

PRELIMINARY HYDROLOGY STUDY

Taelor Solar Project

Weld and Morgan Counties, Colorado

FEBRUARY 8, 2022

PREPARED FOR:



PREPARED BY:

Westwood

Westwood

Preliminary Hydrology Study

Taelor Solar Project

Weld and Morgan Counties, Colorado

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Executive Summary

The purpose of this study is to analyze and review the existing hydrology of Phases 1 and 2 of the Taelor Solar Project (Project or Site) and any impacts that the hydrology may play in the design of the proposed solar array. This report was prepared to be used by the Project Team in the design and layout of the Project and not intended for submittal to reviewing agencies for stormwater permitting.

The Project Site is proposed on approximately 17 square miles and is located within Weld and Morgan Counties, Colorado, approximately 2.75 miles southwest of the city of Wiggins in Morgan County, Colorado. The Site is located on rough and varying land that generally slopes inwards towards the onsite reaches. The modeled watershed area encompasses approximately 94 square miles and generally drains northeast.

The analysis of the 100-year, 24-hour storm shows low water depths and velocities (Exhibits 7 through 8A) across the majority of the Site, outside of the onsite reaches and creeks. Higher flood depths and velocities exist within these creeks and their surrounding area. The floodplains onsite are fairly large; however, the flooding is generally well-contained within the floodplain limits. There are also scattered low-lying areas with localized ponding across the Project Site. Minimal velocities and scour are expected on site, outside of the onsite reaches and floodplains, due to the rough terrain and lack of consistent steep slopes.

The analysis of the 50-year, 24-hour storm event yielded similar results to those of the 100-year, 24-hour storm, but with slightly less severe depths, velocities, and scour (Exhibits 10-12).

Based on experience with similar projects, the majority of the Site is suitable for the planned development; however there are portions of the site which will be unusable for solar development, based on the presences of hazardous flows and velocities.

1.0 Data Sources

Table 1 – Data Sources

Task	Format	Source	Use
Elevation	2ft LiDAR	The National Map	FLO-2D Model Elevations
Crop Data	Shapefile	USDA 2013 Crop Data Layer	Landcover
Soils	Shapefile	USGS SSURGO Dataset	Curve Numbers
Precipitation	PDF File	NOAA Atlas 14	Design Storms
HUC-12 Drainage Boundary	Shapefile	USGS	Define Model Extents
Site Boundary	Taelor Solar - Max Footprint2.shp	Balanced Rock Power	Define Model Extents
2014 Aerial Photography	ArcGIS Map Service	USDA FSA	Reference
FEMA Flood Zones	PDF; Shapefile	FEMA	Reference
Culvert Locating and Sizing	Aerial Imagery	Google Earth	Culvert Modeling
Peak Flowrates	PDF	USGS StreamStats	Inflow Hydrographs

2.0 Coordinate System

Table 2 – Coordinate System Used

Projection	State Plane Coordinate System
Zone	Colorado North (FIPS 501)
Datum	NAD83
Planar Units	Feet (U.S. Survey)

3.0 Existing Conditions

3.1 Project Location

The Project Site, Phases 1 and 2 of the Taelor Solar Project, covers approximately 17 square miles and is located within Weld and Morgan Counties, Colorado (Exhibit 1). The Project Site is located approximately 50 miles northeast of Denver, with the nearest town being Wiggins in Morgan County, Colorado. Wiggins is located 2.75 miles northeast of the Project Area (Exhibit 1).

3.2 Watershed Hydrology

The modeled watershed area encompasses approximately 94 square miles that generally discharges to the northeast. The watershed is primarily defined by Kiowa Creek, which originates south of the Project, entering the Project through its southwest corner and flowing northeast through its limits. Kiowa Creek is defined by a fairly wide floodplain, which can range from 2,000 ft to over a mile in width.

Jack Rabbit Creek flows into Kiowa Creek just within the southwest limits of the Site, also originating from the south, but just west of Kiowa Creek.

Rock Creek enters the watershed from the south, approximately 5 miles east of Kiowa Creek, and then flows north through the eastern portion of the Site. Rock Creek then flows into Kiowa Creek within the northeastern corner of the Project.

An additional unnamed tributary of Kiowa Creek enters the watershed from the southeast. The tributary flows north-northwest just east of the project, before flowing into Kiowa Creek roughly 2,500 ft downstream of its junction with Rock Creek, just off the eastern limits of the Site.

See Exhibits 2 and 3 for geospatial displays of the watershed and its features.

3.3 Onsite Conditions

The Project is located on varying landscape, defined by several reaches as well as distributed patches of rougher terrain. The northwestern portion of the site generally is rougher, containing rolling slopes of 1% to 4%, with rougher distributions of a sort of prairie-pothole landscape, defined by many pockets of low-lying depressions. This area minimally discharges; however, there is a subtle drainage pattern towards Kiowa Creek to the southeast.

The majority of the stretch of land extended from the southwestern corner to the northeastern corner of the Site is defined by the channel and floodplain of Kiowa Creek. The floodplain is generally flatter, with more consistent slopes generally less than 0.5%. The southeastern banks are generally made up of rolling terrain with slopes generally between 1% to 4%, whereas the northwestern banks are more

comprised of the rough, prairie-pothole landscape. Kiowa Creek discharges offsite to the northeast.

The eastern portion of the project is generally covered by the channel and floodplain of Rock Creek, as it flows north and merges with Kiowa Creek. The banks are generally made up of the rolling landscape; however, there are small instances of isolated rough prairie-pothole patches. The majority of the runoff from this portion of the site discharges offsite to the northeast via Kiowa Creek.

US Fish and Wildlife Service National Wetlands Inventory (NWI Wetlands) provides information on the distribution of US wetlands and are shown in Exhibit 3. The NWI Wetlands dataset is not all-inclusive and other wetlands not shown may exist. The landcover on the Project area is primarily pastureland and agricultural row crops (Exhibit 6) and has soils that are primarily belonging to Hydrologic Soil Group (HSG) A (Exhibit 5). Typically, A soils are sands.

The main potential hydrologic issues on Site are riverine flooding and erosive velocities, although isolated pockets of ponding should also be considered.

3.4 FEMA Flood Zones

FEMA has completed a study to determine flood hazards for the selected location; the project area is covered by FIRM panels 08087C0575D, 08123C2035E, 08123C2050E, and 08087C0555D (Appendix C). FIRM panels 08123C2035E and 08123C2050E are within Weld County and have not yet been printed; however, electronic flood zones have been delineated for portions of these panels. The Project contains areas of FEMA Zone A flood hazards (Exhibits 3, 7, and 10), particularly associated with Rock Creek and the portions of Kiowa Creek within Morgan County. A FEMA Zone A flood hazard is a 100-year flood hazard with no defined base flood elevation. Preliminary FIRM panels have been issued for Weld County; however, they have not yet been made available or effective.

4.0 Proposed Conditions

4.1 Proposed Conditions

The majority of the proposed solar facility will consist of above ground mounted solar modules. A climate-specific grass seed mix should be planted below the modules and would make up a majority of the land cover. A small amount of impervious surface will be added from the gravel access roads and electrical equipment pads. The Project should be designed to minimize grading and maintain existing drainage patterns. A flood analysis of pre-development and post development depths may need to be completed once civil design is finalized for permitting purposes.

4.2 Post-Construction Stormwater Management

A desktop review of Weld County and Morgan County Stormwater Management and Drainage Requirements identified the 2020 Weld County Engineering and Construction Criteria manual, the Morgan County Zoning Regulations, and the Mile High Flood District (MHFD) Criteria Manual. As the Site design progresses, these manuals and documents should be referenced in order to assure that the Site design complies with any rate control, volume control, or water quality requirements that are outlined within them.

The typical solar project's low-impact development technique of converting the land cover from a row crop field to a meadow grass will provide post-construction stormwater management to meet most agency requirements. The proposed meadow grass will act as a vegetated filter providing both runoff treatment and reduction when compared to existing conditions. As the Project design advances, the post-construction stormwater management should be reviewed in further detail with the County Engineer.

5.0 FLO-2D Modeling

5.1 FLO-2D Modeling Overview

FLO-2D is a physical process model that routes rainfall runoff and flood hydrographs over flow surfaces or in channels using the dynamic wave approximation to the momentum equation. FLO-2D offers advantages over 1-D models and unit hydrograph methods by allowing for breakout flows and visualization of flows across a potential site. The primary inputs are a DTM (elevation data), curve numbers, and precipitation. No culverts were included in the model; all roadways and berms were assumed to overtop.

A FLO-2D model with 50-foot grid cells was utilized to model the watershed within and directly impacting the Project Site.

5.2 Elevation Data

The elevation data input into the FLO-2D model was 2ft LiDAR data from The National Map (Exhibit 6). This data was exported as a single digital terrain model (DTM), which is read directly into FLO-2D.

5.3 Watershed Soils and Land Cover

USDA-NRCS SSURGO soil data provides soil types within the Project boundary and full coverage of the contributing watershed. Soils are primarily classified as Hydrologic Soil Group (HSG) A within the Project boundary (Exhibit 4). Land cover was obtained from the USDA 2013 Crop Data Layer. Exhibit 5 displays the land cover classes for the entire watershed. Curve numbers were applied to each

grid cell in the FLO-2D model based on intersecting the grid with the curve numbers (Exhibit 6).

5.4 Precipitation

Precipitation data was downloaded from NOAA Atlas 14 (Appendix A) and used for the FLO-2D analysis for the 100-Year and 50-Year, 24-Hour storm events. Using the 100-Year and 50-Year rainfall depths of 4.54 inches and 3.95 inches, respectively, for this location allows for the best initial analysis in order to determine the worst areas of flooding and erosion during multiple different storm events. Rainfall inputs were distributed based on a site-specific nested Atlas 14 distribution pattern.

5.5 Inflows

Jack Rabbit Creek, Kiowa Creek, Rock Creek, and an Unnamed Tributary of Kiowa Creek all flow into the modeled watershed. USGS StreamStats provides 50-year and 100-year peak flow rates for these reaches (Appendix D). In order to account for these flows, inflow hydrographs were created at each location where these reaches enter the modeled watershed. Table 3 below displays the flow rates for each reach and flood event. See Exhibits 7 and 10 for inflow locations.

Table 3 – Inflow Rates

Reach	50-Year Peak Flow (cfs)	100-Year Peak Flow (cfs)
Jack Rabbit Creek	3,250	4,660
Kiowa Creek	28,900	40,700
Rock Creek	8,780	12,500
Unnamed Tributary	2,750	3,940

6.0 Flood Analysis Results

6.1 Existing Conditions Flood Analysis

The 100-year, 24-hour analysis shows low to moderate water depths and low velocities (Exhibits 7 through 8A) across the majority of the Site, outside of the influence of the onsite reaches. During a 100-year storm, the flood depths across the majority of the Project Area are less than 0.5 feet with velocities less than 1 foot/second, with the exception of the flows within the main onsite creeks and their associated floodplains. The 100-year flood depths within the onsite portions of the main channels of Kiowa Creek and Rock Creek can easily exceed 10ft, whereas the depths within the floodplains are generally between 2ft to 8ft. The area where the two creeks converge results in a large area of more significant flooding, due to the convergence of the creeks’ floodplains. Although the extents of the floodplains are fairly wide, the flooding within them is generally well-contained to the floodplain

limits. The 100-year peak velocities within the channels can exceed 13 ft/second, whereas the velocities within the floodplain are generally between 1 ft/second and 6 ft/second. The majority of flood depths and velocities associated with the unnamed tributary to the east do not directly encroach onto the Project Area itself.

In addition to the riverine flooding, there are additional areas of isolated flooding within the more prairie-pothole portions of the site, particularly to the northwest. The 100-year flood depths within these pothole areas are generally less than 5ft, but have minimal velocities due to their disconnected nature. The presence of HSG A soils within the Project will likely help these flood depths infiltrate more quickly. See Table 3 below for a breakdown of 100-year flood depths within the Project Site.

Table 4 – Flood Depths Onsite

Peak Flow Depth (ft)	Percentage of Project Area Covered by Peak Flow Depths
0.00 - 0.49	56.5%
0.50 - 1.00	4.5%
1.01 - 1.50	5.6%
1.51 - 2.00	6.4%
2.01 - 2.50	5.9%
2.51 - 3.00	4.6%
3.01 - 4.00	5.9%
4.01 - 6.00	6.6%
6.01+	4.0%

See Exhibits 7 through 8A for areas within the Project with higher flood depths and velocities during the 100-year, 24-hour storm.

