490	SJ-HCM-0124	03/11/2010	RC	5396947	414667	10N
441	SJ-HCM-0068	13/10/2010	RC	5390066	409671	10N	491	SJ-HCM-0125	03/11/2010	RC	5396789	414862	10N
442	SJ-HCM-0069	13/10/2010	RC	5390237	409669	10N	492	SJ-HCM-0126	03/11/2010	RC	5396630	414956	10N
443	SJ-HCM-0070	13/10/2010	RC	5390276	409661	10N	493	SJ-HCM-0127	03/11/2010	RC	5396254	415113	10N
444	SJ-HCM-0071	13/10/2010	RC	5390443	409685	10N	494	SJ-HCM-0128	03/11/2010	RC	5396176	415218	10N
445	SJ-HCM-0072	02/11/2010	RC	5390451	409683	10N	495	SJ-HCM-0129	03/11/2010	RC	5396095	415255	10N
446	SJ-HCM-0073	02/11/2010	RC	5390756	409789	10N	496	SJ-HCM-0130	03/11/2010	RC	5396037	415454	10N
447	SJ-HCM-0074	02/11/2010	RC	5390887	409832	10N	497	SJ-HCM-0131	03/11/2010	RC	5396064	415550	10N
448	SJ-HCM-0076	02/11/2010	Bridge	5392067	410027	10N	498	SJ-HCM-0132	03/11/2010	RC	5396097	415764	10N
449	SJ-HCM-0077	02/11/2010	RC	5392142	410032	10N	499	SJ-HCM-0133	03/11/2010	RC	5396099	415857	10N
450	SJ-HCM-0079	02/11/2010	RC	5392474	410152	10N	500	SJ-HCM-0134	03/11/2010	RC	5396125	415924	10N

No.	Cross ID	GPS Date	Type	Northing	Easting	Zone	No.	Cross ID	GPS Date	Type	Northing	Easting	Zone
501	SJ-HCM-1001	03/11/2010	RC	5398585	408069	10N	551	SJ-HEM-291	10/08/2010	RC	5390178	406391	10N
502	SJ-HCM-1002	03/11/2010	RC	5398559	408112	10N	552	SJ-HEM-292	10/08/2010	RC	5390321	406385	10N
503	SJ-HCM-1003	03/11/2010	RC	5398502	408167	10N	553	SJ-HEM-293	10/08/2010	RC	5390424	406389	10N
504	SJ-HCM-1004	03/11/2010	RC	5398421	408232	10N	554	SJ-HEM-294	10/08/2010	RC	5390464	406408	10N
505	SJ-HCM-1005	03/11/2010	RC	5398384	408319	10N	555	SJ-HEM-295	10/08/2010	RC	5390505	406434	10N
506	SJ-HCM-1006	03/11/2010	RC	5398322	408410	10N	556	SJ-HEM-296	10/08/2010	RC	5390641	406517	10N
507	SJ-HCM-1007	03/11/2010	RC	5398229	408442	10N	557	SJ-HEM-297	10/08/2010	Bridge	5390571	406674	10N
508	SJ-HCM-1008	03/11/2010	RC	5398252	408526	10N	558	SJ-HEM-298	10/08/2010	RC	5390405	406711	10N
509	SJ-HCM-1009	03/11/2010	RC	5398130	408619	10N	559	SJ-HEM-299	10/08/2010	RC	5390249	406802	10N
510	SJ-HCM-1010	03/11/2010	RC	5398089	408769	10N	560	SJ-HEM-300	10/08/2010	RC	5390214	406803	10N
511	SJ-HCM-1011	03/11/2010	RC	5398028	408805	10N	561	SJ-HEM-301	10/08/2010	RC	5390152	406800	10N
512	SJ-HCM-1012	03/11/2010	RC	5397814	408927	10N	562	SJ-HEM-302	10/08/2010	WBC	5390098	406786	10N
513	SJ-HCM-1013	03/11/2010	RC	5397675	408871	10N	563	SJ-HEM-303	10/08/2010	RC	5393747	403481	10N
514	SJ-HCM-1014	03/11/2010	RC	5397808	408590	10N	564	SJ-HEM-304	10/08/2010	RC	5393711	403509	10N
515	SJ-HCM-1015	03/11/2010	RC	5397629	408809	10N	565	SJ-HEM-305	10/08/2010	RC	5393680	403511	10N
516	SJ-HCM-1016	03/11/2010	RC	5397514	408867	10N	566	SJ-HEM-306	10/08/2010	WBC	5393653	403519	10N
517	SJ-HCM-1017	03/11/2010	RC	5397355	408984	10N	567	SJ-HEM-307	10/08/2010	RC	5393584	403525	10N
518	SJ-HCM-1018	03/11/2010	RC	5397320	409122	10N	568	SJ-HEM-308	10/08/2010	RC	5393471	403566	10N
519	SJ-HCM-1019	03/11/2010	RC	5397329	409165	10N	569	SJ-HEM-309	10/08/2010	RC	5393440	403597	10N
520	SJ-HCM-1020	03/11/2010	RC	5397455	409315	10N	570	SJ-HEM-310	10/08/2010	Bridge	5393380	403624	10N
521	SJ-HCM-1021	03/11/2010	Bridge	5397372	409496	10N	571	SJ-HEM-311	10/08/2010	RC	5393312	403606	10N
522	SJ-HCM-1022	03/11/2010	WBC	5397226	409681	10N	572	SJ-HEM-312	10/08/2010	RC	5393251	403596	10N
523	SJ-HCM-1023	03/11/2010	RC	5397058	409786	10N	573	SJ-HEM-313	10/08/2010	RC	5393216	403589	10N
524	SJ-HCM-1024	03/11/2010	RC	5396902	410152	10N	574	SJ-HEM-314	10/08/2010	RC	5393146	403582	10N
525	SJ-HCM-1026	03/11/2010	RC	5396553	410613	10N	575	SJ-HEM-315	10/08/2010	RC	5393086	403545	10N
526	SJ-HCM-1027	03/11/2010	RC	5395868	410802	10N	576	SJ-HEM-316	10/08/2010	RC	5393035	403539	10N
527	SJ-HEM-266	09/08/2010	RC	5391807	404941	10N	577	SJ-HEM-317	10/08/2010	RC	5392972	403542	10N
528	SJ-HEM-267	09/08/2010	RC	5391790	405044	10N	578	SJ-HEM-318	10/08/2010	RC	5392928	403552	10N
529	SJ-HEM-268	09/08/2010	RC	5391793	405105	10N	579	SJ-HEM-319	10/08/2010	RC	5392882	403563	10N
530	SJ-HEM-269	09/08/2010	RC	5391789	405176	10N	580	SJ-HEM-320	10/08/2010	RC	5392857	403581	10N
531	SJ-HEM-270	09/08/2010	RC	5391752	405261	10N	581	SJ-HEM-321	10/08/2010	RC	5392811	403597	10N
532	SJ-HEM-272	09/08/2010	RC	5391720	405471	10N	582	SJ-HEM-322	10/08/2010	RC	5392724	403641	10N
533	SJ-HEM-273	09/08/2010	RC	5391684	405536	10N	583	SJ-HEM-323	10/08/2010	RC	5392584	403642	10N
534	SJ-HEM-274	09/08/2010	RC	5391765	405652	10N	584	SJ-HEM-324	10/08/2010	RC	5392468	403635	10N
535	SJ-HEM-275	09/08/2010	RC	5391676	405704	10N	585	SJ-HEM-325	10/08/2010	RC	5392354	403695	10N
536	SJ-HEM-276	09/08/2010	RC	5391634	405781	10N	586	SJ-HEM-326	10/08/2010	RC	5392264	403781	10N
537	SJ-HEM-277	09/08/2010	RC	5391651	405813	10N	587	SJ-HEM-327	10/08/2010	RC	5392175	403913	10N
538	SJ-HEM-278	10/08/2010	RC	5391576	405876	10N	588	SJ-HEM-328	10/08/2010	RC	5392137	404036	10N
539	SJ-HEM-279	10/08/2010	RC	5391511	405980	10N	589	SJ-HEM-329	10/08/2010	RC	5392126	404167	10N
540	SJ-HEM-280	10/08/2010	RC	5391486	406039	10N	590	SJ-HEM-330	10/08/2010	RC	5392141	404179	10N
541	SJ-HEM-281	10/08/2010	RC	5391429	406112	10N	591	SJ-HEM-331	10/08/2010	RC	5392012	404457	10N
542	SJ-HEM-282	10/08/2010	RC	5391418	406131	10N	592	SJ-HEM-332	10/08/2010	RC	5392060	404542	10N
543	SJ-HEM-283	10/08/2010	RC	5391320	406195	10N	593	SJ-HEM-333	10/08/2010	WBC	5392225	404549	10N
544	SJ-HEM-284	10/08/2010	RC	5391230	406313	10N	594	SJ-HEM-334	10/08/2010	RC	5392164	404773	10N
545	SJ-HEM-285	10/08/2010	RC	5391143	406364	10N	595	SJ-HEM-335	10/08/2010	WBC	5392187	404825	10N
546	SJ-HEM-286	10/08/2010	RC	5391041	406429	10N	596	SJ-HEM-336	10/08/2010	WBC	5392132	405041	10N
547	SJ-HEM-287	10/08/2010	RC	5390949	406468	10N	597	SJ-HEM-337	10/08/2010	RC	5392099	405361	10N
548	SJ-HEM-288	10/08/2010	RC	5390891	406500	10N	598	SJ-HEM-338	10/08/2010	WBC	5392098	405559	10N
549	SJ-HEM-289	10/08/2010	RC	5390798	406533	10N	599	SJ-HEM-339	10/08/2010	RC	5392031	405699	10N
550	SJ-HEM-290	10/08/2010	RC	5390696	406590	10N	600	SJ-HEM-341	10/08/2010	RC	5391987	405788	10N

