

ENGINEERING EVALUATION/COST ANALYSIS WORK PLAN

**Stehekin and Newhalem Firing Ranges
North Cascades National Park Complex
Stehekin and Newhalem, Washington**

P13PD01436

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Prepared for:

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1.0 EXECUTIVE SUMMARY

This Engineering Evaluation/Cost Analysis (EE/CA) Work Plan has been prepared by Resource Environmental Management Consultants, Inc. (RMC) to address firing range soils at the following two small-arms firing ranges located in North Cascades National Park Complex (NOCA, Sites):

- Stehekin; and
- Newhalem.

This EE/CA Work Plan has been prepared to:

- Summarize Site Characterization Results;
- Summarize Risk Evaluation;
- Present an Initial Range of Alternatives and Costs ; and
- Present a Proposed Table of Contents for the EE/CA.

The purpose of this Work Plan is to describe how the EE/CA will be planned, including general sampling activities, sampling results, an initial risk evaluation and cost estimates to resolve unacceptable risks. There is no guidance from the U.S. Environmental Protection Agency, the National Park Service or the State of Washington for the preparation of an EE/CA Work Plan. The Work Plan is generally used to define activities anticipated in conducting an EE/CA. RMC has determined, with approval from NOCA, that the Work Plan for this project will briefly describe activities for the EE/CA, develop preliminary remedial goals (PRGs) and provide results from recent sampling activities.

This EE/CA Work Plan provides supporting documentation for a non-time critical removal action (NTCRA) at the Sites. The EE/CA is being conducted in accordance with Guidance on Conducting Non-Time Critical Removal Actions under CERCLA (EPA, 1993).

The EE/CA is a streamlined focused document that provides site characterization data, assesses human health risks, evaluates ecological exposures, evaluates various response alternatives, recommends a preferred response alternative and provides a vehicle for public involvement.

A Stehekin Site Location Map is presented in Figure 1-1. A Newhalem Site Location Map is presented in Figure 1-2.

The sole threat consists of non-industrial lead impacted soils from use of the Sites as firing ranges. One source of contamination has been identified in the EE/CA:

- Lead in soil.

One preliminary Remedial Action Objective (RAO) has been established for the Sites:

- Minimize the potential for lead impacts to human health and the environment.

The EE/CA will analyze the following proposed response action alternatives for each Site:

Stehekin

- Alternative 1 – No Action.
- Alternative 2 – Cover as Part of Road Construction.
- Alternative 3 – Excavate and Encapsulate Firing Range Soils.

Newhalem

- Alternative 1 – No Action.
- Alternative 2 – Institutional Controls.
- Alternative 3 – Removal of Berm Soils and Institutional Controls.
- Alternative 4 – Waste Removal and Offsite Disposal at an Appropriate Disposal Facility.

2.0 SITE CHARACTERIZATION SUMMARY

This Section describes Site background, characterization of impacts, risk evaluation and the development of preliminary remedial goals (PRGs).

2.1 Source, Nature and Extent of Contamination

This Section presents the results of Site characterization activities conducted as part of the EE/CA. All Site activities and data analysis were conducted in accordance with the Field Sampling Plan (FSP, RMC, 2013).

Soil concentrations are compared to State of Washington Model Toxics Control Act (MTCA, 173-340 WAC) Method A regulatory cleanup levels which are summarized as follows:

- Human Health – Unrestricted use: 250 parts per million;
- Human Health – Industrial use: 1000 ppm;
- Ecological Health – Plants: 50 ppm;
- Ecological Health – Soil Biota: 500 ppm; and

- Ecological Health – Wildlife: 118 ppm.

Health risk criteria details are presented in Section 2.3.

2.1.1 Multi Increment Sampling and Decision Units

Site characterization utilized Multi Increment (MI) sampling. MI sampling is based on dividing the project area into a series of Decision Units (DU). A DU is the area and depth of soil (the sampled population) to be characterized by the average concentration of the MI sample. DUs are restricted to actual source zones and must incorporate only areas that are similar as far as impacts as to not dilute contamination.

A DU is a specific area (or volume of soil) about which a decision is to be made. The critical concern is that the entire area of a DU is consistent as far as contamination distribution and future use/exposure scenario. The sample from each DU consisted of a 0 to 2” soil depth increment at thirty locations throughout the DU.

Stehekin sample DU locations are presented in Figure 2-1. Newhalem sample DU locations are presented in Figure 2-2. Site Characterization sample results are presented in Table 2-1. DU dimensions are presented in Table 2-2.

Quality Assurance/Quality Control (QA/QC) sampling at each Site consisted of the collection of the following samples:

One DU at each Site was selected for triplicate sampling. Two additional replicate samples were collected from this DU. Subsamples for each triplicate sample were collected by following a unique sample collection path/grid that did not overlap with subset samples collected from either of the other two replicate samples. One QA/QC duplicate sample was selected for each Site by the analytical laboratory. Typically, this is done in the field and submitted “blind” to the laboratory. However, MI samples are processed at the laboratory. The laboratory was instructed to randomly select a post-processed sample for this analysis. QA/QC sample results are presented in Table 2-3.

2.1.2 Stehekin Soil Sampling Results

Stehekin sample DU locations are presented in Figure 2-1. Site Characterization sample results are presented in Table 2-1. Stehekin DU dimensions are presented in Table 2-2.

Samples were collected from four DUs. One DU was delineated specifically for the collection of a background sample. This background DU was located outside of the range area. The three

remaining DUs were delineated on and near the firing range. Descriptions of each DU are presented in Table 2-1.

