Natural Systems Design
Stream & Riparian
Resource Management
P.O. Box 15609
Seattle, WA 98115

EXHIBIT A: CONSULTING SERVICES SCOPE OF WORK

DESIGN AND ENGINEERING SERVICES FOR GOLD CREEK HABITAT ASSESSMENT AND CONCEPTUAL DESIGN PROJECT

Kittitas Conservation Trust (KCT) has requested that Natural Systems Design (NSD) prepare a scope of work for design and engineering services in support of the Gold Creek Habitat Assessment and Conceptual Design Project (Project). The project site includes the lower 6.8 miles of Gold Creek. The objective of the Project is to restore instream habitat for threatened Gold Creek Bull Trout (*Salvelinus confluentus*). The Project reach has been impacted by historic development and now experiences significant dewatering during the summer months.

NSD's approach to the Project will be to evaluate the causal mechanisms of dewatering and habitat degradation within the project reach, and develop conceptual design to enhance migratory, spawning and rearing conditions for Gold Creek Bull Trout. The conceptual design will incorporate existing geomorphic, infrastructure and stakeholder comments to produce a self-maintaining final project. The objectives of this scope of work are to:

(1) identify and describe the casual mechanisms leading to seasonal dewatering;
(2) produce detailed conceptual design plans to enhance habitat conditions for Gold Creek Bull Trout sufficient for moving into final design.
(3) provide scientific basis for how concept designs will achieve project goals .

This scope of work includes a discussion of the activities, assumptions, and deliverables associated with each task of the Project:

- Task 1 – Data Inventory and Data Gap Analysis
- Task 2 – Hydrologic Surface and Subsurface Assessment
- Task 3 – Geomorphic Channel, Floodplain and Riparian Assessment
- Task 4 – Habitat Assessment
- Task 5 – Conceptual Design
- Task 6 – Meetings and Stakeholder Communication
- Task 7 – Project Management

Work to be performed by NSD under this scope of work is limited to the items of work described in this document subject to all of the assumptions and limitations described herein. If, during the execution of this scope of work, it is determined that additional work is needed in order to complete the Project to the applicable standards of the industry(s) involved, and the execution of such work is not explicitly stated in this scope of work, then a scope and budget addendum may be required. NSD will report to Mitch Long, the KCT project manager (PM). Tim Abbe will be the NSD Principal-in-charge responsible for project deliverables and Quality Assurance/Quality Control (QA/QC). Mr. Michael Ericsson will be responsible for managing staff time, completing draft documents and project timeline. Key NSD staff includes:

Geomorphology, Surface and Groundwater Hydrology –
Tim Abbe, PhD, PEG, PHG; Michael Ericsson, MS, PG;
Shawn Higgins, MS; Anne Weekes, PhD
Hydraulics –
Leif Embertson, MS, PE, CFM; Tim Abbe, PhD, PEG, PHG;
Michael Ericsson, MS, PG
Habitat Ecology –
Pat Trotter, PhD (Fisheries and Bull Trout)
Marcia Fisher (Riparian and Forest conditions)
Design –
Tim Abbe, PhD, PEG, PHG, Rocky Hrachovec, MS, PE;
NSD and KCT Team
Engineering –
Rocky Hrachovec, MS, PE, Leif Embertson, MS, PE, CFM

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TASK 1: DATA INVENTORY

The purpose of this task is to compile existing information from previous investigations relevant to the Gold Creek assessments to be completed in subsequent tasks. Critical data sources will focus on describing the processes most directly impacting the stream: sediment supply, sedimentation, bank strength and riparian conditions, surface and subsurface water flow, in-stream and floodplain habitat, presence and function of wood, and human impacts to fluvial system (e.g., stream bank impacts, drainage modifications, floodplain ponds). Anticipated materials to be compiled in the project database include:

- Previous studies of bull trout in the basin (e.g. Wissmar and Craig, 1997; Meyer, 2002; Reiss et al. 2012);
- Habitat surveys;
- Monitoring data including previous measurements of stream flow;
- Readily available geologic reports and subsurface information (e.g. boring logs);
- Topographic datasets
    - Previously surveyed channel & valley cross-sections
    - Floodplain surveys (e.g., development, drainage)
- GIS data including Digital elevation Models (DEMs), aerial photographs, geologic units, parcel boundaries.

