WETLAND AND STREAM CRITICAL AREAS REPORT

Parcels 19588, 19589, 19590, 19591, 19592, 19593, 443233, 493233

Thorp Hwy North / Thorp Depot Rd / Goodwin Rd

Kittitas County, Washington

Prepared for:

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May 17, 2022

GG Environmental
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Summary

On May 10, 2022, Geoffrey Gray, MA, PWS (GG Environmental) completed a wetland and stream critical areas investigation for Kittitas County parcels 19588, 19589, 19590, 19591, 19592, 19593, 443233, and 493233 ("project footprint"), northwest of the intersection of Thorp Highway North and Thorp Depot Road, south of Goodwin Road, in unincorporated Kittitas County, Washington. The investigation included all areas within a 250-foot (ft) radius of the parcel boundaries ("study area").

The study area has been flood irrigated and managed for hay and pasture since at least 1954, although this practice likely began decades earlier. Water arrives via the West Side Canal upgradient of the study area. Water is released from the canal and is distributed across the landscape via a complex network of irrigation ditches, irrigation swales, lateral dikes, culverts, and gated pipes that collectively deliver surface water, via gravity flow, onto otherwise dry land. Irrigation was active during the investigation with irrigation ditches flowing and water being flooded across the northern portion of the study area and onto fields upgradient to the west.

The soils mapped within the project footprint are well-drained and not characterized as hydric soils. Depth to groundwater is listed at 30 to over 80 inches (in) depending on location. Irrigation water flooded across the landscape infiltrates into the soil profile, serving to raise the groundwater level. Dominant soil units mapped upgradient of the study area exhibit a depth to impervious duripan from 20 to 40 in. As such, irrigation water applied upgradient of the study area likely results in hyporheic flow that contributes toward downgradient groundwater elevations.

Vegetation on irrigated land consists of cultivated hay and pasture grasses. Irrigation ditch banks and bottoms within the study area are dominated by non-native reed canarygrass with stands of poison hemlock (Kittitas County Class A Noxious Weed) and small patches of cattails. Infiltration from irrigation ditches along the west boundary supports a band of woody vegetation along the ditches, colonized by a variety of native shrubs and trees, including both upland species and species typically associated with wetlands.

Based upon best available science, the vicinity was likely xeric, lacking wetlands, prior to the advent of irrigation. Observed hydrology within the study area is best explained by ongoing irrigation practices. The artificial management of irrigation water on uplands can support wetland vegetation and result in hydric soil indicators, especially in the bottoms of irrigation ditches and irrigation swales. However, according to the Kittitas County (county) Critical Areas Ordinance (CAO) Sections 17A.02.840 and 17A.07.020(1), *wetlands do not include those artificial wetlands intentionally created from non-wetland sites, including, but not limited to, irrigation and drainage ditches, grass-lined swales, canals, detention facilities, wastewater treatment facilities, farm ponds, and landscape amenities.* Although these irrigation-related features may delineate as *biological* wetlands, they are not regulated by the county. Based upon best available science, no jurisdictional wetlands are present within the study area.

The county maps an unnamed Type 2 (F) (fish-bearing) stream along the south shoulder of Goodwin Road for which it assigns a regulatory buffer of 100 feet (ft)[1] per CAO Section 17A.04.030 – *Riparian Management Zones and Buffers* plus a 15-ft building setback per CAO 17A.01.090(4) – *Building Setbacks*. No other streams are mapped within the study area.

The northeast corner of the study area intersects the mapped FEMA[2] floodplain and channel migration zone of the Yakima River.

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[1] For the Columbia Plateau Ecoregion
[2] Federal Emergency Management Agency

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Acronyms and Abbreviations

AgACIS	Agricultural Applied Climate Information System
CAO	Critical Areas Ordinance
Corps	United States Army Corps of Engineers
CMZ	Channel migration zone
County	Kittitas County
DNR	Washington State Department of Natural Resources
Ecology	Washington State Department of Ecology
FEMA	Federal Emergency Management Agency
GIS	Geographic Information System
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
LIDAR	Light Detection and Ranging
NHD	National Hydrography Dataset
NRCS	Natural Resources Conservation Service
NOAA	National Oceanic and Atmospheric Administration
NWI	National Wetlands Inventory
PWS	Professional Wetland Scientist
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WDFW	Washington Department of Fish and Wildlife
WETS	Climate Analysis for Wetlands Tables
WGS84	World Geodetic System 1984

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1. Introduction

GG Environmental (Geoffrey Gray, MA, PWS) was retained by Jeff Greear (client) to complete a wetland and stream critical areas investigation for parcels 19588, 19589, 19590, 19591, 19592, 19593, 443233, and 493233 in unincorporated Kittitas County (county), Washington (project).

2. Location

The project is located between Thorp and Interstate 90, northwest of the intersection of Thorp Highway North and Thorp Depot Road and south of Goodwin Road (**Figure 1**). Ranging in elevation from 1,624 to 1,652 feet (ft) (Google 2022), topography is generally sloped at less than one percent toward the east (**Figure 2**). Positioned within the SE ¼ of section 11 in Township 18 North, Range 17 East, the approximate center of the project footprint is located at latitude 47°3'41.85" North and longitude 120°40'23.00" West (WGS84).

Figure 1. Project Location

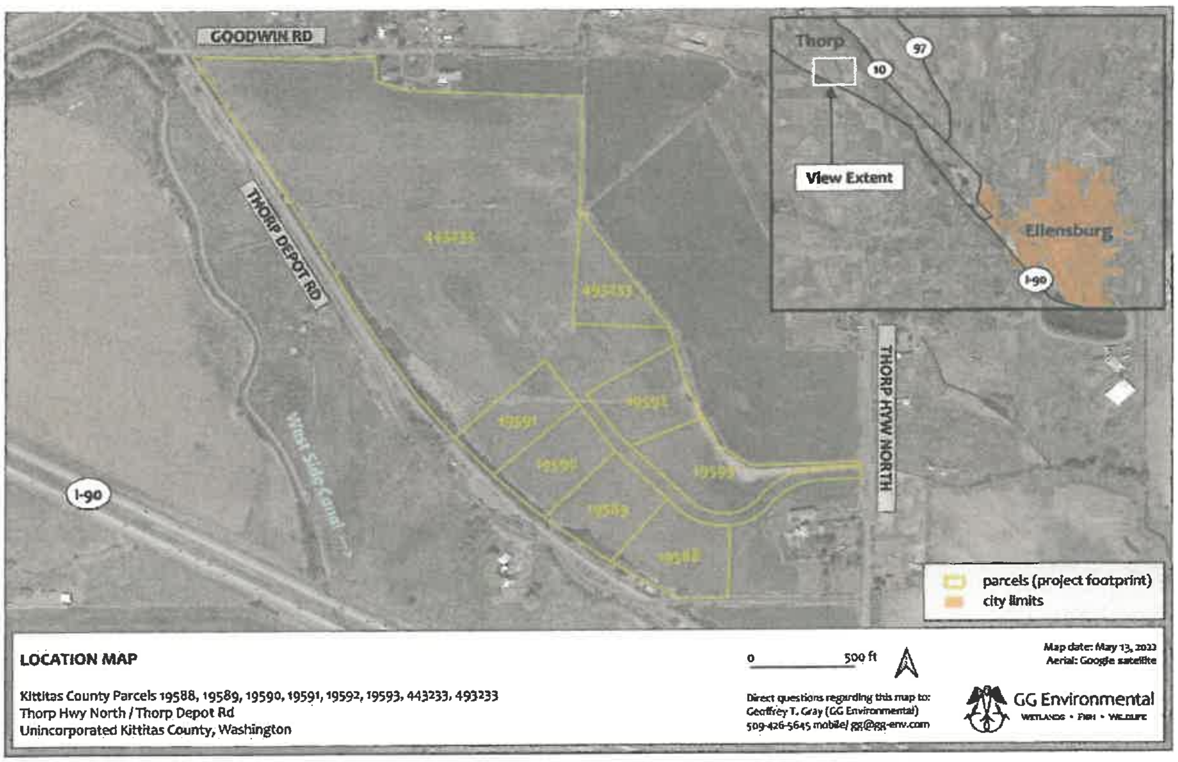
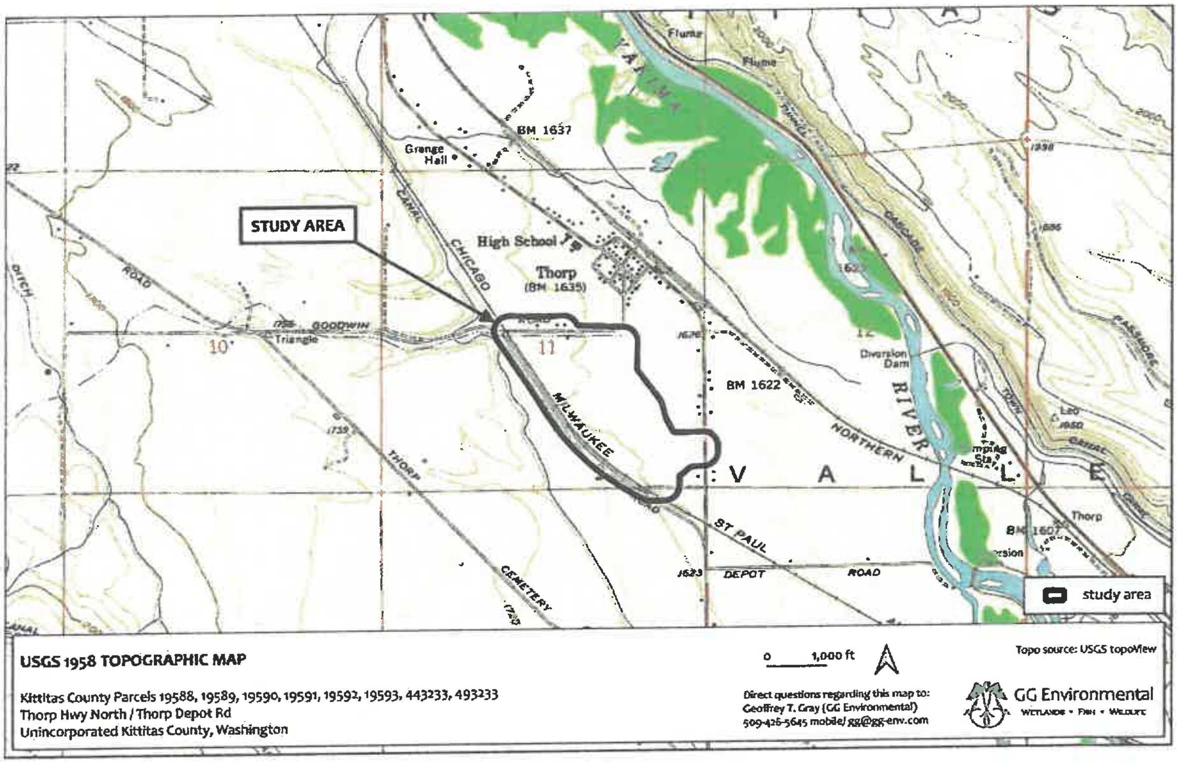


