FDP15-0003

FLOODPLAIN HABITAT ASSESSMENT

Mary Olson Farm
Auburn, Washington

May 6, 2015

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Wetland & Aquatic Sciences
Wildlife Ecology
Landscape Architecture

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1.0 INTRODUCTION

1.1 STATEMENT OF PURPOSE

The Mary Olson Farm is a 67 acre, City of Auburn park that is a City and King County Landmark and is listed on the National Register of Historic Places. Over the past 20 years the Farm has been restored to its 1902 form and is operated as a living history and environmental education site. Olson Creek bisects the property. Years of restoration efforts have created a rich riparian habitat, and over that time the runs of salmon have grown from Coho and Chum to also include Pink and Chinook.

As early as 1879, the Olsons and their predecessors built a bridge to span the stream to gain access from the historic Green River Road (which is now the driveway into the farm) across the stream to the Olson's south meadow and garden area. One photograph exists of that historic bridge, the details of which are informing design of a proposed bridge.

The proposed project involves constructing a new bridge for pedestrian and livestock use only. Reconstructing this historic bridge is proposed for several reasons. Cattle and ponies reside on the Farm and are used in educational programs. They are led back and forth across the stream daily to access the south pasture. Using a bridge the farm will keep the livestock out of the stream, thus demonstrating to the public Best Management Practices. The fall field trip program brings thousands of students to the Farm where they observe salmon spawning and study stream ecology. With a bridge students can observe salmon from above and stay out of the delicate stream bank areas where hundreds of feet compact the soils and kill native vegetation. Lastly, the south end of the bridge will lead to an existing historic road grade that wraps around the south meadow. In the future, the farm hopes to improve this grade to form a path connecting to a trail system that will extend across the whole Farm.

As part of the project permitting process, and at the request of Ms. Patricia Cosgrove, White River Valley Museum Director, Raedeke Associates, Inc. has prepared this habitat impact assessment of the stream and riparian environment adjacent to the property at 28728 Green River Road, Auburn, WA.

The habitat assessment is required as part of the permitting for the proposed placement of a small pedestrian and livestock crossing bridge across Olson Creek. The bridge is intended to provide access to the south pasture and eliminate livestock crossing directly in the creek. A habitat impact assessment for the project is required under City of Auburn (2015) Municipal Code (AMC) 15.68.135(I), unless a development activity is allowed under AMC 15.68.130(D).

The format and scale of the assessment generally follows the Floodplain Habitat Assessment and Mitigation guidance prepared by the Federal Emergency Management

Agency (FEMA 2013), AMC 15.68.135(J)(4), and the Floodplain Habitat Assessment for the River Mobile Home Park, King County Parcel # 0621059002 (City of Auburn 2013).

1.2 Study Area and Project Description

For purposes of this habitat assessment, the study area encompasses the area including the proposed bridge crossing, the nearby upstream and downstream riparian and stream environments of Olson Creek, the adjacent riparian habitat zone, and the Green River adjacent habitats related to use by listed salmonid fishes (Figures 1 and 2). The project site is located at approximately latitude 47° 20' 36.61" N, longitude 122°12'16.37"W. This places the site in the southwest quarter of the southwest quarter of Section 5, Township 21 North, Range 5 East, W.M. and the northwest quarter of the northwest quarter of Section 32, Township 22 North, Range 5 East, W.M.

The proposed pedestrian bridge would be a 40-foot-long span with a 5-foot-wide surface, comprising a 12- inch hollow core slab, rough sawed planks, and a 3.5-foot-tall hand rail with mesh siding (Figure 3; Appendix A). The footings for the slab would be six feet wide, poured in place grade beam held in place with two or three pin piles. The ends of the slab would rest on the grade beams and attached in place. The approaches to the north end of the bridge will be a gravel trail or ramp leading up to the bridge deck on a 1:12 slope or less to allow handicap access on the north side of the bridge. The south end of the bridge is not proposed to be handicap accessible, and therefore, would be more steeply sloped to minimize impacts to the stream buffer. Construction access for the bridge will be from the existing access road on the north side of the creek, or from the south through the pasture, without crossing in the creek with any construction equipment.

1.3 Mitigation Sequencing and Proposed Minimization Measures

Mitigation has been defined by the State Environmental Policy Act (SEPA) (WAC 197-11-768; cf. Cooper 1987), and more recently in a Memorandum of Agreement between the Environmental Protection Agency and the COE (Anonymous 1989). In order of desirability, mitigation may include:

- Avoidance - avoiding impacts by not taking action or parts of an action;
- Minimization - minimizing impacts by limiting the degree or magnitude of the action and its implementation;
- Compensatory Mitigation - may involve:
  a) repairing, rehabilitating, or restoring the affected environment;
  b) replacing or creating substitute resources or environments;
  c) mitigation banking.

Following are avoidance, minimization and compensatory measures related most immediately to the placement of the pedestrian bridge. For a broader description of the avoidance, minimization, and compensatory measures related to wetlands and compensatory mitigation, see the associated Mary Olson Farm Olson Creek Pedestrian Bridge Conceptual Mitigation Plan (Raedeke Associates, Inc. 2015).

1.3.1 Avoidance of Impacts

A variety of measures are being taken to avoid impacts. These include:

1. The bridge would be located entirely outside the ordinary high water mark (OHWM) to avoid direct impacts to Olson Creek.

2. The bridge would be aligned through a space between existing trees to avoid removal of any trees over approximately four inches in diameter.

3. Bridge footings would be placed above the base flood elevation of 52 feet (NGVD 29).

4. The bridge will be pinned or otherwise attached to the footings to prevent buoyancy in the case that a flood event in Olson Creek occurs. This will prevent movement of the bridge and potential damage to the creek channel downstream.

1.3.2 Minimization of Impacts

Impacts will be minimized by:

1. Clearly marking the ordinary high water marks of the stream banks prior to construction to prevent inadvertent encroachment.

2. Use of spill control measures during mixing of concrete, and cleanup after use of the concrete, for the footings at the site.

3. Install and maintain temporary and permanent soil erosion control measures (TESC Plan) during and after construction, consistent with best management practices, as required by the City of Auburn, including placement of straw bales and silt fencing between work activities and adjacent wetlands or stream channels, designed to prevent sediment from entering these surface waters during and after construction. Soil excavated for the footings will be hauled off-site or temporarily covered by plastic sheeting away from the stream.

4. All site grading and buffer restoration/enhancement would be done during the dry season or the anticipated fish work window as designated by Washington

Department of Fish and Wildlife.

5. All work adjacent to Olson Creek would be completed with clean equipment in good condition with no evidence of petroleum product leakage. All equipment would be inspected, serviced, and cleaned off-site to prevent leakage or any contamination of the water.

6. Emergency spill response and clean-up equipment would be available on site during all work activities. At a minimum, this kit will include material for containment and clean-up of petroleum products.

7. No fueling or servicing of construction vehicles would be permitted within the project work area.

8. Telephone numbers of appropriate agency/department contacts would be readily available on-site in case a spill should occur (e.g., Washington Department of Ecology, City of Auburn Fire Department Hazmat Team, City of Auburn Fire and Rescue).