Task 1 will reveal the extent of site information already acquired, particularly work by the U.S. Forest Service. Since this may influence subsequent tasks, NSD and KCT will revisit and finalize scope and budget after the completion of Task 1.

DELIVERABLES

1. Brief memorandum presenting a bulleted inventory of existing information and identifying the key data gaps to be addressed by this study. An FTP site will be created to organize background materials in a central location accessible to KCT and other project stakeholders.

SCHEDULE

Existing data and data gaps memo	6/1/2013
Existing data posted to FTP site	6/1/2013

ASSUMPTIONS

1. KCT will provide NSD will all data already collected for the project
2. KCT will request any relevant data from USFS, USFW, WDFW, WDOE, USBoR, Yakama Nation and other stakeholders pertaining to Gold Creek: including but not limited to:
    a. Historic maps and airphotos, topography
    b. Geomorphic and hydrologic investigations, including any flow data
    c. Habitat surveys (including: channel bed grain size, wood, pools, habitat mapping)
    d. Historic & existing valley/floodplain forest conditions
    e. Landuse history
    f. Groundwater investigations and well data
3. NSD will search for and compile the same information listed from other sources, A total of 64 hours is budgeted for key staff to compile, search for, and review existing data covering the topics listed above. Existing data collection will be limited to the resources collected within the allotted time, including public and state online bibliographic search engines (WDOE, WDNR, WDFW, UW, CWU, WSU, USGS, USEPA, USFS, USFW), UW library resources, and gray literature (e.g., Plum Creek Timber watershed analyses). Individual staff focus regarding data compilation and data summary:
    a. The data inventory memo will consist of a bulleted list of existing data and sources, and a brief discussion of data gaps identified using sources compiled by KCT and NSD.

TASK 1 BUDGET (labor) $ 6,860

TASK 2: HYDROLOGIC SURFACE AND SUBSURFACE ASSESSMENT

NSD will lead a hydrologic monitoring investigation to collect new data supporting an analysis of the spatial and temporal variation of surface water-groundwater interactions. Findings of this investigation will be utilized in conjunction with the geomorphic assessment to develop design solutions to address the negative impacts of seasonal dewatering on the Gold Creek Bull Trout population. This Task will be the single most important and time consuming due to effort needed to establish and monitor piezometers. Monitoring stations will include surface water sites to record fluctuating water levels in Gold Creek and Gold Creek Pond, a former gravel pit excavated within the floodplain. We propose to install up to 12 monitoring wells and install data loggers for collecting both water level (derived from pressure) and temperature information at up to 6 locations in Lower Gold Creek Valley. Additional sites could be monitored at discrete intervals (e.g. monthly) to supplement the network of sites with continuous data. The proposed well locations will be reviewed by the project stakeholders prior to installation of the monitoring network. Wells will be installed by hand using a gasoline powered auger and PVC piping. The data will be used to determine hydraulic gradients between surface flows and the water table in adjacent floodplain sediments. Maps of water table contours for critical periods will be produced to evaluate spatial variations of hyporheic exchange in the project area. A brief technical memo (up to 5 pages long and with 3 figures) will be produced that describes the development, data and results of the monitoring network.

DELIVERABLES

1. Map of proposed and final well locations defining the monitoring network
2. Maps of water table elevations within the monitoring network for critical time periods
3. Technical memo

SCHEDULE

Map of proposed and final well locations	6/1/2013
Maps of water table elevations	11/1/2013
Technical memo	11/1/2013

ASSUMPTIONS

1. KCT will distribute the proposed monitoring locations map to the project stakeholders and provide feedback to NSD
2. Monitoring sites will depend on landowner consent.
3. Monitoring wells will be installed using a gasoline powered auger
4. KCT staff will prioritize well monitoring and data collection with at least 10 days and up to 50 days of field time.
5. Up to 20 monitoring locations will be installed to establish the monitoring network. The wells will be installed by NSD and KCT staff (hand operated gasoline auger or hand excavation) and collect data for up to 6 months