Lead concentrations at the Stehekin firing range ranged from 10 to 427 parts per million (ppm). All samples contained lead concentrations below MTCA industrial land use concentration of 1,000 ppm. One DU contained lead concentrations above MTCA unrestricted (e.g. residential) land use concentration of 250 ppm lead. The sample collected for background purposes contained a lead concentration of 10 ppm. All three DUs contained lead concentrations greater than MTCA ecological soil screening criteria for plants of 50 ppm. One DU contained lead concentrations greater than MTCA ecological wildlife screening criteria for plants of 118 ppm. All three DUs contained lead concentrations below MTCA ecological soil biota screening criteria of 500 ppm.

The triplicate set of samples collected from DU2 (area behind berm) contained a range of 320 to 427 ppm lead with an average of 365.7 and a standard deviation of 45.1 ppm. The laboratory duplicate split sample for this DU contained a concentration of 285 ppm lead. The range of lead concentrations is typical and likely due to the nonhomogeneous nature of soil samples with dispersed bullet fragments.

2.1.3 Newhalem Soil Sampling Results

Newhalem sample DU locations are presented in Figure 2-2. Site Characterization sample results are presented in Table 2-1. Newhalem DU dimensions are presented in Table 2-2.

Samples were collected from five DUs. One DU was delineated specifically for the collection of a background sample. This background DU was located outside of the range area. The four remaining DUs were delineated on and near the firing range. Descriptions of each DU are presented in Table 2-1.

Lead concentrations at the Newhalem firing range ranged from 136 to 2,730 parts per million (ppm). One DU (DU 3, target and berm area) contained a lead concentration which exceeds MTCA industrial land use concentration of 1,000 ppm. Two DUs contained lead concentrations above MTCA unrestricted (e.g. residential) land use concentration of 250 ppm lead. The sample collected for background purposes contained a lead concentration of 9 ppm. All four DUs contained lead concentrations greater than MTCA ecological soil screening criteria for plants of 50 ppm. All four DUs contained lead concentrations greater than MTCA ecological wildlife screening criteria for plants of 118 ppm. Two DUs contained lead concentrations above MTCA ecological soil biota screening criteria of 500 ppm.

The triplicate set of samples collected from DU4 (target and meadow area) contained a range of 136 to 181 ppm lead with an average of 151.7 and a standard deviation of 20.8 ppm. The range of lead concentrations is typical and likely due to the nonhomogeneous nature of soil samples with dispersed bullet fragments.

2.1.4 Data Validation

The results of the Data Validation Review indicate that overall, the analytical data are of good quality and acceptable for use. A Data Validation Report will be presented in the EE/CA.

2.2 Preliminary Remedial Goals

Preliminary remedial goals (PRGs) are based on acceptable screening levels set by the State of Washington which are more protective than typical EPA values. These levels are general values that have been determined to be protective of human health and the environment. The soil PRG proposed for the Sites is 250 ppm lead as based on MTCA soil screening criteria for unrestricted use (WaDOE, 2007). The PRG was selected based on the following factors:

- RMC contacted the State of Washington Department of Ecology on October 21, 2013. RMC was told that due to the limited aerial extent of small-arms firing ranges; they are typically cleaned up using the MTCA unrestricted human health standard of 250 ppm lead.
- Meets unrestricted use for human health and is protective of soil biota ecological receptors. This value is more conservative than the typical EPA criteria of 400 ppm for residential land-use.
- The likelihood of impacting a threatened or endangered species is low. NOCA provided a list of Threatened and Endangered (T&E) Species occurring in in the park. The T&E list is as follows:

Endangered Species:

Gray Wolf (*Canus lupus*)

Threatened Species:

Canada Lynx (*Lynx canadensis*)

Grizzly Bear (*Ursus arctos*)

Marbled Murrelet (*Brachyramphus marmoratus marmoratus*)

Northern Spotted Owl (*Strix occidentalis caurina*)

Bull Trout (*Salvelinus confluentus*)

Puget Sound Chinook Salmon (*Oncorhynchus tshawtscha*)

Candidate Species:

Fisher (*Martes pennanti*)
Wolverine (*Gulo gulo luscus*)
Columbia Spotted Frog (*Rana luteiventris*)

Species of Concern:

Bald Eagle (*Haliaeetus leucocephalus*)
Peregrine Falcon (*Falco peregrinus*)

Due to the limited aerial extent of impacts, coupled with human use activities in the vicinity of the Sites, it is unlikely that these species would utilize the Sites.

Further information on screening levels and how they relate to PRGs are provided in Section 2.3.

2.3 Streamlined Risk Evaluation

This Section presents the results of Human Health Risk Evaluation (HHRE) and Ecological Risk Evaluation (ERE).

2.3.1 Human Health Risk Evaluation

This Streamlined HHRE based human health risk-related criteria for lead on the following:

- State of Washington Model Toxics Control Act (MTCA) soil screening criteria of 250 ppm for unrestricted use (WaDOE, 2007);
- EPA Region 9 Residential Preliminary Remediation Goal (PRG) of 400 ppm (EPA, 2010);
- EPA Region 3 Residential Risk-Based Concentration (RBC) of 400 ppm (EPA, 2010); and
- Regional Screening Levels (RSL) for Chemical Contaminants at Superfund Sites of 400 ppm (EPA, 2010).

This Streamlined HHRE compared on-Site concentrations of lead in soils to the values described above:

- The maximum lead concentration of 427 ppm at Stehekin exceeded all of the above described screening values.
- The maximum lead concentration of 2,730 ppm at Newhalem exceeded all of the above described screening values.

Both Sites contain maximum lead concentrations that exceeded screening values, thus the Sites “fail” and they can go directly into the corrective action process.