1.3.3 Compensatory Mitigation

A compensatory mitigation plan has been developed for unavoidable buffer impacts due to installation and operation of the bridge. The compensatory mitigation plan is detailed in Raedeke Associates Inc. (2015). The overall goal of the compensatory mitigation would be to increase the existing level of protection provided by the buffer for wetland and stream functions. The enhanced/restored wetland buffer is designed to be a low maintenance, self-sustaining community resembling native forest habitat typical of the Puget Sound lowlands.

1.4 Water Resources and Protected Species Information

The proposed bridge location lies across Olson Creek approximately 250 feet upstream from its confluence with the Green River at river mile 28.5 (Figure 2 and 3). The Olson Creek basin encompasses approximately 1,022 acres, with approximately three miles of defined stream channel. Most of this stream system lies on the upland plateau between 350 and 500 feet in elevation. Williams et al. (1975) identified two tributaries (09.0064 and 09.0063). Olson Creek is formed from surface water of two wetlands. A third wetland drains into the combined flow of the first two at a series of constructed ornamental ponds at RM 1.08 just before the creek descends steeply through Olson Canyon to the valley floor (Kerwin and Nelson 2000). The project site lies adjacent to the Mary Olson farm within this lower valley floor portion of the stream.

Stream flows in Olson Creek are 44, 121, and 174 cfs for the 2-year, 25-year, and 100-year flows respectively under conditions current at the time of publication of Booth et

al.(1994). The confluence of Olson Creek with the Green River is at approximately river mile 28.5.

As a tributary to the Green River, Olson Creek is within the range of three listed species, each listed as Threatened status (City of Auburn 2013). These include Puget Sound distinct population segment (DPS) steelhead trout (*Oncorhynchus mykiss*), Puget Sound evolutionarily significant unit (ESU) Chinook salmon (*Oncorhynchus tshawytscha*), and Coastal-Puget Sound distinct population segment bull trout (*Salvelinus confluentus*).

2.0 METHODS

2.1 BACKGROUND REVIEW

Background review conducted for this habitat assessment included:

1. Conducting a visual characterization and taking photographs of the stream and riparian environments.

2. Reviewing related background documents prepared by other sources including:

    a. FEMA (1995) Flood Insurance Rate Map (FIRM) 1252F and 1254F, revision date May 16, 1995.

    b. Review of the City of Auburn (2015b) Municipal Code Section 15.68, Flood Hazard Areas.

    c. Scientific literature data base search and review of appropriate articles or other literature related to the ecology and habitat of these listed salmonids.

2.2 FIELD INVESTIGATION

On January 14, 2015, Raedeke Associates, Inc. staff conducted a reconnaissance-level visual assessment of the project site to characterize stream and riparian habitat conditions. The purpose was to develop a narrative description of stream channel, substrate and instream habitat units, and collect representative photos.

3.0 EXISTING CONDITIONS

3.1 STREAM AND RIPARIAN HABITAT CONDITIONS

Stream habitat was characterized beginning at the four-foot-diameter culvert passing beneath Green River Road where Olson Creek flows into the Green River. From this point upstream, three distinct stream channel segments or reaches can be discerned passing through the proposed bridge location and through the overall Mary Olson Farm site (Figure 2):

1. The first segment is approximately 160 feet in length beginning at the culvert beneath the Green River Road. This reach is the steepest of the three, and passes through a constructed stream bank restoration project completed by King County (2007).

   This segment is characterized by a wide range in stream bed substrate material from small gravel to large boulders, some incised stream channel banks, and includes the restoration site overbank terraces, woody debris, and planted riparian vegetation (Photos 1 and 2). Recent high flow events showed evidence of high flows out of the main channel creating habitat and potentially juvenile fish refugia within the adjacent banks, with recent chum salmon carcasses seen deposited on the banks.

2. The second segment begins at the upstream end of the restoration project, beginning approximately at the location of the proposed bridge crossing (Photo 3) and extending approximately 240 feet upstream. The proposed location of the bridge currently shows evidence of bank erosion by livestock trampling and direct input of manure to the stream (Photo 4). This reach includes a series of wood debris-formed pool sequences and otherwise riffle reaches (Photo 5).

3. The third segment extends approximately 300 feet upstream of segment two, and extends to the upstream end of the property. This reach is a lower gradient than the first two, and is characterized by both longer glide and riffle pool units (Photo 6) and some wood debris formed pool segments (Photo 7). This reach included a high flow side channel area that appears to be inundated during higher flows (Photo 8).

The upstream limit of fish access in Olson Creek is at RM 0.49 where migration ends at a natural 10-foot-high waterfall (Kerwin and Nelson 2000).

3.2 REGULATORY FLOOD PLAIN

The City of Auburn (2015a) municipal code defines the regulatory floodplain as the area of the special flood hazard area (aka the base flood or the 100-yr flood plain) and the protected areas. The base flood identified for the site is elevation 52 feet elevation (NGVD 29) (FEMA 1995), and the applicable protected area includes the riparian habitat zone 200 feet from the stream for fish bearing streams. The apparent base flood for the vicinity of the bridge is shown in Figure 4.

Because the apparent upstream edge of the base flood elevation was in the vicinity of the bridge crossing (Figure 4), Parametrix Inc. was contracted to conduct a controlled ground survey of the cross sectional profile across the stream banks and stream channel at the location of the bridge crossing. Results of the Parametrix (2015) survey indicate the stream thalweg elevation at the bridge crossing point is approximately 50.2 feet, and ground surface elevations at the corners of the bridge footings are approximately 53.5 to 55 feet elevation NGVD 29. This indicates the bridge will span, but will not encroach into, the upper extent of the Green River base flood.

4.0 PROTECTED SPECIES INFORMATION

Endangered Species Act (ESA) -listed salmonids are listed in Table 1. NOAA Fisheries does not list Olson Creek as critical habitat, but the confluence with the Green River (which is critical habitat) places the Green River within near proximity of the project site.

Common Name	Scientific Name	Federal Status	Regulatory Agency	Critical habitat present
Puget Sound DPS Steelhead Trout	*Onchorynchus mykis*	Threatened	NMFS	Under review
Puget Sound ESU Chinook salmon	*Onchorynchus tshawytscha*	Threatened	NMFS	Yes
Coastal-Puget Sound DPS Bull Trout	*Salvalinus confluentus*	Threatened	USFWS	Yes

4.1 ESSENTIAL FISH HABITAT

The Magnuson-Stevens Fishery Conservation and Management Act (MSA) includes a mandate that NOAA Fisheries must identify essential fish habitat (EFH) for federally managed marine fish, and federal agencies must consult with NOAA Fisheries on all activities, or proposed activities, authorized, funded, or undertaken by the agency that may adversely affect EFH.

The Pacific Fishery Management Council (PFMC) has designated EFH for the Pacific salmon fishery, federally managed ground fishes, and coastal pelagic fisheries (NOAA Fisheries 2014). The majority of EFH is marine-based, though EFH is also designated for inland portions of the range for anadromous Pacific salmon. In addition to Chinook salmon, other EFH fish present in Olson Creek include coho salmon (O. *kisutch*) and pink salmon (O. *gorbuscha*).