Overall, the results of the 50-year, 24-hour storm model were similar to those of the 100-year, 24-hour storm, but with slightly lower extremes. The exceedance of 13 ft flood depths within the creek channels is less common during the 50-year storm, although it still occurs in some areas. The majority of channel depths are generally less than 10 ft. Similarly, the presence of floodplain depths in excess of 7ft is less common during the 50-year storm, with the majority of the floodplain depths being less than 5ft. Within the isolated ponding locations, flood depths rarely exceed 4ft. Channel velocities are generally less than 10 ft/second, with floodplain velocities generally between 1 ft/second and 5.5 ft/second. See Exhibits 7 through 8A for areas within the Project with higher flood depths and velocities during the 50-year, 24-hour storm.

6.2 Scour

Minimal scour is expected onsite, outside of the main reaches and their associated floodplains, during both the 50-year and 100-year storms (Exhibits 9 and 12). The scour depths calculated for this Project are based on HEC-18 Pier Scour Equations of a 6-inch-wide pile perpendicular to flow. Scour calculations consist of local scour only with unarmored soils and pile bases to provide the conservative local scour results. These scour results do not account for general, rill, or gully scour.

7.0 Recommendations

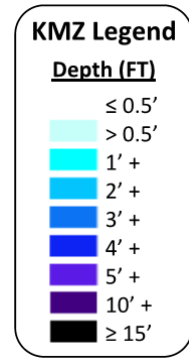
Based on experience on similar projects, the majority of the Site is suitable for the planned development; however, portions of the site, as is seen in Table 4 as well as Exhibits 7-12, will be unsuitable for solar development, due to the presence of hazardous flows and velocities. These areas should be reviewed and considered as Site design progresses, for areas of avoidance, as well as any potential locations where infrastructure could be designed to accommodate higher flood depths. Additionally, local stormwater requirements and regulations should be reviewed as the design progresses, in order to ensure Site compliance.

8.0 Next Steps

1. Final engineering design should account for the flood depths and velocities presented in Exhibits 7-11A.
2. Facilities to be elevated 1' above the 100-year, 24-hour peak flood elevations.
3. Proposed facilities should avoid FEMA Flood Zones located onsite.
4. Stormwater management should be revisited to ensure the final design meets the local and state requirements.

9.0 Included Output Files

1. Shapefile of 100-Year Rain Event Flow Depth
2022-02-08_Taelor_PrelimFlowDepthatCell_100yr.shp
 Attribute "ID" = Grid Cell Number
 Attribute "VAR" = Max Flow Depth (Feet)
2. Shapefile of 100-Year Rain Event Velocity
2022-02-08_Taelor_PrelimVelocityatCell_100yr.shp
 Attribute "ID" = Grid Cell Number
 Attribute "VAR" = Max Velocity (Feet)
3. Shapefile of 50-Year Rain Event Flow Depth
2022-02-08_Taelor_PrelimFlowDepthatCell_50yr.shp
 Attribute "ID" = Grid Cell Number
 Attribute "VAR" = Max Flow Depth (Feet)
4. Shapefile of 50-Year Rain Event Velocity
2022-02-08_Taelor_PrelimVelocityatCell_50yr.shp
 Attribute "ID" = Grid Cell Number
 Attribute "VAR" = Max Velocity (Feet)
5. KMZ of FLO-2D Results
2022-02-08_Taelor_PrelimFLO-2D.kmz
 Overlay in Google Earth for graphical representation.

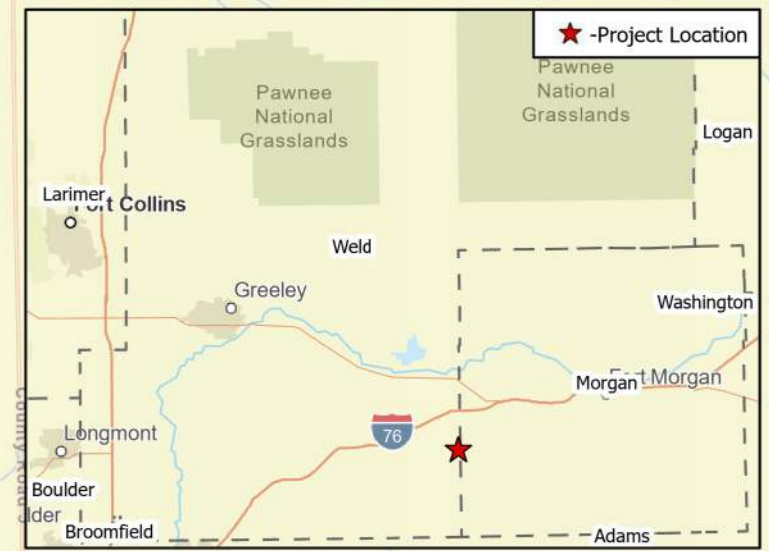
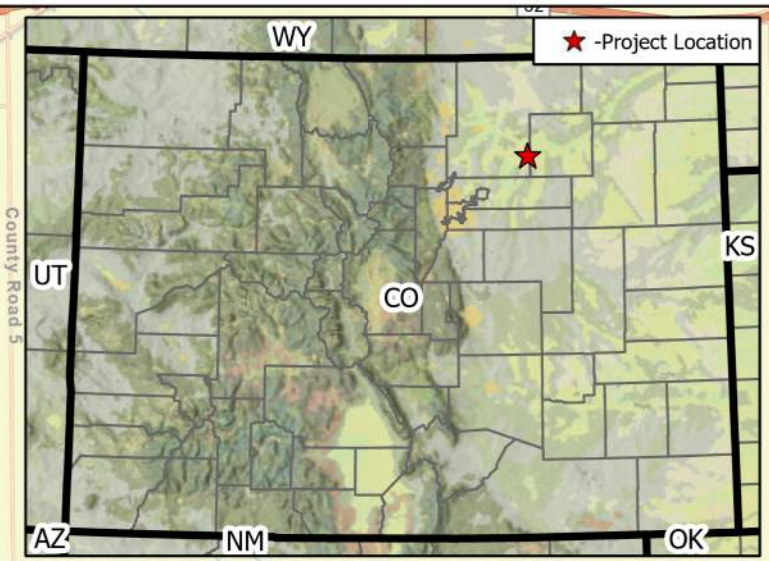
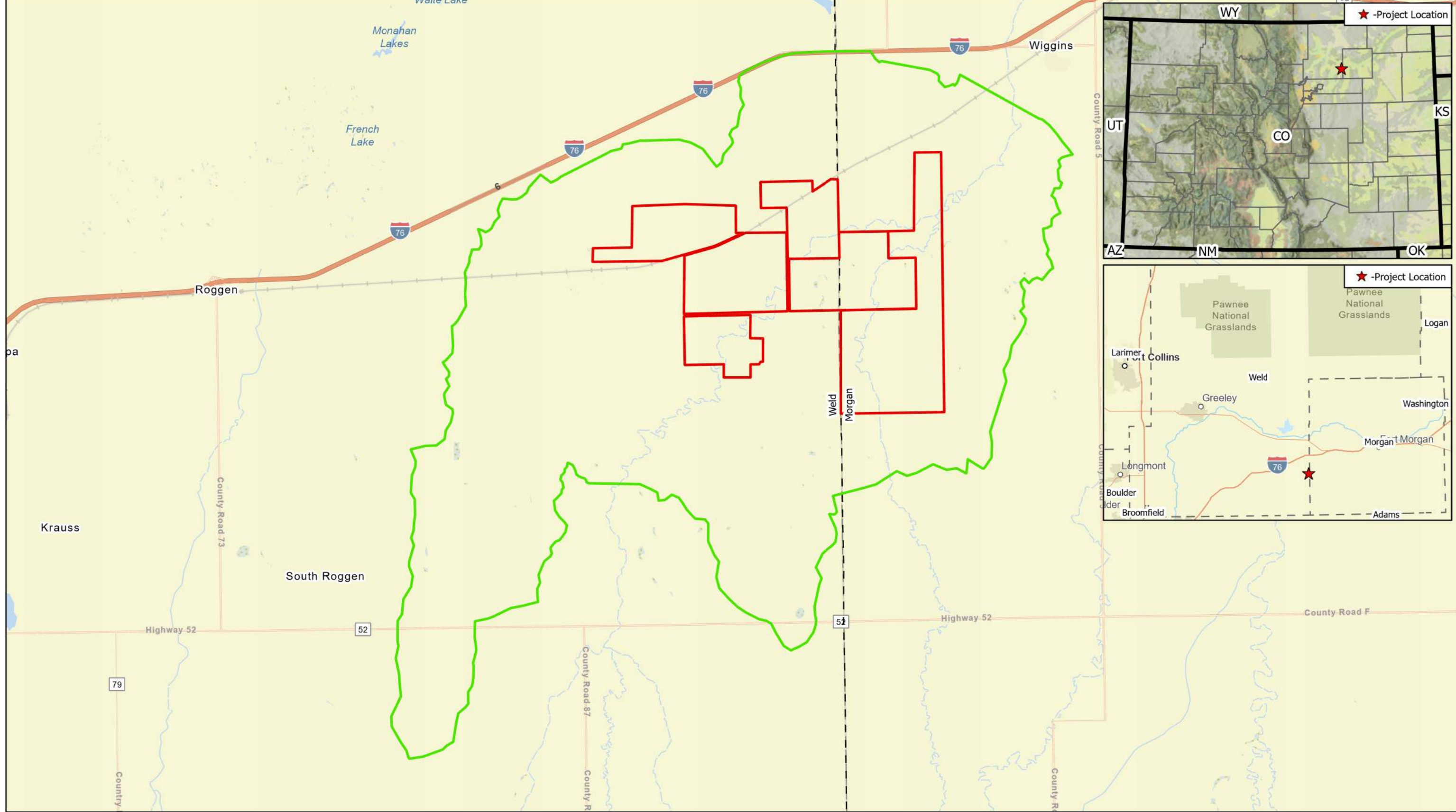


10.0 References Cited

- National Engineering Handbook, Part 630 Hydrology. Chapter 9 Hydrologic Soil-Cover Complexes. USDA. NRCS. 210-VI-NEH, July 2004
- The National Map, 2-ft DEM, Elevation data, Accessed February 2022, from <https://viewer.nationalmap.gov/basic/>
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- USDA 2013 Crop Data Layer, Landcover data, retrieved February 2022, from https://www.nass.usda.gov/Research_and_Science/Cropland/SARS1a.php
- FEMA Flood Insurance Rate Maps, retrieved February 2022, from <https://msc.fema.gov/portal/advanceSearch#searchresultsanchor>
- USGS Streamstats Flow Rates, retrieved February 2022, from https://www.usgs.gov/mission-areas/water-resources/science/streamstats-streamflow-statistics-and-spatial-analysis-tools?qt-science_center_objects=0#qt-science_center_objects
- Morgan County Zoning Regulations, retrieved February 2022, from <https://morgancounty.colorado.gov/sites/morgancounty/files/Zoning-Regulations-21819.pdf>
- Mile High Flood District. Criteria Manual, retrieved February 2022, from <https://mhfd.org/resources/criteria-manual-volume-3/>
- Weld County Engineering and Construction Criteria, retrieved February 2022, from <https://www.weldgov.com/files/sharedassets/public/departments/public-works/documents/evans-folder/2020-weld-county-engineering-and-construction-criteria-final-version-2021-03-17.pdf>

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Exhibits



Data Source(s): Westwood (2022); Esri WMS Basemap Imagery (Accessed 2022); USGS (2022); FEMA (2022); USDA (2022)