2.3.2 Ecological Risk Evaluation

This Streamlined ERE based ecological risk-related criteria for lead on the following:

- Oak Ridge National Laboratory (ORNL) Toxicological Benchmarks for Screening Contaminants of Potential Concern of 500 ppm for earthworms and 900 ppm for soil microorganisms and microbial processes (ORNL, 1997); and
- State of Washington Model Toxics Control Act (MTCA) soil screening criteria (WaDOE, 2007) of 50 ppm for plants, 500 ppm for soil biota and 118 ppm for wildlife. The State of Washington Department of Ecology (WaDOE) bases firing range cleanup on human health considerations. This information was included for completeness.

The Streamlined ERE compared on-Site concentrations of lead in soils to the values described above:

- The maximum lead concentration of 427 ppm at Stehekin exceeded (MTCA) soil screening criteria (WaDOE, 2007) of 50 ppm for plants and 118 ppm for wildlife.
- The maximum lead concentration of 2,730 ppm at Newhalem exceeded all of the above described screening values.

Both Sites contain maximum lead concentrations that exceeded screening values, thus the Sites “fail” and they can go directly into the corrective action process.

3.0 IDENTIFICATION OF REMOVAL ACTION OBJECTIVES

This Section describes the objectives of the Removal Action.

3.1 Planned Removal/Remedial Activities

Planned removal activities at the Sites will consist of tasks to reduce lead impacts to concentrations protective of human health and the environment. Planned removal activities may include but are not limited to:

- No action;
- Land use restrictions;
- Excavation of impacted soils;
- Disposal of impacted soils; and

- Site reclamation.

Potential removal activities are detailed further in Section 4.0.

3.2 Removal Action Objectives

Removal Action Objectives (RAOs) were developed based on the nature and extent of contamination as documented in Section 2.1.

One source of contamination has been identified in the EE/CA:

- Lead in soils.

One RAO has been established for the Sites:

- Minimize the potential for lead impacts to human health and the environment.

4.0 IDENTIFICATION AND ANALYSIS OF REMOVAL ACTION ALTERNATIVES

This Section presents removal action alternatives proposed to achieve the RAO identified in Section 3.2.

The proposed removal action alternatives for the Stehekin firing range include the following:

- Alternative 1 – No Action.
- Alternative 2 – Cover as Part of Road Construction.
- Alternative 3 – Excavate and Encapsulate Firing Range Soils.

The proposed removal action alternatives for the Newhalem firing range include the following:

- Alternative 1 – No Action.
- Alternative 2 – Institutional Controls.
- Alternative 3 – Removal of Berm Soils and Institutional Controls.
- Alternative 4 – Waste Removal and Offsite Disposal at an Appropriate Disposal Facility.

4.1 Evaluation Criteria

As specified by EPA guidance (USEPA, 1993), each response alternative is evaluated in terms of three criteria: Effectiveness, Implementability and Cost. These three criteria encompass the

elements required to meet National Oil and Hazardous Substances Pollution Contingency Plan (NCP) removal criteria. The criteria are described below:

Effectiveness: The effectiveness of a proposed alternative refers to the ability to meet the response action objective, and to the degree of protectiveness of the environment as well as public and site worker health, both in the short and long term. The RAO for the Sites are:

- Minimize the potential for lead impacts to human health and the environment.

Implementability: Implementability addresses the technical and administrative feasibility of implementing an alternative. Technical feasibility includes the difficulty of conducting the proposed response action. Administrative feasibility includes issues such as permitting, availability of services and disposal sites and the likelihood of public and regulatory acceptance.

Cost: An initial approximate cost for each proposed alternative is presented in this Work Plan. These costs are intended for comparison purpose only and may differ significantly from final costs presented in the EE/CA.

4.2 Stehekin

The alternatives for Stehekin were formulated based on a new road alignment passing through the firing range area. The alternatives assume that removal activities would be conducted concurrently with construction of the Stehekin Valley Road re-route (estimated construction period 2014 – 2016).

4.2.1 Alternative 1 - No Action

Alternative 1, No Action, is a baseline alternative by which other alternatives may be compared. No Action involves not taking any further actions to manage environmental concerns at the Site.

Effectiveness: The Site would remain as is. Implementation of the No Action alternative would not achieve the RAO.

Implementability: The No Action alternative is technically feasible to implement.

Cost: As this alternative does not involve taking any actions at the Site, there are no associated costs.

4.2.2 Alternative 2 – Placement of Cover Soils

Alternative 2 involves placement of cover soils. The placement of cover soils would occur concurrently with construction of a new alignment of the Stehekin Valley Road. The new road alignment will cross the north boundary of the firing range area. Institutional controls would be established to control and warn users of hazards that they may encounter while using the Site. Institutional controls would include a set of written agreements for contractors working in impacted areas and deed restrictions. Institutional controls for recreational users would include the posting of warning and “No Trespassing” signs. This alternative contains two potential options that are based on final road design:

Firing Range is Located in Fill Area:

A minimum of one foot of soil would be placed on the firing range area. Areas of the range directly below the road travel or shoulder surface would be covered with at least one foot of road base or similar material. The soil would be compacted with tracked or similar equipment. The portion of the firing range not directly beneath the road travel or shoulder surface would be revegetated concurrently with the remainder of the road realignment.

Firing Range is Located in Cut Area:

In the event that the firing range is located in a cut area of the road alignment, the firing range soils would be excavated and placed in a fill area. Confirmation samples would be collected to ensure that all contaminated material had been removed. The fill area would be surveyed and recorded as containing the material. The firing range soil area would be covered with a minimum of one foot of clean soil or road base material if it is located in the road travel or shoulder surface. The cover soil would be compacted with tracked or similar equipment. The portion of the firing range soils not directly beneath the road travel or shoulder surface would be revegetated concurrently with the remainder of the road realignment.

Contaminated soil would be handled by workers trained in accordance with 40 CFR 1910.120 (HAZWOPER). A five year review would be conducted to evaluate the implementation and performance of the remedy in order to determine if the remedy was or would be protective of human health and the environment.