TASK 2 BUDGET (labor) $ 31,950

TASK 3: GEOMORPHIC ASSESSMENT

A basic geomorphic assessment will be completed to characterize prevailing conditions within the Gold Creek watershed and the Lower 4600 ft of Gold Creek (upstream of I-90 bridge) to identify key drivers affecting the channel response potential in the project reach. This assessment will utilize existing information and GIS data to describe basin scale characteristics and identify potential source, transport, and response reaches. In addition to field work completed in Task 2, two days will be spent mapping basic channel characteristics in Lower Gold Creek, including bank erosion, bank characteristics and functional wood, The assessment will evaluate whether the channel is continuing to widen and summarize the geomorphic context framing the response potential of the focus reach affected by seasonal dewatering. NSD will use a regime model to predict channel geometry under different scenarios of bank strength given the stream's gradient, grain size and formative flow. Channel widening is expected with a loss of bank strength that occurs with clearing riparian forests. Using the current channel conditions to calibrate the model, we will be able to predict the width of the creek when bank strength is re-introduced. NSD will also set up a 1-D HEC GEO-RAS model to predict basic flow conditions and check formative flow estimates and evaluate potential changes in stage resulting from changes in channel geometry. Since the creek is ungauged, the hydraulic model will not be calibrated and only used to make reasonable estimates which will be compared against regional curve projections if available. More detailed modeling is expected in the next project phase in developing final designs. A technical memo (~5 pages, ~10 figures) outlining the key findings of the geomorphic assessment will be produced.

DELIVERABLES

1. Technical memo

SCHEDULE

Technical memo ___3/1/2014_____

ASSUMPTIONS

1. Field data collection support from U.S. Forest Service and/or U.S. Fish & Wildlife Service will be provided, and directed by NSD to facilitate data collection. Should field data collection support not be provided, NSD will work closely with KCT to ensure that needed data is collected through scope or budget adjustments or separately contracted manpower.
2. KCT staff will participate in field work.

TASK 3 BUDGET (labor) $ 11,400

TASK 4: HABITAT ASSESSMENT

NSD will evaluate the effects of both natural and human induced changes on channel, riparian and floodplain conditions. A field survey will be conducted to inventory key habitat features within Lower Gold Creek. The locations and function(s) of these features will be used to evaluate current conditions and document mechanisms contributing to and degrading habitat conditions. Two field days will be spent describing and mapping basic pools and riparian conditions. A brief technical memo (~4 pages, ~4 figures) outlining the key findings of the habitat assessment will be produced.

DELIVERABLES

1. Technical memo

SCHEDULE

Technical memo 11/1/2013

ASSUMPTIONS

1. If previous habitat mapping (e.g., USFS, etc.) is acquired it will be repeated to extent possible in the time allotted.
2. Field data collection support from U.S. Forest Service and/or U.S. Fish & Wildlife Service will be provided, and directed by NSD to facilitate data collection. Should field data collection support not be provided, NSD will work closely with KCT to ensure needed data is collected through scope or budget adjustments or separately contracted manpower.

TASK 4 BUDGET (labor) $ 7,060

TASK 5: CONCEPTUAL DESIGN

The findings of the hydrologic, geomorphic and habitat assessments will be integrated and used to inform the development of up to 3 conceptual design that achieve the restoration goals in a way that is based on natural processes, provides a self-sustaining long-term solution that is compatible with the local community and site constraints. Drawings and a brief description of each conceptual alternative will be developed and presented by NSD at a project stakeholder meeting. Review comments will be considered and addressed, and a preferred alternative chosen at the stakeholder meeting. A final conceptual design and cost estimate will be developed and produced following the stakeholder meeting. A memo (~5 pages and ~8 figures) describing the background assessments and conceptual design development and selection will be produced. The details from the hydrologic, geomorphic and habitat assessments will reference the brief technical memos previously produced as appendices in the design memo. NSD will produce a draft memo for KCT review, and a final memo addressing KCT comments.