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Legend

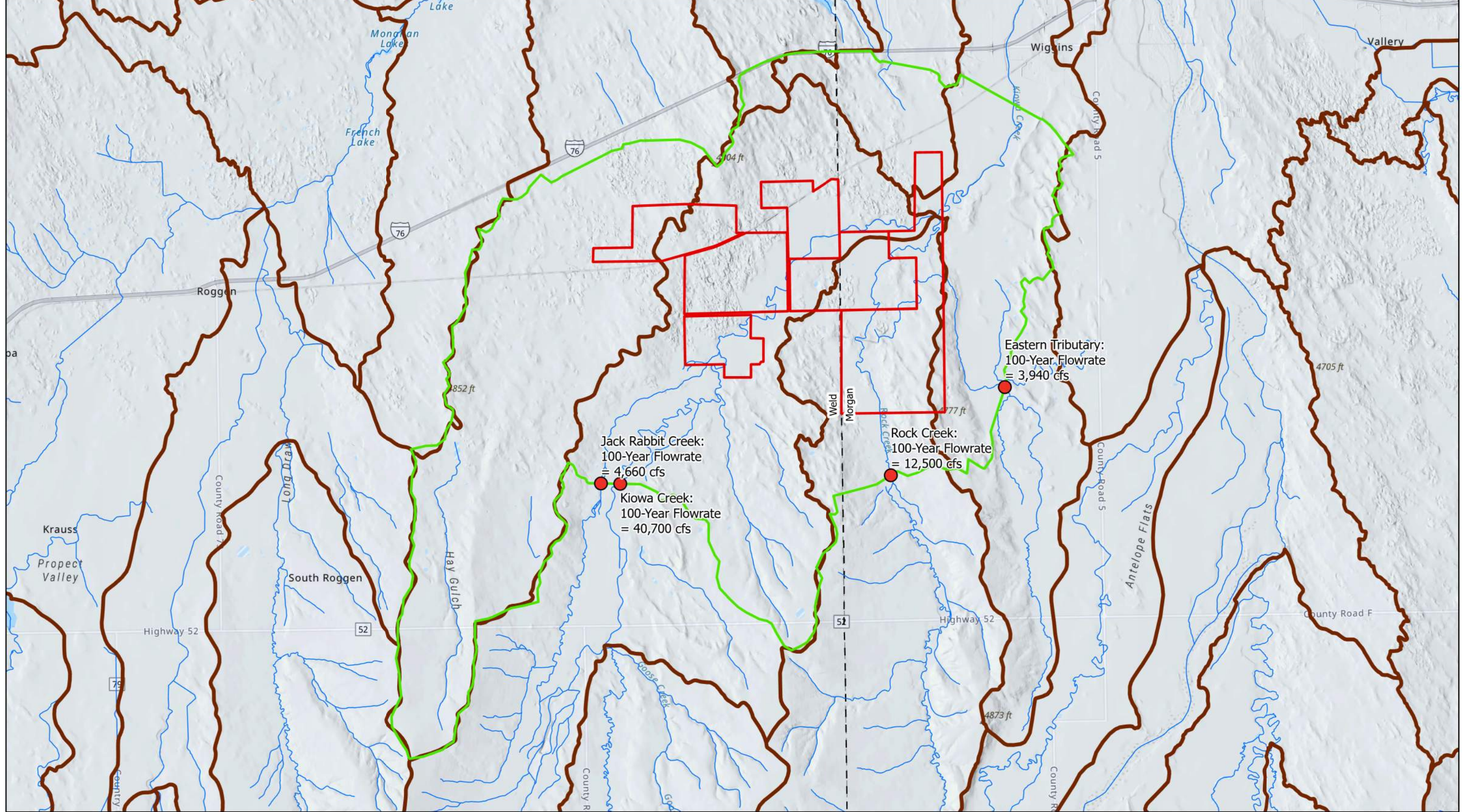
- Project Boundary- Phases 1 & 2
- FLO-2D Boundary
- County Boundary



Taelor Solar Project
Weld and Morgan Counties, Colorado

Exhibit 1: Location Map
February 7, 2022

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Location Map - Location Map | 2/7/2022 2:39 PM | G:\Powerant



Data Source(s): Westwood (2022); Esri WMS Basemap Imagery (Accessed 2022); USGS (2022); FEMA (2022); USDA (2022)

- Legend**
- Project Boundary- Phases 1 & 2
 - FLO-2D Boundary
 - County Boundary
 - HUC-12 Boundary
 - NHD Flowlines
 - Inflow Location

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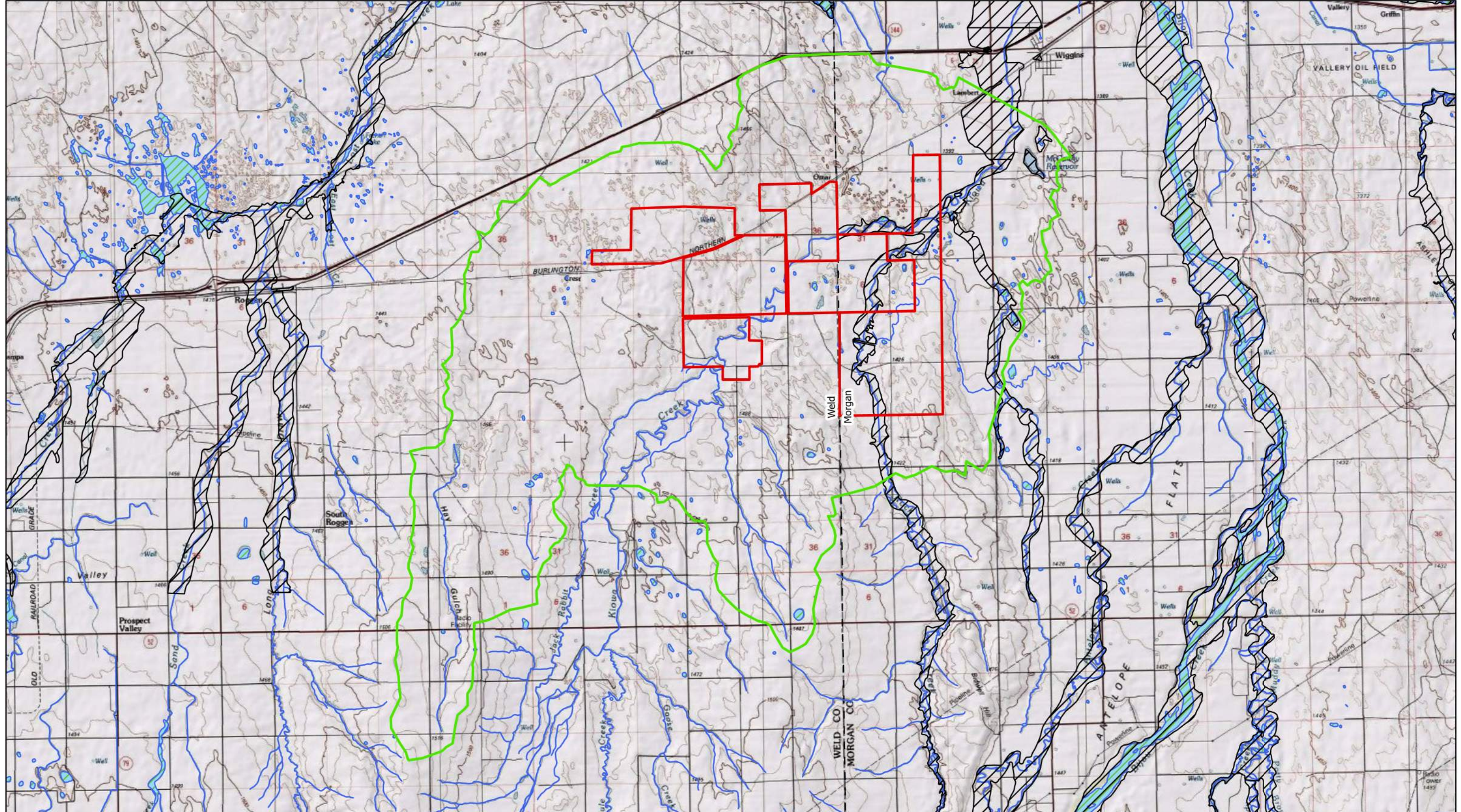
Taelor Solar Project

Weld and Morgan Counties, Colorado

Exhibit 2: Base Hydrologic Map

February 7, 2022






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Data Source(s): Westwood (2022); Esri WMS Basemap Imagery (Accessed 2022); USGS (2022); FEMA (2022); USDA (2022)

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Legend

-  Project Boundary- Phases 1 & 2
-  FLO-2D Boundary
-  County Boundary
-  FEMA Zone A
-  NWI Wetlands

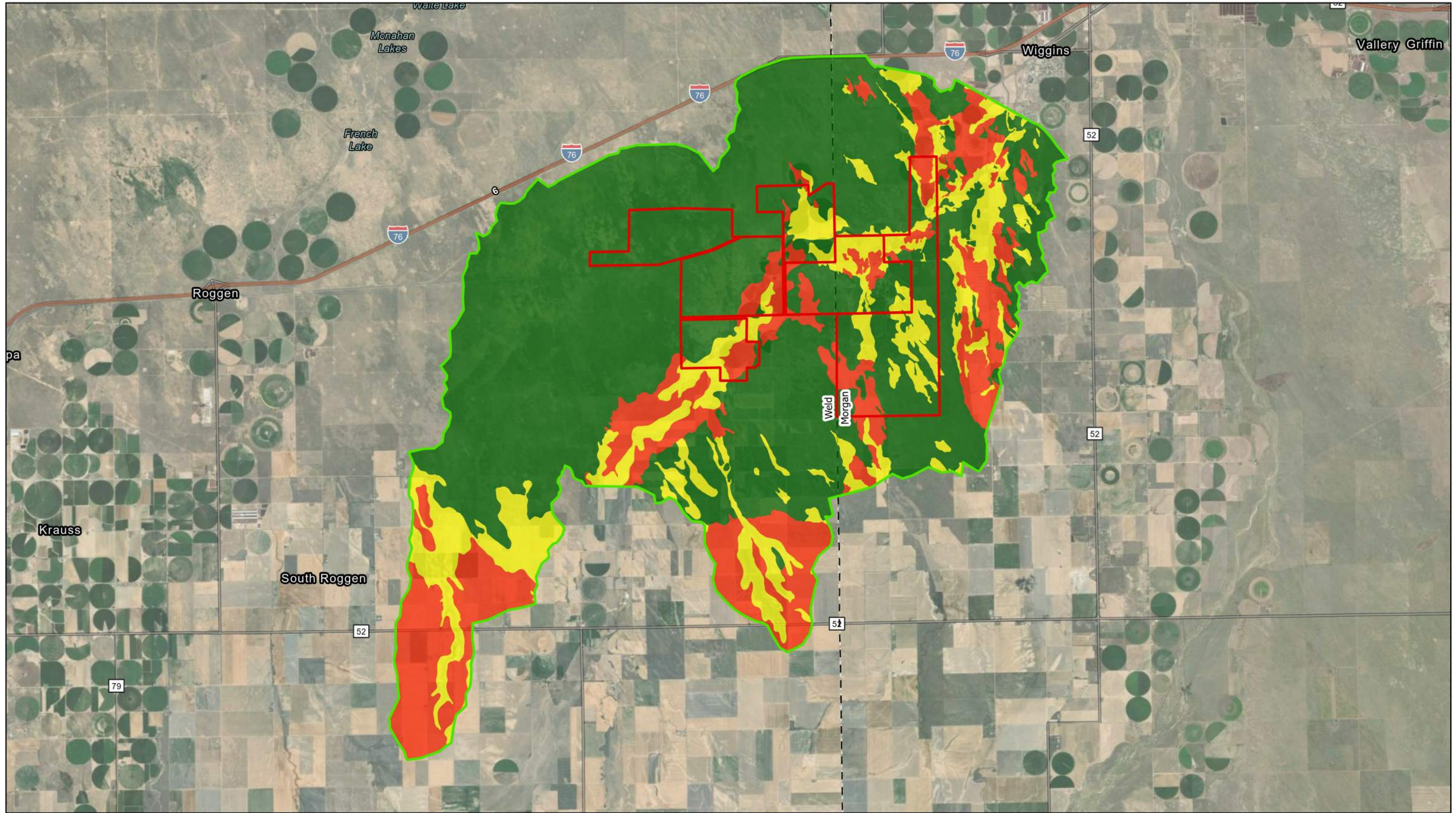


Taelor Solar Project

Weld and Morgan Counties, Colorado

Exhibit 3: USGS, FEMA, and NWI Wetlands Map

February 7, 2022



Data Source(s): Westwood (2022); Esri WMS Basemap Imagery (Accessed 2022); USGS (2022); FEMA (2022); USDA (2022)

