Project Title: ***MIDDLE O'DELL CREEK LIDAR ACQUISITION PROPOSAL***

Date: November 6, 2020

Applicability to Project 2188 License Article(s)

Light Detection and Ranging (LiDAR) elevation data is proposed to be collected on the Middle O'Dell Creek project area, extending from fever point downstream to Highway 287 (Figure 1). Total acquisition area is 2.4 square miles. The data will support the proposed Phase 18 stream and wetland restoration work, assist in restoration project planning and design for possible future phases, and allow for analysis of conditions in a reference reach of Middle O'Dell Creek near U.S. Highway 287. Future phases of restoration work in the Middle O'Dell Creek project area will offset impacts to river resources associated with Project 2188 (Madison-Missouri River). The future projects meet the purpose and intent of License Article 423, which requires development of a vegetation and wildlife monitoring and enhancement plan intended to enhance native plants and wildlife populations on Project 2188 wildlife habitats adjacent to the Madison River. Specifically, NorthWestern Energy is successfully enhancing Project 2188 wildlife habitats through funding aimed to protect, restore, and enhance riparian, wetland, and upland habitats on private lands. The O'Dell Creek project, and the benefits that have resulted from 15 phases of restoration work in the O'Dell Creek headwaters, are specifically referenced in Article 423 (see Updated Five Year 2013-2017 Project 2188 Wildlife Plan). NorthWestern Energy continues to monitor benefits to stream temperature, streamflow quantity, avian species richness and numbers, sensitive plants, and acres of restored/enhanced wetlands.

Justification for Priority 2 Classification

Future phases of restoration work on Middle O'Dell Creek which will be supported by this proposed LiDAR acquisition, including the Phase 18 Stream and Wetland Restoration Project, classify as a Priority 2 2188 license project. The project is located on O'Dell Creek, a major cold-water spring creek tributary to the Madison River, within 0.5 miles of the Madison River, and will address limiting factors related to degraded wildlife, wetland and aquatic resources.

Project Sponsors: Granger Ranches, L.P.
NorthWestern Energy, Inc.
River Design Group, Inc.

Location of Proposed Project

The project is in Madison County directly south of Ennis, Montana (Figure 1). The project includes several ownerships, including Granger Ranches, L.P.; Longhorn Ranch, L.P.; State of Montana; Theresa, Larry and Shirley Love; Two Creeks Estate LLC; and Montana Fish, Wildlife and Parks (Figure 2). The legal description of the project area is Township 6 South, Range 1 West, Sections 3, 4, 9, 10, 16, 17, 20, and 21.

Geocodes: 25-0423-20-1-01-01-0000, 25-0423-21-1-01-01-0000, 25-0423-17-4-05-01-0000, 25-0423-17-1-01-25-0000, 25-0423-16-1-01-01-0000, 25-0423-09-3-01-01-0000, 25-0423-09-1-01-01-0000, 25-0423-04-3-20-01-0000, 25-0423-04-4-01-01-0000, 25-0423-03-3-02-01-0000, 25-0423-03-3-01-20-0000, 25-0423-04-4-01-10-0000.