Effectiveness: Placement of soil cover would achieve the RAO.

Implementability: Soil cover placement is technically feasible to implement with no anticipated difficulties.

Cost: The initial approximate cost for this alternative is \$90,310.00

4.2.3 Alternative 3 – Excavate and Encapsulate Firing Range Soils

Alternative 3 involves excavating contaminated soils and encapsulating them in a repository. The repository would be constructed of High-Density Polyethylene (HDPE) and covered with one foot of clean soil and revegetated. Institutional controls would be established to control and warn users of hazards that they may encounter while using the area surrounding the repository. Institutional controls would include a set of written agreements for contractors working in impacted areas and deed restrictions. Institutional controls for recreational users would include the posting of warning and “No Trespassing” signs. Monitoring would be conducted to monitor the integrity of the remedy.

Contaminated soil would be handled by workers trained in accordance with 40 CFR 1910.120 (HAZWOPER). A five year review would be conducted to evaluate the implementation and performance of the remedy in order to determine if the remedy was or would be protective of human health and the environment.

Effectiveness: Placement of soil in a repository would achieve the RAO.

Implementability: Placement of soil in a repository is technically feasible to implement with no anticipated difficulties.

Cost: The initial approximate cost for this alternative is \$176,520.00.

4.3 Newhalem

The alternatives for Newhalem were formulated based on continued use of the Site as a firing range for NOCA administrative use only.

4.3.1 Alternative 1 - No Action

Alternative 1, No Action, is a baseline alternative by which other alternatives may be compared. No Action involves not taking any further actions to manage environmental concerns at the Site.

Effectiveness: The Site would remain as is. Implementation of the No Action alternative would not achieve the RAO.

Implementability: The No Action alternative is technically feasible to implement.

Continued operation may require an Operating Plan in compliance with EPA Best Management Practices (EPA, 2005), which is outside the scope of the EE/CA.

Cost: As this alternative does not involve taking any actions at the Site, there are no associated costs.

4.3.2 Alternative 2 - Institutional Controls

Alternative 2 involves implementing institutional controls to control and warn users of hazards that they may encounter while using the Site. Institutional controls would include a set of written agreements for contractors working in impacted areas and deed restrictions. Institutional controls for recreational users would include the posting of warning and “No Trespassing” signs. In the event that construction is considered at the Site, construction workers would be trained in proper health and safety protocols as well as construction Best Management Practices (BMPs). A five year review would be conducted to evaluate the implementation and performance of the remedy in order to determine if the remedy was or would be protective of human health and the environment.

Effectiveness: Implementation of institutional controls would only achieve protection of human health and would not provide protection of the environment. The potential for human exposure to metals would be reduced given the assumption that recreational users obeyed posted closures and regulations. Construction worker exposure, although unlikely, would be limited by following health and safety protocols. Risks to the environment would be unabated with this alternative.

Implementability: Institutional controls are technically feasible with no anticipated difficulties. The Site is located on land wholly owned by NOCA; therefore, no access agreements are required. Site users would be expected to comply with temporary closures.

Continued operation may require an Operating Plan in compliance with EPA Best Management Practices (EPA, 2005), which is outside the scope of the EE/CA. A five year review program would be conducted to evaluate the implementation and performance of the remedy in order to determine if the remedy was or would be protective of human health and the environment.

Cost: The initial approximate cost for this alternative is \$63,575.00.

4.3.3 Alternative 3 – Removal of Berm Soils and Institutional Controls

Alternative 3 involves excavation and disposal of contaminated soils from the berm, reconstruction of the berm according to EPA Best Management Practices and institutional controls. All contaminated berm soils would be excavated and stockpiled to an on-site staging area or direct-loaded onto trucks for transport to an appropriate disposal facility. Contaminated soil would be handled by workers trained in accordance with 40 CFR 1910.120 (HAZWOPER). A five year review program would be conducted to evaluate the implementation and performance of the remedy in order to determine if the remedy was or would be protective of human health and the environment.

Effectiveness: Implementation of contaminated berm soils excavation, berm reconstruction and institutional controls would achieve protection of human health and would provide partial protection of the environment. The potential for human exposure to metals would be reduced given the assumption that closure of areas behind the berm is obeyed. Construction worker exposure, although unlikely, would be limited by following health and safety protocols. Risks to the environment would remain on the portion of the site behind the berm.

Implementability: Contaminated soils excavation, berm reconstruction and institutional controls are technically feasible with no anticipated difficulties. The Site is located on land wholly owned by NOCA; therefore, no access agreements are required. Site users would be expected to comply with closures during implementation of the Removal Action.

Continued operation may require an Operating Plan in compliance with EPA Best Management Practices (EPA, 2005), which is outside the scope of the EE/CA.

Cost: The initial approximate cost for this alternative is \$178,325.00.

4.3.4 Alternative 4 – Waste Removal and Offsite Disposal at an Appropriate Disposal Facility

Alternative 4 involves the removal of contaminated soils exceeding the PRG. All contaminated soils would be excavated and transported to an appropriate disposal facility. Soil would be either direct-loaded onto trucks or temporally stockpiled at an on-site staging prior to loading onto over the road trucks. Confirmation samples would be collected to determine that all contamination had been removed. The Site would be regraded and revegetated. Note: at the time of preparation of this Work Plan it has not been determined if the two structures located in DU 2 are historic.

Effectiveness: Waste removal would achieve the RAO.

Implementability: Waste removal is technically feasible to implement with no anticipated difficulties.

Continued operation may require an Operating Plan in compliance with EPA Best Management Practices (EPA, 2005), which is outside the scope of the EE/CA.

Cost: The initial approximate cost for this alternative is \$202,100.00

4.4 Cost Summary

This Section summarizes the initial costs for each alternative. The costs presented in this Work Plan are initial approximate costs intended for comparison purpose only. The costs will be refined further in the EE/CA.