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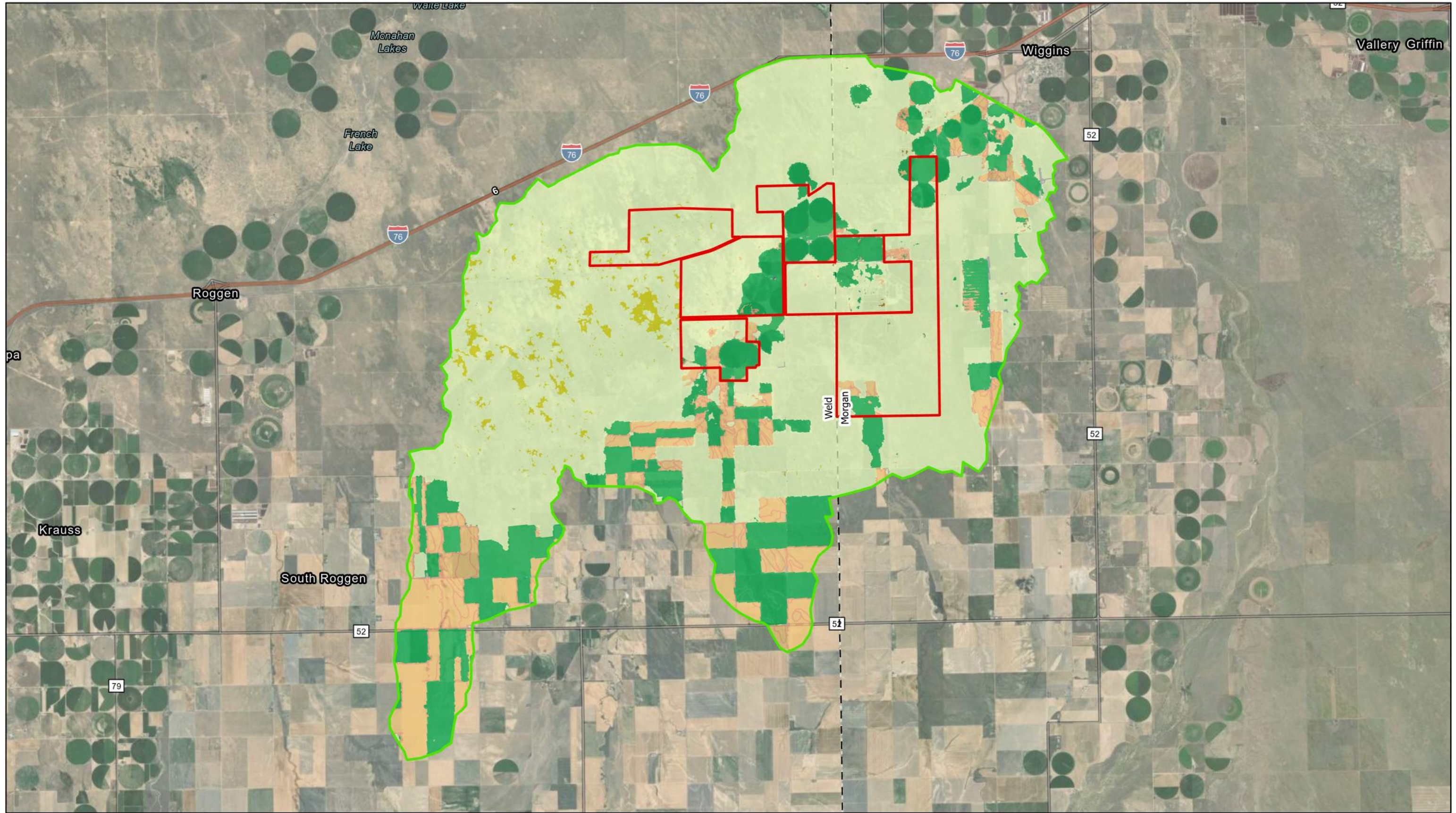
- Project Boundary- Phases 1 & 2
- FLO-2D Boundary
- County Boundary
- Hydrologic Soil Group**
- A
- B
- C



Taelor Solar Project
Weld and Morgan Counties, Colorado

Exhibit 4: Soils Map
February 7, 2022

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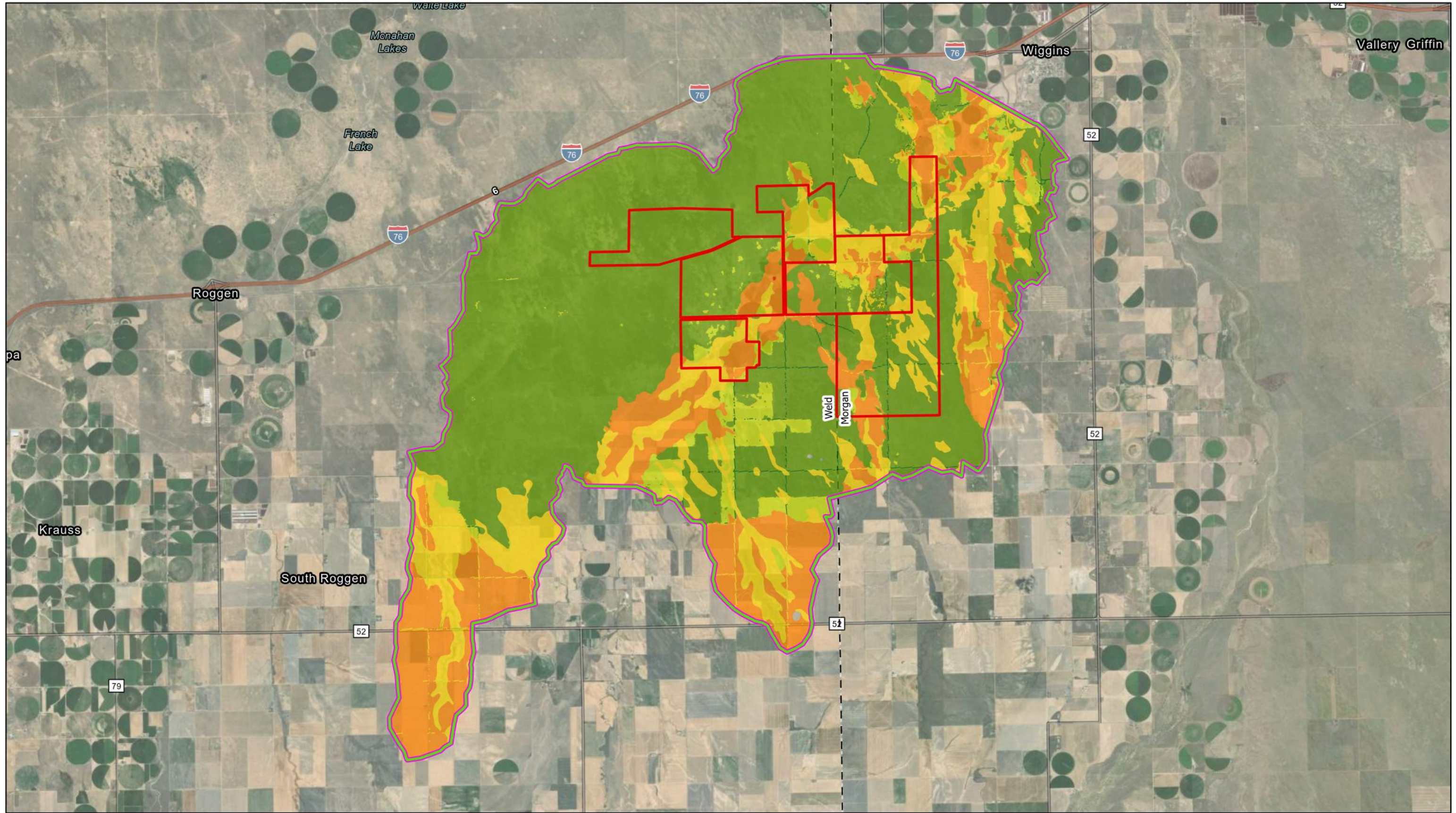
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Legend		
Project Boundary- Phases 1 & 2	Cultivated	Shrubland
FLO-2D Boundary	Developed	Water
County Boundary	Fallow	Wetland
Landcover		
Barren	Woods	Grassland/Pasture



Taelor Solar Project
Weld and Morgan Counties, Colorado

Exhibit 5: Landcover Map
February 7, 2022



Data Source(s): Westwood (2022); Esri WMS Basemap Imagery (Accessed 2022); USGS (2022); FEMA (2022); USDA (2022)

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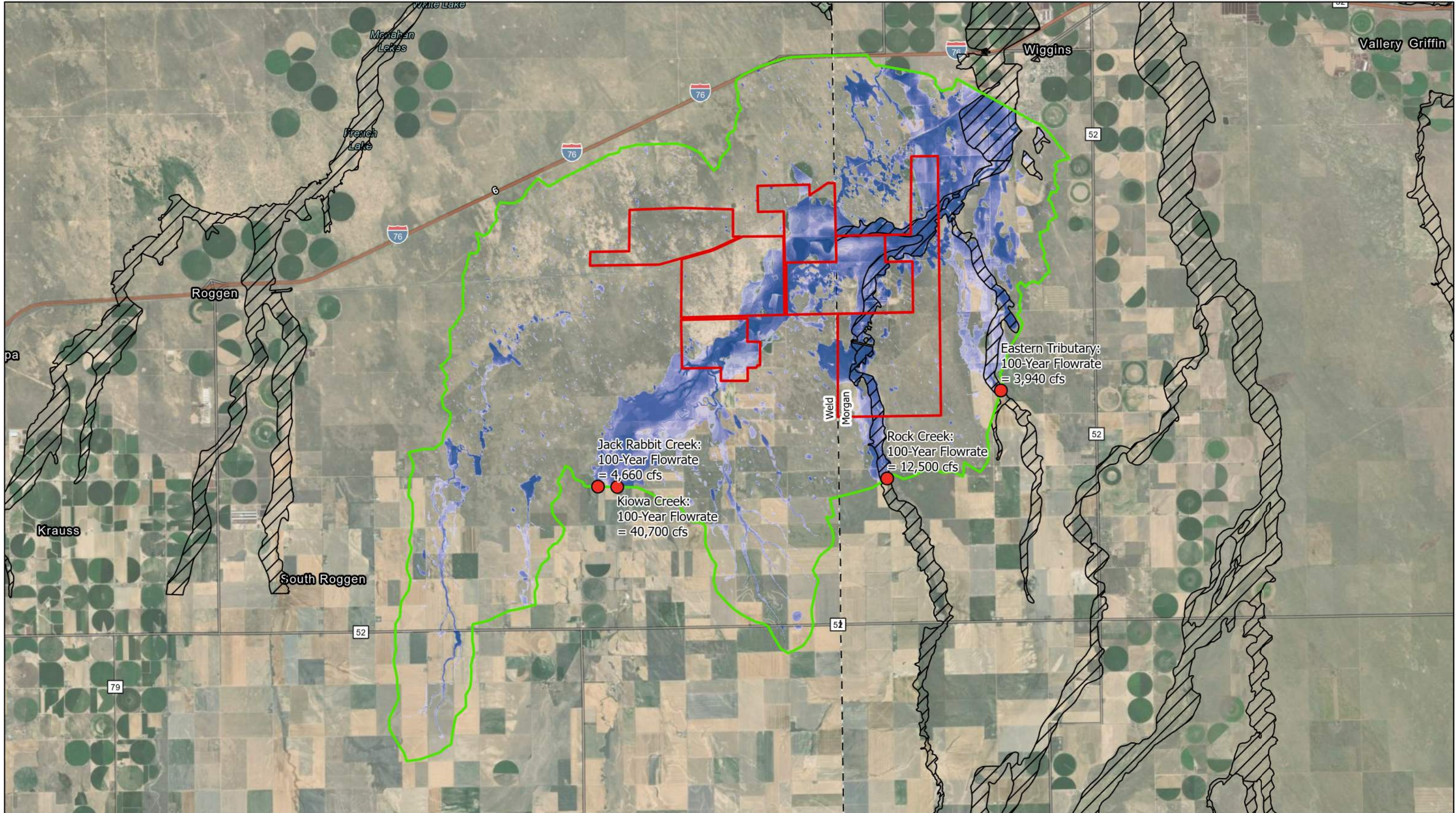
Legend

- | | | |
|--------------------------------|--------------|---------|
| Project Boundary- Phases 1 & 2 | Curve Number | 70 - 79 |
| FLO-2D Boundary | 40 - 49 | 80 - 89 |
| County Boundary | 50 - 59 | 90 - 99 |
| 2-ft LiDAR Extents | 60 - 69 | |



Taelor Solar Project
Weld and Morgan Counties, Colorado
Exhibit 6: Curve Number and Topographic Source Map
February 7, 2022

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Data Source(s): Westwood (2022); Esri WMS Basemap Imagery (Accessed 2022); USGS (2022); FEMA (2022); USDA (2022)

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Legend

- | | | | |
|---|--|--|--|
| Project Boundary- Phases 1 & 2 | ● Inflow Location | 1.51 - 2.00 | 4.01 - 6.00 |
| FLO-2D Boundary | Max Water Depth (ft) | 2.01 - 2.50 | 6.01 + |
| County Boundary | 0.50 - 1.00 | 2.51 - 3.00 | |
| FEMA Zone A | 1.01 - 1.50 | 3.01 - 4.00 | |