EFH is defined by the MSA as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." Further, according to the Pacific Fishery Management Council (1999), "the geographic extent of freshwater EFH is specifically defined as all currently viable waters and most of the habitat historically accessible to salmon."

4.2 PROTECTED SPECIES LIFE HISTORY AND ECOLOGY

Descriptions of the life history and ecology of these fish are provided in City of Auburn (2013) and a short summary of each provided here.

4.2.1 Steelhead Trout

Steelhead trout (O. mykiss) are the anadromous form of rainbow trout. Steelhead generally spend from one to four years in fresh water prior to smoltification, and up to three years in salt water prior to first spawning. The average spawning age of these fish is four years (NOAA Species of Concern). In addition, Steelhead have the ability to spawn more than once (iteroparity).

The DPS includes all naturally spawning anadromous winter-run and summer-run steelhead populations, in the river basins of the Straight of Juan de Fuca, Puget Sound, Hood Canal, Washington, bounded to the west by the Elwha River (inclusive) and the north by the Nooksack River and Dakota Creek (inclusive), as well as the Green River natural and Hamma Hamma winter-run Steelhead hatchery stocks. This area includes the Duwamish/Green River Watershed.

Both winter-run and summer-run steelhead are known to exist in the in the Green Duwamish River Watershed. Winter-run steelhead in the Green River is a wild stock, while the summer-run component is a non-native stock. Native steelhead typically spawn in the Green River from mid-January to mid-March, from RM25 to 61.

4.2.2 Chinook Salmon

Chinook salmon display multiple life history variations including a range of ages at return and periods of residence in freshwater and estuarine habitat. "Ocean-type" chinook juveniles migrate to the ocean during the first year after emergence, and "spring-type" chinook juveniles migrate to the ocean as yearlings. Upon entering the marine waters Chinook spend anywhere from one to five years before returning to rivers and stream to spawn Chinook salmon (O. tshawytscha) in the Green River primarily occur as summer/fall chinook (ocean-type fish), migrating upstream during the summer and fall, and the juveniles generally migrating out as young of the year.

This evolutionarily significant unit, or ESU, includes all naturally spawned populations of Chinook salmon from rivers and streams flowing into Puget Sound, including the Strait of Juan De Fuca from the Elwha River, eastward, including rivers and streams flowing into Hood Canal, South Sound, North Sound and the Strait of Georgia in Washington, and 26 artificial propagation programs (Federal Register, 2005).

According to the Federal Register (Federal Register, 2005) critical habitat for Chinook salmon has been designated to include all marine, estuarine, and river reached accessible to Puget Sound Chinook salmon. This includes the Duwamish/Green River Watershed.

4.2.3 Bull trout

Bull trout are grouped with char, within the salmonid family of fishes. They are best suited for the upper reaches of watersheds where coldwater and relatively pristine streams are typically found. Bull trout require complex habitats, including streams with riffles and deep pools, undercut banks, large woody debris, and connections from rivers and streams to lake and ocean habitats. Most bull trout populations are migratory where they spend most of their life in larger rivers and lakes before returning to smaller streams to spawn. Portions of the Puget Sound bull trout population are anadromous where they spend some of their life in marine waters before returning to smaller streams to spawn.

According to the to the Federal Register (Federal Registered 2010), federally-designated critical habitat for bull trout extends to all major river basins across Whatcom, Skagit, Snohomish, King, Pierce, Thurston, and Islands Counties in Washington. This critical habitat designation includes the Duwamish/Green River Watershed. Information on the presence, abundance, distribution, and life history of bull trout/Dolly Varden in the Green River basin is unavailable or extremely limited.

4.3 Factors of Decline

Factors of decline specific to Olson Creek identified by Kerwin and Nelson (2000) include impediments or barriers to migration at the confluence with the Green River and upstream at a falls; low riparian function in the vicinity of the proposed bridge location; small or poor quality large woody debris; increasing flows due to development in the upper basin; and increasing rates of erosion in the basin.

4.4 Primary Constituent Elements and Potential Impacts to Habitat Elements

The primary constituent elements from the Federal Register (2005: 52684) for Chinook salmon and steelhead that are applicable to this project site include:

1. Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation and larval development;
2. Freshwater rearing sites with:
    a. Water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility;
    b. Water quality and forage supporting juvenile development;

c. Natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks;

3. Freshwater migration corridors free of obstruction and excessive predation with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival.

Primary constituent elements for bull trout (Federal Register 2010: 63928) include:

1. Space for individual and population growth and for normal behavior;
2. Food, water, air, light, minerals, or other nutritional or physiological requirements;
3. Cover or shelter;
4. Sites for breeding, reproduction, or rearing (or development) of offspring; and
5. Habitats that are protected from disturbance or are representative of the historical, geographical, and ecological distributions of a species.

Referring to the narrative habitat reach description above, each of these primary constituent elements exists within the lower portion of Olson Creek.

Following is a discussion of variables recommended by FEMA (2013) to be addressed for potential impacts.

4.4.1 Water Quality

Water quality conditions resulting from construction and operation of the bridge are not expected to cause water quality impacts in violation of state water quality standards. Olson Creek does not appear on the Washington State 303 (d) list of polluted waters (Washington State Department of Ecology 2015). Water quality conditions are expected to improve through long term operation of the bridge to prevent the current crossing of cattle through the stream.

The primary threat to water quality during construction of the bridge will be from inadvertent release of concrete into the stream during construction of the bridge footings on either side of the stream. Measures will be taken during construction to prevent release of concrete, and ground spills would be cleaned up. In addition, a plank will be used to for workers at the site to cross the stream to prevent turbidity from walking in the creek.

4.4.2 Water Temperature and Dissolved Oxygen

The proposed bridge and resulting shading are not expected to cause measureable changes in water temperatures and dissolved oxygen levels in Olson Creek. The extent of shading

of stream flow will be only approximately 6 wide at this point in the creek. Given the flow velocity (approximately 1 to 2 feet per second at base flow) and small area of the bridge, no effect on temperature or dissolved oxygen will occur.

4.4.3 Low Flow Hydrologic Regimes

The bridge footings and aerial coverage of the bridge are not expected to cause measureable changes in rainfall interception, infiltration, or direct input to the stream. The 6-foot-long bridge footings will be buried above the ordinary high water mark parallel to the stream and may slow or intercept lateral flows to the stream, but to an immeasurable degree.

4.4.4 Flood Velocities

The bridge bridge bottom elevation will lie at approximately 55 feet elevation (NGVD 29), three feet above the Green River Base flood elevation of 52 feet. This base flood elevation of the Green River extends into the project area beneath the bridge. Design of the bridge has been conducted to provide clearance above the small portion of Green River base flood area that extends into the project site.

4.4.5 Sediment Delivery

As the bridge bottom elevation and footings are outside the base flood, no change in sediment delivery is expected during the base flood in the Green River. Sediment delivery may be affected, however, if flood event flows in Olson Creek reach the elevation of the bridge, causing increased velocities and potentially scour in the vicinity of the bridge.