Figure 2. USGS Topographic Map



The project occurs within United States Department of Agriculture (USDA) Land Resource Region B and USDA Major Land Resource Area 8 (Columbia Plateau) (NRCS 2006), Water Resource Inventory Area 39 (Upper Yakima), and Robinson Creek-Yakima River subwatershed (12th Hydrologic Unit Code 170300010507).

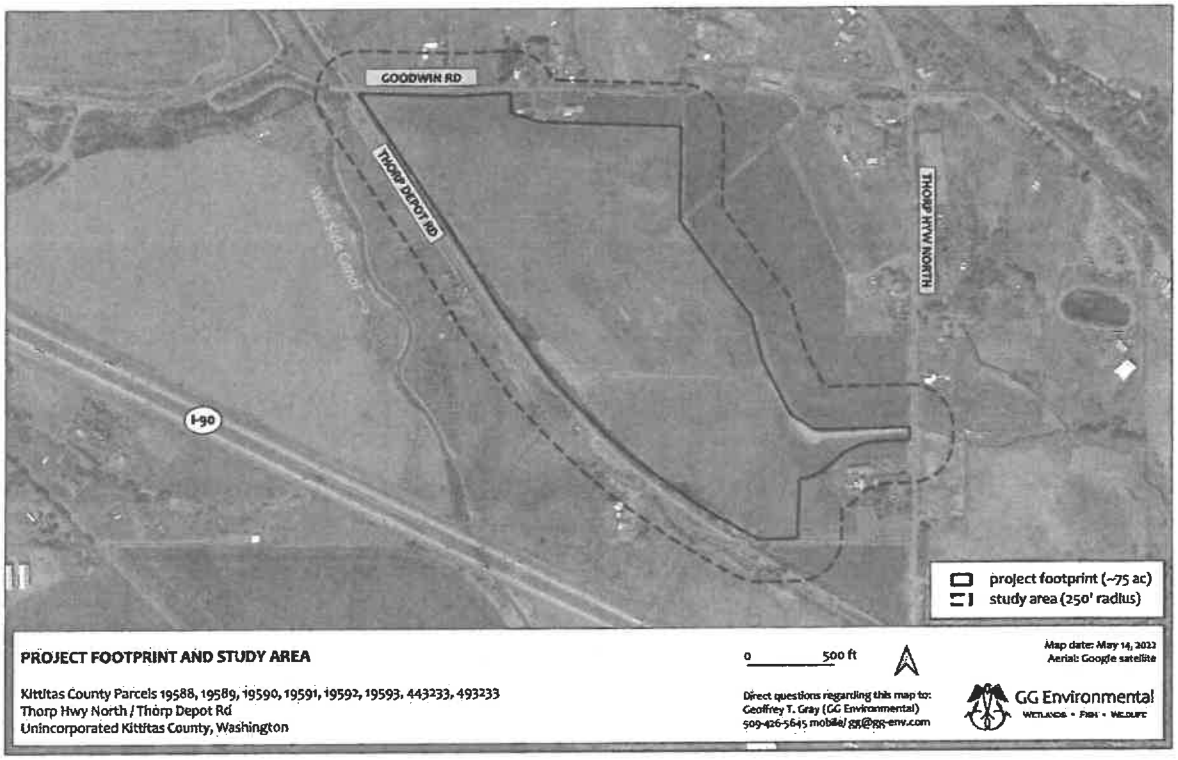
3. Methods

An overview of the methods employed to investigate wetlands and streams is presented in this section.

3.1. Project Footprint and Study Area

The project footprint is limited to land within the parcel boundaries. The study area includes the project footprint as well as a 250-foot (ft) radius from the project footprint consistent with county Critical Areas Ordinance (CAO) Section 17A.07.060(2)(a) – *Reporting/Contents* (Kittitas County 2022a) (**Figure 3**).

Figure 3. Project Footprint and Study Area



3.2. Background Research

Available data for the study area, including information on soils, topography, vegetation, precipitation, wetlands, streams, floodplains, CMZ, LIDAR, historic aerial imagery, irrigation history and infrastructure, and the county code were researched:

- National Wetlands Inventory (NWI) (USFWS 2022a) (**Appendix A-1**);
- Kittitas County Code (Kittitas County 2022a);
- Kittitas County COMPAS (Kittitas County 2022b);
- Wetlands and Plants of High Conservation Value (DNR 2022a);
- NRCS soil survey data (NRCS 2022a) (**Appendix A-2**);
- AgACIS climate data (NRCS 2022b). (**Appendix B**);
- USGS National Hydrography Dataset (NHD) (USGS 2022a);
- USGS historic topographic maps (USGS 2022b);
- Historic aerial photography: 1954 (CWU 2022) (**Appendix A-3**) and 1985-2021 (Google 2022);
- Light Detection and Ranging (LIDAR) data (DNR 2022b);
- Washington Geologic Information Portal (DNR 2022c).

3.3. Field Investigation

Fieldwork was completed on May 10, 2022 by GG Environmental (Geoffrey Gray, MA, PWS). The project footprint was traversed on foot. The study area was visually observed from within the parcel boundaries and from publicly-accessible roads, complimented by a review of historic aerial imagery. Representative photos are presented in **Appendix C.**

3.4. Wetland Delineation Guidance, Regulatory Jurisdiction

The wetland investigation was performed in reference to routine methods described in the *Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory 1987) and *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0)* (Corps 2008). Plants were identified by scientific name and wetland indicator status per Corps (2020).

Since the project occurs within unincorporated Kittitas County and is located outside shoreline jurisdiction, jurisdictional wetlands and streams are regulated under CAO Chapter 17A – *Critical Areas* (Kittitas County 2022a).

3.5. Geospatial Documentation

Features were geospatially surveyed with a Motorola G7 Power mobile phone, running the Mapit Spatial GIS application paired via Bluetooth® with a Juniper Systems Geode$_{TM}$ Multi-Global Navigation Satellite System (Multi-GNSS) receiver capable of sub-meter horizontal accuracy.

4. Existing Conditions

4.1. Topography

The west boundary of the project footprint begins at the toe of an escarpment of glacial outwash materials (DNR 2022c). However, topography within the project footprint is relatively flat, slightly undulating, and generally sloped at approximately one percent toward the east. Decades of management for hay production has eliminated any finer topographic variation, resulting in smooth slopes that are plowed, graded, and cultivated to uniformly direct flood irrigation waters across the hayfields. Highest elevations are to the north and south, and opposing slope aspects meet in a slight east-west swale within which an excavated tailwater ditch drains excess irrigation water toward the east.

4.2. Geology

The Thorp Prairie, extending southeast to Thorp, lies upon aggraded till materials deposited by glaciers ("Pleistocene alpine glacial drift") (DNR 2022c). The west boundary of the project footprint occurs at the eastern escarpment toe of these raised glacial till materials. The project footprint lies upon a lower terrace of alluvial sediment comprised of clay, silt, sand, gravel and/or cobble deposits ("Quaternary alluvium").

4.3. Soils

4.3.1. Soils mapped upon glacial drift

West of the project footprint, the two dominant soil map units east of I-90 include Reeser-Reelow-Sketter complex, 2 to 5 percent slopes and Reeser ashy clay loam, 2 to 5 percent slopes (NRCS 2022a) (**Appendix A-2**). These map units are similar in their geomorphic association, composition, profile, permeability, and shallow depth to restrictive feature (duripan).