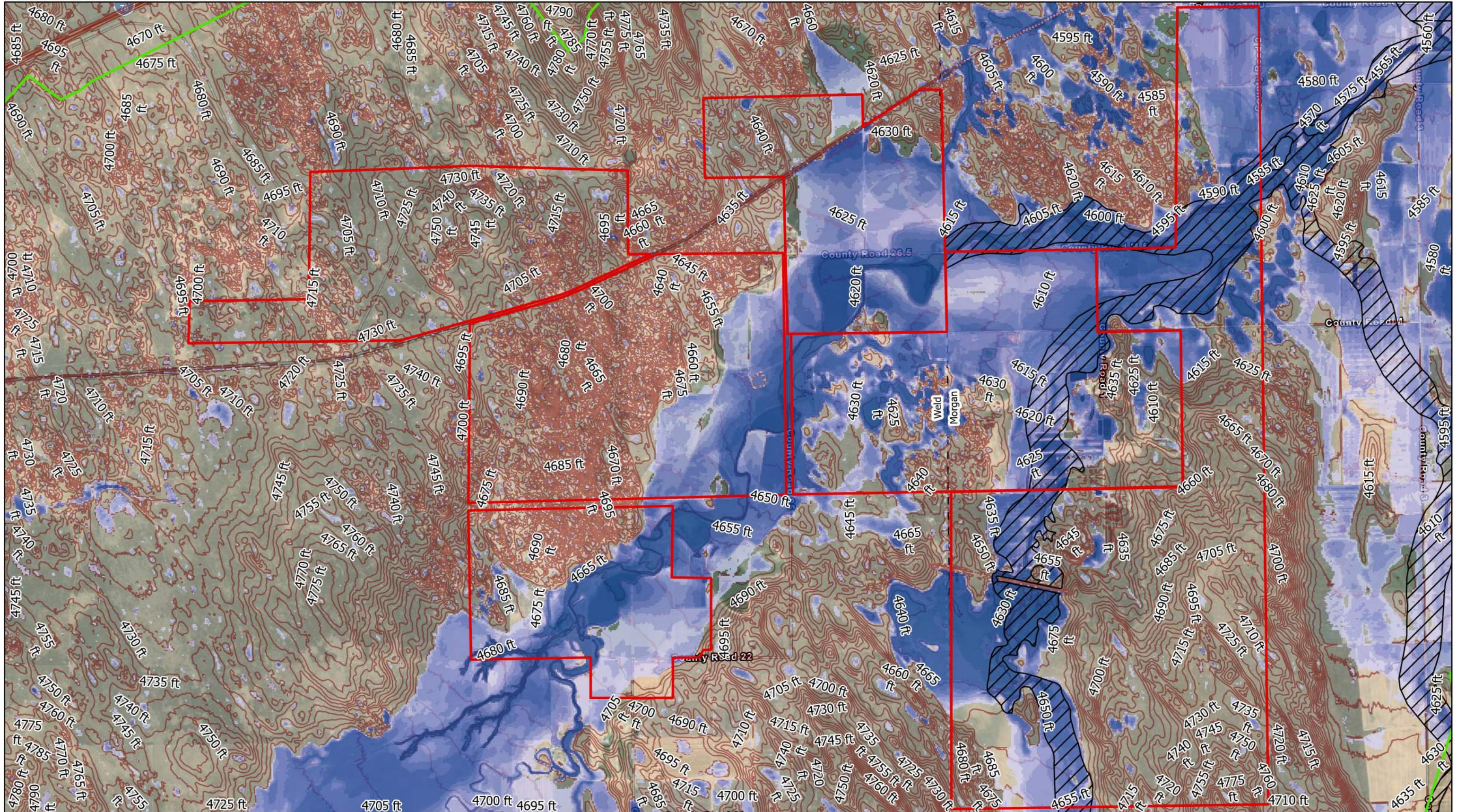


Taelor Solar Project

Weld and Morgan Counties, Colorado

Exhibit 7: 100-Year
Max Water Depth Map

February 7, 2022



Data Source(s): Westwood (2022); Esri WMS Basemap Imagery (Accessed 2022); USGS (2022); FEMA (2022); USDA (2022)

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Legend

- | | | | |
|--------------------------------|-----------------------------|-------------|-------------|
| Project Boundary- Phases 1 & 2 | 5-foot Contours | 1.51 - 2.00 | 4.01 - 6.00 |
| FLO-2D Boundary | Max Water Depth (ft) | 2.01 - 2.50 | 6.01 + |
| County Boundary | 0.50 - 1.00 | 2.51 - 3.00 | |
| FEMA Zone A | 1.01 - 1.50 | 3.01 - 4.00 | |

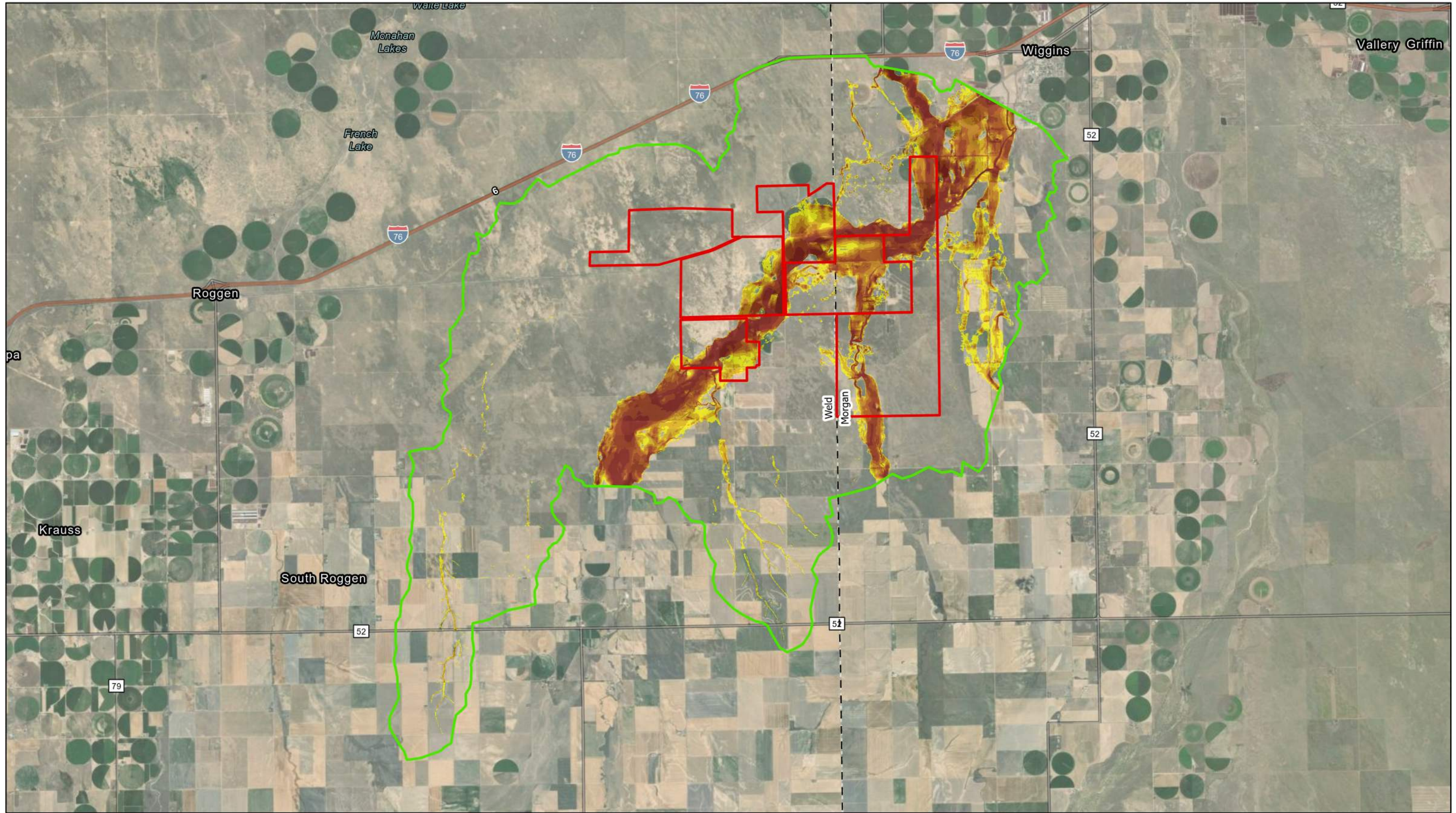


Taelor Solar Project

Weld and Morgan Counties, Colorado

Exhibit 7A: 100-Year Max Water Depth Project Area Map

February 7, 2022



Data Source(s): Westwood (2022); Esri WMS Basemap Imagery (Accessed 2022); USGS (2022); FEMA (2022); USDA (2022)

Westwood
Toll Free (888) 937-5150 westwoodps.com

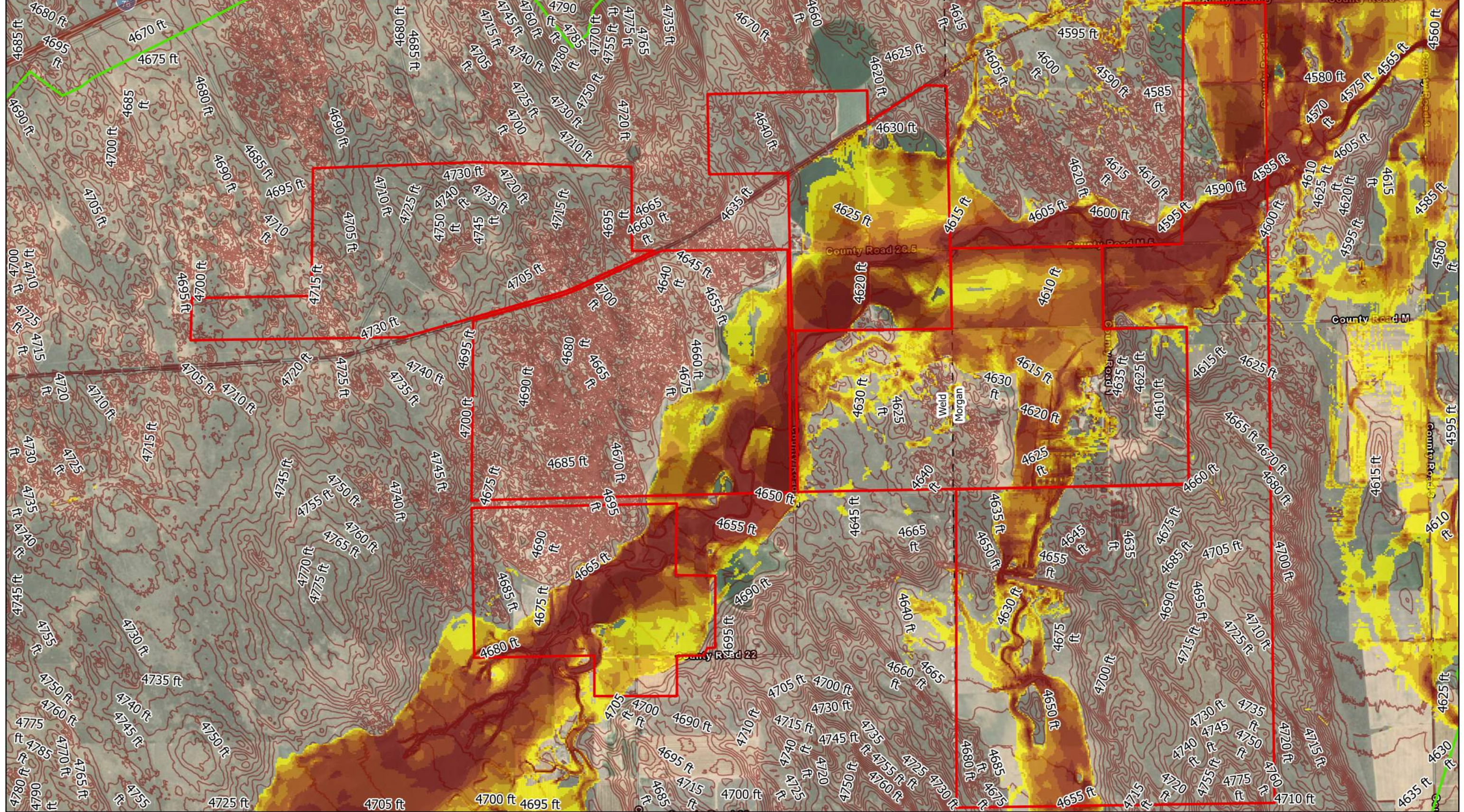
Legend

- | | | |
|--------------------------------|----------------------------|-------------|
| Project Boundary- Phases 1 & 2 | Peak Velocity (fps) | 2.51 - 3.00 |
| FLO-2D Boundary | 1.00 - 1.50 | 3.01 - 4.00 |
| County Boundary | 1.51 - 2.00 | 4.01 + |
| | 2.01 - 2.50 | |



Taelor Solar Project
Weld and Morgan Counties, Colorado
Exhibit 8: 100-Year Peak Velocity Map
February 7, 2022

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100 Yr Peak Velocity Map - 100 Yr Peak Velocity | 2/7/2022 3:05 PM | G:\Powerant



Data Source(s): Westwood (2022); Esri WMS Basemap Imagery (Accessed 2022); USGS (2022); FEMA (2022); USDA (2022)

Westwood
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Legend

Project Boundary- Phases 1 & 2	Peak Velocity (fps)	2.51 - 3.00
FLO-2D Boundary	1.00 - 1.50	3.01 - 4.00
County Boundary	1.51 - 2.00	4.01 +
5-foot Contours	2.01 - 2.50	