4.4.6 Stream Substrate

Substrate in the vicinity of the bridge crossing is wide-ranging small to medium gravel, with some larger gravel. The sand component of the banks is washed from the bed substrate, leaving the larger gravels. Again the proposed project is not expected to cause a change in the distribution of substrate unless extreme high flows submerge the bridge and cause greater erosion or stream bed transport.

4.4.7 Floodplain Connectivity

All components of the bridge including the span, footings, and gravel approach ramps to the bridge decking are expected to be above the base flood elevation of the Green River and the elevation of the 100-year flood elevation of Olson Creek. As a result, the fill materials associated with these components including the footings and gravel approaches are not expected to cause disconnection with the flood plain.

4.4.8 Refugia for ESA-listed Fish Species from High Velocity Flows

Given the bridge span and support footing and approach ramps are expected to be above the flood flow of Olson Creek, no change in the channel that may affect in-stream habitat conditions for refugia from high velocity flows is expected.

The primary effect of the bridge on instream conditions will be shading on a small portion of stream channel. In this case, the increased shade in a riffling reach where presently neither juvenile salmonids nor predatory species are likely to reside will not cause an increase in predation potential on listed species (Jones and Stokes 2006). Similarly, no aquatic vegetation occurs within the stream channel at the project location so none will be removed.

4.4.9 Riparian Vegetative Community

The existing vegetative community in the vicinity of the project site consists of approximately a 20- to 30-foot-wide riparian community on both banks with balsam poplar (*Populus balsamifera)*, Douglas fir (*Pseudotsuga menziesii*), and planted red osier dogwood (*Cornus albus*), intermixed with cutleaf and Himalayan blackberry (*Rubus laciniatus and R. armenicus*) and other shrubs. The overstory is up to 60 feet in height on the east side of the project site (primarily cottonwood trees), and up to 15 feet in height on the west side of the project (primarily one small cedar and red osier dogwood planted in the habitat restoration area).

Within the immediate riparian community, the proposed bridge lies across a narrow clearing in the riparian zone. As a result, no trees are anticipated to be removed as part of the bridge installation. Riparian mitigation will be provided by enhancement plantings of native conifer trees and shrubs to increase riparian function (Raedeke Associates 2015).

5.0 DETERMINATION OF EFFECT

The determination of effects is based upon information regarding the presence of listed species and EFH within the project area, existing site conditions, and the actions described to avoid, minimize, and mitigate potential impacts.

Based on the description of work activity and long term use of the proposed bridge, the proposed project M**ay Affect, but is Not Likely to Adversely Affect** Chinook salmon, Puget Sound steelhead, bull trout, and EFH.

The "may affect" determination is based on the possible occurrence of these fish in Olson Creek, and their likely occurrence in the Green River, within 200 feet downstream of the site.

The "not likely to adversely affect" determination is based on the expectation of implementation of actions to avoid, minimize and mitigate the project impacts, and the small scale of the project itself. Following Jones and Stokes (2006) conclusions of risk assessment for overwater structures, this proposed bridge would be a low risk of impacts to habitat or fish.

6.0 LIMITATIONS

We have prepared this report for the exclusive use of the White River Valley Museum and its consultants. No other person or agency may rely upon the information, analysis, or conclusions contained herein without permission from the White River Valley Museum.

The determination of ecological system classifications, functions, values, and boundaries is an inexact science, and different individuals and agencies may reach different conclusions. We cannot guarantee the outcome of such determinations.

We warrant that the work performed conforms to standards generally accepted in our field, and prepared substantially in accordance with then-current technical guidelines and criteria. The conclusions of this report represent the results of our analysis of the information provided by the project proponent and their consultants, together with information gathered in the course of the study. No other warranty, expressed or implied, is made.

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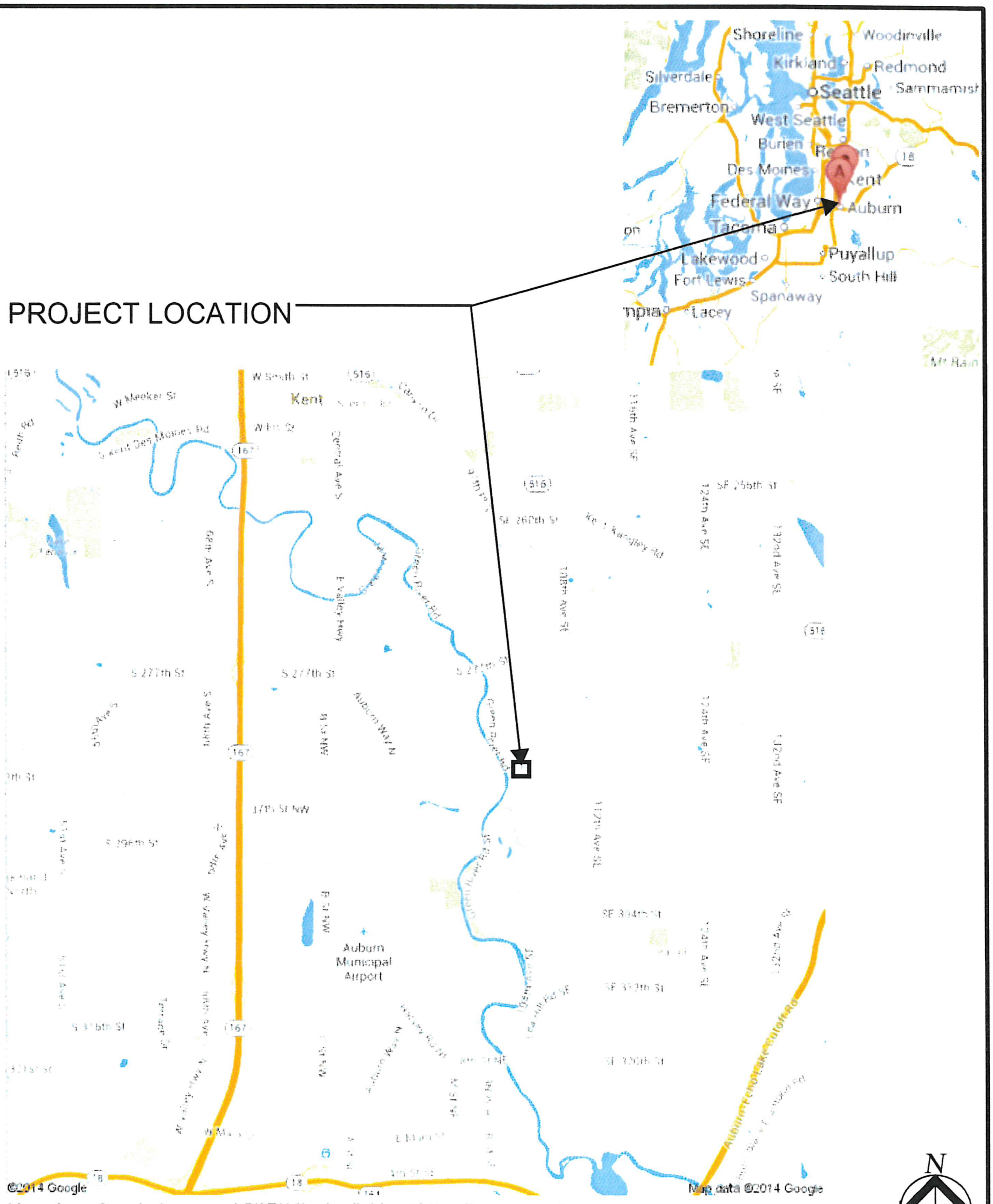
FIGURES



Maps from Google (accessed 5/27/14). Available at https://maps.google.com.