No.	Cross ID	GPS Date	Type	Northing	Easting	Zone	No.	Cross ID	GPS Date	Type	Northing	Easting	Zone
601	SJ-HEM-342	10/08/2010	RC	5391871	405988	10N	651	SJ-LEN-059	25/07/2010	RC	5382900	413253	10N
602	SJ-HEM-343	10/08/2010	RC	5391742	406072	10N	652	SJ-LEN-060	25/07/2010	RC	5382923	413173	10N
603	SJ-HEM-344	10/08/2010	Bridge	5391677	406119	10N	653	SJ-LEN-061	25/07/2010	RC	5383059	413023	10N
604	SJ-HEM-345	10/08/2010	RC	5391810	406444	10N	654	SJ-LEN-062	25/07/2010	RC	5383204	412914	10N
605	SJ-HEM-346	10/08/2010	RC	5391830	406508	10N	655	SJ-LEN-063	25/07/2010	Bridge	5383334	412827	10N
606	SJ-HEM-347	10/08/2010	RC	5391814	406645	10N	656	SJ-LEN-064	25/07/2010	RC	5383371	412710	10N
607	SJ-HEM-348	10/08/2010	Bridge	5391760	406704	10N	657	SJ-LEN-066	25/07/2010	RC	5383421	412088	10N
608	SJ-HEM-349	10/08/2010	RC	5391722	406729	10N	658	SJ-LEN-067	25/07/2010	RC	5383298	411665	10N
609	SJ-HEM-350	10/08/2010	RC	5391665	406746	10N	659	SJ-LEN-3001	14/12/2010	RC	5388968	412951	10N
610	SJ-HEM-351	10/08/2010	RC	5391485	406884	10N	660	SJ-LEN-3002	14/12/2010	RC	5389026	412924	10N
611	SJ-HEM-352	10/08/2010	RC	5391261	406931	10N	661	SJ-LEN-3003	14/12/2010	RC	5389181	412890	10N
612	SJ-HEM-353	10/08/2010	RC	5391168	406913	10N	662	SJ-LEN-3004	14/12/2010	RC	5389267	412853	10N
613	SJ-HEM-354	10/08/2010	RC	5391105	406920	10N	663	SJ-LEN-3005	14/12/2010	RC	5389311	412857	10N
614	SJ-HEM-355	10/08/2010	RC	5391049	406943	10N	664	SJ-LEN-3006	14/12/2010	RC	5389455	412786	10N
615	SJ-HEM-356	10/08/2010	RC	5391002	406957	10N	665	SJ-LEN-3007	14/12/2010	RC	5389497	412759	10N
616	SJ-HEM-357	10/08/2010	Bridge	5390857	406932	10N	666	SJ-LEN-3008	14/12/2010	RC	5389640	412734	10N
617	SJ-HEM-403	12/08/2010	RC	5390602	406892	10N	667	SJ-LEN-3009	14/12/2010	RC	5389692	412705	10N
618	SJ-HEM-404	12/08/2010	RC	5390245	406829	10N	668	SJ-LEN-3010	14/12/2010	RC	5389751	412680	10N
619	SJ-HEM-405	12/08/2010	RC	5390089	406809	10N	669	SJ-LEN-3011	14/12/2010	RC	5389923	412711	10N
620	SJ-HEM-406	12/08/2010	Bridge	5389933	406781	10N	670	SJ-LEN-3012	14/12/2010	RC	5390057	412689	10N
621	SJ-HEM-407	12/08/2010	RC	5389671	406794	10N	671	SJ-LEN-3013	14/12/2010	RC	5390149	412674	10N
622	SJ-HEM-408	12/08/2010	RC	5389266	406830	10N	672	SJ-LEN-3014	14/12/2010	RC	5390262	412688	10N
623	SJ-HEM-409	12/08/2010	Bridge	5389087	406969	10N	673	SJ-LEN-3015	14/12/2010	WBC	5390385	412704	10N
624	SJ-HEM-410	12/08/2010	RC	5389035	406974	10N	674	SJ-LEN-3016	14/12/2010	RC	5390409	412788	10N
625	SJ-HEM-411	12/08/2010	RC	5388699	406986	10N	675	SJ-LEN-3017	14/12/2010	RC	5390422	412901	10N
626	SJ-HEM-412	12/08/2010	RC	5388540	407026	10N	676	SJ-LEN-3018	14/12/2010	RC	5390336	413015	10N
627	SJ-HEM-413	12/08/2010	Bridge	5388066	407216	10N	677	SJ-LEN-3019	14/12/2010	RC	5390292	413096	10N
628	SJ-HWY-14-0001	12/10/2010	Bridge	5379568	397410	10N	678	SJ-LEN-3020	14/12/2010	RC	5390250	413176	10N
629	SJ-HWY-14-0002	12/10/2010	Bridge	5379665	398282	10N	679	SJ-LEN-3021	14/12/2010	RC	5390212	413248	10N
630	SJ-LEN-038	24/07/2010	WBC	5386877	413286	10N	680	SJ-LEN-3022	14/12/2010	RC	5390163	413385	10N
631	SJ-LEN-039	24/07/2010	RC	5386344	412858	10N	681	SJ-LEN-3023	14/12/2010	Bridge	5390171	413632	10N
632	SJ-LEN-040	24/07/2010	RC	5386228	412758	10N	682	SJ-LEN-3024	14/12/2010	RC	5390123	413785	10N
633	SJ-LEN-041	24/07/2010	RC	5385941	412641	10N	683	SJ-LEN-3025	14/12/2010	RC	5390130	413976	10N
634	SJ-LEN-042	24/07/2010	Bridge	5385516	412573	10N	684	SJ-LEN-3026	14/12/2010	RC	5390090	414179	10N
635	SJ-LEN-043	24/07/2010	WBC	5384419	412441	10N	685	SJ-LEN-3027	14/12/2010	RC	5390074	414298	10N
636	SJ-LEN-044	24/07/2010	RC	5383381	414331	10N	686	SJ-LEN-3028	14/12/2010	RC	5390073	414397	10N
637	SJ-LEN-045	24/07/2010	RC	5383037	413862	10N	687	SJ-LEN-3029	14/12/2010	RC	5390148	414685	10N
638	SJ-LEN-046	25/07/2010	RC	5382883	415351	10N	688	SJ-LEN-3030	14/12/2010	RC	5390171	414888	10N
639	SJ-LEN-047	25/07/2010	RC	5382910	415026	10N	689	SJ-LEN-3031	14/12/2010	RC	5390160	410518	10N
640	SJ-LEN-048	25/07/2010	RC	5383257	414719	10N	690	SJ-LEN-3032	14/12/2010	RC	5390155	415035	10N
641	SJ-LEN-049	25/07/2010	Bridge	5383439	415041	10N	691	SJ-LEN-3033	14/12/2010	RC	5390133	415136	10N
642	SJ-LEN-050	25/07/2010	RC	5383499	415018	10N	692	SJ-LEN-3034	14/12/2010	RC	5390113	415264	10N
643	SJ-LEN-051	25/07/2010	RC	5383509	414981	10N	693	SJ-LEN-3035	14/12/2010	RC	5390118	415353	10N
644	SJ-LEN-052	25/07/2010	RC	5383357	414533	10N	694	SJ-LEN-3036	14/12/2010	RC	5390132	415489	10N
645	SJ-LEN-053	25/07/2010	RC	5383236	414177	10N	695	SJ-LEN-3037	14/12/2010	RC	5390145	415551	10N
646	SJ-LEN-054	25/07/2010	RC	5383166	414086	10N	696	SJ-LEN-3038	14/12/2010	RC	5390168	415649	10N
647	SJ-LEN-055	25/07/2010	RC	5383101	413975	10N	697	SJ-LEN-3039	14/12/2010	RC	5390151	415930	10N
648	SJ-LEN-056	25/07/2010	RC	5383022	413818	10N	698	SJ-LEN-3040	14/12/2010	RC	5390272	416037	10N
649	SJ-LEN-057	25/07/2010	RC	5382950	413686	10N	699	SJ-LEN-3041	14/12/2010	RC	5390333	416126	10N
650	SJ-LEN-058	25/07/2010	RC	5382908	413524	10N	700	SJ-LEN-3042	14/12/2010	RC	5390407	416219	10N

No.	Cross ID	GPS Date	Type	Northing	Easting	Zone	No.	Cross ID	GPS Date	Type	Northing	Easting	Zone
701	SJ-LEN-3043	14/12/2010	RC	5390453	416260	10N	751	SJ-LEN-4040	15/12/2010	RC	5389767	415771	10N
702	SJ-LEN-3044	14/12/2010	RC	5390657	416423	10N	752	SJ-LEN-4041	15/12/2010	RC	5389780	415810	10N
703	SJ-LEN-3045	14/12/2010	RC	5390897	416370	10N	753	SJ-LEN-4042	15/12/2010	RC	5389806	415934	10N
704	SJ-LEN-3046	14/12/2010	RC	5391093	416278	10N	754	SJ-LEN-4043	15/12/2010	Bridge	5389831	416068	10N
705	SJ-LEN-3047	14/12/2010	RC	5391324	416278	10N	755	SJ-LEN-4044	15/12/2010	RC	5390187	416220	10N
706	SJ-LEN-3047Z	12/08/2010	Bridge	5383504	409031	10N	756	SJ-LEN-4045	15/12/2010	RC	5390276	416515	10N
707	SJ-LEN-3048	14/12/2010	Bridge	5391594	416197	10N	757	SJ-LEN-4046	15/12/2010	RC	5390441	416604	10N
708	SJ-LEN-3049	14/12/2010	RC	5392215	416240	10N	758	SJ-LEN-4047	15/12/2010	RC	5390578	416582	10N
709	SJ-LEN-3050	14/12/2010	RC	5392631	416419	10N	759	SJ-LEN-4048	15/12/2010	WBC	5390720	416647	10N
710	SJ-LEN-3051	14/12/2010	RC	5392701	416461	10N	760	SJ-LEN-4049	15/12/2010	RC	5390995	416642	10N
711	SJ-LEN-3052	14/12/2010	RC	5392803	416514	10N	761	SJ-LEN-4050	15/12/2010	RC	5391157	416542	10N
712	SJ-LEN-3053	14/12/2010	RC	5392880	416581	10N	762	SJ-LEN-4051	15/12/2010	WBC	5391235	416549	10N
713	SJ-LEN-3054	14/12/2010	Bridge	5393399	416891	10N	763	SJ-LEN-4052	15/12/2010	RC	5391336	416499	10N
714	SJ-LEN-3056	14/12/2010	Bridge	5394116	416704	10N	764	SJ-LEN-4053	15/12/2010	RC	5391664	416442	10N
715	SJ-LEN-4001	15/12/2010	RC	5387102	413456	10N	765	SJ-LEN-5001	02/11/2010	Bridge	5383479	409066	10N
716	SJ-LEN-4002	15/12/2010	RC	5387148	413493	10N	766	SJ-LEN-5002	02/11/2010	WBC	5383412	409392	10N
717	SJ-LEN-4003	15/12/2010	RC	5387234	413626	10N	767	SJ-LEN-5003	02/11/2010	RC	5383450	410303	10N
718	SJ-LEN-4004	15/12/2010	WBC	5387389	413878	10N	768	SJ-MCB-0001	12/10/2010	RC	5377483	399198	10N
719	SJ-LEN-4005	15/12/2010	RC	5387401	413881	10N	769	SJ-MCB-0002	12/10/2010	RC	5377368	399152	10N
720	SJ-LEN-4006	15/12/2010	RC	5387431	413891	10N	770	SJ-MCB-0003	12/10/2010	RC	5377268	399153	10N
721	SJ-LEN-4007	15/12/2010	RC	5387608	413801	10N	771	SJ-MCB-0004	12/10/2010	RC	5377119	399086	10N
722	SJ-LEN-4008	15/12/2010	Bridge	5387806	413771	10N	772	SJ-MCB-0005	12/10/2010	RC	5377053	399041	10N
723	SJ-LEN-4009	15/12/2010	Bridge	5387908	413449	10N	773	SJ-MOS-079	26/07/2010	WBC	5379517	408387	10N
724	SJ-LEN-4011	15/12/2010	RC	5388101	413785	10N	774	SJ-MOS-080	26/07/2010	RC	5379489	408278	10N
725	SJ-LEN-4012	15/12/2010	RC	5388589	413616	10N	775	SJ-MOS-081	26/07/2010	RC	5379478	408246	10N
726	SJ-LEN-4013	15/12/2010	RC	5388612	413616	10N	776	SJ-MOS-082	26/07/2010	RC	5379474	408059	10N
727	SJ-LEN-4014	15/12/2010	RC	5388754	413567	10N	777	SJ-MOS-083	26/07/2010	RC	5379476	408032	10N
728	SJ-LEN-4015	15/12/2010	RC	5388820	413543	10N	778	SJ-MOS-084	26/07/2010	RC	5379486	407946	10N
729	SJ-LEN-4016	15/12/2010	RC	5388831	413529	10N	779	SJ-MOS-085	26/07/2010	RC	5379493	407910	10N
730	SJ-LEN-4017	15/12/2010	RC	5388855	413482	10N	780	SJ-MOS-086	26/07/2010	RC	5379506	407841	10N
731	SJ-LEN-4019	15/12/2010	RC	5388991	413367	10N	781	SJ-MOS-087	26/07/2010	WBC	5379509	407772	10N
732	SJ-LEN-4020	15/12/2010	RC	5389085	413316	10N	782	SJ-MOS-088	26/07/2010	RC	5379556	407646	10N
733	SJ-LEN-4021	15/12/2010	RC	5389269	413335	10N	783	SJ-MOS-089	26/07/2010	RC	5379570	407591	10N
734	SJ-LEN-4022	15/12/2010	RC	5389361	413352	10N	784	SJ-MOS-090	26/07/2010	RC	5379631	407478	10N
735	SJ-LEN-4023	15/12/2010	RC	5389458	413373	10N	785	SJ-MOS-091	26/07/2010	Bridge	5380170	403950	10N
736	SJ-LEN-4024	15/12/2010	RC	5389823	413447	10N	786	SJ-MOS-092	26/07/2010	RC	5380260	403886	10N
737	SJ-LEN-4025	15/12/2010	RC	5389852	413668	10N	787	SJ-MOS-093	26/07/2010	RC	5380283	404001	10N
738	SJ-LEN-4026	15/12/2010	RC	5389867	413908	10N	788	SJ-MOS-094	26/07/2010	RC	5380347	404113	10N
739	SJ-LEN-4027	15/12/2010	RC	5389777	414034	10N	789	SJ-MOS-095	26/07/2010	RC	5380415	404236	10N
740	SJ-LEN-4028	15/12/2010	RC	5389830	414270	10N	790	SJ-MOS-096	26/07/2010	RC	5380452	404396	10N
741	SJ-LEN-4029	15/12/2010	RC	5389808	414323	10N	791	SJ-MOS-097	26/07/2010	RC	5380521	404557	10N
742	SJ-LEN-4030	15/12/2010	RC	5389803	414491	10N	792	SJ-MOS-098	26/07/2010	RC	5380545	404842	10N
743	SJ-LEN-4031	15/12/2010	RC	5389807	414621	10N	793	SJ-MOS-099	26/07/2010	RC	5380543	405000	10N
744	SJ-LEN-4032	15/12/2010	RC	5389827	414706	10N	794	SJ-MOS-100	26/07/2010	RC	5380292	404088	10N
745	SJ-LEN-4033	15/12/2010	RC	5389834	414800	10N	795	SJ-MOS-101	26/07/2010	RC	5380299	404209	10N
746	SJ-LEN-4034	15/12/2010	RC	5389895	415093	10N	796	SJ-MOS-102	26/07/2010	RC	5380272	404492	10N
747	SJ-LEN-4036	15/12/2010	RC	5389726	415408	10N	797	SJ-MOS-103	26/07/2010	RC	5380258	404652	10N
748	SJ-LEN-4037	15/12/2010	RC	5389723	415562	10N	798	SJ-MOS-104	26/07/2010	RC	5380197	405139	10N
749	SJ-LEN-4038	15/12/2010	Bridge	5389748	415685	10N	799	SJ-MOS-105	26/07/2010	RC	5380169	405274	10N
750	SJ-LEN-4039	15/12/2010	RC	5389754	415716	10N	800	SJ-MOS-106	26/07/2010	RC	5380120	405380	10N