DELIVERABLES

- Conceptual design drawings and brief description (up to 3 alternatives)
- Stakeholder meeting and preferred concept selection
- Final concept design
- Draft and final design memo

SCHEDULE

Concept design drawings & brief description	10/1/2014
Stakeholder meeting	10/15/2014
Final concept design	12/1/2014
Draft design memo	10/1/2014
Final design memo	12/1/2014

ASSUMPTIONS

1. Schedule for final submittals will be dependent on receiving review comments on time.
2. Design memo will fulfill SRFB requirements for conceptual design projects (outlined in Manual 18 Appendix D-1).

TASK 5 BUDGET (labor) $ 24,560

TASK 6: MEETINGS AND STAKEHOLDER COMMUNICATION

To ensure communication between the design team, KCT, project stakeholders, local community, several meetings will be required. The agenda and scheduling for each meeting will be led by KCT, with input from NSD as requested. NSD has will participate in up to 4 formal meetings, including:

A one day kick-off meeting with stakeholders and landowners (morning) and stakeholders (afternoon) at the project site.

1. Presentation of assessment results and preliminary concept designs to stakeholders (i.e., Technical Working Group) in Cle Elum.

2. Presentation of assessment results and preliminary concepts, incorporating feedback from stakeholders to landowners at project site.

3. Presentation of final concept design to stakeholders (i.e., Technical Working Group) in Cle Elum.

4. Local landowner Carl Menconi will lead NSD communication with local community, coordinating all communications with KCT and NSD project managers.

DELIVERABLES

Local landowner communication and coordination, as approved by KCT
2 teleconferences with KCT and 4 meetings with KCT staff at NSD office
4 meetings
All meeting presentations and notes

SCHEDULE

TWG		5/1/2013
meeting 1		11/1/2013
meeting 2		3/4/2014
meeting 3	TWG Concept Designs	10/15/2014

ASSUMPTIONS

1. KCT and/or stakeholder meetings to be held local to Gold Creek (on-site or in Cle Elum, WA).

2. NSD will provide KCT will summary of all local landowner communications.

TASK 6 BUDGET (labor) $ 19,980

TASK 7: PROJECT MANAGEMENT

This task includes the labor and expenses associated with scheduling, coordination, and quality control services for this work. For activities covered by this scope of work, NSD shall work closely with KCT and project stakeholders throughout the process to meet the goals and objectives of the work assignment. NSD will coordinate its activities with KCT's project manager, Mitch Long, to ensure that NSD's activities do not duplicate or conflict with other KCT activities, approaches, policies, or procedures. The NSD project team will be overseen by Dr. Tim Abbe and managed by Mike Ericsson, who will act as the NSD project manager.

DELIVERABLES

Monthly invoicing
Progress updates (email and/or teleconference) as appropriate

SCHEDULE

Monthly invoicing
Progress updates (email and/or teleconference) as needed (not to exceed 4 weeks)
Project must be completed and all time billed prior to ___12/1/2014_____.

TASK7 BUDGET (labor)	**$ 5,900**

TOTAL PROJECT BUDGET

Labor		$107,710
Management Reserve/Contingency (5% Labor)		$ 5,386
Total Labor Subtotal		**$113,096**
Expenses		
Mileage	$ 1,320	
Food/lodging/equipment	$ 1,625	
12 well installations, 6 recording	$ 9,500	
Total Expenses		**$ 12,198**
TOTAL		**$125,293**