Latitude: 45.306; **Longitude:** -111.745

Total Project Cost: **$**29,260

WildTAC Funds (Cost-Share) Requested for Project: $13,300

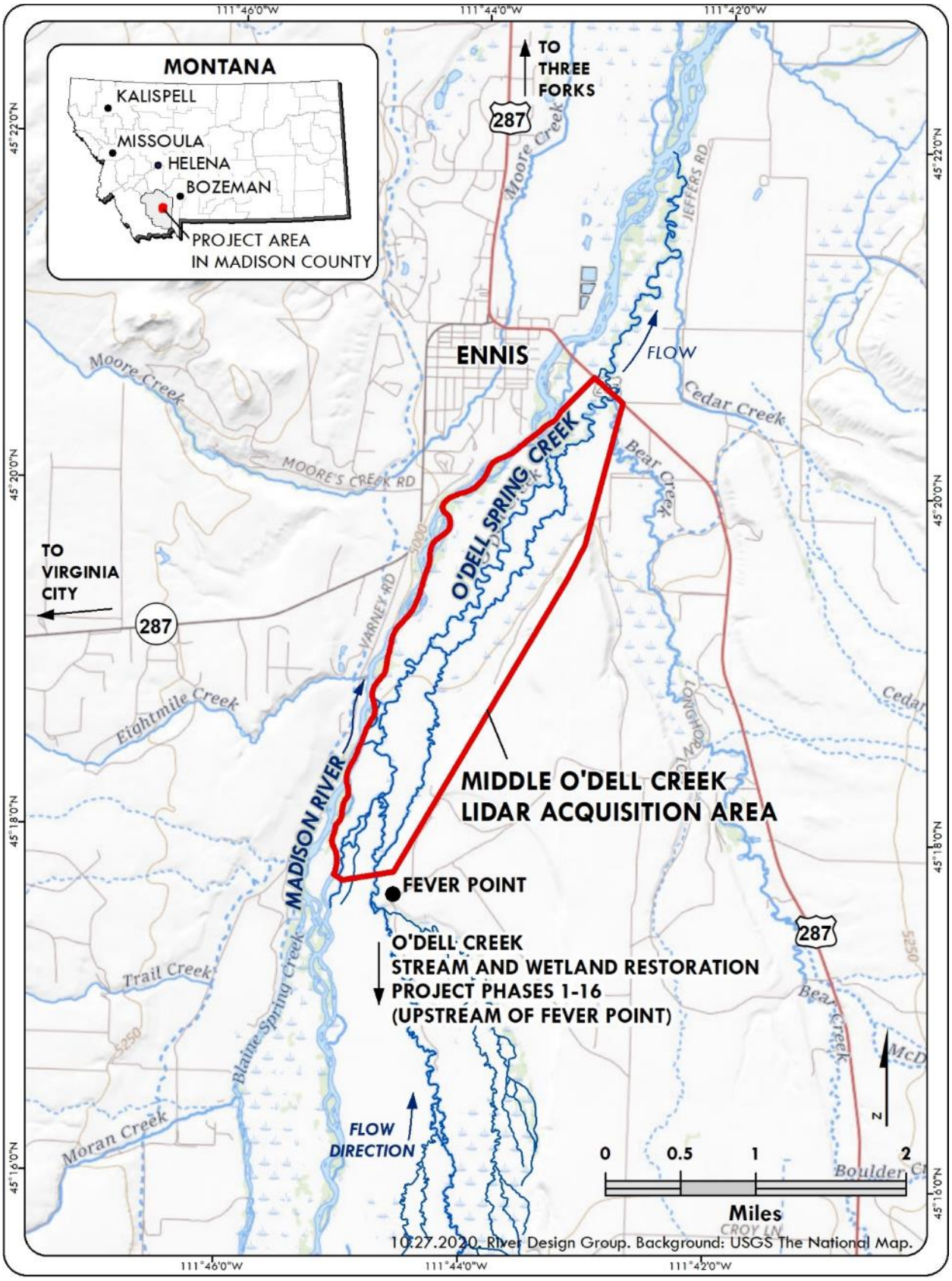

Figure 1. Middle O'Dell Creek lidar acquisition area and project vicinity map.