No.	Cross ID	GPS Date	Type	Northing	Easting	Zone	No.	Cross ID	GPS Date	Type	Northing	Easting	Zone
801	SJ-MOS-107	26/07/2010	RC	5380129	405484	10N	851	SJ-MOS-157	03/08/2010	RC	5379199	408579	10N
802	SJ-MOS-108	26/07/2010	RC	5380144	405537	10N	852	SJ-MOS-158	03/08/2010	RC	5379178	408457	10N
803	SJ-MOS-109	26/07/2010	RC	5380170	405611	10N	853	SJ-MOS-159	03/08/2010	RC	5379204	408350	10N
804	SJ-MOS-110	26/07/2010	RC	5380175	405661	10N	854	SJ-MOS-160	03/08/2010	WBC	5379252	407730	10N
805	SJ-MOS-111	26/07/2010	RC	5380216	405774	10N	855	SJ-MOS-161	03/08/2010	WBC	5379241	407795	10N
806	SJ-MOS-112	26/07/2010	RC	5380261	405819	10N	856	SJ-MOS-162	03/08/2010	WBC	5379237	407947	10N
807	SJ-MOS-113	26/07/2010	RC	5380301	405886	10N	857	SJ-MOS-163	03/08/2010	WBC	5379233	408177	10N
808	SJ-MOS-114	26/07/2010	RC	5380335	406058	10N	858	SJ-MOS-164	03/08/2010	RC	5379828	406821	10N
809	SJ-MOS-115	26/07/2010	RC	5380334	406127	10N	859	SJ-MOS-165	03/08/2010	WBC	5379764	407128	10N
810	SJ-MOS-116	26/07/2010	RC	5380347	406195	10N	860	SJ-MOS-166	03/08/2010	RC	5379723	407361	10N
811	SJ-MOS-117	26/07/2010	RC	5380326	406304	10N	861	SJ-MOS-167	03/08/2010	RC	5380308	405286	10N
812	SJ-MOS-118	26/07/2010	RC	5380312	406388	10N	862	SJ-MOS-168	03/08/2010	RC	5380350	405357	10N
813	SJ-MOS-119	26/07/2010	RC	5380314	406510	10N	863	SJ-MOS-169	03/08/2010	RC	5380452	405551	10N
814	SJ-MOS-120	26/07/2010	RC	5380276	406629	10N	864	SJ-MOS-170	03/08/2010	RC	5380527	405530	10N
815	SJ-MOS-121	26/07/2010	RC	5380178	406734	10N	865	SJ-MOS-171	03/08/2010	RC	5380488	405392	10N
816	SJ-MOS-122	26/07/2010	RC	5380132	406838	10N	866	SJ-MOS-172	03/08/2010	RC	5380497	405334	10N
817	SJ-MOS-123	26/07/2010	RC	5380081	406902	10N	867	SJ-MOS-173	03/08/2010	RC	5380996	411932	10N
818	SJ-MOS-124	26/07/2010	RC	5380026	406987	10N	868	SJ-MOS-174	03/08/2010	RC	5381045	411963	10N
819	SJ-MOS-125	26/07/2010	RC	5379985	407000	10N	869	SJ-MOS-175	03/08/2010	RC	5381201	412174	10N
820	SJ-MOS-126	26/07/2010	RC	5379943	406992	10N	870	SJ-MOS-176	03/08/2010	RC	5381153	412496	10N
821	SJ-MOS-127	26/07/2010	RC	5379946	407075	10N	871	SJ-MOS-177	03/08/2010	WBC	5381134	412745	10N
822	SJ-MOS-128	26/07/2010	RC	5379982	407187	10N	872	SJ-MOS-178	03/08/2010	RC	5381364	413083	10N
823	SJ-MOS-129	26/07/2010	RC	5379844	407219	10N	873	SJ-MOS-179	03/08/2010	RC	5381464	413178	10N
824	SJ-MOS-130	26/07/2010	WBC	5379822	407228	10N	874	SJ-MOS-180	03/08/2010	RC	5381632	413216	10N
825	SJ-MOS-131	26/07/2010	RC	5379767	407326	10N	875	SJ-MOS-181	03/08/2010	RC	5381711	413216	10N
826	SJ-MOS-132	03/08/2010	RC	5379531	408428	10N	876	SJ-MOS-182	03/08/2010	RC	5382029	413756	10N
827	SJ-MOS-133	03/08/2010	RC	5379550	408497	10N	877	SJ-RED-068	25/07/2010	RC	5381508	409681	10N
828	SJ-MOS-134	03/08/2010	RC	5379553	408552	10N	878	SJ-RED-069	25/07/2010	RC	5381484	409631	10N
829	SJ-MOS-135	03/08/2010	WBC	5379563	408618	10N	879	SJ-RED-070	25/07/2010	RC	5381485	409582	10N
830	SJ-MOS-136	03/08/2010	RC	5379617	409012	10N	880	SJ-RED-071	25/07/2010	RC	5381487	409562	10N
831	SJ-MOS-137	03/08/2010	RC	5379624	409044	10N	881	SJ-RED-072	25/07/2010	RC	5381477	409279	10N
832	SJ-MOS-138	03/08/2010	Bridge	5379650	409185	10N	882	SJ-RED-073	25/07/2010	RC	5381472	409160	10N
833	SJ-MOS-139	04/08/2010	RC	5379705	409358	10N	883	SJ-RED-074	25/07/2010	RC	5381468	409075	10N
834	SJ-MOS-140	03/08/2010	RC	5379765	409524	10N	884	SJ-RED-075	25/07/2010	RC	5381438	408981	10N
835	SJ-MOS-141	03/08/2010	RC	5379819	410011	10N	885	SJ-RED-076	25/07/2010	RC	5381414	408828	10N
836	SJ-MOS-142	03/08/2010	RC	5379840	410168	10N	886	SJ-RED-077	25/07/2010	RC	5381378	408739	10N
837	SJ-MOS-143	03/08/2010	RC	5379875	410302	10N	887	SJ-RED-078	25/07/2010	RC	5381353	408593	10N
838	SJ-MOS-144	03/08/2010	RC	5379939	410549	10N	888	SJ-RED-231	06/08/2010	RC	5381216	406341	10N
839	SJ-MOS-145	03/08/2010	RC	5379947	410579	10N	889	SJ-RED-232	06/08/2010	RC	5381297	406710	10N
840	SJ-MOS-146	03/08/2010	RC	5379983	410710	10N	890	SJ-RED-233	06/08/2010	RC	5381312	406772	10N
841	SJ-MOS-147	03/08/2010	RC	5380004	410791	10N	891	SJ-RED-234	06/08/2010	RC	5381345	406859	10N
842	SJ-MOS-148	03/08/2010	RC	5380005	410804	10N	892	SJ-RED-235	06/08/2010	RC	5381363	407029	10N
843	SJ-MOS-149	03/08/2010	WBC	5380257	411350	10N	893	SJ-RED-236	06/08/2010	RC	5381386	407102	10N
844	SJ-MOS-150	03/08/2010	RC	5380317	411457	10N	894	SJ-RED-237	06/08/2010	RC	5381378	407356	10N
845	SJ-MOS-151	03/08/2010	RC	5380379	411550	10N	895	SJ-RED-238	06/08/2010	RC	5381364	407433	10N
846	SJ-MOS-152	03/08/2010	WBC	5380401	411597	10N	896	SJ-RED-239	06/08/2010	RC	5381362	407476	10N
847	SJ-MOS-153	03/08/2010	WBC	5380412	411611	10N	897	SJ-RED-240	06/08/2010	RC	5381179	407423	10N
848	SJ-MOS-154	03/08/2010	RC	5380593	411883	10N	898	SJ-RED-241	06/08/2010	RC	5381165	407537	10N
849	SJ-MOS-155	03/08/2010	RC	5379193	408748	10N	899	SJ-RED-242	06/08/2010	RC	5381184	407624	10N
850	SJ-MOS-156	03/08/2010	RC	5379209	408630	10N	900	SJ-RED-243	06/08/2010	RC	5381222	407529	10N

No.	Cross ID	GPS Date	Type	Northing	Easting	Zone	No.	Cross ID	GPS Date	Type	Northing	Easting	Zone
901	SJ-RED-244	06/08/2010	RC	5381229	407514	10N	928	SJ-RED-5025	02/11/2010	RC	5380920	404477	10N
902	SJ-RED-245	06/08/2010	RC	5381253	407477	10N	929	SJ-RED-5026	02/11/2010	RC	5380918	404605	10N
903	SJ-RED-246	06/08/2010	RC	5381271	407398	10N	930	SJ-RED-5027	02/11/2010	RC	5380947	404700	10N
904	SJ-RED-247	06/08/2010	RC	5381339	407324	10N	931	SJ-RED-6001	02/11/2010	WBC	5379965	398298	10N
905	SJ-RED-248	06/08/2010	RC	5381340	407375	10N	932	SJ-RED-6002	02/11/2010	WBC	5379893	399015	10N
906	SJ-RED-249	06/08/2010	RC	5381348	407424	10N	933	SJ-TAC-001	23/07/2010	RC	5378336	416744	10N
907	SJ-RED-250	06/08/2010	RC	5381368	407564	10N	934	SJ-TAC-002	23/07/2010	RC	5378381	416746	10N
908	SJ-RED-251	06/08/2010	RC	5381380	407662	10N	935	SJ-TAC-003	23/07/2010	Bridge	5378376	416709	10N
909	SJ-RED-252	06/08/2010	RC	5381406	407818	10N	936	SJ-TAC-004	23/07/2010	RC	5378581	416754	10N
910	SJ-RED-253	06/08/2010	RC	5381419	407985	10N	937	SJ-TAC-006	23/07/2010	RC	5379449	416978	10N
911	SJ-RED-254	06/08/2010	RC	5381428	408116	10N	938	SJ-TAC-007	23/07/2010	RC	5379609	417031	10N
912	SJ-RED-255	06/08/2010	RC	5381426	408306	10N	939	SJ-TAC-008	23/07/2010	RC	5379641	417040	10N
913	SJ-RED-5002	01/11/2010	RC	5380257	399503	10N	940	SJ-TAC-009	23/07/2010	RC	5379875	417131	10N
914	SJ-RED-5003	01/11/2010	Bridge	5380339	400071	10N	941	SJ-WL100-0001	17/12/2010	RC	5386579	412488	10N
915	SJ-RED-5005	01/11/2010	RC	5380523	401061	10N	942	SJ-WL100-0002	17/12/2010	RC	5386695	412451	10N
916	SJ-RED-5006	01/11/2010	Bridge	5380532	401629	10N	943	SJ-WL100-0003	17/12/2010	RC	5386733	412458	10N
917	SJ-RED-5011	01/11/2010	RC	5380800	402254	10N	944	SJ-WL100-0004	17/12/2010	RC	5386805	412512	10N
918	SJ-RED-5014	02/11/2010	RC	5380911	402582	10N	945	SJ-WL100-0005	17/12/2010	RC	5386913	412615	10N
919	SJ-RED-5016	02/11/2010	RC	5380955	402891	10N	946	SJ-WL100-0006	17/12/2010	RC	5387036	412681	10N
920	SJ-RED-5017	02/11/2010	WBC	5380955	403239	10N	947	SJ-WL100-0007	17/12/2010	RC	5387103	412747	10N
921	SJ-RED-5018	02/11/2010	RC	5380968	403339	10N	948	SJ-WL100-0008	17/12/2010	RC	5387170	412862	10N
922	SJ-RED-5019	02/11/2010	RC	5380948	403709	10N	949	SJ-WL100-0009	17/12/2010	RC	5387421	412925	10N
923	SJ-RED-5020	02/11/2010	RC	5380935	403861	10N	950	SJ-WL100-1000	17/12/2010	RC	5387875	413159	10N
924	SJ-RED-5021	02/11/2010	RC	5380924	404080	10N	951	SJ-WL100-1001	17/12/2010	RC	5387715	413099	10N
925	SJ-RED-5022	02/11/2010	RC	5380903	404214	10N	952	SJ-WL100-1002	17/12/2010	WBC	5387605	412980	10N
926	SJ-RED-5023	02/11/2010	RC	5380916	404278	10N	953	SJ-WL100-1003	17/12/2010	WBC	5387489	412908	10N
927	SJ-RED-5024	02/11/2010	RC	5380916	404359	10N							