Reeser-Reelow-Sketter complex, 2 to 5 percent slopes: Reeser is associated with fan remnants. Comprised of alluvium and glacial drift with an influence of loess and volcanic ash, the typical profile includes ashy clay loam and clay to 22 in with cemented material and cemented extremely gravelly sandy loam below 22 in. It is well drained, with depth to the water table at more than 80 in, but it exhibits a depth to duripan of 20 to 40 in. It does not flood or pond and is not listed as a hydric soil. **Reelow** is associated with fan remnants and terraces. Comprised of alluvium and glacial drift with an influence of loess and volcanic ash, the typical profile includes ashy clay loam and gravelly clay to 14 in with cemented material and cemented extremely gravelly sandy loam below 14 in. It is well drained, with depth to the water table at more than 80 in, but it exhibits a depth to duripan of 10 to 20 in. It does not flood or pond and is not listed as a hydric soil. **Sketter** is associated with terraces and fan remnants. Comprised of alluvium and glacial drift over a duripan with an influence of loess mixed with volcanic ash at the surface, the typical profile includes cobbly ashy loam, gravelly ashy loam, and extremely cobbly sandy clay to 21 in with cemented material and cemented extremely gravelly sandy loam below 21 in. It is well drained, with depth to the water table at more than 80 in, but it exhibits a depth to duripan of 20 to 40 in. It does not flood or pond and is not listed as a hydric soil.

Reeser ashy clay loam, 2 to 5 percent slopes, is associated with fan remnants. Comprised of alluvium and glacial drift with an influence of loess and volcanic ash, the typical profile includes ashy clay loam and clay to 22 in with cemented material and cemented extremely gravelly sandy loam below 22 in. It is well drained, with depth to the water table at more than 80 in, but it exhibits a depth to duripan of 20 to 40 in. It does not flood or pond and is not listed as a hydric soil. Minor components include **Sketter** (5 percent) and **Reelow,** (5 percent), neither of which is listed as a hydric soil.

4.3.2. Soils mapped within the project footprint

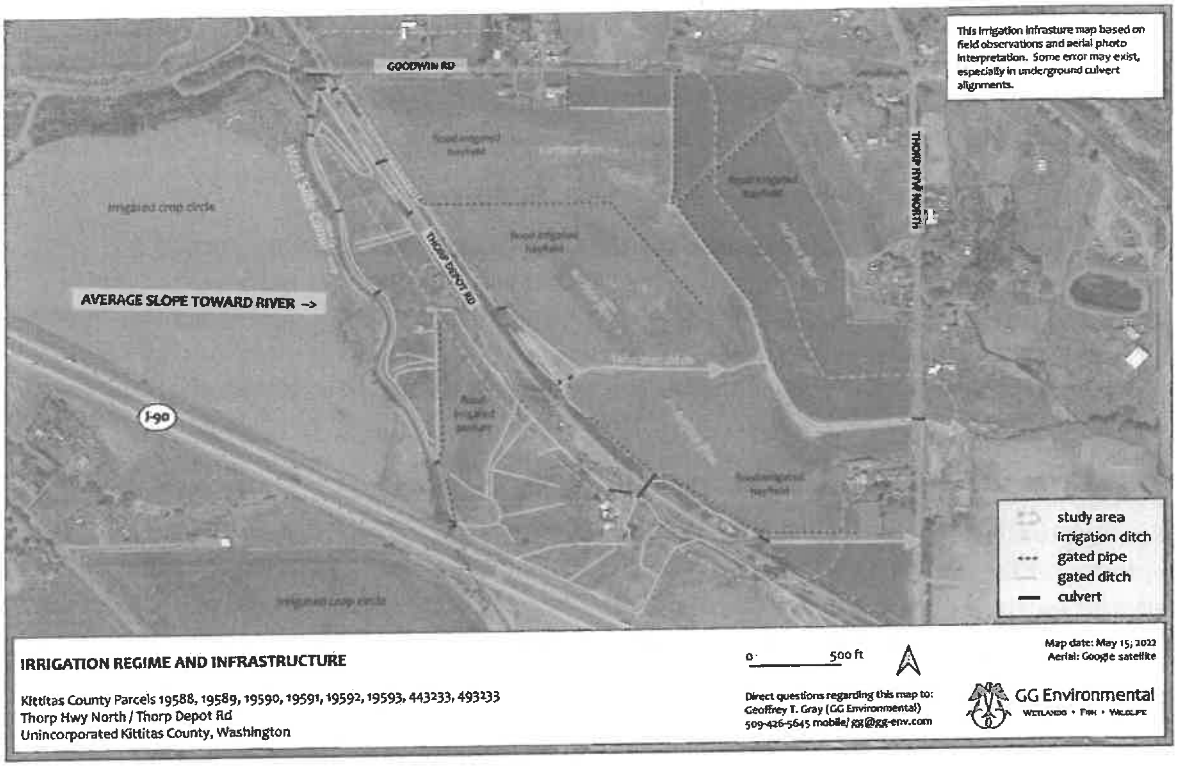
Two soil units underlie the project footprint. **Metser clay loam, 2 to 5 percent slopes,** is associated with alluvial fans and terraces. Comprised of alluvium with an influence of volcanic ash in the upper part, the typical profile includes clay loam and clay to 30 in with very gravelly sandy clay and extremely gravelly sandy clay below 30 in. It is moderately well-drained and exhibits a depth to water table of about 30 to 37 in. It does not flood or pond and is not listed as a hydric soil. Minor components include **Vanderbilt** (10 percent) and **Ackna,** (5 percent), neither of which is listed as a hydric soil.

Vanderbilt ashy loam, 0 to 2 percent slopes is associated with alluvial fans. Comprised of alluvium with an influence of volcanic ash in the surface, the typical profile includes ashy loam to 28 in and clay loam below 28 in. It is well-drained and exhibits a depth to water table of greater than 80 in. It does not flood or pond and is not listed as a hydric soil. Minor components include **Mitta** (5 percent), **Nosel** (5 percent), and **Umtanum**, (5 percent), none of which is listed as a hydric soil.

4.4. Irrigation Regime

According to historic aerial imagery, the study area and surrounding landscape has been irrigated since at least 1954 (CWU 2022, Google 2022) (**Figure 4**) although this practice likely began decades earlier.

Figure 4. Irrigation Regime



Water arrives via the unlined West Side Canal from which water is diverted across the landscape via a complex network of excavated irrigation ditches, lateral dikes, weirs, culverts, and pipes. This infrastructure is maintained and managed to collectively distribute water, via gravity flow, onto otherwise dry land.

In lower areas where flood irrigation surface flow can temporarily impound, irrigation tailwater ditches are cut to direct water downslope, thereby maximizing farmable acreage.

Regional irrigation practices can artificially raise the groundwater table. Groundwater in the project footprint is not only influenced by immediate flood irrigation practices, but likely by upgradient irrigation as well. The sources of upgradient hydrology west of Thorp Depot Rd include seepage from the unlined West Side Canal, multiple irrigated crop circles, and a maze of unlined irrigation ditches, dikes and swales. Given the shallow depth to impervious duripan in these areas, combined with an average topographic slope toward the east, a significant amount of irrigation water likely flows, both surface and subsurface, down-gradient toward the project footprint.

4.5. Plants

Vegetation on irrigated land includes cultivated hay and pasture forage species. Irrigation ditch banks and bottoms are commonly dominated by non-native reed canarygrass (*Phalaris arundinaceae*) (FACW[3]) with small patches of cattails (*Typha latifolia*) (OBL[4]). Non-native and noxious weeds are also present, including poison hemlock (*Conium maculatum*) (Kittitas County Class A Noxious Weed). Irrigation ditches excavated at the escarpment toe support a woody overstory colonized by a variety of native shrubs and trees, including both upland species and species associated with wetlands including black elder (*Sambucus nigra*) (FACU[5]), choke cherry (*Prunus virginiana*) (FAC[6]), Nootka rose (*Rosa nutkana*) (FACU), red osier (*Cornus alba*) (FACW), narrow-leaf willow (*Salix exigua*) (FACW), quaking aspen (*Populus tremuloides*) (FACU), and cottonwood (*Populus balsamifera*) (FAC).

4.6. Precipitation and Hydrology

Chapter 19 of the Engineering Field Handbook (NRCS 2015) was referenced in determining if precipitation that fell within three months of the site visit was within the normal range (30-year average). Normal climatic conditions prevailed the aggregate three months prior to the May 10 field visit (**Appendix B**). However, due to the geomorphic character of the vicinity, pervious soils, and local irrigation practices, the relative contribution of precipitation toward soil moisture in the study area during the growing season is low.

4.7. Growing Season

According to Climate Analysis for Wetlands Tables (WETS) (NRCS 2022b), the growing season (28 °F or greater) at the nearest AgACIS station (Ellensburg) demonstrates a 70 percent probability of occurring between April 16 and October 14 (181 days) and 50 percent between April 20 and October 10 (173 days). Fieldwork was completed during the growing season.

4.8. Mapped Wetlands

The NWI and county both map wetlands within the study area including Palustrine Forested/Scrub-shrub, Riverine, and Palustrine Emergent wetlands (**Appendix A-1**).

4.9. Mapped Streams

Kittitas County maps an unnamed Type 2 (F) (fish-bearing) stream within the study area and along the south shoulder of Goodwin Road (**Appendix A-4**).