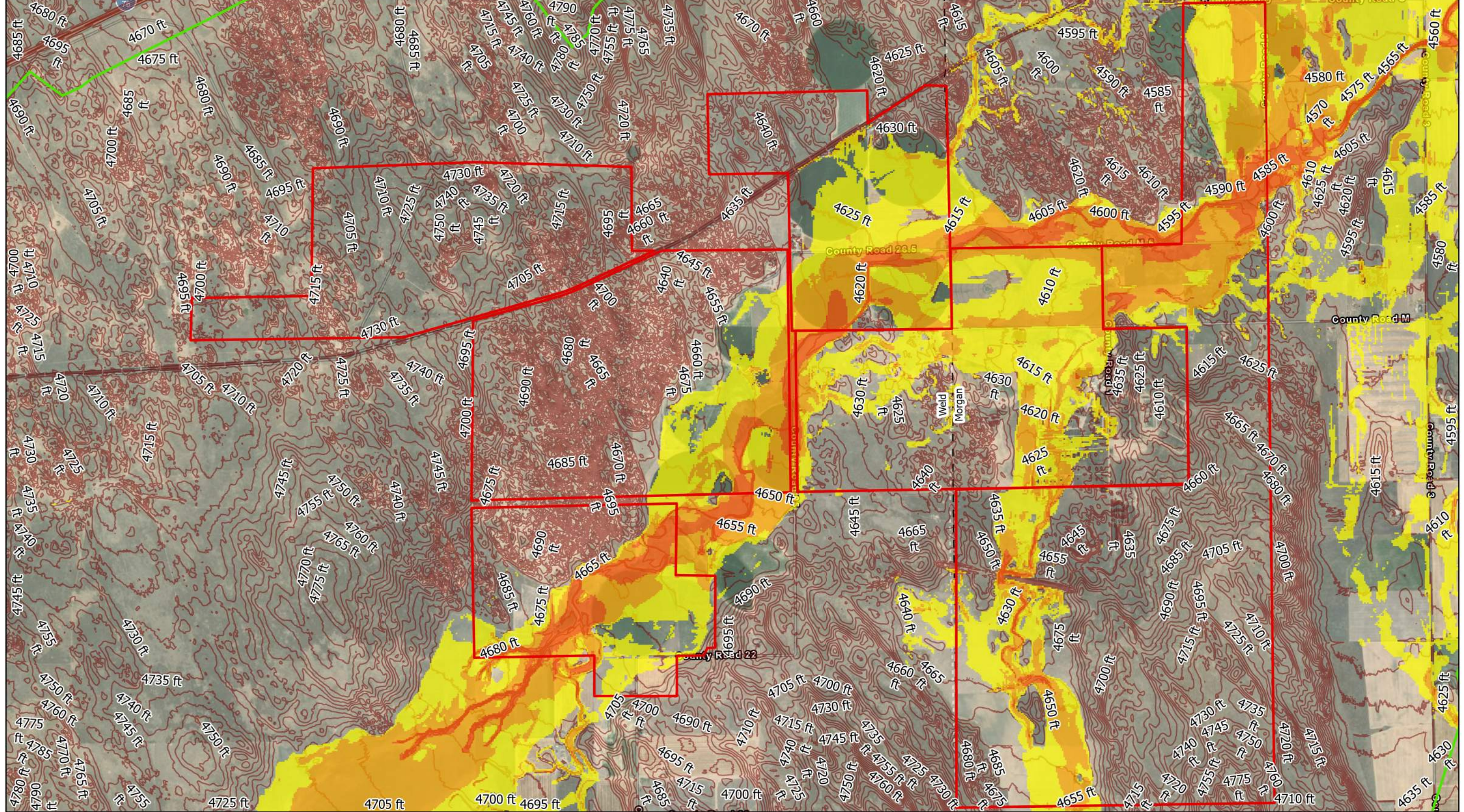
Taelor Solar Project

Weld and Morgan Counties, Colorado

Exhibit 8A: 100-Year Peak Velocity Project Area Map

February 7, 2022

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100 Yr Peak Velocity Project Area Map - 100 Yr Peak Velocity Project Area | 2/7/2022 3:06 PM | G:\P\overan



Data Source(s): Westwood (2022); Esri WMS BaseMap Imagery (Accessed 2022); USGS (2022); FEMA (2022); USDA (2022)

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Legend

Project Boundary- Phases 1 & 2	5-foot Contours	1.51 - 2.00
FLO-2D Boundary	Scour (ft)	2.01 +
County Boundary	1.00 - 1.50	

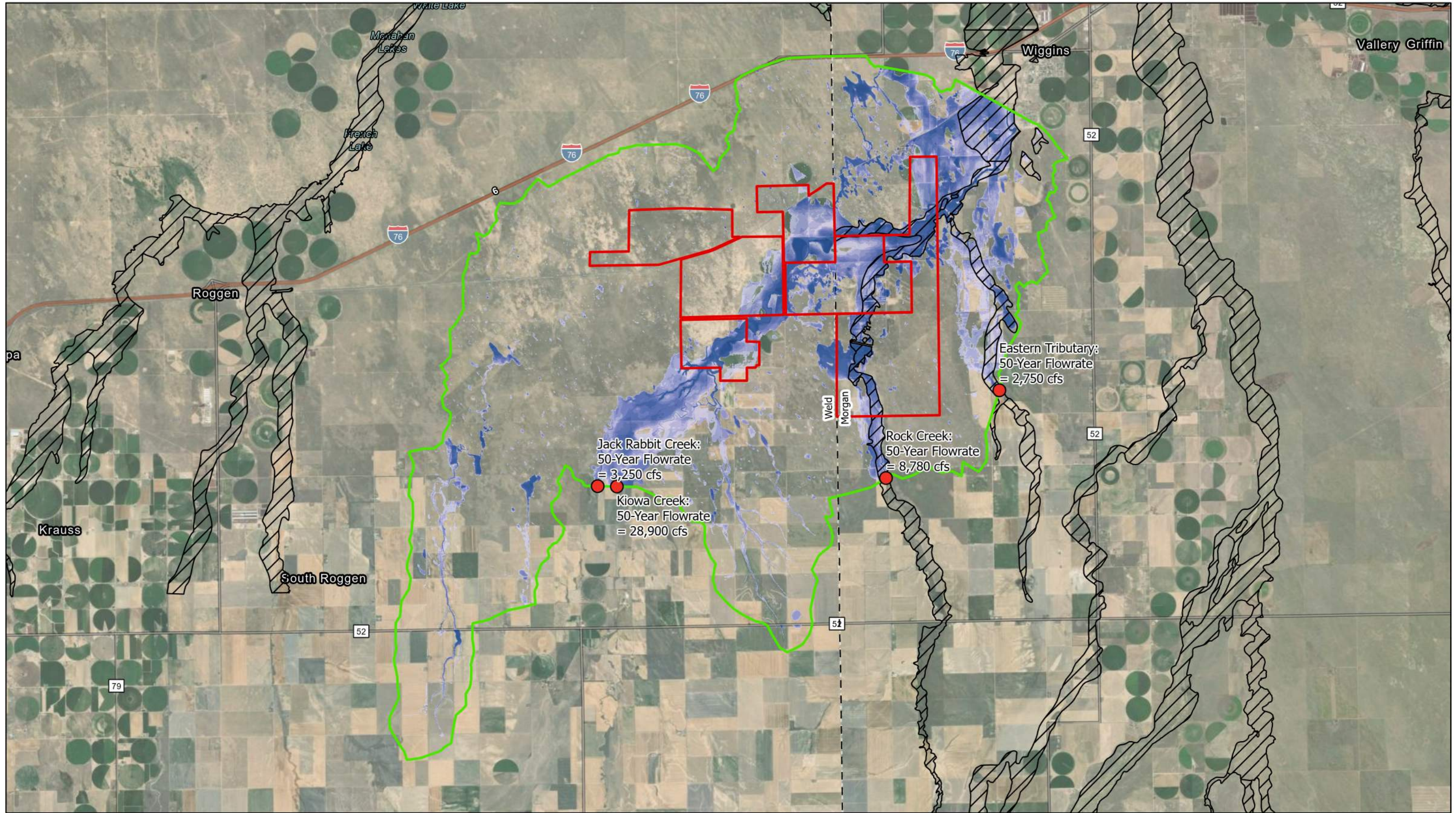


Taelor Solar Project

Weld and Morgan Counties, Colorado

Exhibit 9: 100-Year Scour Map
February 7, 2022

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100 Yr Scour Map - 100 Yr Scour 1/27/2022 3:07 PM | G:\powerent



Data Source(s): Westwood (2022); Esri WMS Basemap Imagery (Accessed 2022); USGS (2022); FEMA (2022); USDA (2022)

Westwood
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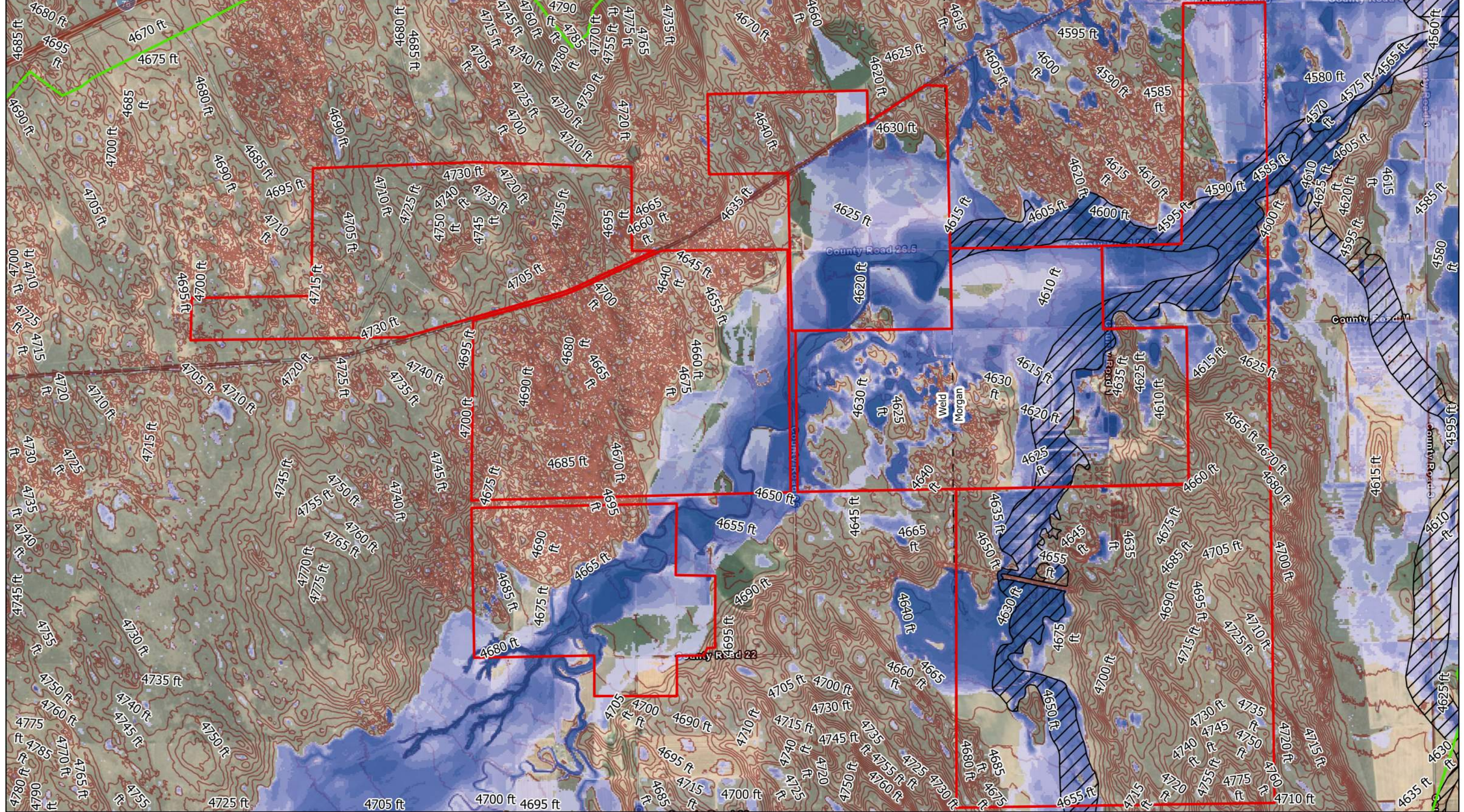
Legend

- Project Boundary- Phases 1 & 2
- FLO-2D Boundary
- County Boundary
- FEMA Zone A
- Inflow Location
- Max Water Depth (ft)**
- 0.50 - 1.00
- 1.01 - 1.50
- 1.51 - 2.00
- 2.01 - 2.50
- 2.51 - 3.00
- 3.01 - 4.00
- 4.01 - 6.00
- 6.01 +