Appendix 3. Fish Barrier Scores for Assessed Crossings

San Juan River Watershed Culvert Assessments
Appendix 3: Fish Barrier Scoring for 34 Assessed Structures

Crossing ID	Embed-ment	Embed-ment Score	Outlet Drop	OD Score	Stream Width Ratio	SWR Score	Culvert Slope	Slope Score	Culvert Length	Length Score	Total Score	Result
SJ-CAM-3086	None, Discont	10	21	5	3.10	6	7.5	10	12	0	31	Barrier
SJ-FLT-0050	None, Discont	10	47	10	1.39	6	8.1	10	12	0	36	Barrier
SJ-FLT-0058	None, Discont	10	78	10	2.22	6	13.9	10	15	3	39	Barrier
SJ-GRA-364	None, Discont	10	41	10	3.60	6	4.1	10	10	0	36	Barrier
SJ-HCM-0003	None, Discont	10	-63	0	6.83	6	4.1	10	14	0	26	Barrier
SJ-HCM-0004	None, Discont	10	7	0	2.50	6	1.6	5	15	3	24	Barrier
SJ-HCM-0019	None, Discont	10	-4	0	2.13	6	2.3	5	17.5	3	24	Barrier
SJ-HCM-0022	None, Discont	10	-19	0	10.00	6	0.6	0	13.5	0	16	Potential Barrier
SJ-HCM-0075	None, Discont	10	20	5	3.75	6	1.5	5	15	3	29	Barrier
SJ-HCM-0078	None, Discont	10	-7	0	3.75	6	12.0	10	16	3	29	Barrier
SJ-HCM-0088	Partial, Contin	5	-1	0	1.00	3	0.9	0	16	3	11	Passable
SJ-HCM-0092	None, Discont	10	-2	0	2.00	6	2.0	5	16	3	24	Barrier
SJ-HCM-0109	None, Discont	10	3	0	1.67	6	5.6	10	17	3	29	Barrier
SJ-HCM-0111	None, Discont	10	22	5	2.86	6	2.1	5	12	0	26	Barrier
SJ-HCM-0116	None, Discont	10	115	10	2.67	6	5.4	10	12	0	36	Barrier
SJ-HCM-1025	None, Discont	10	28	5	2.50	6	6.3	10	10	0	31	Barrier
SJ-HEM-271	None, Discont	10	85	10	3.39	6	4.7	10	10	0	36	Barrier
SJ-HEM-340	None, Discont	10	11	0	2.13	6	6.3	10	9	0	26	Barrier
SJ-LEN-065	None, Discont	10	55	10	4.50	6	6.0	10	11	0	36	Barrier
SJ-LEN-3055	Partial, Contin	5	-68	0	1.50	6	1.4	5	10	0	16	Potential Barrier
SJ-LEN-4010	None, Discont	10	-2	0	0.77	0	5.2	10	11	0	20	Barrier
SJ-LEN-4018	None, Discont	10	6	0	3.75	6	-0.5	0	9	0	16	Potential Barrier
SJ-LEN-4035	None, Discont	10	-5	0	1.67	6	9.2	10	8	0	26	Barrier
SJ-MCB-0006	None, Discont	10	-1	0	1.88	6	7.4	10	10	0	26	Barrier
SJ-RED-5001	None, Discont	10	112	10	18.75	6	11.1	10	11	0	36	Barrier
SJ-RED-5004	None, Discont	10	9	0	1.94	6	9.0	10	16	3	29	Barrier
SJ-RED-5007	None, Discont	10	-7	0	0.97	0	0.8	0	14	0	10	Passable
SJ-RED-5008	None, Discont	10	-10	0	2.50	6	1.5	5	12	0	21	Barrier
SJ-RED-5009	None, Discont	10	26	5	1.43	6	2.1	5	14	0	26	Barrier
SJ-RED-5010	None, Discont	10	-7	0	1.25	3	5.5	10	11	0	23	Barrier
SJ-RED-5012	None, Discont	10	5	0	1.88	6	4.2	10	12	0	26	Barrier
SJ-RED-5013	None, Discont	10	-16	0	2.50	6	6.3	10	11	0	26	Barrier
SJ-RED-5015	None, Discont	10	24	5	1.43	6	8.8	10	14	0	31	Barrier
SJ-TAC-005	None, Discont	10	21	5	4.13	6	9.4	10	9	0	31	Barrier

Appendix 4: Information Summaries for Closed-Bottomed Structures

San Juan River Crossings 2010: Information Summary for Closed-Bottomed Structures

Location and Priority

Crossing ID No.	SJ-HCM-0003	Priority for Replacement: 2	Recommended
Date Assessed	13-Oct-10	HGI (m)	100
UTM Co-ordinates (Zone 10N)		Option 1 - Permanent Bridge (Composite Steel)	
Northing	5382228	Option 2 - Permanent Slab Bridge	
Easting	398405	Reference Map	8
Road Name	Harris Creek Mainline	Cost Benefit Ratio	1.10/0.89

CBS Parameters

Length (m)	14	Stream Width Ratio	6.83
Diameter (mm)	600	Downstream Channel Gradient (%)	1.9
Culvert Gradient (%)	4.1	Upstream Habitat Value	Moderate
Outlet Drop (cm)	7	Fish Barrier Score	26
Depth of Fill (cm)	75	Result	Barrier
Mean Channel Width (m)	4.1	Replacement Options	OBS

Considerations Prior to Replacement

Upstream Habitat Notes:	Downstream Habitat Notes:
Nice branched channel upstream of the culvert with gravel substrate and gentle gradient.	Channel is uniform, mostly flat, with good spawning substrate.
Culvert is too small for the size of the channel.	Channel is a fish-inferred tributary that connects to the San Juan River.
Channel may dry up during low flow periods.	A thorough assessment downstream should be conducted prior to replacement. DS barriers and/or gradient may act as fish barrier.
Assessment of US habitat quality strongly recommended prior to replacement or removal	

Photo Plates

DS view of inlet



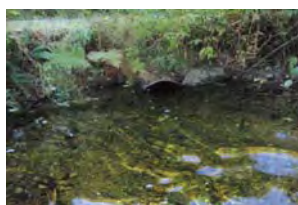
US channel habitat



DS channel habitat



US view of outlet



San Juan River Crossings 2010: Information Summary for Closed-Bottomed Structures

Location and Priority

Crossing ID No.	SJ-HCM-0004	Priority for Replacement: 2	Recommended
Date Assessed	13-Oct-10	HGI (m)	140
UTM Co-ordinates (Zone 10N)		Option 1 - Permanent Bridge (Composite Steel)	
Northing	5382261	Option 2 - Permanent Slab Bridge	
Easting	398483	Reference Map	8
Road Name	Harris Creek Mainline	Cost Benefit Ratio	1.54/1.24

CBS Parameters

Length (m)	15	Stream Width Ratio	2.50
Diameter (mm)	800 (x2)	Downstream Channel Gradient (%)	3.3
Culvert Gradient (%)	1.6	Upstream Habitat Value	Moderate
Outlet Drop (cm)	-4	Fish Barrier Score	24
Depth of Fill (cm)	75	Result	Barrier
Mean Channel Width (m)	4.0	Replacement Options	OBS

Considerations Prior to Replacement

Upstream Habitat Notes:	Downstream Habitat Notes:
Flat channel upstream of the culvert with gravel substrate and gentle gradient.	Channel is uniform, mostly flat with good spawning substrate.
Channel may dry up during low flow periods.	
Assessment of US habitat quality strongly recommended prior to replacement or removal.	A thorough assessment downstream should be conducted prior to replacement. DS barriers and/or gradient may act as fish barrier.

Photo Plates

DS view of inlet



US channel habitat



DS channel habitat



US view of outlet



San Juan River Crossings 2010: Information Summary for Closed-Bottomed Structures

Location and Priority

Crossing ID No.	SJ-HCM-0022	Priority for Replacement: 2	Recommended
Date Assessed	13-Oct-10	HGI (m)	539
UTM Co-ordinates (Zone 10N)		Option 1 - Permanent Bridge (Composite Steel)	
Northing	5383023	Option 2 - Permanent Slab Bridge	
Easting	403755	Reference Map	8
Road Name	Harris Creek Mainline	Cost Benefit Ratio	4.73/3.82

CBS Parameters

Length (m)	13.5	Stream Width Ratio	10.00
Diameter (mm)	900	Downstream Channel Gradient (%)	4.2
Culvert Gradient (%)	0.6	Upstream Habitat Value	Moderate
Outlet Drop (cm)	-19	Fish Barrier Score	16
Depth of Fill (cm)	150	Result	Potential Barrier
Mean Channel Width (m)	9.0	Replacement Options	OBS

Considerations Prior to Replacement

Upstream Habitat Notes:	Downstream Habitat Notes:
Lots of LWD and gravel substrate.	Downstream of the culvert is a large pool.
Channel is too large for the culvert.	Channel is a fish-inferred tributary that connects to the San Juan River.
Assessment of US habitat quality strongly recommended prior to replacement or removal.	A thorough assessment downstream should be conducted prior to replacement. DS barriers and/or gradient may act as fish barrier.

Photo Plates

DS view of inlet



US channel habitat



DS channel habitat



US view of outlet



San Juan River Crossings 2010: Information Summary for Closed-Bottomed Structures

Location and Priority

Crossing ID No.	SJ-HCM-0075	Priority for Replacement: 2	Recommended
Date Assessed	2-Nov-10	HGI (m)	200
UTM Co-ordinates (Zone 10N)		Option 1 - Permanent Slab Bridge	
Northing	5391326	Option 2 - Arch Culvert	
Easting	410024	Reference Map	9
Road Name	Harris Creek Mainline	Cost Benefit Ratio	2.36/2.22

CBS Parameters

Length (m)	15	Stream Width Ratio	3.75
Diameter (mm)	800	Downstream Channel Gradient (%)	1.5
Culvert Gradient (%)	1.5	Upstream Habitat Value	Moderate
Outlet Drop (cm)	20	Fish Barrier Score	29
Depth of Fill (cm)	50	Result	Barrier
Mean Channel Width (m)	3	Replacement Options	OBS

Considerations Prior to Replacement

Upstream Habitat Notes:	Downstream Habitat Notes:
Visible habitat looks like step-pools. Good spawning substrate.	Gentle gradients, gentle flow, good spawning substrate.
	Channel drains into Harris Creek.
Assessment of US habitat quality strongly recommended prior to replacement or removal.	A thorough assessment downstream should be conducted prior to replacement. DS barriers and/or gradient may act as fish barrier.