FIGURE 1

REGIONAL & VICINITY MAP

MARY OLSON FARM

AUBURN, WA

Raedeke Associates Inc.
1610 Stone Avenue North
Seattle, WA 98103

RAI # 2014-022

T:\2014\2014-022-Mary Olson Farm\Mary Olson Figs.dwg

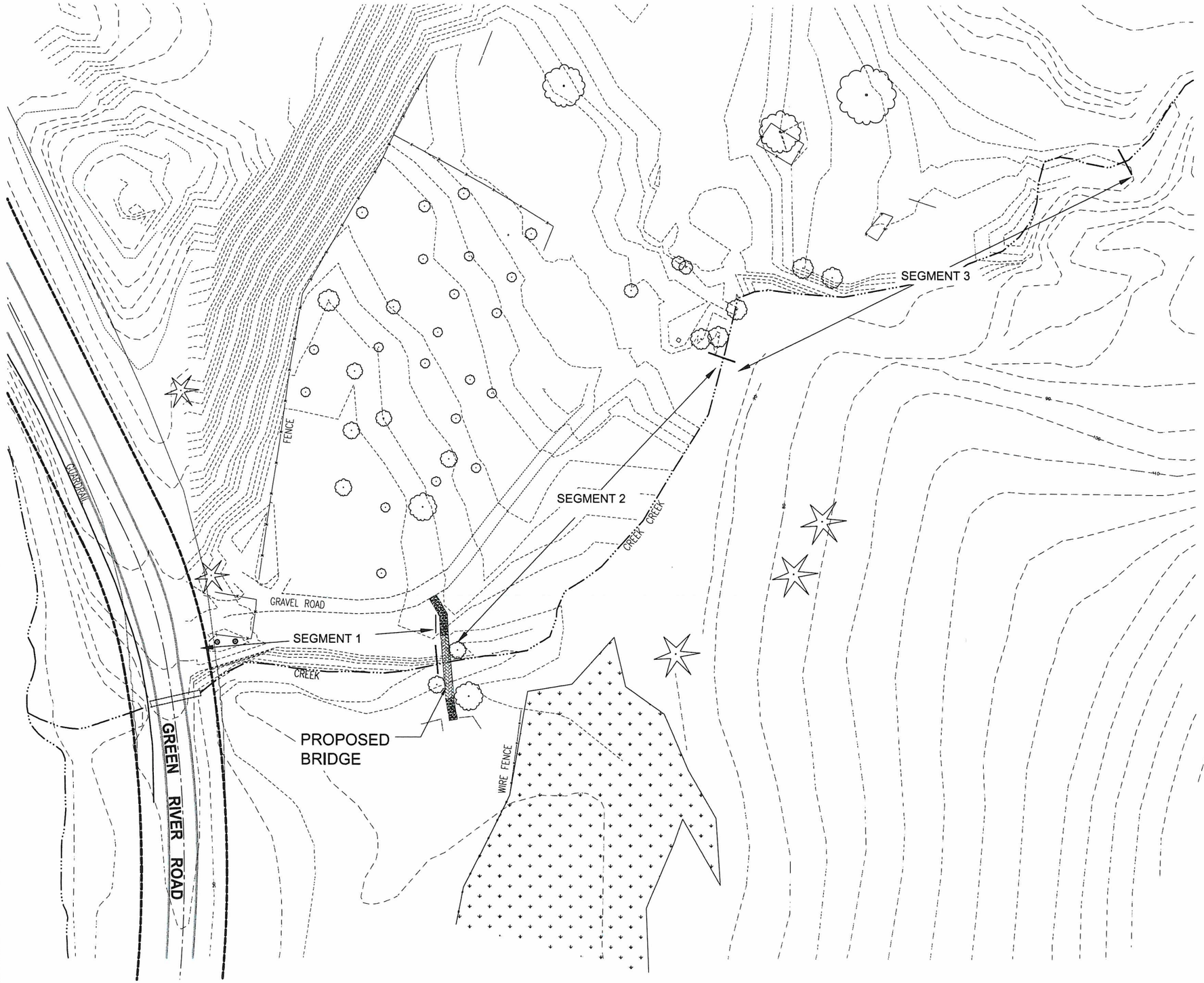
FIGURE 2

WHITE RIVER VALLEY MUSUEM

MARY OLSON FARM

HABITAT ASSESSMENT

EXISTING CONDITIONS



LEGEND

- EXISTING CONTOURS
- OLSON CREEK
- WETLAND

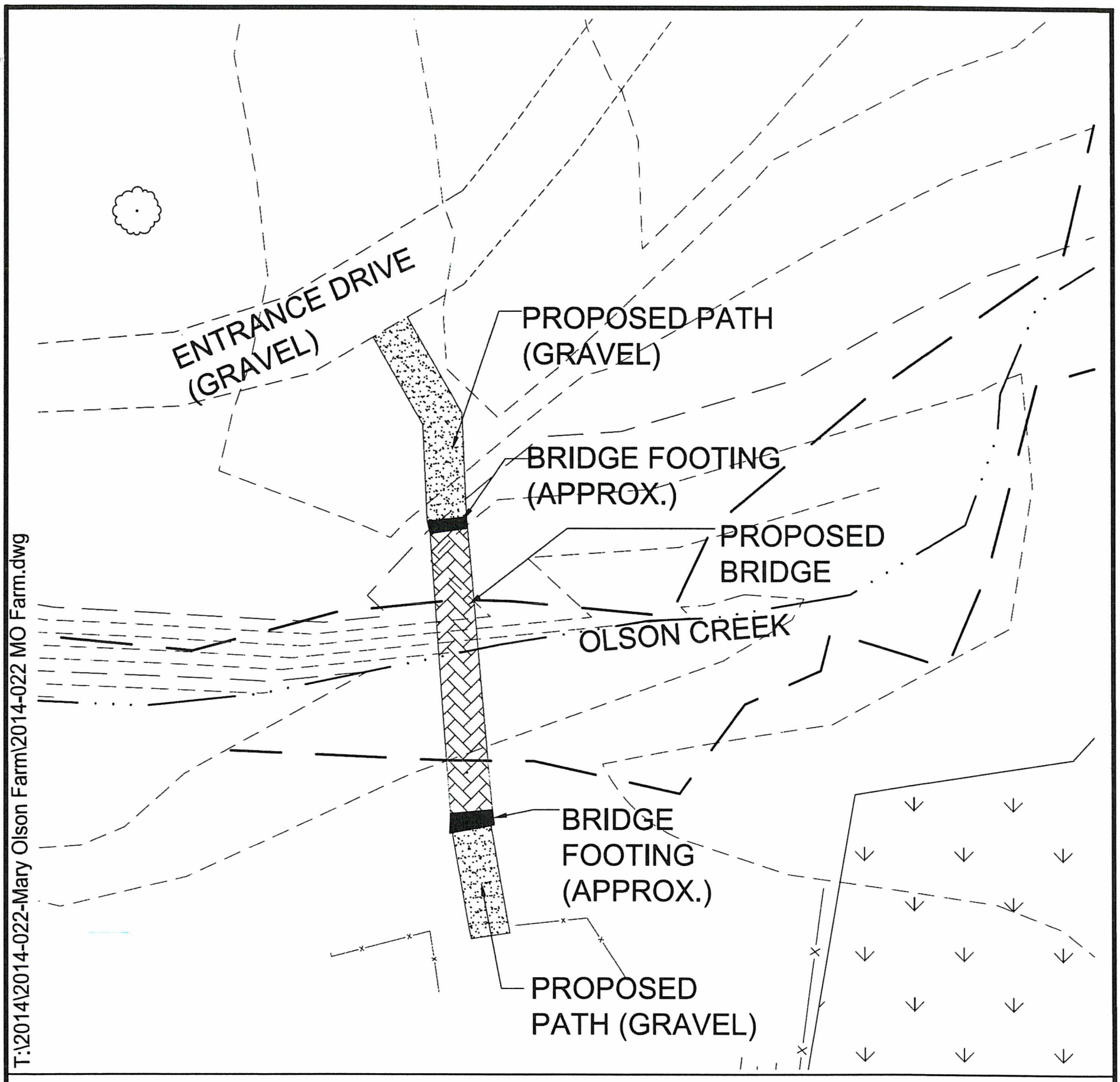
NORTH 0 35' 70' 140'