4.4.1 Stehekin

<u>Alternative</u>	<u>Estimated Cost</u>
Alternative 1 – No Action	None
Alternative 2 – Cover as Part of Road Construction	\$ 90,310.00
Alternative 3 – Excavate and Encapsulate Firing Range Soils	\$ 176,520.00

4.4.1 Newhalem

<u>Alternative</u>	<u>Estimated Cost</u>
Alternative 1 – No Action	None
Alternative 2 – Institutional Control	\$ 63,575.00
Alternative 3 – Removal of Berm Soils and Institutional Controls	\$ 178,325.00
Alternative 4 – Waste Removal and Offsite Disposal	\$ 202,100.00

5.0 PROPOSED EE/CA OUTLINE

This Section presents a proposed outline for the EE/CA Report.

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- 2.3 SOURCE, NATURE AND EXTENT OF CONTAMINATION
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 - 6.1 STEHEKIN
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7.0 REFERENCES

6.0 REFERENCES

Resource Environmental Management Consultants Inc. (RMC), 2013, Field Sampling Plan, Stehekin and Newhalem Firing Ranges, North Cascades National Park Complex, Stehekin and Newhalem, Washington

USEPA, 1993, Guidance on Conducting Non-Time Critical Removal Action Under CERCLA, EPA 540-R-93-057.

USEPA, 1998, Guidance for Quality Assurance Project Plans”, EPA QA/G5 EPA/600/R98.

USEPA, 2010, Regional Screening Levels (RSL) for Chemical Contaminants at Superfund Sites.

USEPA, 2005, Best Management Practices for Lead at Outdoor Shooting Ranges, EPA-902-B-01-00, Revised June 2005

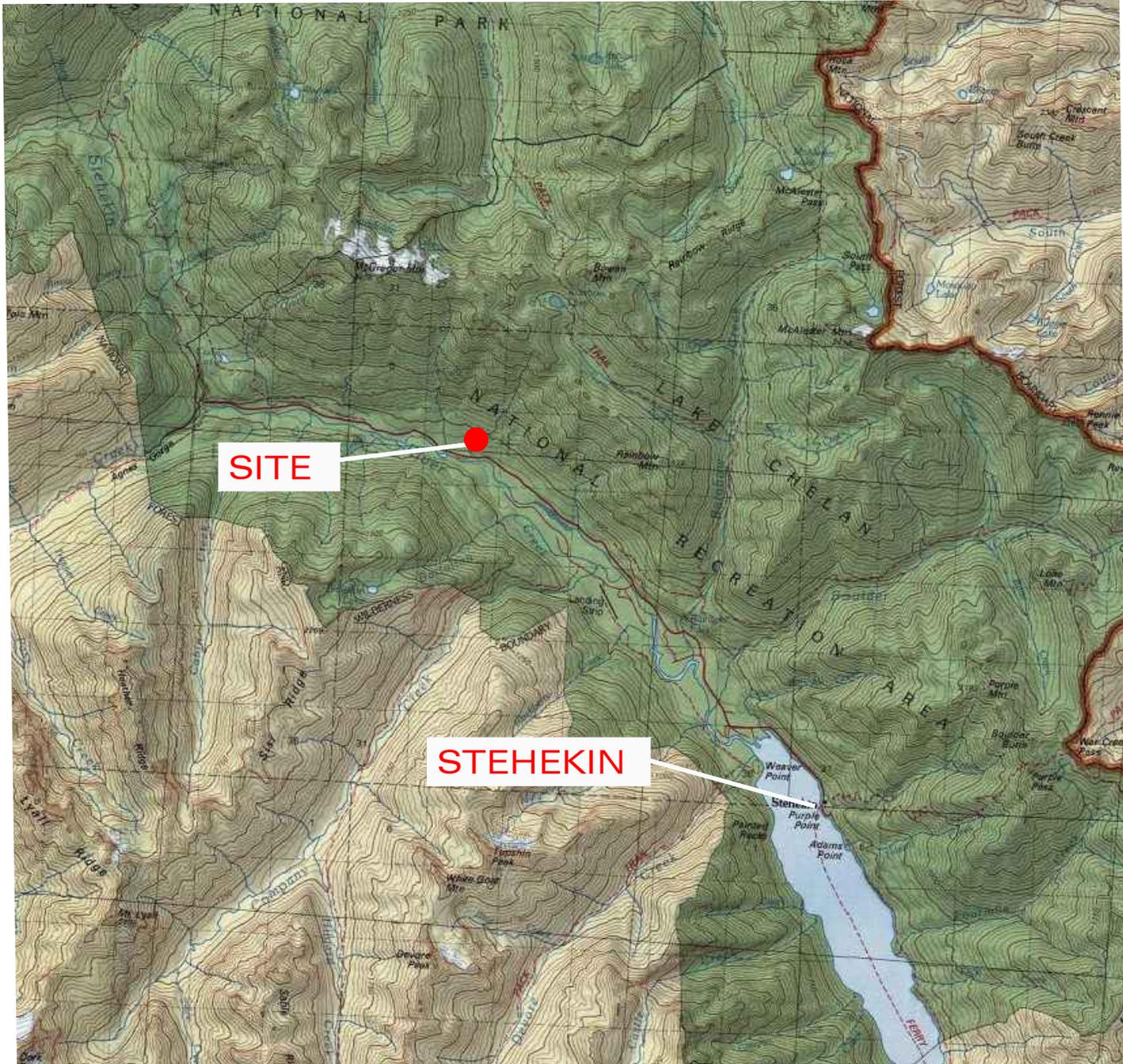
USEPA, 2006, Region III Biological Technical Assistance Group (BTAG)
Freshwater Screening Benchmarks,
<http://www.epa.gov/reg3hwmd/risk/eco/btag/sbv/fw/screenbench.htm>