Photo Plates

DS view of inlet



US channel habitat



DS channel habitat



US view of outlet



San Juan River Crossings 2010: Information Summary for Closed-Bottomed Structures

Location and Priority

Crossing ID No.	SJ-HCM-0078	Priority for Replacement: 2	Recommended
Date Assessed	2-Nov-10	HGI (m)	197.5
UTM Co-ordinates (Zone 10N)		Option 1 - Permanent Bridge (Composite Steel)	
Northing	5392224	Option 2 - Permanent Bridge (Composite Steel)	
Easting	410117	Reference Map	9
Road Name	Harris Creek Mainline	Cost Benefit Ratio	1.62/1.62

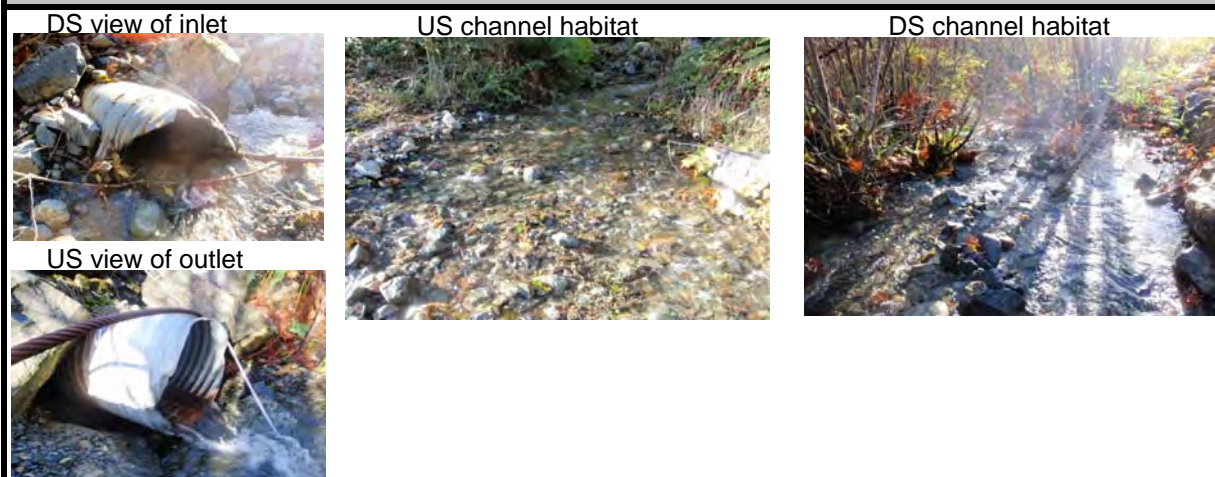
CBS Parameters

Length (m)	16	Stream Width Ratio	3.75
Diameter (mm)	800	Downstream Channel Gradient (%)	4.1
Culvert Gradient (%)	12.0	Upstream Habitat Value	Moderate
Outlet Drop (cm)	-7	Fish Barrier Score	29
Depth of Fill (cm)	300	Result	Barrier
Mean Channel Width (m)	3.0	Replacement Options	OBS

Considerations Prior to Replacement

Upstream Habitat Notes:	Downstream Habitat Notes:
Suitable spawning substrate, not a lot of flow so it may dry up during dry periods.	Good spawning substrate, braided channel.
Banks under developed.	Channel drains into Harris Creek.
Culvert is too small for channel.	A thorough assessment downstream should be conducted prior to replacement. DS barriers and/or gradient may act as fish barrier.
Assessment of US habitat quality strongly recommended prior to replacement or removal.	

Photo Plates



San Juan River Crossings 2010: Information Summary for Closed-Bottomed Structures

Location and Priority

Crossing ID No.	SJ-HCM-0092	Priority for Replacement: 2	Recommended
Date Assessed	2-Nov-10	HGI (m)	107
UTM Co-ordinates (Zone 10N)		Option 1 - Permanent Bridge (Composite Steel)	
Northing	5394773	Option 2 - Permanent Slab Bridge	
Easting	410586	Reference Map	9&10
Road Name	Harris Creek Mainline	Cost Benefit Ratio	1.01/0.81

CBS Parameters

Length (m)	16	Stream Width Ratio	2.00
Diameter (mm)	1000	Downstream Channel Gradient (%)	9.7
Culvert Gradient (%)	2.0	Upstream Habitat Value	Moderate
Outlet Drop (cm)	-2	Fish Barrier Score	24
Depth of Fill (cm)	200	Result	Barrier
Mean Channel Width (m)	2.0	Replacement Options	OBS

Considerations Prior to Replacement

Upstream Habitat Notes:	Downstream Habitat Notes:
Channel comes down through a cut block.	Large boulder substrate, mostly dry.
Steep gradient further upstream.	Channel is a fish-inferred tributary that connects to Harris Creek.
Channel is likely dry during low flow periods.	A thorough assessment downstream should be conducted prior to replacement. DS barriers and/or gradient may act as fish barrier.
Assessment of US habitat quality strongly recommended prior to replacement or removal.	

Photo Plates

DS view of inlet



US channel habitat



DS channel habitat



US view of outlet



San Juan River Crossings 2010: Information Summary for Closed-Bottomed Structures

Location and Priority

Crossing ID No.	SJ-HCM-0111	Priority for Replacement: 3	Recommended
Date Assessed	3-Nov-10	HGI (m)	65
UTM Co-ordinates (Zone 10N)		Option 1 - Permanent Bridge (Composite Steel)	
Northing	5397944	Option 2 - Permanent Slab Bridge	
Easting	412559	Reference Map	10
Road Name	Hillcrest Mainline	Cost Benefit Ratio	0.61/0.49

CBS Parameters

Length (m)	12	Stream Width Ratio	2.86
Diameter (mm)	700	Downstream Channel Gradient (%)	5.8
Culvert Gradient (%)	2.1	Upstream Habitat Value	Low
Outlet Drop (cm)	22	Fish Barrier Score	26
Depth of Fill (cm)	100	Result	Barrier
Mean Channel Width (m)	2.0	Replacement Options	OBS

Considerations Prior to Replacement

Upstream Habitat Notes:	Downstream Habitat Notes:
Narrow channel with good spawning substrate.	Nice spawning substrate with large cobble, narrow channel may become quite dry during low flows.
Small cascade visible.	Downstream crossings all bridges in good working order. HGI could be higher.
Assessment of US habitat quality strongly recommended prior to replacement or removal.	A thorough assessment downstream should be conducted prior to replacement. DS barriers and/or gradient may act as fish barrier.

Photo Plates



San Juan River Crossings 2010: Information Summary for Closed-Bottomed Structures

Location and Priority

Crossing ID No.	SJ-HCM-0116	Priority for Replacement: 1	Recommended
Date Assessed	3-Nov-10	HGI (m)	166.5
UTM Co-ordinates (Zone 10N)		Option 1 - Permanent Composite Steel Bridge	
Northing	5398061	Option 2 - Permanent Slab Bridge	
Easting	413499	Reference Map	10
Road Name	Hillcrest Mainline	Cost Benefit Ratio	1.83/1.48

CBS Parameters

Length (m)	12	Stream Width Ratio	2.67
Diameter (mm)	2000	Downstream Channel Gradient (%)	8.1
Culvert Gradient (%)	5.4	Upstream Habitat Value	High
Outlet Drop (cm)	115	Fish Barrier Score	36
Depth of Fill (cm)	175	Result	Barrier
Mean Channel Width (m)	5.3	Replacement Options	OBS

Considerations Prior to Replacement

Upstream Habitat Notes:	Downstream Habitat Notes:
Nice spawning substrate, gentle gradient, well-defined channel with good flow.	Well-defined channel, gentle flow, gentle gradient and good spawning substrate.
Upstream is expected to provide good fish habitat.	Channel is a fish-inferred tributary that connects to Lens Creek (fish observed).
Assessment of US habitat quality strongly recommended prior to replacement or removal.	A thorough assessment downstream should be conducted prior to replacement. DS gradients may act as fish barrier. Downstream Barriers likely to be intact bridges that are not hindering fish movement.

Photo Plates

DS view of inlet



US channel habitat



DS channel habitat



US view of outlet



San Juan River Crossings 2010: Information Summary for Closed-Bottomed Structures

Location and Priority

Crossing ID No.	SJ-LEN-3055	Priority for Replacement: 2	Recommended
Date Assessed	14-Dec-10	HGI (m)	2055
UTM Co-ordinates (Zone 10N)		Option 1 - Permanent Bridge (Composite Steel)	
Northing	5393957	Option 2 - Permanent Slab Bridge	
Easting	416732	Reference Map	5
Road Name	Lens Creek ML West	Cost Benefit Ratio	22.53/18.22

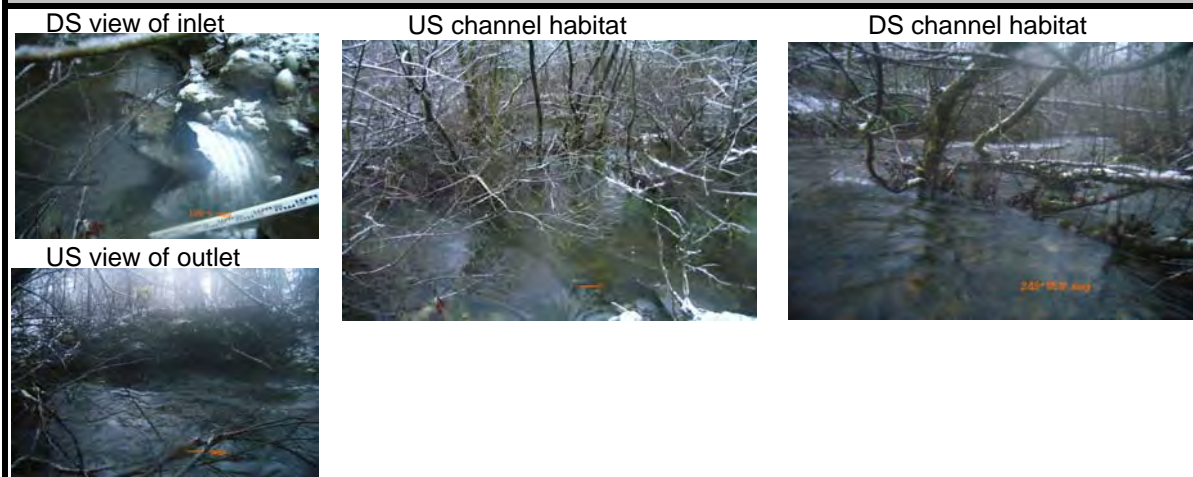
CBS Parameters

Length (m)	10	Stream Width Ratio	1.50
Diameter (mm)	1000 (x2)	Downstream Channel Gradient (%)	11.5
Culvert Gradient (%)	1.4	Upstream Habitat Value	Moderate
Outlet Drop (cm)	-68	Fish Barrier Score	16
Depth of Fill (cm)	100	Result	Potential Barrier
Mean Channel Width (m)	3.0	Replacement Options	OBS

Considerations Prior to Replacement

Upstream Habitat Notes:	Downstream Habitat Notes:
No defined channel. Undefined source.	Well defined cutbanks
Looks to be a flooded area due to high flow.	Good gravel and cobble substrate for spawning.
Assessment of US habitat quality strongly recommended prior to replacement or removal.	A thorough assessment should be done before considering removal or replacement; DS barriers and/or gradient may act as a fish barrier.

Photo Plates



San Juan River Crossings 2010: Information Summary for Closed-Bottomed Structures

Location and Priority

Crossing ID No.	SJ-LEN-4035	Priority for Replacement: 3	Recommended
Date Assessed	15-Dec-10	HGI (m)	118
UTM Co-ordinates (Zone 10N)		Option 1 - Permanent Slab Bridge	
Northing	5389789	Option 2 - Permanent Bridge (Composite Steel)	
Easting	415291	Reference Map	6
Road Name	Lens Creek ML East	Cost Benefit Ratio	1.57/1.94

CBS Parameters

Length (m)	8	Stream Width Ratio	1.67
Diameter (mm)	900	Downstream Channel Gradient (%)	17.0
Culvert Gradient (%)	9.2	Upstream Habitat Value	Low
Outlet Drop (cm)	-5	Fish Barrier Score	26
Depth of Fill (cm)	150	Result	Barrier
Mean Channel Width (m)	1.5	Replacement Options	OBS

Considerations Prior to Replacement

Upstream Habitat Notes:	Downstream Habitat Notes:
Lots of woody debris jams impeding flow. Could get really low in summer.	Good mix of boulder and gravel substrate.
Lots of bedrock showing.	Almost 100% overhanging vegetation.
No real channel definition.	A thorough assessment should be done before considering removal or replacement; DS barriers and/or gradient may act as a fish barrier.
Assessment of US habitat quality strongly recommended prior to replacement or removal.	