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[3] FACW (Facultative Wetland Plants) – usually occur in wetlands, but may occur in non-wetlands.
[4] OBL (Obligate Wetland Plants) – almost always occur in wetlands.
[5] FACU (Facultative Upland Plants) – usually occur in non-wetlands, but may occur in wetlands.
[6] FAC (Facultative Wetland Plants) – occur in wetlands and non-wetlands.

4.10. 100-year Floodplain and Channel Migration Zone

Kittitas County maps the FEMA[7] floodplain and channel migration zone (CMZ) of the Yakima River in the northeast corner of the study area (**Appendix A-6**).

5. Findings and Discussion

5.1. Wetlands

Irrigation ditches were flowing, thereby exhibiting wetland hydrology, albeit, artificial. Hydrophytic wetland vegetation is rooted in some irrigation ditch reaches, but its spatial location is closely correlated to, and dependent upon, the moisture ditches provide during the growing season via seepage and, perhaps, elevated groundwater, during the growing season. The confluence of irrigation ditch flow and flood irrigation water results in significant hydrologic buildup where opposing slope aspects meet, but a representative soil sample evaluated in a patch of cattails just downgradient of observed surface water in the ditches failed to show hydrology and soil indicators. This observation can be explained in that the presence of cattails (and other wetland-associated plants) is common where water is consistently irrigated on uplands/permeable soils during the growing season. The development of hydric soil indicators can be inhibited where soils are well-drained and water moves quickly through the soil profile. The lack of hydrology at the sample location demonstrates that water infiltrates quickly into the upper 12-16 in of the soil profile. Therefore, given the pervious character of soils, irrigation as a primary hydrology source during the growing season, and correlation between wetland vegetation and ditch location, it is concluded that the sole reason wetland vegetation is present within the study area is probably due to ongoing irrigation practices.

Although irrigation ditches can delineate as *biological* wetlands, the county does not regulate *those artificial wetlands intentionally created from non-wetland sites, including, but not limited to, irrigation and drainage ditches, grass-lined swales, canals, detention facilities, wastewater treatment facilities, farm ponds, and landscape amenities* per CAO Sections 17A.02.840 and 17A.07.020(1). Given the best available science in the context of the CAO, it is determined that no jurisdictional wetlands are present within the study area.

5.2. Streams

The county maps an unnamed Type 2 (F) (fish-bearing) stream parallel to the south shoulder of Goodwin Road (Kittitas County 2022b) for which it assigns a regulatory buffer of 100 feet (ft)[8] per CAO Section 17A.04.030 – *Riparian Management Zones and Buffers* plus a 15-ft building setback per CAO 17A.01.090(4) – *Building Setbacks* (**Appendix A-4**). The stream is not designated as critical

[7] Federal Emergency Management Agency
[8] For the Columbia Plateau Ecoregion

habitat for Mid-Columbia River Distinct Population Segment steelhead (NOAA 2022) or bull trout (USFWS 2022b). Although StreamNet (WDFW 2022a) does not identify it as supporting fish, it is presumed by WDFW that fish can access the creek (WDFW 2022b).

No other streams are mapped within the study area in the 1902 USGS topographic map (**Appendix A-5**), 1958 USGS topographic map (**Figure 2**), or by the NHD (**Appendix A-5**).

5.3. Floodplain and Channel Migration Zone

The county maps the FEMA 100-year floodplain, FEMA 500-year floodplain, and CMZ of the Yakima River as intersecting parcel 443233. The FEMA 500-year floodplain overlaps the boundary of parcel 493233 (**Appendix A-6**).

6. Limitations

The data presented herein reflect site conditions encountered on May 10, 2022. Work was performed in accordance with accepted standards for professional wetland biologists and applicable and current federal, state, and local ordinances. Although this report is accurate and complete to the best of available scientific knowledge, it should be considered a preliminary determination, with no warranty, express or implied, until it has been reviewed, and approved in writing, by appropriate jurisdictional authorities.

7. Consultant Qualifications

Geoffrey Gray is a professional biologist and wetland scientist whose 25-year career has provided him with a unique breadth of experience that can readily assist you in moving your project forward.

Investing eight years in higher education, he earned a Bachelor's Degree in Business Management and a Master's degree in Biology from California State University at Fresno.

Geoffrey has earned 12.4 credit hours of certified professional wetland training, including completion of the *38-hour Army Corps of Engineers (Corps) Wetland Delineation and Management Training Program*, as well as Corps *Advanced Wetland Delineation*, Corps *Delineation Manual Regional Supplements*, Washington State Department of Ecology (Ecology) 2014 *Wetland Rating System*, Ecology *Credit-Debit Method for Estimating Mitigation Needs*, Ecology *Selecting Wetland Mitigation Sites Using a Watershed Approach*, and multiple courses in wetland plant identification.

Continuously employed as a wetland, fish, and wildlife biologist since 1997, while serving tenures in field research, a large environmental consulting firm, state agencies in both California and Washington, and as an independent environmental consultant, Geoff's resume includes over 16 years of full-time duty as a wetland biologist, with experience ranging from the unique vernal pool wetland habitats of California's Central Valley to the diverse wetlands of Eastern Washington State, stretching from the Cascade crest to Idaho. Spanning his career, Geoff has performed over 90 wetland delineations and has managed 40 wetland mitigation/riparian restoration sites. As a fish and wildlife biologist, he has evaluated over 620 projects for compliance under the Endangered Species Act, including over 120 federal consultations.

Geoff founded GG Environmental in 2015, and has since served a diverse palette of clients including habitat restoration groups, private landowners, commercial businesses, developers, and local governments who need assistance in overcoming the challenges of Critical Areas/Shorelines permitting and Endangered Species Act consultation.

A professional-level GPS/GIS user for over 20 years, Geoff employs cutting-edge GPS technology in the field and is proficient in GIS mapping with ArcGIS and QGIS.

Certified as a Professional Wetland Scientist by the Society of Wetland Scientists, Geoff's work is performed to the highest standards and is fully insured.

8. References

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[WDFW] 2022b. E-mail exchange with Jennifer Nelson (WDFW) regarding fish presence in the mapped Type 2 (F) stream. Email date: 5-16-2022 (8:29AM).

Appendix A. Background Information

Appendix A includes the following sub-appendices:

A-1 USFWS NWI and Kittitas County Wetlands

A-2 NRCS Soil Survey Map

A-3 1954 Historic Aerial Image

A-4 Kittitas County Stream Map and Regulatory Buffer

A-5 USGS 1902 Topographic Map and NHD

A-6 FEMA Floodplain and CMZ

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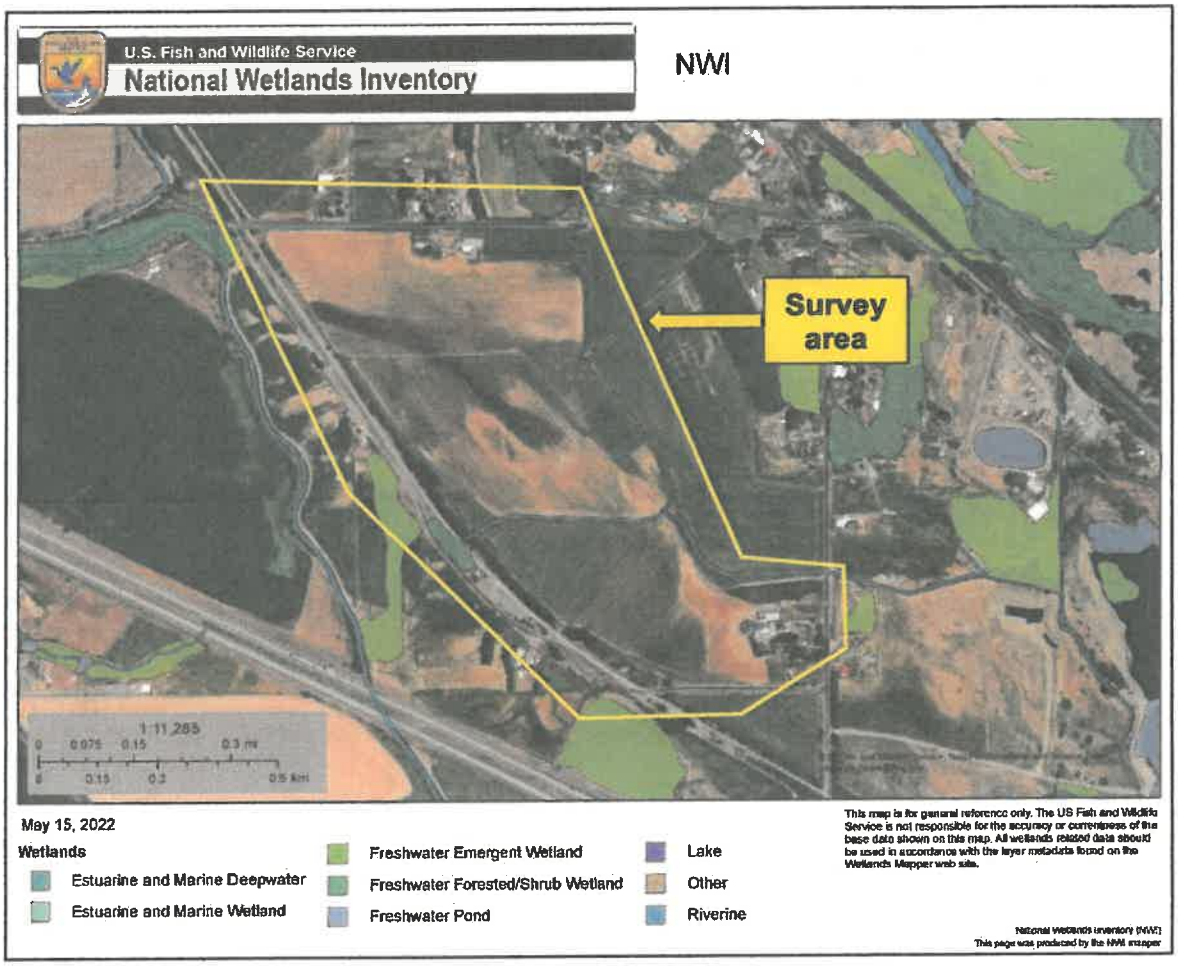
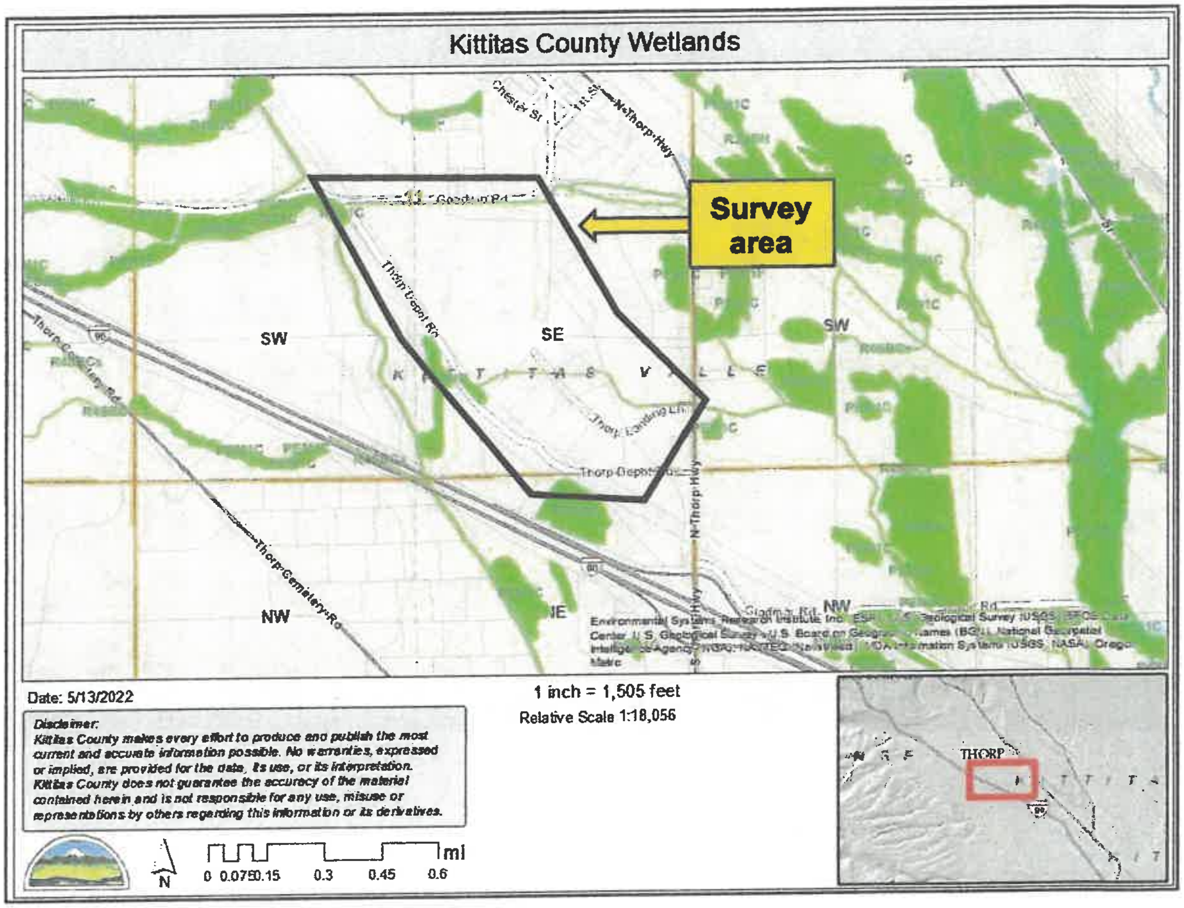
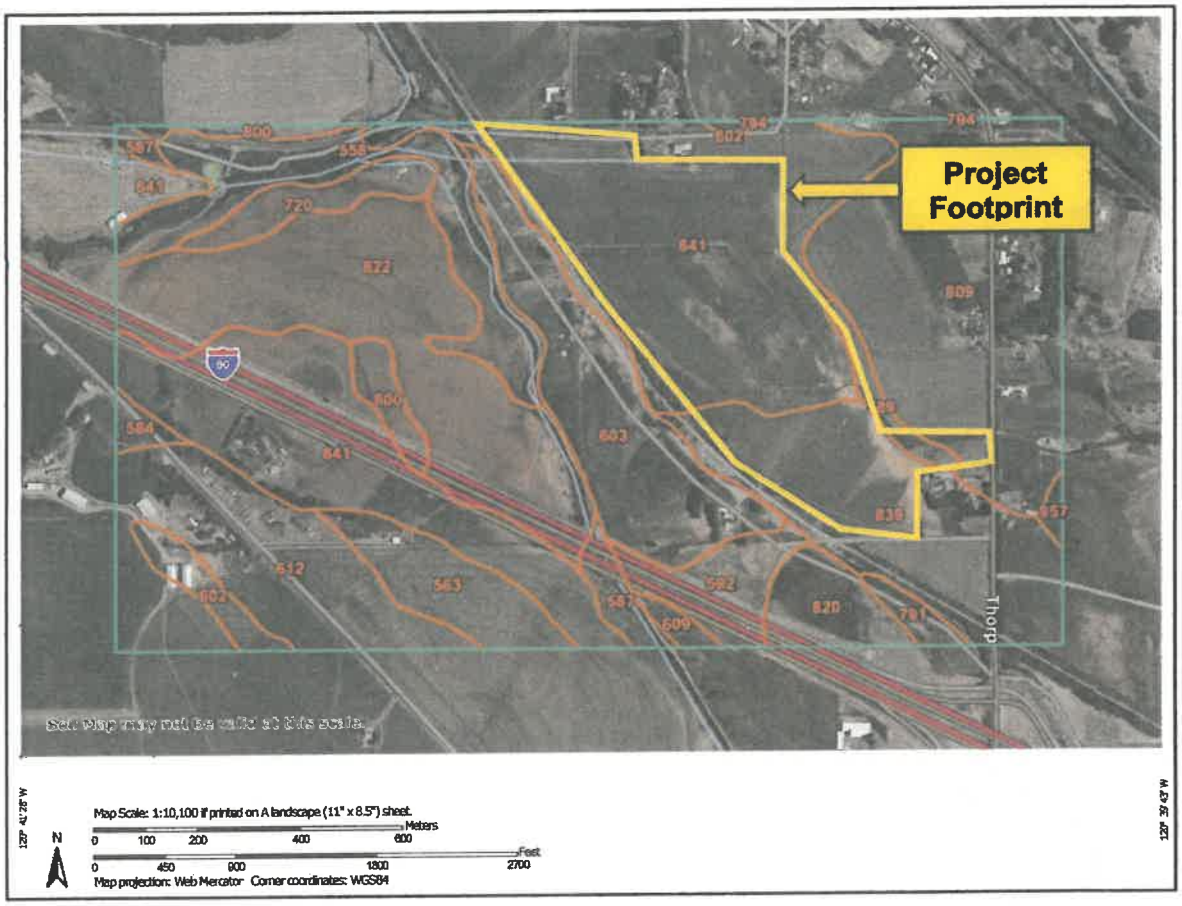
Appendix A-1. USFWS NWI and Kittitas County Wetlands





Kittitas County Wetlands
Survey area
Goodwin Rd
Thorp Depot Rd
Thorp Landing Ln
N Thorp Hwy
Chester St
Thorp Cemetery Rd
SW
SE
NW
K I T T I T A S V A L L E Y
Date: 5/13/2022
1 inch = 1,505 feet
Relative Scale 1:18,056
Disclaimer:
Kittitas County makes every effort to produce and publish the most current and accurate information possible. No warranties, expressed or implied, are provided for the data, its use, or its interpretation. Kittitas County does not guarantee the accuracy of the material contained herein and is not responsible for any use, misuse or representations by others regarding this information or its derivatives.
0 0.075 0.15 0.3 0.45 0.6 mi
N
THORP