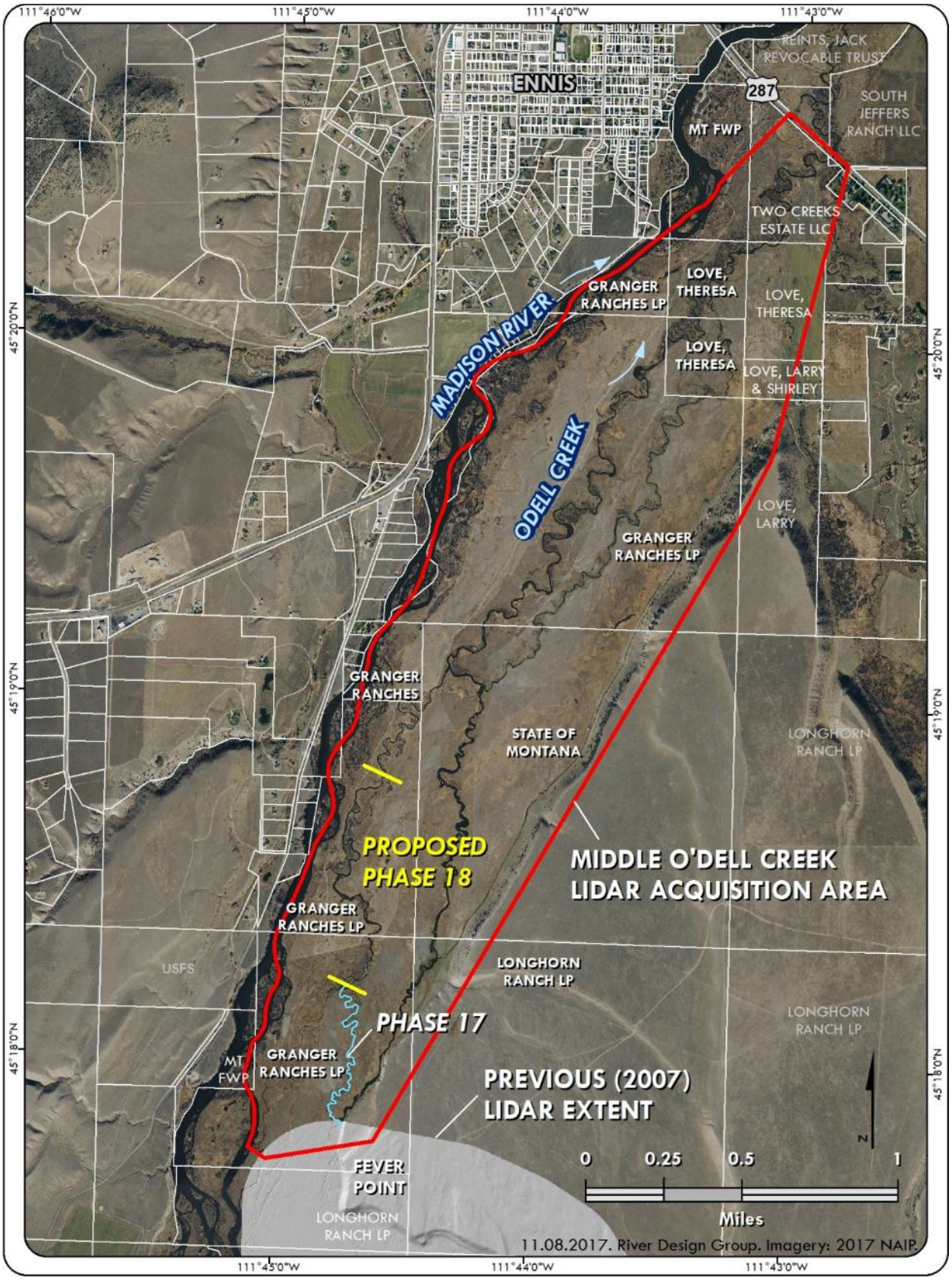

Figure 2. LiDAR acquisition project area and landowner map, and proximity to Phase 17 and proposed Phase 18 project areas, and Madison River.

I. INTRODUCTION

O'Dell Spring Creek and floodplain wetlands are important ecological resources to the Madison River. Over the past 16 years, 15 major phases of restoration work have culminated in the restoration of over 14 miles of spring creek and close to 900 acres of improved wetland functions. Restoration suitability, willing landowners, and private-public partnerships are the reasons for the success of this large-scale, comprehensive restoration project. In 2018, NorthWestern Energy, Granger Ranches, Longhorn Ranch, and the US Fish and Wildlife Service received the ***Society for Ecological Restoration Northwest Restoration Project of the Year Award.*** The award recognizes the important wildlife habitat gains resulting from permanently protecting and restoring wetland habitats. Accomplishments include:

- Restoring complex riffle and pool sequences throughout the 14-mile project area, including the mainstem O'Dell Creek and East and West Branches O'Dell Creek.
- Reconnecting close to 900 acres of previously drained floodplain wetlands, consisting of 265 wetland plant taxa, which represents 20% of Montana's wetland flora including five rare species.
- Increasing the distribution in the availability of adult holding and juvenile rearing habitat, with an estimated ten-fold increase compared to pre-restoration conditions.
- Reducing surface water temperatures by improving channel morphology (e.g. lower width-to-depth ratios, reduced surface water area), and increasing hyporheic exchange between surface water and groundwater.

This LiDAR acquisition project will support the continuation of the fish and wildlife habitat restoration gains that have been achieved during the past 16 years of restoration. In addition, analysis of LiDAR data in the downstream reference reach near US Highway 287 will enable further clarification on what physical characteristics are present in the well-functioning reach and how they differ from what is present in the upstream impaired reaches.

II. Objectives

The following objectives have been developed for the Middle O'Dell Creek Lidar Acquisition Project:

1. Perform LiDAR data collection with a target average first-return density of 8 points/m^2 (0.74 points/ft^2), for the entire 2.4 mi^2 lidar acquisition area.
2. Establish and collect survey-grade GPS ground control data, including monumentation and collection of ground survey points, to geospatially correct the LiDAR data and perform quality assurance checks on final LiDAR data deliverables;
3. Apply American Society of Photogrammetry and Remote Sensing (ASPRS) LAS v.1.4 classification standards to produce Ground Points, Default Points, and Model Key Points using z-tolerances of 0.1, 0.2, 0.5, and 1.0 feet; and
4. Produce and deliver LiDAR points in LAS v 1.4 format, with all returns as well as model key points included, and separated into tiles no more than 200 MB in size.