4: Scope, Budget and Work Breakdown Structure

Client:	Kittitas Conservation Trust								Job Name:	0	Principal:		Tim Abbe	
Job #:									Project Manager:	ME	Date:		3/18/2013	
Billing Rates	$180	$180	$120	$115	$130	$100	$55	$70	$100	$100				
Staff Name: / Staff Level (below):	T. ABBE	R. HRACHOVEC	Mike Ericsson	SHAWN HIGGINS	MARCIA FISHER	CADD	DAVID FRENCH	D. DUNCAN	Meconi	Pat Trotter				
Task / Task Description (* = assumes similar time commitment from KCT staff)													Total Hours	Total Cost
1 DATA INVENTORY														
1 .1 Data source compilation, review existing data	3	2	2	6	3		10		6	5			37	$3,870
1 .2 compile inventory and write summary memo with data gaps	3	1	5		1		8		2	3			23	$2,390
1 .3 Data summary and gaps conference call with KCT	2		2										4	$600
Subtotals	8	3	9	6	4	0	18	0	8	8	0	0	64	$6,860
2 HYDROLOGIC ASSESSMENT														
2 .1 Watershed Assessment (flood frequencies, seasonal hydrology)	3			8			10						21	$2,010
2 .2 Monitoring plan/reconnaisance*	8		10	10					8				36	$4,590
2 .3 Field Installation/sediment characterization*	8		10	40			40		16				114	$11,040
2 .4 Late summer data collection*			8				24		8				40	$3,080
2 .5 Pull data loggers*									8				8	$800
2 .6 Data processing/analysis	8		16				40						64	$5,560
2 .7 Technical memo	8		24				10						42	$4,870
Subtotals	35	0	68	58	0	0	124	0	40	0	0	0	325	$31,950
3 GEOMORPHIC ASSESSMENT														
3 .1 Historic channel changes	2		4				8						14	$840
3 .2 Assess reach conditions, map eroding banks*	1		2				10						13	$420
3 .3 Characterize channel & floodplain sediment distributions*	2		2				16						20	$600
3 .4 Describe existing wood function	8		10				10						28	$2,640
3 .5 Channel geometry UBC regime model	4		4	16			16						40	$1,200
3 .6 HEC GEO RAS hydraulic model	3		24										27	$3,420
3 .7 Technical memo	6		10				16						32	$2,280
Subtotals	26	0	56	16	0	0	76	0	0	0	0	0	174	$11,400
4 HABITAT ASSESSMENT														
4 .1 Field Assessment	2		2		10					16			30	$3,500
4 .2 Incorporation existing agency studies and plans										8			8	$800
4 .3 Technical memo	4				8					10			22	$2,760
4 .4													0	$0
Subtotals	6	0	2	0	18	0	0	0	0	34	0	0	60	$7,060
5 CONCEPTUAL DESIGN														
5 .1 Preliminary Design	10	12	8		4	8			8	6			56	$7,640
5 .2 Design Charrette (Seattle)	8	8	8										24	$3,840
5 .3 Prepare Concept Design Plan	8	10	4			24							46	$6,120
5 .4 Design Evaluation Report	8	4	40										52	$6,960
5 .5													0	$0
Subtotals	34	34	60	0	4	32	0	0	8	6	0	0	178	$24,560
6 MEETINGS AND STAKEHOLDER COMMUNICATION														
6 .1 Coordinate Landowner Relations		1	2						24				27	$2,820
6 .2 Meeting preparation (graphics, agenda)	3	2	5				16		2				28	$1,700
6 .3 Two 1 hr NSD/KCT status meetings (NSD office/webinar)	2	2	2										6	$960
6 .4 Methodology & data collaboration w/ stakeholders	2		4	2					4				12	$1,240
6 .5 On-site landowner and stakeholder kickoff meeting	8		8						8				24	$3,200
6 .6 Present assessment & preliminary concepts to stakeholders (Cle Elum)	7		8										15	$2,220
6 .7 Present assessment & preliminary concepts to landowners (on site)	8	8	2						8				26	$3,920
6 .8 Presentation of final project results to stakeholders (Cle Elum)	8	8	2						8				26	$3,920
Subtotals	38	21	33	2	0	0	16	0	54	0	0	0	164	$19,980
7 PROJECT MANAGEMENT														
7 .1 COORDINATION, COMMUNICATION	2		8					12	4				26	$2,560
7 .2 INTERNAL MEETINGS (3)	3	2	4	1	2			3	3	2			20	$2,350
7 .3 INVOICING			2					8					10	$800
7 .4 PROJECT CLOSE OUT			1					1					2	$190
7 .5													0	$0
Subtotals	5	2	15	1	2	0	0	24	7	2	0	0	58	$5,900
Subtotals	0	0	0	0	0	0	0	0	0	0	0	0	0	$0
SubTotals	152	60	243	83	28	32	234	24	117	50	0	0	1023	$107,710
APC (6% of labor)														$0
Admin. Allocation (6% of labor)														$0
Labor Contingency (management reserve fund)	5%													$5,386
Subcontractor Fees														$0
TOTAL														$113,096
Expenses														$12,198
GRAND TOTAL														$125,293