State of Washington Department of Ecology (WaDOE), 2007, Model Toxics Control Act (MTCA), Chapter 173-340 WAC

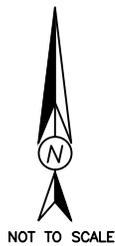
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Figures

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NOTE:
LOCATIONS NOT SURVEYED



NORTH CASCADES NP

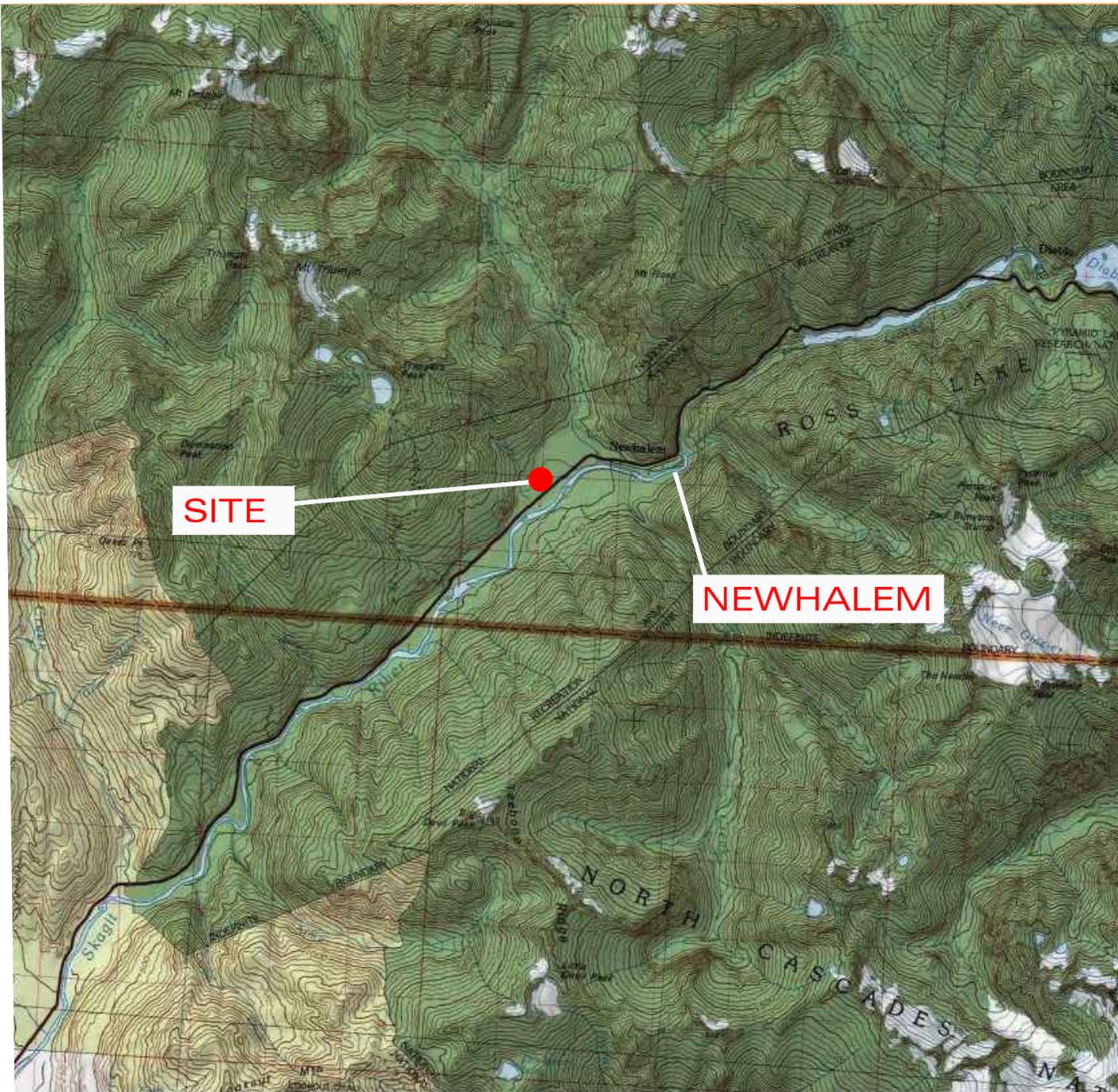
FIGURE 1-1
STEHEKIN FIRING RANGE
SITE MAP

RESOURCE MANAGEMENT CONSULTANTS
8138 SOUTH STATE ST.
SUITE 2A
MIDVALE, UT 84047
801-255-2626

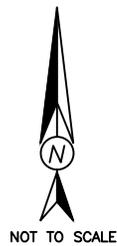


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nc site map.dwg



NOTE:
LOCATIONS NOT SURVEYED



NORTH CASCADES NP

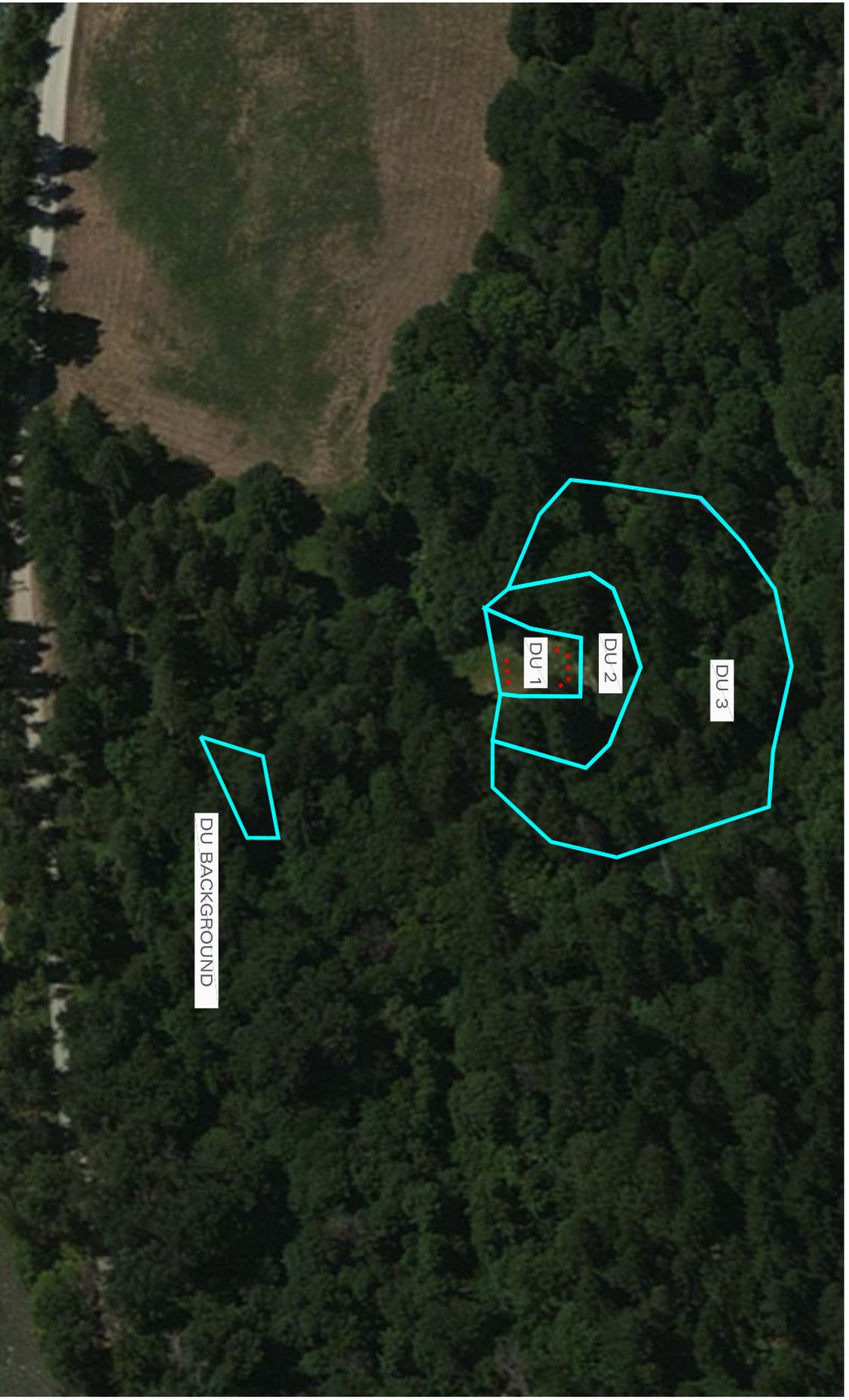
FIGURE 1-2
NEWHALEM FIRING RANGE
SITE MAP

RESOURCE MANAGEMENT CONSULTANTS
8138 SOUTH STATE ST.
SUITE 2A
MIDVALE, UT 84047
801-255-2626



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nc site map.dwg

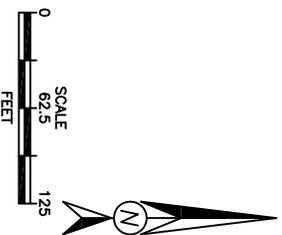


LEGEND

— DECISION UNIT (DU) BOUNDARY

● TARGET STRUCTURE

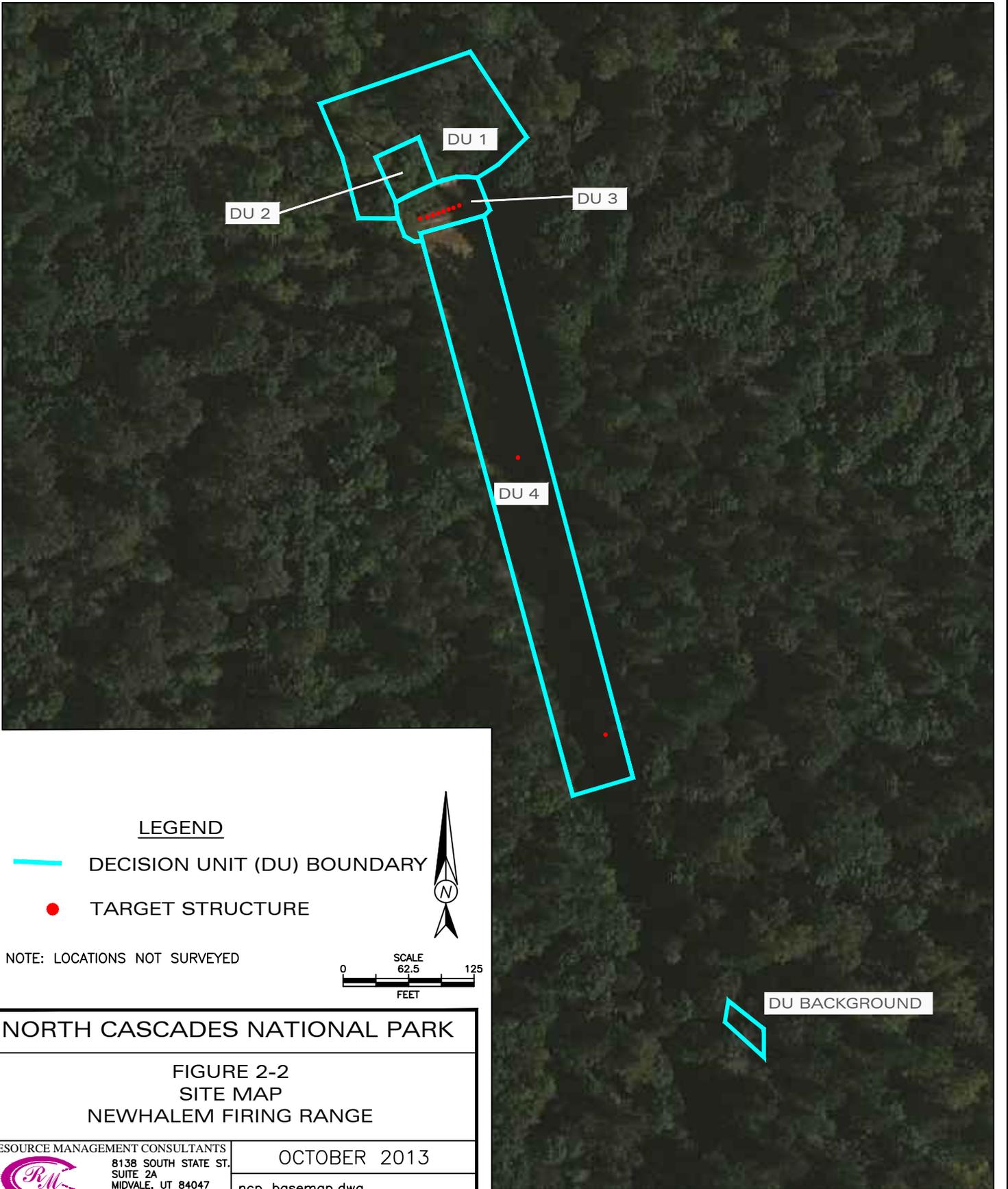
NOTE: LOCATIONS NOT SURVEYED



NORTH CASCADES NATIONAL PARK

FIGURE 2-1
SITE MAP
STEHKIN FIRING RANGE

RESOURCE MANAGEMENT CONSULTANTS
 8138 SOUTH STATE ST. OCTOBER 2013
 SUITE 2A UT 84047
 MIDVALE, UT 84047
 801-255-2626 ncp_baserncp.dwg



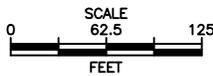
LEGEND

 DECISION UNIT (DU) BOUNDARY

 TARGET STRUCTURE



NOTE: LOCATIONS NOT SURVEYED



NORTH CASCADES NATIONAL PARK