Appendix A-2. NRCS Soil Survey Map



Map Unit Legend

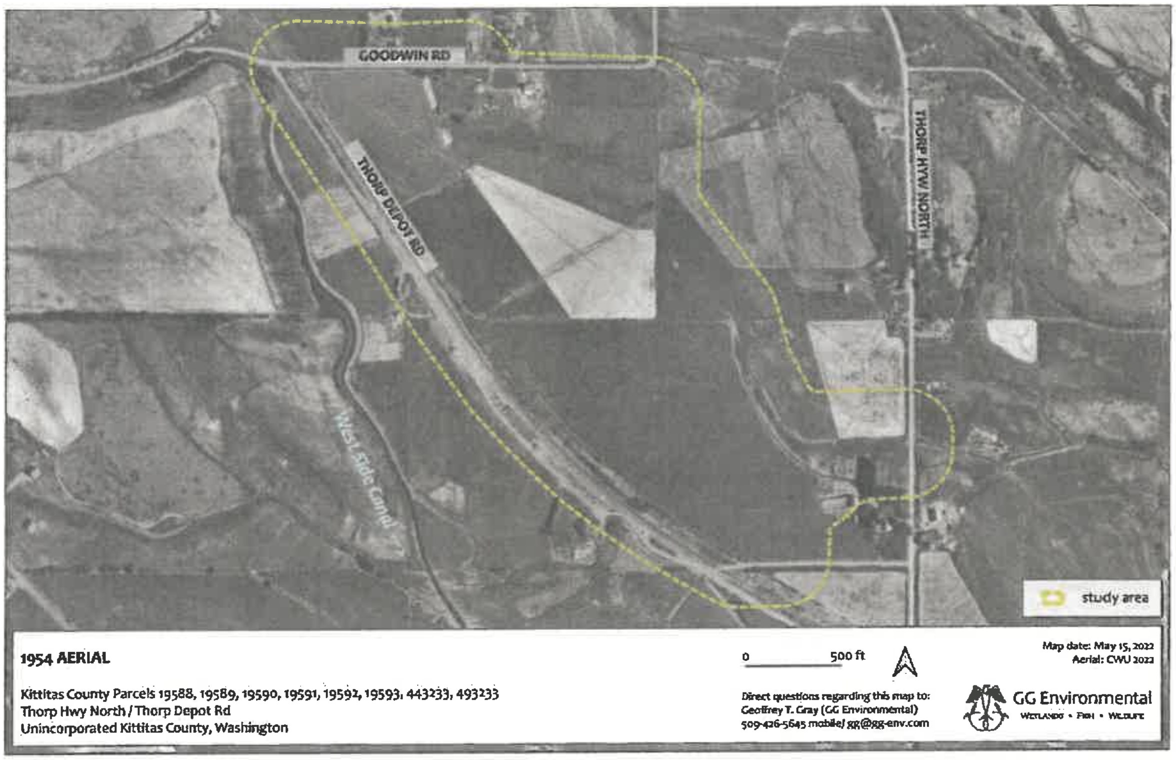
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
558	Argixerolls-Durixerolls complex, 30 to 70 percent north slopes	27.1	5.7%
563	Mendian very fine sandy loam, 0 to 2 percent slopes	14.1	3.0%
584	Varodale clay, 0 to 2 percent slopes	2.1	0.5%
587	Argixerolls, 15 to 30 percent slopes	5.5	1.2%
589	Nack-Brickmill complex, 0 to 5 percent slopes	3.8	0.8%
592	Umtanum ashy silt loam, 2 to 5 percent slopes	10.9	2.3%
602	Brickmill gravelly ashy loam, 2 to 5 percent slopes	5.6	1.2%
603	Reeser ashy clay loam, 2 to 5 percent slopes	35.2	7.4%
609	Ackna ashy loam, 0 to 2 percent slopes	1.8	0.4%
612	Nitcha ashy loam, 0 to 2 percent slopes	39.3	8.3%
720	Nanum ashy sandy clay loam, 0 to 2 percent slopes	7.9	1.7%
791	Mitta ashy silt loam, drained, 0 to 2 percent slopes	2.8	0.6%
794	Kayak-Weirman complex, 0 to 2 percent slopes	0.1	0.0%
800	Brysill gravelly ashy loam, 2 to 5 percent slopes	6.7	1.4%
809	Weirman-Kayak-Zillah complex, 0 to 2 percent slopes	68.9	14.6%
820	Modsel complex, 0 to 5 percent slopes	9.8	2.1%
822	Reeser-Reelow-Sketter complex, 2 to 5 percent slopes	58.9	12.5%
839	Vanderbilt ashy loam, 0 to 2 percent slopes	45.0	9.5%
841	Metser clay loam, 2 to 5 percent slopes	125.9	26.7%
957	Kayak-Weirman complex, rarely flooded, 0 to 2 percent slopes	1.0	0.2%
Totals for Area of Interest		472.4	100.0%

USDA Natural Resources Conservation Service

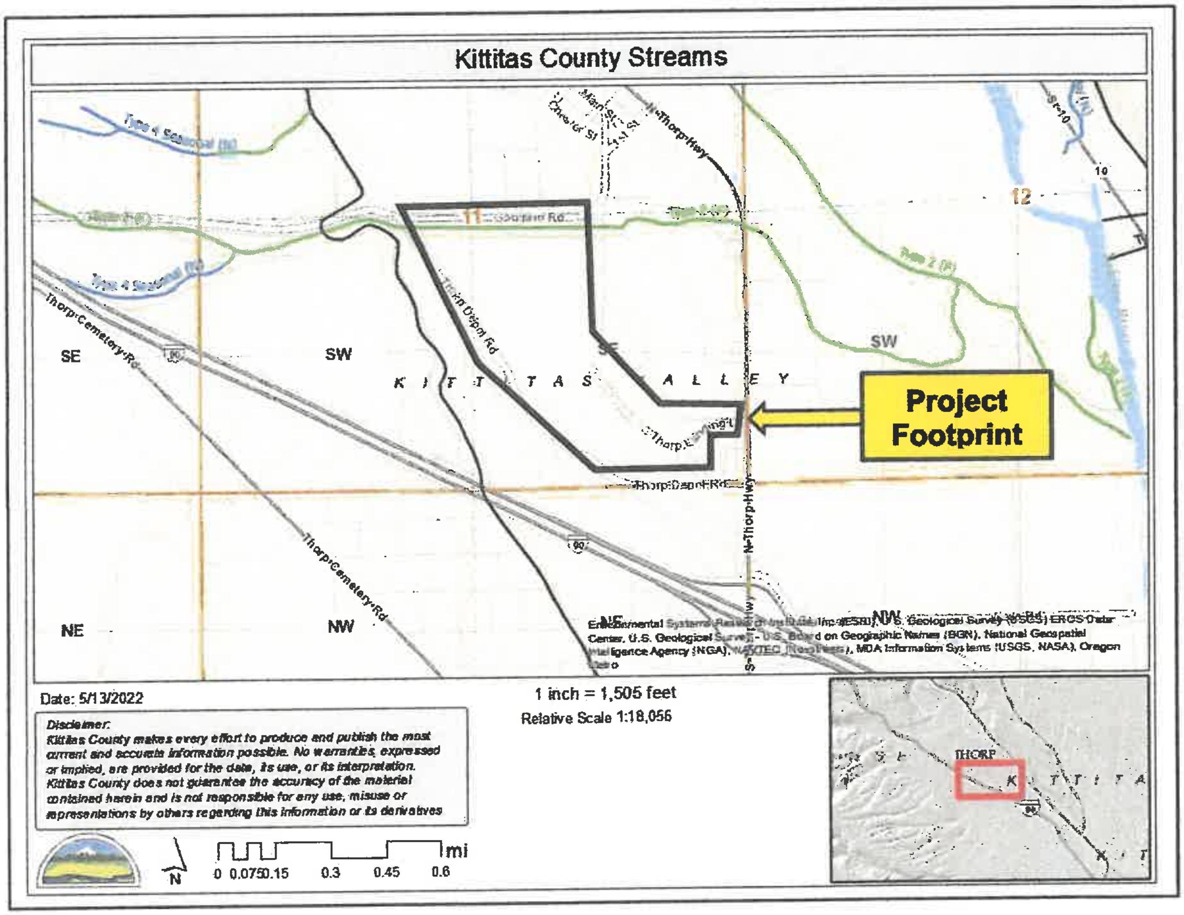
Web Soil Survey
National Cooperative Soil Survey

5/13/2022
Page 3 of 4

Appendix A-3. 1954 Historic Aerial Image



Appendix A-4. Kittitas County Stream Map and Regulatory Buffer



TYPE 2 (F) STREAM BUFFER AND BUILDING SETBACK

Kittitas County Parcels 19588, 19589, 19590, 19591, 19592, 19593, 443233, 493233
Thorp Hwy North / Thorp Depot Rd
Unincorporated Kittitas County, Washington