Taelor Solar Project
Weld and Morgan Counties, Colorado
Exhibit 10: 50-Year
Max Water Depth Map
February 7, 2022

N:\0034725\00_GIS\Hydro_Exhibits\2022-02-07 Taelor Hydro Exhibits\10-12 Taelor Solar Project.aprx
50 Yr Max Water Depth Map - 50 Yr Max Water Depth | 2/7/2022 3:30 PM | G:\Powerant



Data Source(s): Westwood (2022); Esri WMS Basemap Imagery (Accessed 2022); USGS (2022); FEMA (2022); USDA (2022)

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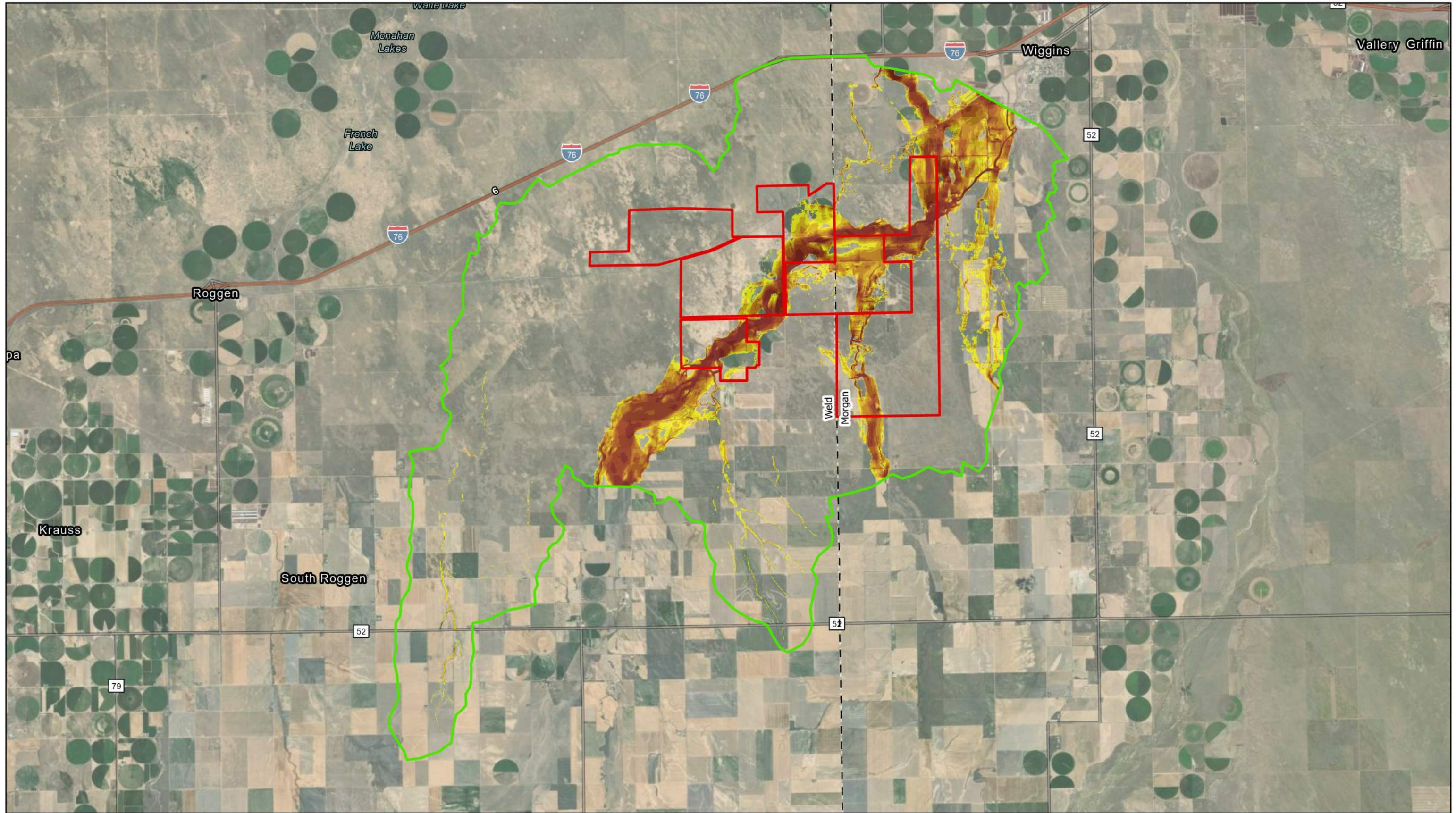
Legend

- Project Boundary- Phases 1 & 2
- FLO-2D Boundary
- County Boundary
- FEMA Zone A
- 5-foot Contours
- 0.50 - 1.00
- 1.01 - 1.50
- 1.51 - 2.00
- 2.01 - 2.50
- 2.51 - 3.00
- 3.01 - 4.00
- 4.01 - 6.00
- 6.01 +



Taelor Solar Project
Weld and Morgan Counties, Colorado
Exhibit 10A: 50-Year Max Water Depth Project Area Map
February 7, 2022

N:\0034725.00\GIS\Hydro\Exhibits\2022-02-07 Taelor Hydro Exhibits 10-12\Taelor Solar Project.aprx
50 Yr Max Water Depth Project Area Map - 50 Yr Max Water Depth Project Area | 2/7/2022 3:30 PM | G:\Powerent



Data Source(s): Westwood (2022); Esri WMS Basemap Imagery (Accessed 2022); USGS (2022); FEMA (2022); USDA (2022)

Westwood
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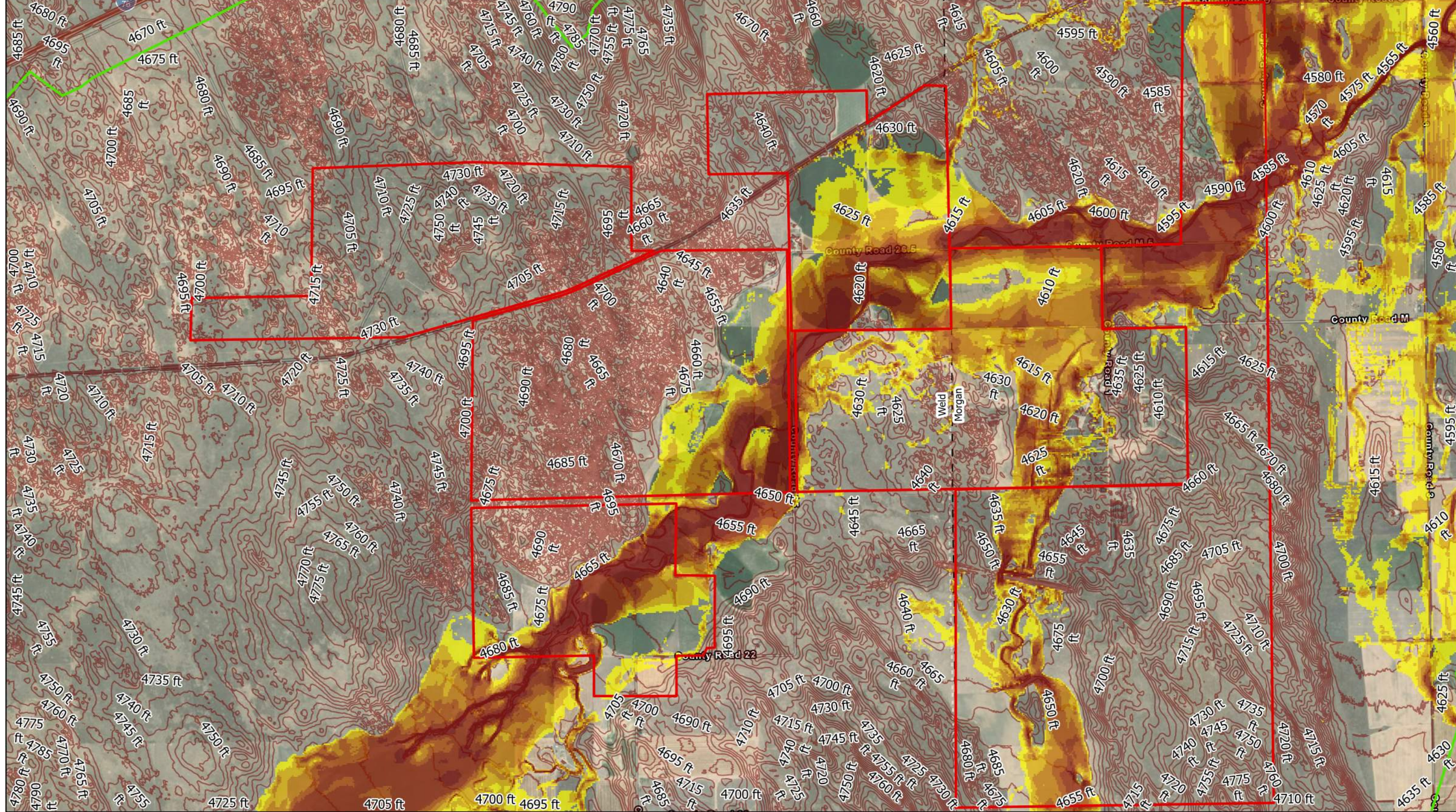
Legend

- | | | |
|--------------------------------|----------------------------|-------------|
| Project Boundary- Phases 1 & 2 | Peak Velocity (fps) | 2.51 - 3.00 |
| FLO-2D Boundary | 1.00 - 1.50 | 3.01 - 4.00 |
| County Boundary | 1.51 - 2.00 | 4.01 + |
| | 2.01 - 2.50 | |



Taelor Solar Project
Weld and Morgan Counties, Colorado
Exhibit 11: 50-Year Peak Velocity Map
February 7, 2022

N:\0034723_00_GIS_Hydro_Exhibits\2022-02-07 Taelor Hydro Exhibits\10-12 Taelor Solar Project.aprx 50 Yr Peak Velocity Map - 50 Yr Peak Velocity | 2/7/2022 3:31 PM | G:\P\overant



Data Source(s): Westwood (2022); Esri WMS Basemap Imagery (Accessed 2022); USGS (2022); FEMA (2022); USDA (2022)

Westwood
Toll Free (888) 937-5150 westwoodps.com

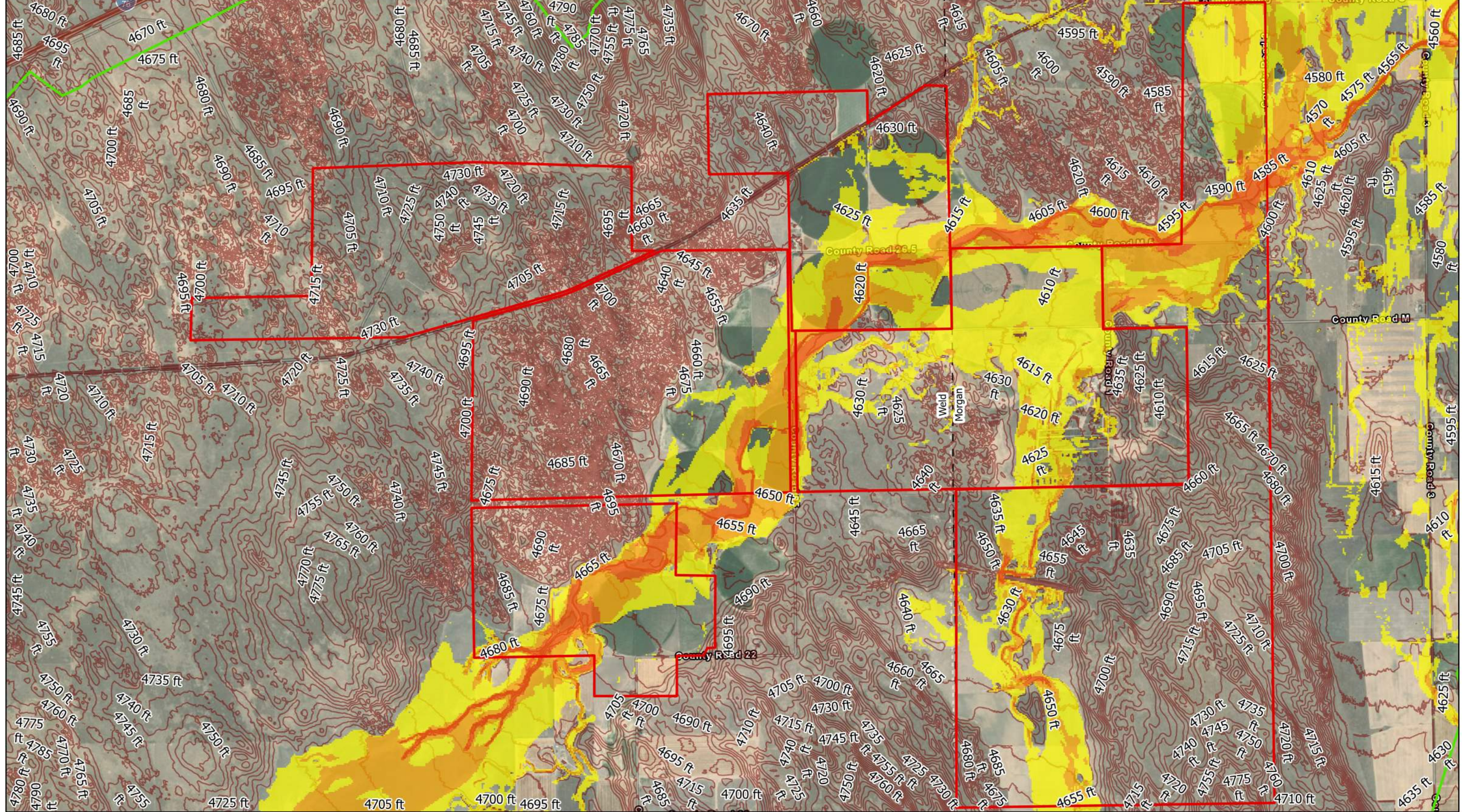
Legend

Project Boundary- Phases 1 & 2	Peak Velocity (fps) 1.00 - 1.50	2.51 - 3.00
FLO-2D Boundary	1.51 - 2.00	3.01 - 4.00
County Boundary	2.01 - 2.50	4.01 +
5-foot Contours		