SCALE: 1" = 70'

Raedeke Associates, Inc.
9510 Stone Avenue North
Seattle, WA 98103

RAI PROJECT: 2014-022	
DATE: MARCH 24, 2015	
DRAWN BY:AC	PM:BT

BASE INFORMATION:
PROVIDED BY CITY OF AUBURN & PARAMETRIX



LEGEND

- EXISTING CONTOURS
- ORDINARY HIGH WATER LINE
- OLSON CREEK
- WETLAND

N

10 20 40

SCALE 1"=20'

FIGURE 3

BRIDGE LOCATION

MARY OLSON FARM
AUBURN, WA

Raedeke Associates, Inc
9540 Stone Avenue North
Seattle, WA 98103

RAI # 2014-022

FIGURE 4

MARY OLSON FARM FLOODPLAIN MAP

Legend

- Parcels
- Street Centerlines
- Channel Migration Area (CMA)
- Riparian Habitat Zones (RHZ)
- Special Flood Hazard Areas (SFHA)
- Floodway
- Streams
- Lakes and Rivers
- 2012 Aerial North
  - Red Band_1
  - Green Band_2
  - Blue Band_3
- 2012 Aerial South
  - Red Band_1
  - Green Band_2
  - Blue Band_3

Raedeke Associates, Inc.
9210 Stone Avenue North
Seattle, WA 98103

Printed On 4/24/2015

Created by City of Auburn eGIS

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PHOTO PLATES

Photo 1. Stream reach in segment 1, downstream of proposed bridge project location. January 14, 2015.

Photo 2. Overbank terrace and riparian planting restoration site adjacent to Olson Creek, downstream of the proposed bridge project site. January 14, 2015.

Photo Plate 1

Photo 3. Proposed bridge crossing location in Stream reach segment 2. January 14, 2015.

Photo 4. Evidence of livestock erosion of stream banks and direct inputs of manure to the stream at the proposed bridge crossing site. January 14, 2015.

Photo Plate 2

Photo 5. Wood debris – formed pool and riffle sequence in Stream Segment 2, just upstream of proposed bridge location. January 14, 2015.

Photo 6. Lower gradient riffle and glide reaches within Stream Segment 3. January 14, 2015.

Photo Plate 3

Photo 7. Wood debris formed pool habitat within Stream Segment 3. January 14, 2015.

Photo 8. High flow side channel on the right bank within Stream Segment 3, with evidence of flooding from recent high flow event. January 14, 2015.

Photo Plate 4

APPENDIX A

Mary Olson Farm Bridge Schematic
(Rupert Engineering, Inc., September 2014)

Rupert Engineering, Inc.

CONSULTING ENGINEERS/CIVIL AND STRUCTURAL

September 26, 2014

Patricia Cosgrove, Museum Director
Daryl Faber, Parks Director

RE: Bridge at Mary Olson Farm

Attached are sketches of a preliminary Bridge Design. Below are comments regarding this design.

- Design is based on a 40'-0" span
- Discussion with Tom Using , City of Auburn Building Official, Superimposed Live Load for a pedresidian bridge = 100 PSF
- The 12" Prestressed Hollow Core Slab is good for 175 PSF superimposed Load
- The abutment reaction with LL=100PSF & 150PSF bridge weight is 20,000 lb +\-
- (2)-3" pin pile good for 24,000 lb
- Museum possibly can hire a contractor without bidding because of the amount of the contract
- Waters & Woods general contractors (they are an approved Auburn small works contractor) Has given me a firm cost estimate that this design can be built for $30,000 +\-. Items that will affect this price are:
    1. Does the City Project have to pay Sales Tax (9.8%)
    2. Does the contractor have to pay "Prevailing Wages"
    3. Price is for Doug Fir decking, Cedar Decking could add $5000 =\-
    4. Waters and Wood has their own Pin Pile Hammer
    5. Waters and Woods may elect to mix concrete on site since the abutments create only 2→3 Cubic yards.

Call if you have any questions.

Sincerely,

Rupert Engineering, Inc.