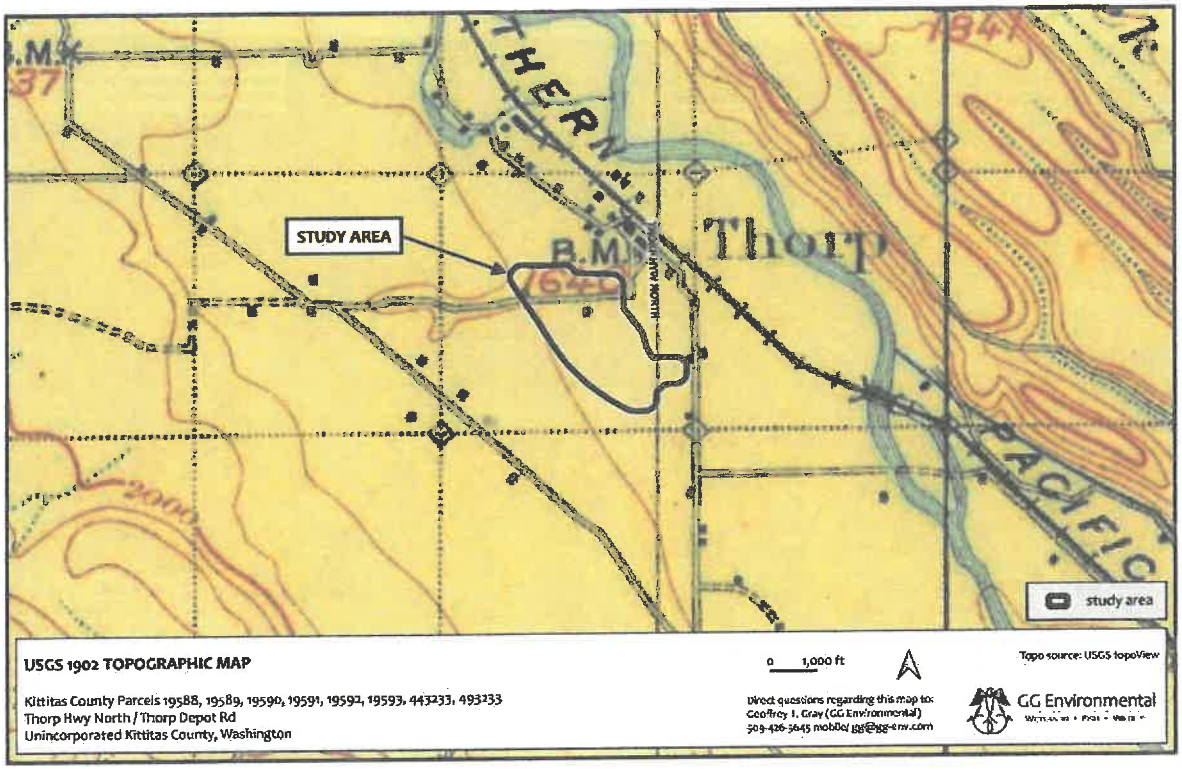
0 500 ft

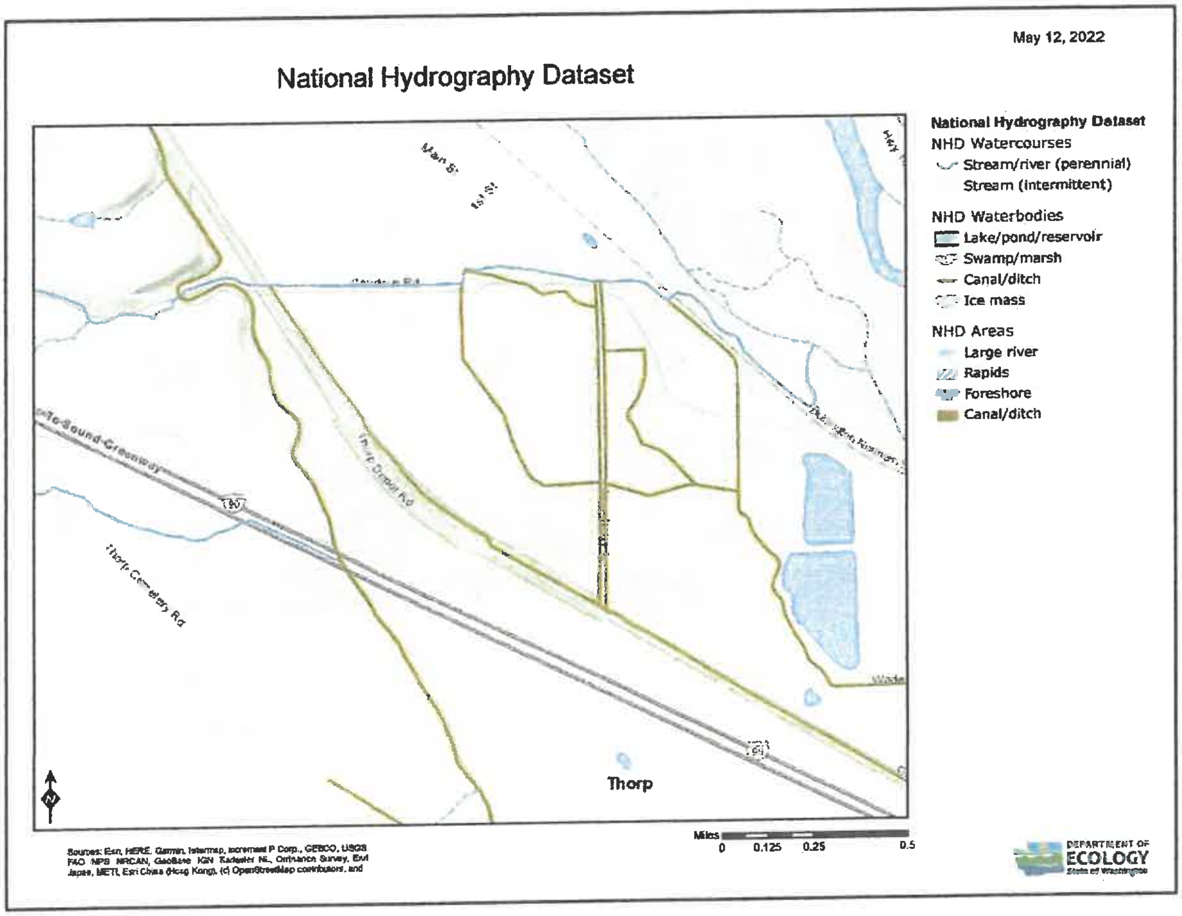
Map date: May 15, 2022
Aerial: Google satellite

Direct questions regarding this map to:
Geoffrey T. Gray (GG Environmental)
509-426-5645 mobile/ gg@gg-env.com

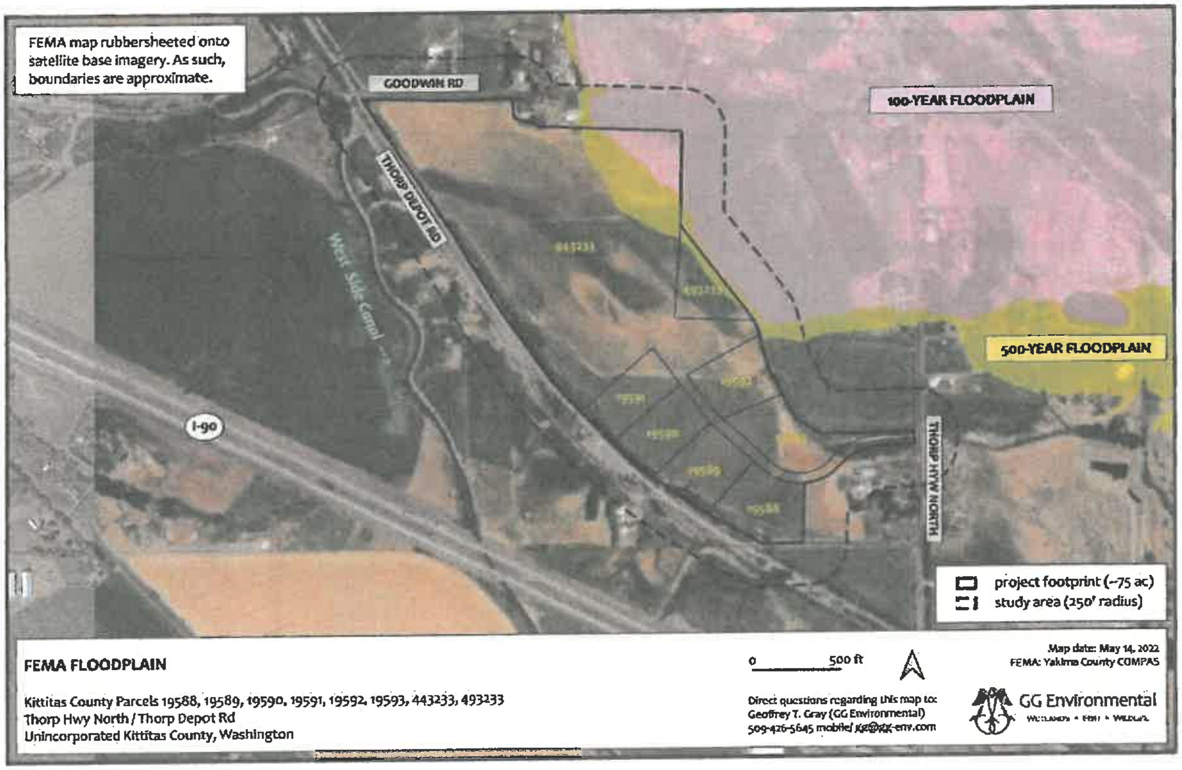
GG Environmental
WETLANDS • FISH • WILDLIFE