FIGURE 2-2
SITE MAP
NEWHALEM FIRING RANGE

RESOURCE MANAGEMENT CONSULTANTS
 8138 SOUTH STATE ST.
 SUITE 2A
 MIDVALE, UT 84047
 801-255-2626

OCTOBER 2013

ncp basemap.dwg

Tables

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**Table 2-1
Data Summary
Stehekin and Newhalem
Firing Ranges EE/CA**

Stehekin			
Decision Unit	Sample Identification	Lead (ppm)	Description
DU background	ST-BG	10	Background area, south of firing range. Forested.
DU 1	ST-DU1	54	Target area. Two sets of target posts. One for close range shooting (3 posts) and the second is directly in front of the berm (5 posts). Open meadow.
DU 2	ST-DU2	427	Berm area. Berm is a cut slope. This area may have been a borrow pit. Cut slope is up to 10' in height. Semi-forested
DU 2	ST-DU2 Duplicate	285	QA split of DU 2
DU 2	ST-DU8	320	Triplicate Sample of DU 2 for QA
DU 2	ST-DU9	350	Triplicate Sample of DU 2 for QA
DU 3	ST-DU3	10	Wooded area behind berm area. Forested

Newhalem			
Decision Unit	Sample Identification	Lead (ppm)	Description
DU background	NE-BG	9	Background area, south of firing range. Forested.
DU 1	NE-DU1	154	Wooded area behind berm area. Forested
DU 2	NE-DU2	586	Wooded area with galvanized metal shack behind berm area. Shack has bullet holes on all sides and dirt floor. Forested
DU 2	NE-DU2 Duplicate	575	QA split of DU 2
DU 3	NE-DU3	2,730	Target and berm area. Area contains 8 target structures. Berm consists of imported material and consists of large logs on the backside. Front side of berm is 8-9 feet tall.