JB Rupert, PE,SE

9.24.14

BYRON RUPERT
STATE OF WASHINGTON
11103
STRUCTURAL ENGINEER
PROFESSIONAL ENGINEER

1519 West Valley Highway North/Suite 101
Post Office Box 836/Auburn, WA 98071
253-833-7776 Fax 253-939-2168

Rupert Engineering, Inc.
CONSULTING ENGINEERS/CIVIL AND STRUCTURAL

1519 West Valley Highway North/Suite 101/Auburn, WA 98001
253-833-7776 Fax 253-939-2168

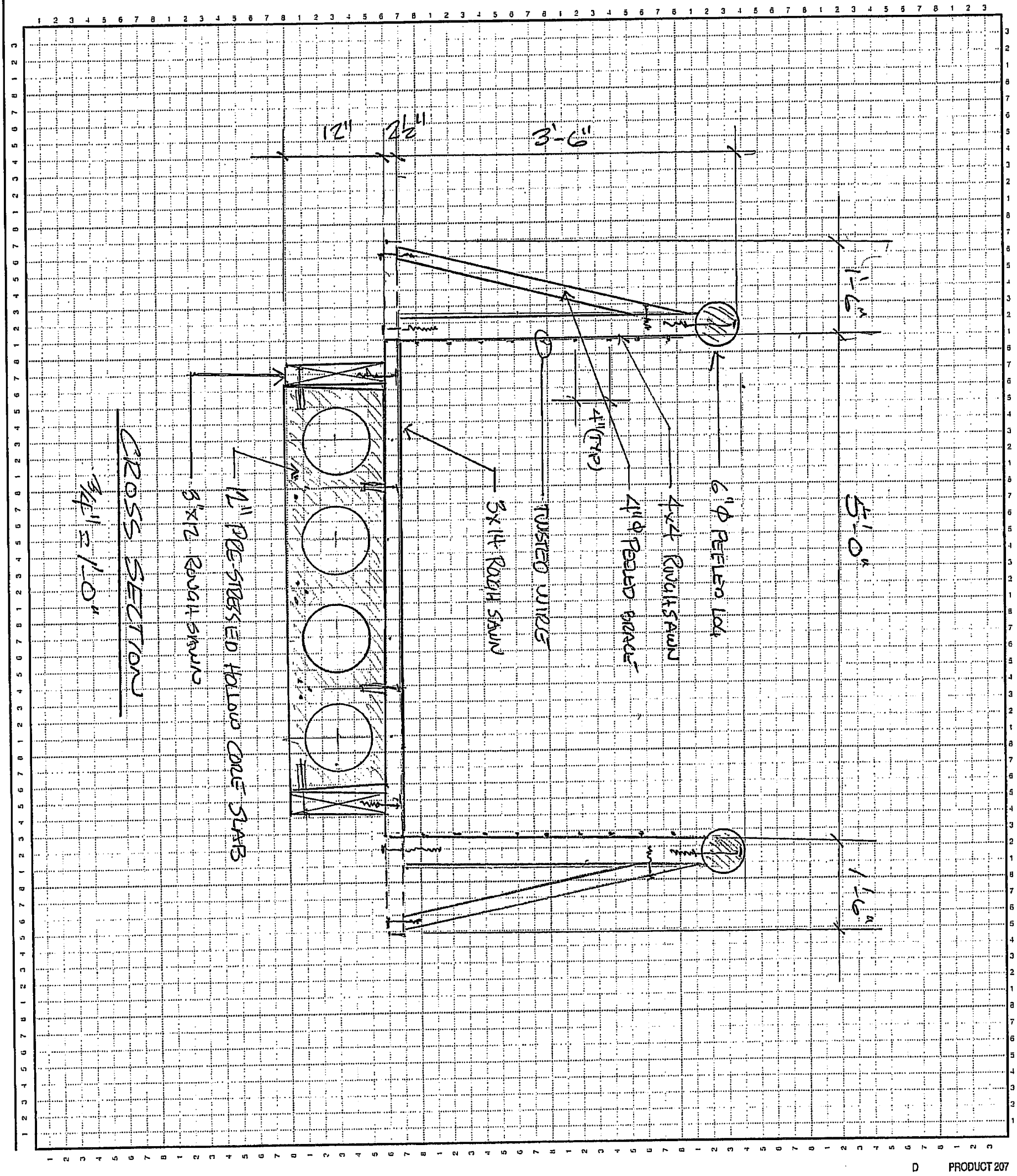
JOB M. OLSON FARM BRIDGE 14071

SHEET NO. _____ OF _____

CALCULATED BY JBK DATE SEPT/14

CHECKED BY _____ DATE _____

SCALE _____



D PRODUCT 207

Rupert Engineering, Inc.
CONSULTING ENGINEERS/CIVIL AND STRUCTURAL

1519 West Valley Highway North/Suite 101/Auburn, WA 98001
253-833-7776 Fax 253-939-2168

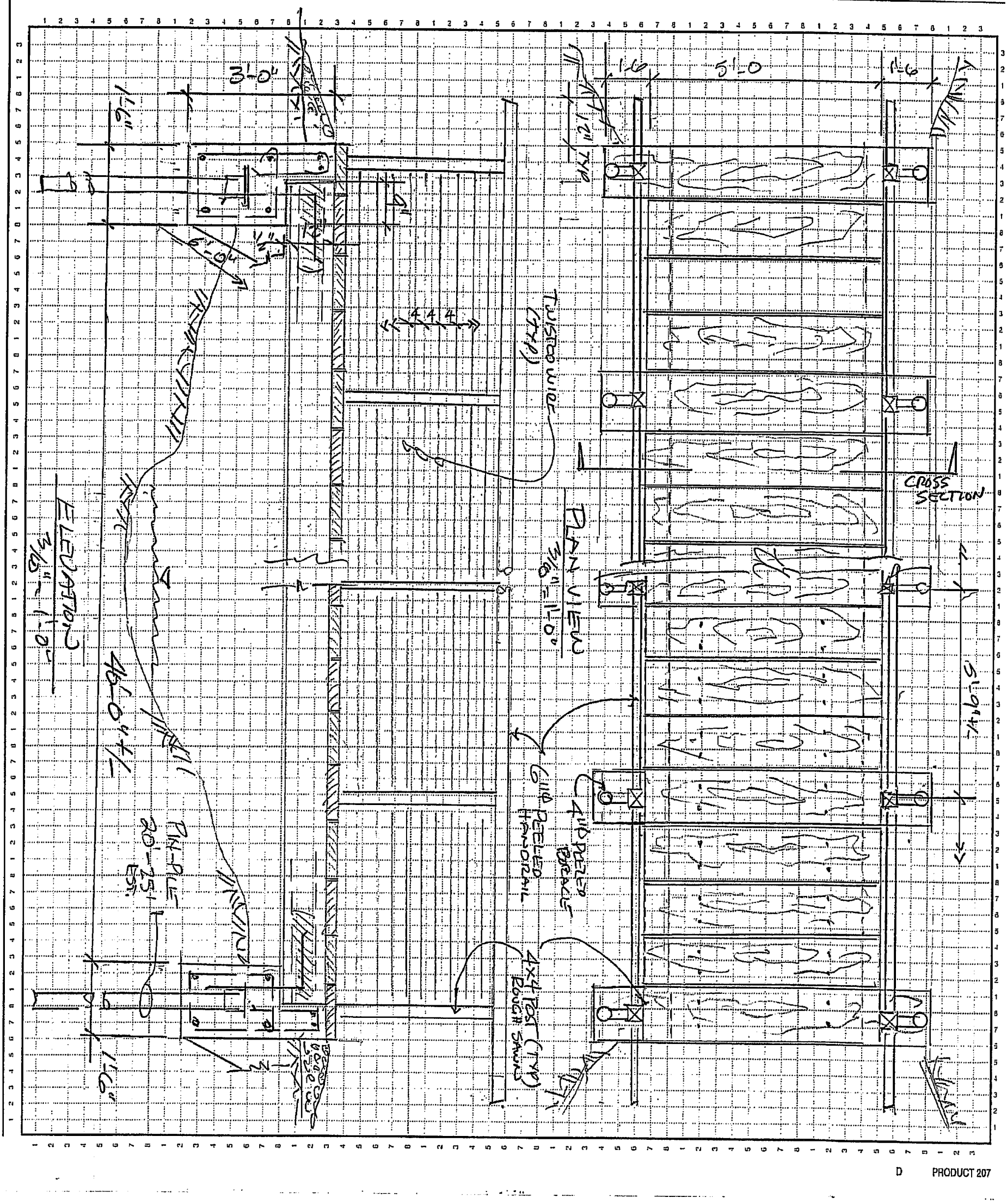
JOB M. OLSON FARM BRIDGE 14071

SHEET NO. _____ OF _____

CALCULATED BY JBR DATE SEPT/14

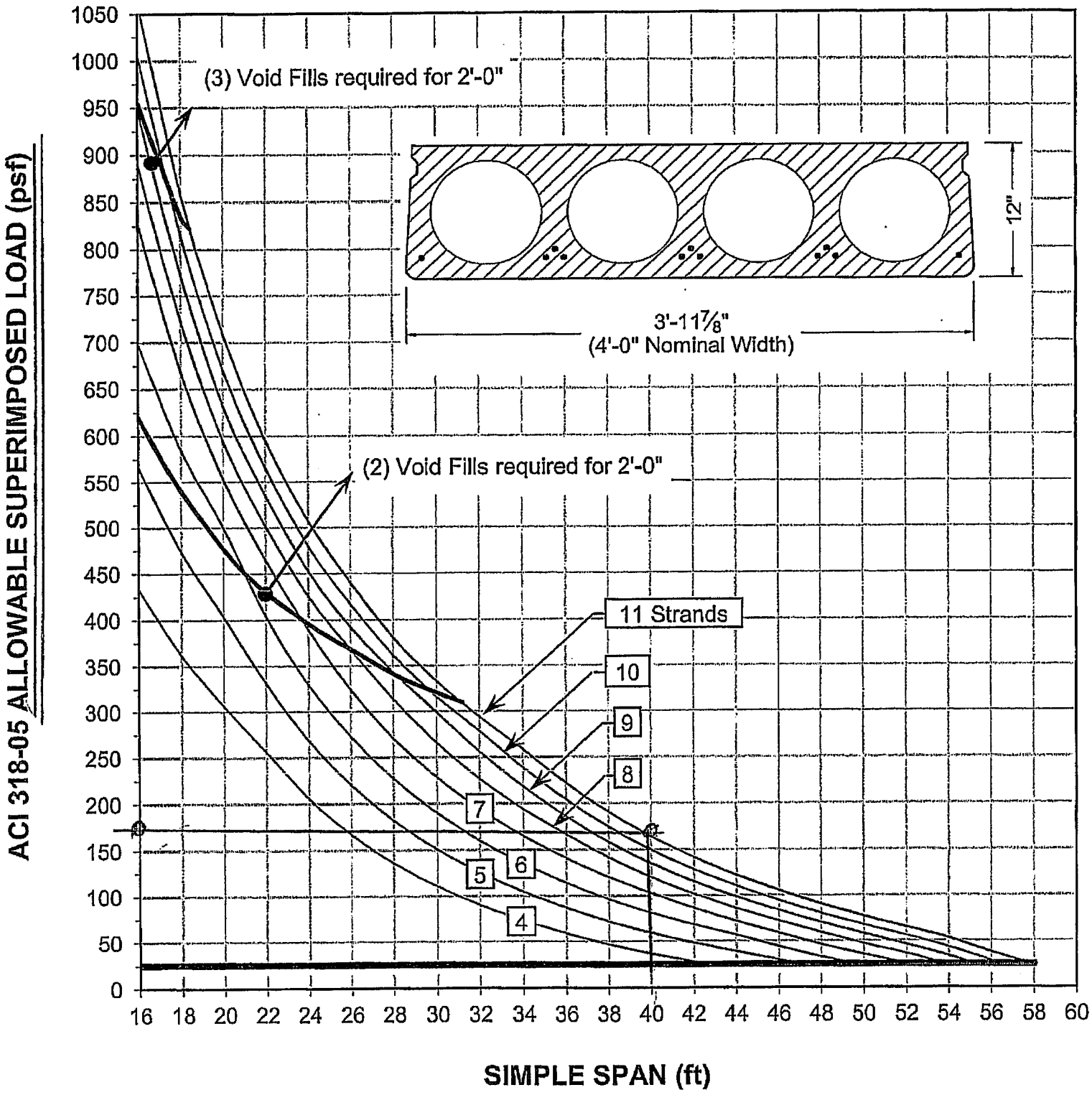
CHECKED BY _____ DATE _____

SCALE _____



D PRODUCT 207

12" HOLLOW CORE SLAB



SECTION PROPERTIES (with shear key grouted)

I =	5,270	in^4	S_t =	878	in^3	S_b =	878	in^3	A =	289	in^2
w =	77	psf	y_t =	6.00	in	y_b =	6.00	in			

NOTES:

1. The values given in this chart are in compliance with ACI 318-11.
2. The values given in this chart are based on hollow core slabs without shear reinforcement. See SHEAR for discussion.
3. Refer to DEFLECTIONS for discussion of deflection criteria.
4. This Span-Load Chart is intended as an aid to preliminary sizing only, and must be interpreted using sound engineering judgment.