Photo Plates



San Juan River Crossings 2010: Information Summary for Closed-Bottomed Structures

Location and Priority

Crossing ID No.	SJ-RED-5001	Priority for Replacement: 2	Recommended
Date Assessed	1-Nov-10	HGI (m)	500
UTM Co-ordinates (Zone 10N)		Option 1 - Removal	
Northing	5380166	Option 2 - Portable Steel Bridge	
Easting	398993	Reference Map	2
Road Name	Red Mainline	Cost Benefit Ratio	90.91/2.89

CBS Parameters

Length (m)	11	Stream Width Ratio	18.75
Diameter (mm)	800	Downstream Channel Gradient (%)	10.0
Culvert Gradient (%)	11.1	Upstream Habitat Value	Moderate
Outlet Drop (cm)	112	Fish Barrier Score	36
Depth of Fill (cm)	150	Result	Barrier
Mean Channel Width (m)	15	Replacement Options	RM

Considerations Prior to Replacement

Upstream Habitat Notes:	Downstream Habitat Notes:
Large backwatered pond/wetland.	Downstream is the San Juan River.
Inlet is submerged and unidentifiable allowing little flow through.	
Assessment of US habitat quality strongly recommended prior to replacement or removal.	A thorough assessment downstream should be conducted prior to removal or replacement. DS barriers and/or gradient may act as fish barrier.

DS view of inlet



US channel habitat



DS channel habitat



US view of outlet



San Juan River Crossings 2010: Information Summary for Closed-Bottomed Structures

Location and Priority

Crossing ID No.	SJ-RED-5004	Priority for Replacement: 2	Recommended
Date Assessed	1-Nov-10	HGI (m)	75
UTM Co-ordinates (Zone 10N)		Option 1 - Removal	
Northing	5380435	Option 2 - Portable Steel Bridge	
Easting	400629	Reference Map	2
Road Name	Red Mainline	Cost Benefit Ratio	9.38/1.30

CBS Parameters

Length (m)	16	Stream Width Ratio	1.94
Diameter (mm)	600	Downstream Channel Gradient (%)	3.1
Culvert Gradient (%)	9.0	Upstream Habitat Value	Moderate
Outlet Drop (cm)	9	Fish Barrier Score	29
Depth of Fill (cm)	200	Result	Barrier
Mean Channel Width (m)	1.2	Replacement Options	RM

Considerations Prior to Replacement

Upstream Habitat Notes:	Downstream Habitat Notes:
Steep further upstream.	Narrow channel lacks definition.
The channel is likely dry during periods of low flow.	Channel drains into San Juan River.
Assessment of US habitat quality strongly recommended prior to replacement or removal.	A thorough assessment should be done before considering removal or replacement; DS barriers and/or gradient may act as a fish barrier.

Photo Plates

DS view of inlet



US channel habitat



DS channel habitat



US view of outlet



San Juan River Crossings 2010: Information Summary for Closed-Bottomed Structures

Location and Priority

Crossing ID No.	SJ-RED-5008	Priority for Replacement: 3	Recommended
Date Assessed	1-Nov-10	HGI (m)	200
UTM Co-ordinates (Zone 10N)		Option 1 - Removal	
Northing	5380788	Option 2 - Portable Steel Bridge	
Easting	402031	Reference Map	2
Road Name	Red Mainline	Cost Benefit Ratio	33.33/3.47

CBS Parameters

Length (m)	12	Stream Width Ratio	2.50
Diameter (mm)	800	Downstream Channel Gradient (%)	6.1
Culvert Gradient (%)	1.5	Upstream Habitat Value	Low
Outlet Drop (cm)	-10	Fish Barrier Score	21
Depth of Fill (cm)	300	Result	Barrier
Mean Channel Width (m)	2.0	Replacement Options	RM

Considerations Prior to Replacement

Upstream Habitat Notes:	Downstream Habitat Notes:
Narrow channel.	Narrow channel that may dry up during low flows.
Lots of LWD in the channel.	Channel drains into the San Juan River.
Assessment of US habitat quality strongly recommended prior to replacement or removal.	A thorough assessment should be done before considering removal or replacement; DS barriers and/or gradient may act as a fish barrier.

Photo Plates

DS view of inlet



US channel habitat



DS channel habitat



US view of outlet



San Juan River Crossings 2010: Information Summary for Closed-Bottomed Structures

Location and Priority

Crossing ID No.	SJ-RED-5009	Priority for Replacement: 2	Recommended
Date Assessed	1-Nov-10	HGI (m)	115
UTM Co-ordinates (Zone 10N)		Option 1 - Removal	
Northing	5380773	Option 2 - Portable Steel Bridge	
Easting	402086	Reference Map	2
Road Name	Red Mainline	Cost Benefit Ratio	16.43/2.00

CBS Parameters

Length (m)	14	Stream Width Ratio	1.43
Diameter (mm)	1400	Downstream Channel Gradient (%)	7.7
Culvert Gradient (%)	2.1	Upstream Habitat Value	Moderate
Outlet Drop (cm)	26	Fish Barrier Score	26
Depth of Fill (cm)	300	Result	Barrier
Mean Channel Width (m)	2.0	Replacement Options	RM

Considerations Prior to Replacement

Upstream Habitat Notes:	Downstream Habitat Notes:
Suitable spawning substrate but the channel is narrow and may dry up during periods of low flow.	Good spawning substrate.
	Channel drains into the San Juan River.
Assessment of US habitat quality strongly recommended prior to replacement or removal.	A thorough assessment should be done before considering removal or replacement; DS barriers and/or gradient may act as a fish barrier.

Photo Plates

DS view of inlet



US view of outlet



US channel habitat



DS channel habitat



San Juan River Crossings 2010: Information Summary for Closed-Bottomed Structures

Location and Priority

Crossing ID No.	SJ-RED-5013	Priority for Replacement: 2	Recommended
Date Assessed	2-Nov-10	HGI (m)	250
UTM Co-ordinates (Zone 10N)		Option 1 - Removal	
Northing	5380823	Option 2 - Portable Steel Bridge	
Easting	402412	Reference Map	2
Road Name	Red Mainline	Cost Benefit Ratio	45.45/4.34

CBS Parameters

Length (m)	11	Stream Width Ratio	2.50
Diameter (mm)	800	Downstream Channel Gradient (%)	0.9
Culvert Gradient (%)	6.3	Upstream Habitat Value	Moderate
Outlet Drop (cm)	-16	Fish Barrier Score	26
Depth of Fill (cm)	150	Result	Barrier
Mean Channel Width (m)	2.0	Replacement Options	RM

Considerations Prior to Replacement

Upstream Habitat Notes:	Downstream Habitat Notes:
Upstream is a backwatered, wetland area.	Channel drains into the San Juan River.
Assessment of US habitat quality strongly recommended prior to replacement or removal.	A thorough assessment should be done before considering removal or replacement; DS barriers and/or gradient may act as a fish barrier.

Photo Plates

DS view of inlet



US channel habitat



DS channel habitat



US view of outlet



San Juan River Crossings 2010: Information Summary for Closed-Bottomed Structures

Location and Priority

Crossing ID No.	SJ-RED-5015	Priority for Replacement: 3	Recommended
Date Assessed	2-Nov-10	HGI (m)	300
UTM Co-ordinates (Zone 10N)		Option 1 - Removal	
Northing	5380915	Option 2 - Portable Steel Bridge	
Easting	402712	Reference Map	2
Road Name	Red Mainline	Cost Benefit Ratio	42.86/6.25

CBS Parameters

Length (m)	14	Stream Width Ratio	1.43
Diameter (mm)	1400	Downstream Channel Gradient (%)	5.1
Culvert Gradient (%)	8.8	Upstream Habitat Value	Low
Outlet Drop (cm)	24	Fish Barrier Score	31
Depth of Fill (cm)	50	Result	Barrier
Mean Channel Width (m)	2.0	Replacement Options	RM

Considerations Prior to Replacement

Upstream Habitat Notes:	Downstream Habitat Notes:
Backwatered wetland area. Upstream channel lacks definition.	Stream channel too wide for the culvert.
Channel may dry up during periods of low flow.	Channel drains into the San Juan River.
Assessment of US habitat quality strongly recommended prior to replacement or removal.	A thorough assessment should be done before considering removal or replacement; DS barriers and/or gradient may act as a fish barrier.

Photo Plates

DS view of inlet



US channel habitat



DS channel habitat



US view of outlet



San Juan River Crossings 2010: Information Summary for Closed-Bottomed Structures

Location and Priority

Crossing ID No.	SJ-CAM-3086	Priority for Replacement: NR	Not Recommended
Date Assessed	13-Aug-10	HGI (m)	47
UTM Co-ordinates (Zone 10N)		Option 1 - Permanent Bridge (Composite Steel)	
Northing	5384393	Option 2 - Permanent Slab Bridge	
Easting	389531	Reference Map	12
Road Name	Camper ML	Cost Benefit Ratio	N/A

CBS Parameters

Length (m)	12	Stream Width Ratio	3.10
Diameter (mm)	1000	Downstream Channel Gradient (%)	12.0
Culvert Gradient (%)	7.5	Upstream Habitat Value	Low
Outlet Drop (cm)	8	Fish Barrier Score	31
Depth of Fill (cm)	150	Result	Barrier
Mean Channel Width (m)	3.1	Replacement Options	OBS

Considerations Prior to Replacement

Upstream Habitat Notes:	Downstream Habitat Notes:
Nearly dry, fairly steep gradient, mostly large cobble substrate.	A thorough assessment downstream should be conducted prior to replacement. DS barriers and/or gradient may act as fish barrier.
Channel is overgrown with terrestrial vegetation.	
Assessment of US habitat quality strongly recommended prior to replacement or removal.	

Photo Plates

DS view of inlet



US channel habitat



DS channel habitat



San Juan River Crossings 2010: Information Summary for Closed-Bottomed Structures

Location and Priority

Crossing ID No.	SJ-FLT-0050	Priority for Replacement: NR	Not Recommended
Date Assessed	13-Dec-10	HGI (m)	379
UTM Co-ordinates (Zone 10N)		Option 1 - Permanent Slab Bridge	
Northing	5389432	Option 2 - Permanent Bridge (Composite Steel)	
Easting	420100	Reference Map	4
Road Name	Fleet ML West	Cost Benefit Ratio	N/A

CBS Parameters

Length (m)	12	Stream Width Ratio	1.39
Diameter (mm)	800, 1000	Downstream Channel Gradient (%)	10.7
Culvert Gradient (%)	8.1	Upstream Habitat Value	Moderate
Outlet Drop (cm)	47	Fish Barrier Score	36
Depth of Fill (cm)	200	Result	Barrier
Mean Channel Width (m)	2.5	Replacement Options	OBS

Considerations Prior to Replacement

Upstream Habitat Notes:	Downstream Habitat Notes:
Very coarse material with no good spawning gravels.	Roughly 15% gradient farther DS.
Shallow. Possibly dry in summer.	Large boulder-cascade.
Assessment of US habitat quality strongly recommended prior to replacement or removal.	A thorough assessment should be done before considering removal or replacement; DS barriers and/or gradient may act as a fish barrier.

Photo Plates

DS view of inlet



US channel habitat



DS channel habitat



US view of outlet



San Juan River Crossings 2010: Information Summary for Closed-Bottomed Structures

Location and Priority

Crossing ID No.	SJ-FLT-0058	Priority for Replacement: NR	Not Recommended
Date Assessed	17-Dec-10	HGI (m)	110
UTM Co-ordinates (Zone 10N)		Option 1 - Permanent Bridge (Composite Steel)	
Northing	5390443	Option 1 - Permanent Slab Bridge	
Easting	420205	Reference Map	4&5
Road Name	Fleet ML West	Cost Benefit Ratio	N/A

CBS Parameters

Length (m)	15	Stream Width Ratio	2.22
Diameter (mm)	900	Downstream Channel Gradient (%)	37.2
Culvert Gradient (%)	13.9	Upstream Habitat Value	Low
Outlet Drop (cm)	78	Fish Barrier Score	39
Depth of Fill (cm)	300	Result	Barrier
Mean Channel Width (m)	2.0	Replacement Options	OBS

Considerations Prior to Replacement

Upstream Habitat Notes:	Downstream Habitat Notes:
Narrow and shallow channel.	Pool leading to a riffle.
Approximately 15% gradient, increasing upstream.	Larger cobble dominating substrate. Some LWD and over hanging vegetation.
LWD and overhanging vegetation present.	A thorough assessment should be done before considering removal or replacement; DS barriers and/or gradient may act as a fish barrier.
Assessment of US habitat quality strongly recommended prior to replacement or removal.	