DU 4	NE-DU4	181	Target and range area. Area contains 2 target posts. Open meadow.
DU 4	NE-DU8	138	Triplicate Sample of DU 4 for QA
DU 4	NE-DU9	136	Triplicate Sample of DU 4 for QA

**Table 2-2
Decision Unit Physical Descriptions
Stehekin and Newhalem
Firing Ranges EE/CA**

Stehekin				
Decision Unit	Area			Description
	M³	Ft³	Acres	
DU background	262	2,820	0.06	Background area, south of firing range. Forested.
DU 1	396	4,263	0.10	Target area. Two sets of target posts. One for close range shooting (3 posts) and the second is directly in front of the berm (5 posts). Open meadow.
DU 2	1,094	11,776	0.27	Berm area. Berm is a cut slope. This area may have been a borrow pit. Cut slope is up to 10' in height. Semi-forested
DU 3	4,461	48,018	1.10	Wooded area behind berm area. Forested

Newhalem				
Decision Unit	Area			Description
	M³	Ft³	Acres	
DU background	78	840	0.02	Background area, south of firing range. Forested.
DU 1	1,425	15,339	0.35	Wooded area behind berm area. Forested
DU 2	177	1,905	0.04	Wooded area with galvanized metal shack behind berm area. Shack has bullet holes on all sides and dirt floor. Forested
DU 3	300	3,229	0.07	Target and berm area. Area contains 8 target structures. Berm consists of imported material and consists of large logs on the backside. Front side of berm is 8-9 feet tall.
DU 4	3,000	32,292	0.74	Target and range area. Area contains 2 target posts. Open meadow.