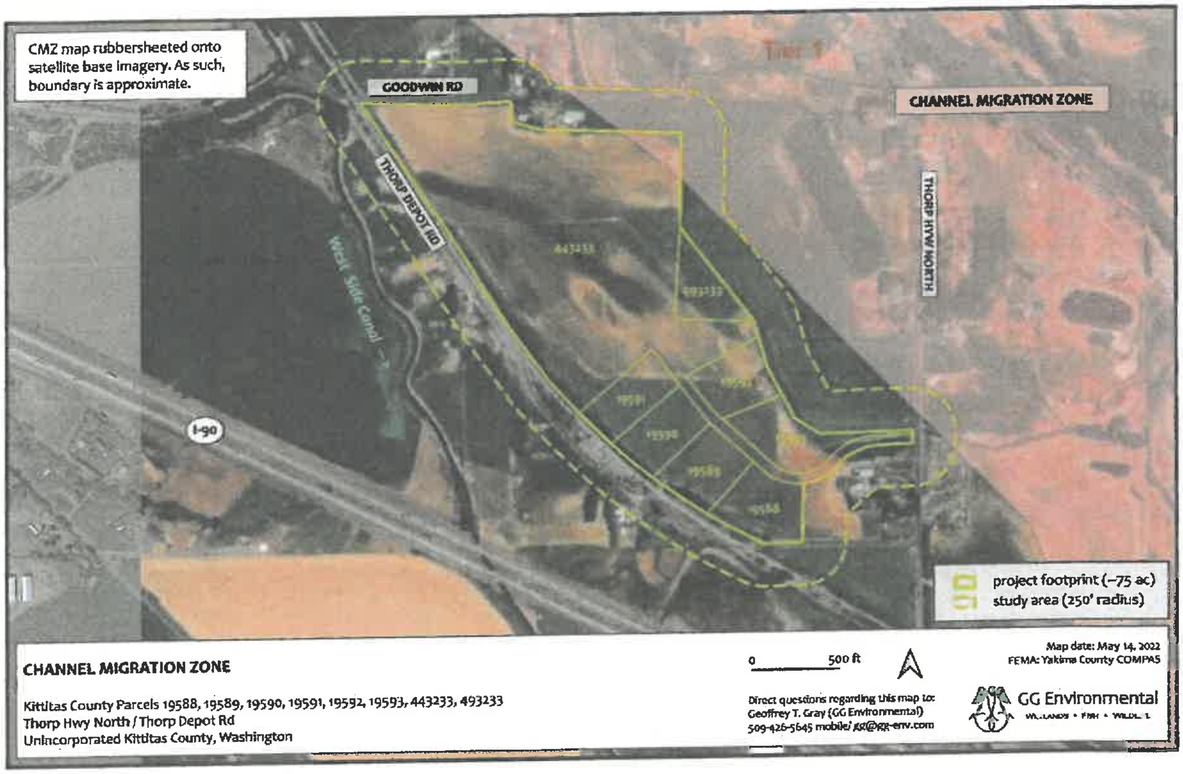
Appendix A-5. USGS 1902 Topographic Map and NHD




May 12, 2022
National Hydrography Dataset
National Hydrography Dataset
NHD Watercourses
Stream/river (perennial)
Stream (intermittent)
NHD Waterbodies
Lake/pond/reservoir
Swamp/marsh
Canal/ditch
Ice mass
NHD Areas
Large river
Rapids
Foreshore
Canal/ditch
Thorp Depot Rd
Thorp Cemetery Rd
Thorp
Miles
0
0.125
0.25
0.5
DEPARTMENT OF ECOLOGY
State of Washington

Appendix A-6. FEMA Floodplain and CMZ




CMZ map rubbersheeted onto satellite base imagery. As such, boundary is approximate.
GOODWIN RD
CHANNEL MIGRATION ZONE
THORP DEPOT RD
THORP HWY NORTH
West Side Canal
I-90
project footprint (~75 ac)
study area (250' radius)
CHANNEL MIGRATION ZONE
Kittitas County Parcels 19588, 19589, 19590, 19591, 19592, 19593, 443233, 493233
Thorp Hwy North / Thorp Depot Rd
Unincorporated Kittitas County, Washington
0 500 ft
Direct questions regarding this map to:
Geoffrey T. Gray (GG Environmental)
509-426-5645 mobile/ gg@gg-env.com
Map date: May 14, 2022
FEMA: Yakima County COMPAS
GG Environmental

Appendix B. Precipitation Analysis

Precipitation analysis per NRCS (2015). All data were obtained from the AgACIS weather station[9] at Ellensburg. Fieldwork was completed on May 10, 2022.

Normal climatic conditions prevailed the previous three months prior to fieldwork (March to April). Shortly before fieldwork, 0.69 inches of rain fell within the prior 10 days.

	Month	Long-term rainfall records[1] (inches)			Total Rainfall Obs.[2]	Condition dry, wet, normal[3]	Condition Value	Month weight value[4]	Product of previous two columns
		3 yrs. in 10 less than	Average	3 yrs. in 10 more than					
1st prior month	Apr	0.35	0.59	0.71	1.07	Wet	3	3	9
2nd prior month	Mar	0.36	0.76	0.93	0.44	Normal	2	2	4
3rd prior month	Feb	0.59	0.91	1.10	T	Dry	1	1	1
								Sum	14[5]

[1] WETS table (NRCS 2022b); [2] Accumulated Daily Precipitation (NRCS 2022b); [3] WETS table "30% more than and 30% less than values ere referenced to compare recorded rainfall to statistically-normal precipitation; [4] Value: Dry = 1; Normal = 2; Wet = 3;
[5] 6-9: drier than normal, 10-14: normal, 15-18: wetter than normal.

Date (2022)	Precipitation Total (inches)
May 10 (fieldwork)	0
April 30 – May 9 (prior 10 days)	0.69

[9] (NRCS 2022b). AgACIS station: Ellensburg. Kittitas County (FIPS 53037).

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Appendix C. Photos

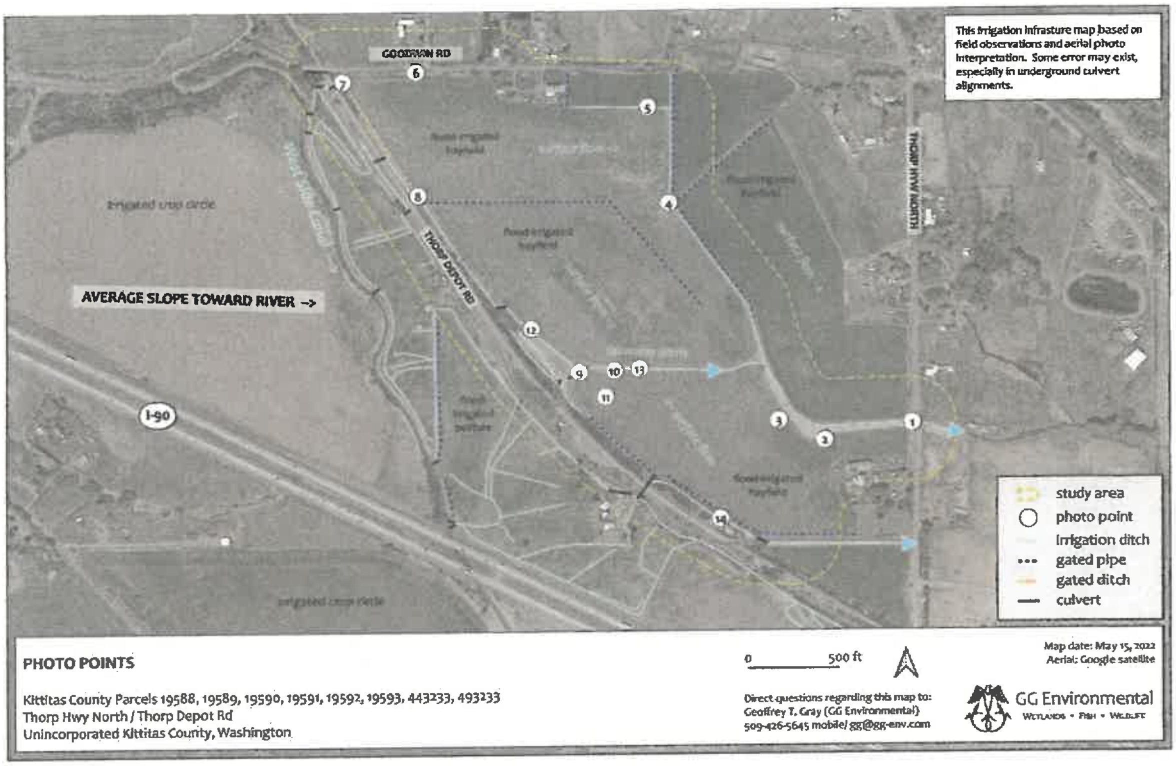

Photo 1
Irrigation ditch. View toward W.

Photo 2
Excavated pond. Groundwater at ~7 ft.
View toward SW.

Photo 3
Test pit. No groundwater to 3 ft.

Photo 4
Irrigation weir and pipes.
View toward E.

Photo 5
Irrigation ditch.
View toward W.

Photo 6
Type 2 (F) stream along Goodwin Rd.
View toward W.

Photo 7
Gated concrete irrigation ditch.
View toward S.

Photo 8
Gated concrete irrigation ditch to gated pipe.
View toward S.

Photo 9
Irrigation tailwater ditch convergence.
View toward NW.

Photo 10
Cattails near irrigation tailwater ditch.
View toward W.

Photo 11
Test pit with groundwater at 3 ft.
View toward NE.

Photo 12
Woody vegetation along irrigation ditch. View toward NW.

Photo 13
Irrigation tailwater ditch.
View toward E.

Photo 14
Irrigation ditch supporting woody vegetation.
View toward SE.