Photo Plates



San Juan River Crossings 2010: Information Summary for Closed-Bottomed Structures

Location and Priority

Crossing ID No.	SJ-GRA-364	Priority for Replacement: NR	Not Recommended
Date Assessed	11-Aug-10	HGI (m)	64
UTM Co-ordinates (Zone 10N)		Option 1 - Removal	
Northing	5388654	Option 2 - Portable Steel Bridge	
Easting	404390	Reference Map	11
Road Name	Granite 6000	Cost Benefit Ratio	N/A

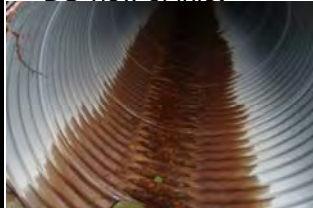
CBS Parameters

Length (m)	10	Stream Width Ratio	3.60
Diameter (mm)	1000	Downstream Channel Gradient (%)	5.0
Culvert Gradient (%)	4.1	Upstream Habitat Value	Low
Outlet Drop (cm)	21	Fish Barrier Score	36
Depth of Fill (cm)	70	Result	Barrier
Mean Channel Width (m)	3.6	Replacement Options	RM

Considerations Prior to Replacement

Upstream Habitat Notes:	Downstream Habitat Notes:
One cutbank present.	Channel branches off.
Gradient >15-20 %.	Dry channel except for the discharge pool.
	Channel is a fish-inferred tributary connecting to Renfrew Ck. which connects to the San Juan.
Assessment of US habitat quality strongly recommended prior to replacement or removal.	A thorough DS assment should occur prior to replacement. DS barriers and/or gradient may be a barrier to fish passage.

DS view of inlet



US channel habitat



DS channel habitat



US view of outlet



San Juan River Crossings 2010: Information Summary for Closed-Bottomed Structures

Location and Priority

Crossing ID No.	SJ-HCM-0019	Priority for Replacement: NR	Not Recommended
Date Assessed	13-Oct-10	HGI (m)	40
UTM Co-ordinates (Zone 10N)		Option 1 - Streambed Simulation CSP 2500mm	
Northing	5382984	Option 2 - Arch Culvert	
Easting	403170	Reference Map	8
Road Name	Harris Creek Mainline	Cost Benefit Ratio	N/A

CBS Parameters

Length (m)	17.5	Stream Width Ratio	2.13
Diameter (mm)	800	Downstream Channel Gradient (%)	0.9
Culvert Gradient (%)	2.3	Upstream Habitat Value	Low
Outlet Drop (cm)	-19	Fish Barrier Score	24
Depth of Fill (cm)	100	Result	Barrier
Mean Channel Width (m)	1.7	Replacement Options	SS

Considerations Prior to Replacement

Upstream Habitat Notes:	Downstream Habitat Notes:
Gentle channel gradient, not a lot of gravel substrate.	Narrow channel, gentle gradient, not a lot of gravel substrate.
Gradient increases upstream of the crossing.	Channel drains into San Juan River.
Assessment of US habitat quality strongly recommended prior to replacement or removal.	A thorough assessment downstream should be conducted prior to replacement. DS barriers and/or gradient may act as fish barrier.

Photo Plates

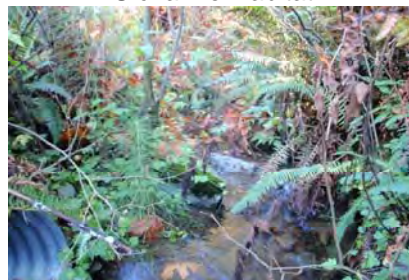
DS view of inlet



US channel habitat



DS channel habitat



US view of outlet



San Juan River Crossings 2010: Information Summary for Closed-Bottomed Structures

Location and Priority

Crossing ID No.	SJ-HCM-0109	Priority for Replacement: NR	Not recommended
Date Assessed	2-Nov-10	HGI (m)	30
UTM Co-ordinates (Zone 10N)		Option 1 - Arch Culvert	
Northing	5397609	Option 2 - Embed Existing Structure	
Easting	412534	Reference Map	10
Road Name	Hillcrest Mainline	Cost Benefit Ratio	N/A

CBS Parameters

Length (m)	17	Stream Width Ratio	1.67
Diameter (mm)	1200	Downstream Channel Gradient (%)	-3.5
Culvert Gradient (%)	5.6	Upstream Habitat Value	Moderate
Outlet Drop (cm)	3	Fish Barrier Score	29
Depth of Fill (cm)	175	Result	Barrier
Mean Channel Width (m)	2.0	Replacement Options	OBS/EM

Considerations Prior to Replacement

Upstream Habitat Notes:	Downstream Habitat Notes:
Backwatered pool with good substrate and LWD.	Lots of LWD and wind throw across the channel.
Assessment of US habitat quality strongly recommended prior to replacement or removal.	A thorough assessment downstream should be conducted prior to replacement. DS barriers and/or gradient may act as fish barrier.

Photo Plates

DS view of inlet



US channel habitat



DS channel habitat



US view of outlet



San Juan River Crossings 2010: Information Summary for Closed-Bottomed Structures

Location and Priority

Crossing ID No.	SJ-HCM-1025	Priority for Replacement: NR	Not Recommended
Date Assessed	3-Nov-10	HGI (m)	90
UTM Co-ordinates (Zone 10N)		Option 1 - Arch Culvert	
Northing	5396769	Option 2 - Permanent Slab Bridge	
Easting	410325	Reference Map	10
Road Name: Harris Creek ML/Truck Rd. 7		Cost Benefit Ratio	N/A

CBS Parameters

Length (m)	10	Stream Width Ratio	2.5
Diameter (mm)	1200	Downstream Channel Gradient (%)	3.1
Culvert Gradient (%)	6.3	Upstream Habitat Value	Low
Outlet Drop (cm)	28	Fish Barrier Score	31
Depth of Fill (cm)	50	Result	Barrier
Mean Channel Width (m)	3	Replacement Options	OBS

Considerations Prior to Replacement

Upstream Habitat Notes:	Downstream Habitat Notes:
Steep farther upstream. Well-defined channel with good spawning substrate.	Well-defined channel with good spawning substrate and gentle gradient.
Assessment of US habitat quality strongly recommended prior to replacement or removal.	A thorough assessment downstream should be conducted prior to replacement. DS barriers and/or gradient may act as fish barrier.

Photo Plates

DS view of inlet



US view of outlet



US channel habitat



DS channel habitat



San Juan River Crossings 2010: Information Summary for Closed-Bottomed Structures

Location and Priority

Crossing ID No.	SJ-HEM-271	Priority for Replacement: NR	Not Recommended
Date Assessed	9-Aug-10	HGI (m)	123
UTM Co-ordinates (Zone 10N)		Option 1 - Permanent Slab Bridge	
Northing	5391769	Option 2 - Permanent Bridge (Composite Steel)	
Easting	405420	Reference Map	11
Road Name	Hemmingson ML	Cost Benefit Ratio	N/A

CBS Parameters

Length (m)	10	Stream Width Ratio	3.39
Diameter (mm)	900 (x2)	Downstream Channel Gradient (%)	8.1
Culvert Gradient (%)	4.7	Upstream Habitat Value	Low
Outlet Drop (cm)	85	Fish Barrier Score	36
Depth of Fill (cm)	100	Result	Barrier
Mean Channel Width (m)	6.1	Replacement Options	OBS

Considerations Prior to Replacement

Upstream Habitat Notes:	Downstream Habitat Notes:
Upstream ditch-like habitat close to spur/road.	Dry channel.
Dry channel. Large cobble substrate.	Large cobble substrate.
	Channel is a fish-inferred tributary connecting to Hemmingsen Ck. which connects to the San Juan.
Assessment of US habitat quality strongly recommended prior to replacement or removal.	A thorough DS assment should occur prior to replacement. DS barriers and/or gradient may be a barrier to fish passage.

Photo Plates

DS view of inlet



US channel habitat



DS channel habitat



US view of outlet



San Juan River Crossings 2010: Information Summary for Closed-Bottomed Structures

Location and Priority

Crossing ID No.	SJ-HEM-340	Priority for Replacement: NR	Not Recommended
Date Assessed	10-Aug-10	HGI (m)	152.5
UTM Co-ordinates (Zone 10N)		Option 1 - Permanent Slab Bridge	
Northing	5392002	Option 2 - Permanent Bridge (Composite Steel)	
Easting	405763	Reference Map	11
Road Name	Hemmingsen ML	Cost Benefit Ratio	N/A

CBS Parameters

Length (m)	9	Stream Width Ratio	2.13
Diameter (mm)	800 (x2)	Downstream Channel Gradient (%)	4.3
Culvert Gradient (%)	6.3	Upstream Habitat Value	Low
Outlet Drop (cm)	11	Fish Barrier Score	26
Depth of Fill (cm)	80	Result	Barrier
Mean Channel Width (m)	3.4	Replacement Options	OBS

Considerations Prior to Replacement

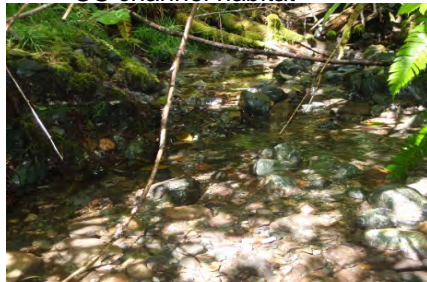
Upstream Habitat Notes:	Downstream Habitat Notes:
Likely dries during low flow periods.	Poorly-defined channel.
Large cobble substrate.	Channel width is far greater than culvert diameter.
Poorly-defined channel.	Channel is a fish-inferred tributary connecting to Hemmingsen Ck. which connects to the San Juan.
Assessment of US habitat quality strongly recommended prior to replacement or removal.	A thorough DS assessment should occur prior to replacement. DS barriers and/or gradient may be a barrier to fish passage.

Photo Plates

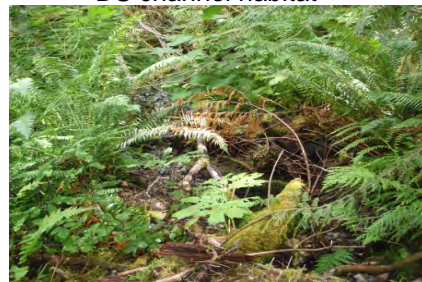
DS view of inlet



US channel habitat



DS channel habitat



US view of outlet



San Juan River Crossings 2010: Information Summary for Closed-Bottomed Structures

Location and Priority

Crossing ID No.	SJ-LEN-065	Priority for Replacement: NR	Not Recommended
Date Assessed	25-Jul-10	HGI (m)	55
UTM Co-ordinates (Zone 10N)		Option 1 - Permanent Slab Bridge	
Northing	5383453	Option 2- Permanent Bridge (Composite Steel)	
Easting	412577	Reference Map	7
Road Name	Lens 6000-A	Cost Benefit Ratio	N/A

CBS Parameters

Length (m)	11	Stream Width Ratio	4.50
Diameter (mm)	800	Downstream Channel Gradient (%)	13.3
Culvert Gradient (%)	6.0	Upstream Habitat Value	Low
Outlet Drop (cm)	85	Fish Barrier Score	36
Depth of Fill (cm)	100	Result	Barrier
Mean Channel Width (m)	3.6	Replacement Options	OBS

Considerations Prior to Replacement

Upstream Habitat Notes:	Downstream Habitat Notes:
No water at time of survey.	Stream Riparian Class S4 by BCTS road maps.
Cut block boundary on LB of channel.	
Eroding LB wall. Steep channel gradient.	A thorough assessment downstream should be conducted prior to replacement. DS barriers and/or gradient may act as fish barrier.
Assessment of US habitat quality strongly recommended prior to replacement or removal.	

Photo Plates

DS view of inlet



US channel habitat



DS channel habitat



US view of outlet



San Juan River Crossings 2010: Information Summary for Closed-Bottomed Structures

Location and Priority

Crossing ID No.	SJ-LEN-4010	Priority for Replacement: NR	Not Recommended
Date Assessed	15-Dec-10	HGI (m)	24.5
UTM Co-ordinates (Zone 10N)		Option 1 - Permanent Slab Bridge	
Northing	5388027	Option 2 - Permanent Bridge (Composite Steel)	
Easting	413797	Reference Map	6
Road Name	Lens Creek ML East	Cost Benefit Ratio	N/A

CBS Parameters

Length (m)	11	Stream Width Ratio	0.77
Diameter (mm)	1300	Downstream Channel Gradient (%)	9.2
Culvert Gradient (%)	5.2	Upstream Habitat Value	Low
Outlet Drop (cm)	-2	Fish Barrier Score	20
Depth of Fill (cm)	30	Result	Barrier
Mean Channel Width (m)	1.0	Replacement Options	OBS

Considerations Prior to Replacement

Upstream Habitat Notes:	Downstream Habitat Notes:
Riffle turning into cascade.	LWD, some boulders present and good overhanging vegetation.
Substrate mostly larger cobble not much gravel.	Very narrow channel.
Lots of overhanging vegetation.	A thorough assessment should be done before considering removal or replacement; DS barriers and/or gradient may act as a fish barrier.
Assessment of US habitat quality strongly recommended prior to replacement or removal.	