III. Methods

RDG will retain Quantum Spatial, Inc. (QSI), a LiDAR acquisition and analytics company based out of Corvallis, Oregon, to perform the LiDAR acquisition flight and data processing. RDG will collect GPS survey ground control data for the project. RDG and QSI have a long-standing working relationship with

LiDAR acquisitions and GPS survey ground control and will work together to provide accurate and reliable LiDAR deliverables to project partners. QSI was the LiDAR vendor for the original O'Dell Creek acquisition in 2007, and the company has extensive experience throughout Montana.

A Cessna Caravan aircraft with a mounted Riegl VQ-1560i system will be used to acquire the LiDAR data in the Middle O'Dell Creek project area. Timing of the flight will ensure the ground is free of snow and ice. Altitude of flights are variable depending on location and can be around 6,000 feet. Flight line overlap will reduce laser shadowing and increase surface laser painting. LiDAR data will be processed with automated and manual techniques.

Ground survey control will be collected with survey-grade GPS by a Professional Land Surveyor. The established survey control network at the O'Dell Creek project site will be utilized and expanded as necessary. All survey data will be collected in the NAD 83 (CORS 96) Montana State Plane, US Survey Feet, spatial reference system.

IV. Schedule

The following schedule has been developed for the Middle O'Dell Creek LiDAR Acquisition Project. However, RDG and QSI will develop a final project schedule following contract award and will ensure that the ground surface is free of snow and ice for the flight.

Table 1. Project schedule for the Middle O'Dell Creek LiDAR Acquisition Project (2021).

Task	March	April	May
Task 1. Project Management			
Task 2. GPS Ground Survey Control Acquisition			
Task 3a. LiDAR flight			
Task 3b. LiDAR Data Processing and Deliverables			

V. Personnel

RDG is an approved consultant on NorthWestern Energy's Qualified Vendor's List for stream and wetland restoration services. RDG will be the lead on this LiDAR acquisition project and will ensure all deliverables meet specifications. Andy Belski, PLS, will serve as the project manager and technical lead on behalf of RDG. Melissa Christie, Western Region Account Manager, will be the LiDAR flight and processing lead on behalf of QSI.

VI. Budget

Table 2 includes a not-to-exceed cost estimate to perform the Scope of Work (SOW). The total cost to perform the SOW is $29,260. Because benefits to both fisheries and wildlife habitats are anticipated from restoration projects that are supported by this LiDAR acquisition project, this application assumes a $13,300 match from MadTAC (45.5%), and RDG will provide an in-kind contribution of $2,660 (9%). Funds requested from WildTAC total $13,300, or 45.5% of the total project cost.

Table 2. Cost Estimate: Middle O'Dell Creek Lidar Acquisition Project		
Task 1. Project Management (RDG)	**$**	**390**
Principal Professional Land Surveyor (PLS)	$	390
Task 2. GPS Ground Survey Control (RDG)	**$**	**2,090**
Survey Party Chief (PLS)	$	1,700
Principal Professional Land Surveyor (PLS)	$	390
Task 3. LiDAR Flight, Processing, and Deliverables (QSI)	**$**	**25,940**
Includes All Related Costs		
Task 4. Direct Costs (RDG)	**$**	**840**
Mileage	$	370
Per Diem	$	70
Lodging	$	100
Survey-grade GPS	$	300
Estimated Project Cost	**$**	**29,260**
*In-kind Contribution (RDG)	$	2,660
*Cost-Share (MadTAC)	$	13,300
Total WildTAC Funds Requested	**$**	**13,300**

VII. Deliverables

Project deliverables will include the following:

- Classified LAS v 1.4 LiDAR data points;
- Bare Earth model key points (0.1', 0.2', 0.5', 1.0' vertical tolerance);
- Water breaklines;
- Bare Earth Digital Elevation Model (DEM); and
- Project metadata and LiDAR accuracy report.

Success for the project will be demonstrated through the deliverables, including the LiDAR accuracy report, and ensuring all standards for acquisition and processing are met.

VIII. Cultural Resources

Cultural Resources will not be affected by this project, as it is an aircraft flight acquisition. Ground disturbance from GPS ground survey control will be minimal.

IX. Water Rights

Water Rights will not be affected by this project.