McDowell NW Pile King, Inc.

TYPICAL* REFUSAL CRITERIA
PIPE PILE HYDRAULIC HAMMERS

Defined as less than 1" of penetration in "X" seconds
*** for penetration into 50 blow count soils.**

HAMMER	WEIGHT	SECONDS PER INCH			
		2" PIPE	3" PIPE	4" PIPE	6" PIPE
(pneumatic) Jack Hammer	90 lbs.	60			
Hydraulic TB 100	135 lbs.	40			
Hydraulic TB 125	400 lbs.	14	25		
Hydraulic TB 225	650 lbs.	8	15	20	
Hydraulic TB 325	850 lbs.	6	10	16	
Hydraulic TB 425	1100 lbs.		6	10	20
Hydraulic TB 725	2000 lbs.			6	15

SPECIFICATION CHART

Model Number	Hammer Weight (Actual)	Ft. Lb. Class	BPM (Blows per minute) depending on oil flow	BPM at 80% Operating Throttle	Oil Flow Required gpm range	Working Pressure psi range	Tool Diam. Inches
TB 100	135 lbs.	125	1000-1200	1200	4.7-5.5	1000-1300	1.57"
TB 125	400 lbs.	350	600-1200	1000	5-9	1150-2000	2"
TB 225	650 lbs.	550	550-1100	1000	7-12	1400-2150	2.3"
TB 325	850 lbs.	850	550-1100	900	9-16	1400-2300	3"
TB 425	1100 lbs.	1100	550-1100	900	12-21	1400-2300	3.75"
TB 725	2700 lbs.	2000	450-700	600	18-29	1600-2400	4.50"

PIPE SIZE	O.D.	WALL	HAMMER SIZE*	TYPICAL PILE CAPACITY ASSUMES 2X SAFETY FACTOR
2"	2.375"	.218" sch 80	400 lb.	4-6 kps
3"	3.5"	.216" sch 40	650 or 850 lb.	12 kps
4"	4.5"	.237" sch 40	850 or 1100 lb.	20 kps
6"	6.625"	.280" sch 40	2000 lb.	30 kps

Revised
9/23/03

PIN (PIPE) PILE FOUNDATIONS • RETAINING WALLS • MANTA RAY ANCHORS • C-LOC VINYL SHEETPILE
18905 84th Avenue S. • Kent, WA 98032 • (425) 251-8535 • Fax (425) 251-5940
Web: www.pileking.com • Email: mcdnwpk@aol.com