Photo Plates

DS view of inlet



US channel habitat



DS channel habitat



US view of outlet



San Juan River Crossings 2010: Information Summary for Closed-Bottomed Structures

Location and Priority

Crossing ID No.	SJ-LEN-4018	Priority for Replacement: NR	Not Recommended
Date Assessed	15-Dec-10	HGI (m)	25
UTM Co-ordinates (Zone 10N)		Option 1 - Permanent Slab Bridge	
Northing	5388938	Option 2 - Permanent Bridge (Composite Steel)	
Easting	413400	Reference Map	6
Road Name	Lens Creek ML East	Cost Benefit Ratio	N/A

CBS Parameters

Length (m)	9	Stream Width Ratio	3.75
Diameter (mm)	800	Downstream Channel Gradient (%)	15.2
Culvert Gradient (%)	-0.5	Upstream Habitat Value	Low
Outlet Drop (cm)	6	Fish Barrier Score	16
Depth of Fill (cm)	15	Result	Potential Barrier
Mean Channel Width (m)	3.0	Replacement Options	OBS

Considerations Prior to Replacement

Upstream Habitat Notes:	Downstream Habitat Notes:
Good gravel and cobble substrate make up channel.	Fast moving riffle with a plunge pool at outlet.
Lots of overhanging vegetation and lots of LWD.	Good spawning substrate and no debris jams.
Stream splits around central island.	A thorough assessment should be done before considering removal or replacement; DS barriers and/or gradient may act as a fish barrier.
Assessment of US habitat quality strongly recommended prior to replacement or removal.	

Photo Plates

DS view of inlet



US channel habitat



DS channel habitat



US view of outlet



San Juan River Crossings 2010: Information Summary for Closed-Bottomed Structures

Location and Priority

Crossing ID No.	SJ-MCB-0006	Priority for Replacement: NR	Not Recommended
Date Assessed	12-Oct-10	HGI (m)	358
UTM Co-ordinates (Zone 10N)		Option 1 - Arch Culvert	
Northing	5376998	Option 2 - Permanent Slab Bridge	
Easting	398986	Reference Map	2
Road Name	Minute Creek Branch 1	Cost Benefit Ratio	N/A

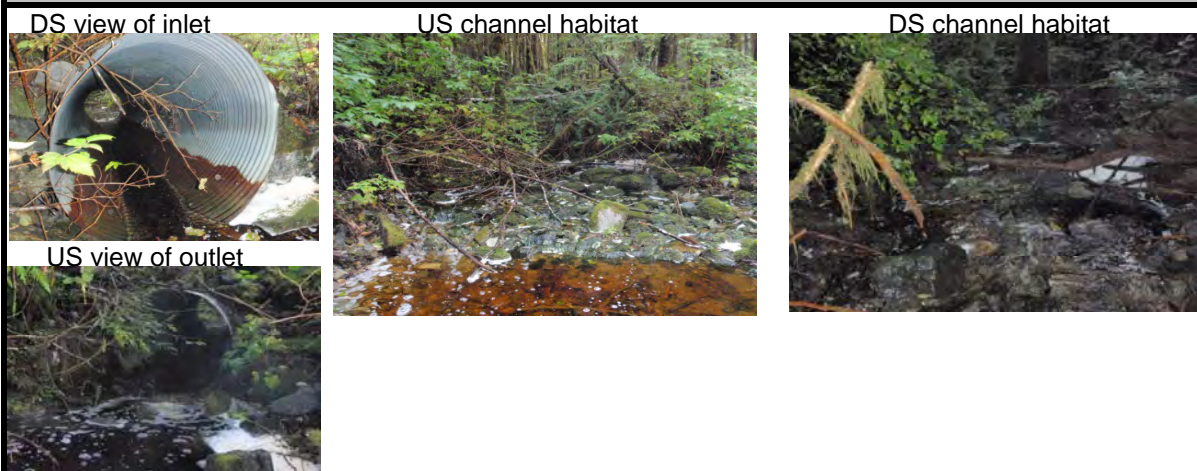
CBS Parameters

Length (m)	10	Stream Width Ratio	1.88
Diameter (mm)	1700	Downstream Channel Gradient (%)	0.3
Culvert Gradient (%)	7.4	Upstream Habitat Value	Moderate
Outlet Drop (cm)	-63	Fish Barrier Score	26
Depth of Fill (cm)	30	Result	Barrier
Mean Channel Width (m)	3.2	Replacement Options	OBS

Considerations Prior to Replacement

Upstream Habitat Notes:	Downstream Habitat Notes:
Steep cascades-likely gets steeper further uphill.	Bedrock exposed throughout channel.
	Channel is a fish-inferred tributary to a fish-observed main branch.
Assessment of US habitat quality strongly recommended prior to replacement or removal.	A thorough assessment downstream should be conducted prior to replacement. DS barriers and/or gradient may act as fish barrier.

Photo Plates



San Juan River Crossings 2010: Information Summary for Closed-Bottomed Structures

Location and Priority

Crossing ID No.	SJ-RED-5010	Priority for Replacement: NR	Not Recommended
Date Assessed	1-Nov-10	HGI (m)	65
UTM Co-ordinates (Zone 10N)		Option 1 - Removal	
Northing	5380767	Option 2 - Arch Culvert	
Easting	402234	Reference Map	2
Road Name	Red Mainline	Cost Benefit Ratio	N/A

CBS Parameters

Length (m)	11	Stream Width Ratio	1.25
Diameter (mm)	800	Downstream Channel Gradient (%)	7.1
Culvert Gradient (%)	5.5	Upstream Habitat Value	Low
Outlet Drop (cm)	-7	Fish Barrier Score	23
Depth of Fill (cm)	100	Result	Barrier
Mean Channel Width (m)	1.0	Replacement Options	RM

Considerations Prior to Replacement

Upstream Habitat Notes:	Downstream Habitat Notes:
Inlet crushed inhibiting flow.	Narrow channel, lacking definition.
Narrow creek, shallow, muddy substrate that likely dries during low flow periods.	Channel drains into the San Juan River.
Steep gradient further upstream.	A thorough assessment should be done before considering removal or replacement; DS barriers and/or gradient may act as a fish barrier.
Assessment of US habitat quality strongly recommended prior to replacement or removal.	

Photo Plates

DS view of inlet



US channel habitat



DS channel habitat



US view of outlet



San Juan River Crossings 2010: Information Summary for Closed-Bottomed Structures

Location and Priority

Crossing ID No.	SJ-RED-5012	Priority for Replacement: NR	Not Recommended
Date Assessed	2-Nov-10	HGI (m)	85
UTM Co-ordinates (Zone 10N)		Option 1 - Removal	
Northing	5380795	Option 2 - Portable Steel Bridge	
Easting	402341	Reference Map	2
Road Name	Red Mainline	Cost Benefit Ratio	N/A

CBS Parameters

Length (m)	12	Stream Width Ratio	1.88
Diameter (mm)	800	Downstream Channel Gradient (%)	-0.8
Culvert Gradient (%)	4.2	Upstream Habitat Value	Low
Outlet Drop (cm)	5	Fish Barrier Score	26
Depth of Fill (cm)	200	Result	Barrier
Mean Channel Width (m)	1.5	Replacement Options	RM

Considerations Prior to Replacement

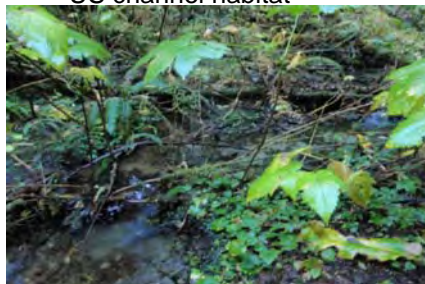
Upstream Habitat Notes:	Downstream Habitat Notes:
Slightly crushed inlet could inhibit flow if further damage occurs.	Narrow channel, but suitable spawning substrate.
Narrow channel lacking definition. May dry up during periods of low flow.	Channel drains into the San Juan River.
Assessment of US habitat quality strongly recommended prior to replacement or removal.	A thorough assessment should be done before considering removal or replacement; DS barriers and/or gradient may act as a fish barrier.

Photo Plates

DS view of inlet



US channel habitat



DS channel habitat



US view of outlet



San Juan River Crossings 2010: Information Summary for Closed-Bottomed Structures

Location and Priority

Crossing ID No.	SJ-TAC-005	Priority for Replacement: NR	Not recommended
Date Assessed	23-Jul-10	HGI (m)	51
UTM Co-ordinates (Zone 10N)		Option 1 - Removal	
Northing	5378907	Option 2 - Arch Culvert	
Easting	416757	Reference Map	3
Road Name	Three Rivers ML	Cost Benefit Ratio	N/A

CBS Parameters

Length (m)	9	Stream Width Ratio	4.13
Diameter (mm)	800	Downstream Channel Gradient (%)	28.2
Culvert Gradient (%)	9.4	Upstream Habitat Value	Low
Outlet Drop (cm)	55	Fish Barrier Score	31
Depth of Fill (cm)	65	Result	Barrier
Mean Channel Width (m)	3.3	Replacement Options	RM

Considerations Prior to Replacement

Upstream Habitat Notes:	Downstream Habitat Notes:
Approximately a 30% gradient.	Gradient >20%.
	Crossing is a fish inferred stream which connects to the Three Arm Creek.
Assessment of US habitat quality strongly recommended prior to replacement or removal.	A thorough assessment downstream should be conducted prior to replacement. DS barriers and/or gradient may act as fish barrier.

Photo Plates

DS view of inlet



US channel habitat



DS channel habitat



US view of outlet



San Juan River Crossings 2010: Information Summary for Closed-Bottomed Structures

Location and Priority

Crossing ID No.	SJ-HCM-0088	Priority for Replacement: NR	Not Recommended
Date Assessed	2-Nov-10	HGI (m)	70
UTM Co-ordinates (Zone 10N)		Option 1 - No Action Required	
Northing	5393674	Option 2 - No Action Required	
Easting	410727	Reference Map	9
Road Name	Harris Creek Mainline	Cost Benefit Ratio	N/A

CBS Parameters

Length (m)	16	Stream Width Ratio	1.00
Diameter (mm)	1000 (x2)	Downstream Channel Gradient (%)	17.8
Culvert Gradient (%)	0.9	Upstream Habitat Value	Low
Outlet Drop (cm)	-1	Fish Barrier Score	11
Depth of Fill (cm)	100	Result	Passable
Mean Channel Width (m)	2	Replacement Options	n/a

Considerations Prior to Replacement

Upstream Habitat Notes:	Downstream Habitat Notes:
Steep gradient further upstream. Small channel with fine substrate.	Large backwatered pond that flows into what looks like a small lake.
Channel may dry up during low flow periods.	No outlet control to survey.
	Channel drains into Harris Creek.
Assessment of US habitat quality strongly recommended prior to replacement or removal.	A thorough DS assessment should occur prior to replacement. DS barriers and/or gradient may be a barrier to fish passage.

Photo Plates

DS view of inlets



US channel habitat



DS channel habitat



US view of outlet



San Juan River Crossings 2010: Information Summary for Closed-Bottomed Structures

Location and Priority

Crossing ID No.	SJ-RED-5007	Priority for Replacement: NR	Not Recommended
Date Assessed	1-Nov-10	HGI (m)	225
UTM Co-ordinates (Zone 10N)		Option 1 - No Action Required	
Northing	5380787	Option 2 - No Action Required	
Easting	401920	Reference Map	2
Road Name	Red Mainline	Cost Benefit Ratio	N/A

CBS Parameters

Length (m)	14	Stream Width Ratio	0.97
Diameter (mm)	1200	Downstream Channel Gradient (%)	20.4
Culvert Gradient (%)	0.8	Upstream Habitat Value	Low
Outlet Drop (cm)	-7	Fish Barrier Score	10
Depth of Fill (cm)	300	Result	Passable
Mean Channel Width (m)	1.2	Replacement Options	n/a

Considerations Prior to Replacement

Upstream Habitat Notes:	Downstream Habitat Notes:
Poorly defined channel.	Channel drains into the San Juan River.
Assessment of US habitat quality strongly recommended prior to replacement or removal.	A thorough assessment should be done before considering removal or replacement; DS barriers and/or gradient may act as a fish barrier.

Photo Plates

DS view of inlet



US channel habitat



DS channel habitat



US view of outlet