Taelor Solar Project
Weld and Morgan Counties, Colorado
Exhibit 11A: 50-Year Peak Velocity Project Area Map
February 7, 2022







N:\0034723\00_GIS\Hydro\Exhibits\2022-02-07 Taelor Hydro Exhibits\10-121Taelor Solar Project.aprx
50 Yr Peak Velocity Project Area Map - 50 Yr Peak Velocity Project Area | 2/7/2022 3:32 PM | G:\P\overant



Data Source(s): Westwood (2022); Esri WMS Basemap Imagery (Accessed 2022); USGS (2022); FEMA (2022); USDA (2022)

Westwood
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Legend

	Project Boundary- Phases 1 & 2		5-foot Contours		1.51 - 2.00
	FLO-2D Boundary	Scour (ft)			2.01 +
	County Boundary		1.00 - 1.50		

Taelor Solar Project

Weld and Morgan Counties, Colorado

Exhibit 12: 50-Year Scour Map
February 7, 2022

N:\0034723.00_GIS\Hydro Exhibits\2022-02-07 Taelor Hydro Exhibits 10-12\Taelor Solar Project.aprx
50 Yr Scour Map - 50 Yr Scour | 2/7/2022 3:36 PM | G:\Powerent

The background of the page is a topographic map with red contour lines. A dashed red line runs vertically through the center, with a solid red dot at the bottom and a red 'X' mark further up.

Appendix A

NOAA Atlas 14 Precipitation Data



NOAA Atlas 14, Volume 8, Version 2
Location name: Wiggins, Colorado, USA*
Latitude: 40.1686°, Longitude: -104.1629°
Elevation: 4639.05 ft**



* source: ESRI Maps
 ** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Deborah Martin, Sandra Pavlovic, Ishani Roy, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Michael Yekta, Geoffrey Bonnin

NOAA, National Weather Service, Silver Spring, Maryland

[PF_tabular](#) | [PF_graphical](#) | [Maps & aeriels](#)

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.257 (0.206-0.325)	0.311 (0.248-0.393)	0.410 (0.326-0.519)	0.503 (0.398-0.640)	0.648 (0.503-0.868)	0.773 (0.582-1.04)	0.909 (0.661-1.25)	1.06 (0.738-1.49)	1.27 (0.854-1.83)	1.45 (0.942-2.09)
10-min	0.377 (0.301-0.476)	0.455 (0.363-0.575)	0.600 (0.477-0.760)	0.736 (0.582-0.937)	0.948 (0.736-1.27)	1.13 (0.853-1.53)	1.33 (0.968-1.83)	1.55 (1.08-2.18)	1.87 (1.25-2.68)	2.13 (1.38-3.06)
15-min	0.460 (0.367-0.581)	0.555 (0.443-0.702)	0.731 (0.582-0.927)	0.898 (0.710-1.14)	1.16 (0.898-1.55)	1.38 (1.04-1.86)	1.62 (1.18-2.23)	1.89 (1.32-2.65)	2.28 (1.53-3.27)	2.59 (1.68-3.73)
30-min	0.612 (0.489-0.774)	0.738 (0.589-0.933)	0.971 (0.772-1.23)	1.19 (0.942-1.52)	1.53 (1.19-2.05)	1.83 (1.38-2.46)	2.15 (1.56-2.95)	2.50 (1.75-3.51)	3.01 (2.02-4.32)	3.43 (2.23-4.93)
60-min	0.754 (0.602-0.953)	0.904 (0.722-1.14)	1.19 (0.945-1.51)	1.46 (1.16-1.86)	1.89 (1.47-2.54)	2.26 (1.71-3.05)	2.67 (1.95-3.68)	3.12 (2.18-4.39)	3.78 (2.54-5.43)	4.32 (2.81-6.22)
2-hr	0.896 (0.721-1.12)	1.07 (0.861-1.34)	1.41 (1.13-1.77)	1.73 (1.38-2.18)	2.25 (1.76-3.00)	2.70 (2.05-3.61)	3.19 (2.35-4.36)	3.75 (2.64-5.23)	4.55 (3.08-6.49)	5.22 (3.42-7.44)
3-hr	0.977 (0.790-1.22)	1.16 (0.939-1.45)	1.52 (1.23-1.90)	1.87 (1.50-2.35)	2.43 (1.92-3.24)	2.93 (2.24-3.91)	3.48 (2.57-4.73)	4.09 (2.89-5.68)	4.98 (3.39-7.06)	5.72 (3.76-8.11)
6-hr	1.13 (0.920-1.40)	1.34 (1.09-1.66)	1.75 (1.42-2.17)	2.14 (1.72-2.66)	2.76 (2.19-3.62)	3.30 (2.54-4.35)	3.89 (2.90-5.24)	4.55 (3.25-6.26)	5.51 (3.78-7.74)	6.30 (4.18-8.86)
12-hr	1.31 (1.08-1.61)	1.57 (1.28-1.92)	2.03 (1.66-2.49)	2.45 (1.99-3.02)	3.09 (2.46-3.99)	3.63 (2.81-4.72)	4.22 (3.15-5.59)	4.85 (3.48-6.58)	5.76 (3.98-7.99)	6.50 (4.35-9.05)
24-hr	1.56 (1.29-1.89)	1.82 (1.51-2.21)	2.30 (1.90-2.80)	2.74 (2.24-3.34)	3.40 (2.72-4.33)	3.95 (3.08-5.08)	4.54 (3.43-5.96)	5.19 (3.76-6.96)	6.10 (4.25-8.37)	6.84 (4.62-9.44)
2-day	1.79 (1.50-2.16)	2.10 (1.75-2.52)	2.62 (2.18-3.16)	3.09 (2.55-3.74)	3.77 (3.03-4.74)	4.33 (3.40-5.49)	4.92 (3.74-6.37)	5.55 (4.05-7.36)	6.43 (4.51-8.72)	7.14 (4.87-9.76)
3-day	1.96 (1.64-2.35)	2.27 (1.90-2.71)	2.79 (2.33-3.35)	3.26 (2.70-3.92)	3.95 (3.19-4.93)	4.51 (3.56-5.69)	5.11 (3.90-6.58)	5.75 (4.21-7.57)	6.63 (4.68-8.95)	7.34 (5.04-9.99)
4-day	2.09 (1.76-2.49)	2.40 (2.01-2.86)	2.93 (2.45-3.50)	3.40 (2.83-4.07)	4.09 (3.32-5.08)	4.66 (3.68-5.84)	5.25 (4.02-6.73)	5.89 (4.33-7.72)	6.78 (4.80-9.10)	7.48 (5.15-10.1)
7-day	2.38 (2.01-2.81)	2.72 (2.30-3.22)	3.31 (2.78-3.92)	3.81 (3.19-4.53)	4.52 (3.67-5.54)	5.09 (4.04-6.31)	5.67 (4.36-7.19)	6.28 (4.64-8.15)	7.11 (5.07-9.45)	7.76 (5.39-10.4)
10-day	2.63 (2.23-3.09)	3.01 (2.56-3.55)	3.65 (3.09-4.31)	4.19 (3.52-4.96)	4.93 (4.01-5.99)	5.51 (4.39-6.78)	6.09 (4.70-7.66)	6.69 (4.96-8.61)	7.49 (5.35-9.88)	8.09 (5.64-10.8)
20-day	3.41 (2.92-3.97)	3.89 (3.32-4.53)	4.66 (3.97-5.44)	5.29 (4.48-6.20)	6.13 (5.02-7.35)	6.77 (5.43-8.23)	7.40 (5.75-9.18)	8.02 (5.99-10.2)	8.83 (6.36-11.5)	9.42 (6.63-12.5)
30-day	4.06 (3.49-4.70)	4.61 (3.96-5.35)	5.50 (4.71-6.39)	6.21 (5.29-7.25)	7.16 (5.89-8.52)	7.86 (6.33-9.48)	8.54 (6.67-10.5)	9.21 (6.91-11.6)	10.0 (7.27-13.0)	10.7 (7.54-14.0)
45-day	4.86 (4.20-5.60)	5.53 (4.77-6.37)	6.58 (5.66-7.60)	7.41 (6.34-8.59)	8.49 (7.00-10.0)	9.28 (7.50-11.1)	10.0 (7.85-12.3)	10.7 (8.09-13.4)	11.6 (8.44-14.9)	12.2 (8.70-16.0)
60-day	5.52 (4.79-6.34)	6.30 (5.45-7.23)	7.50 (6.47-8.62)	8.43 (7.25-9.74)	9.64 (7.97-11.3)	10.5 (8.51-12.5)	11.3 (8.88-13.7)	12.0 (9.11-15.0)	12.9 (9.44-16.5)	13.6 (9.69-17.7)

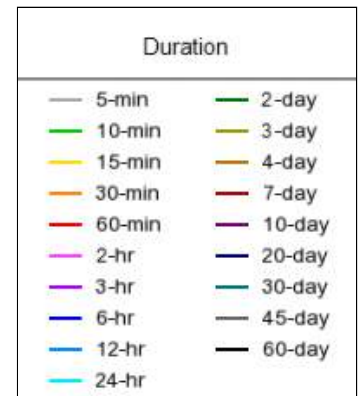
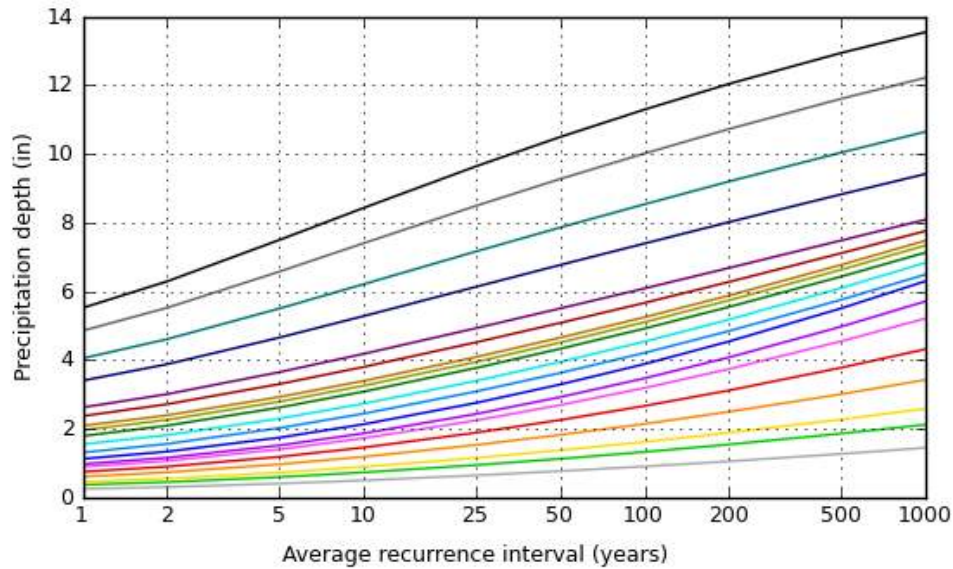
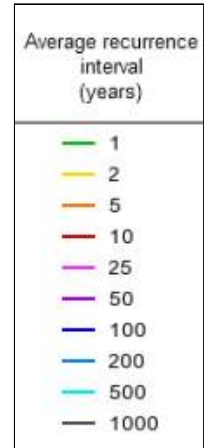
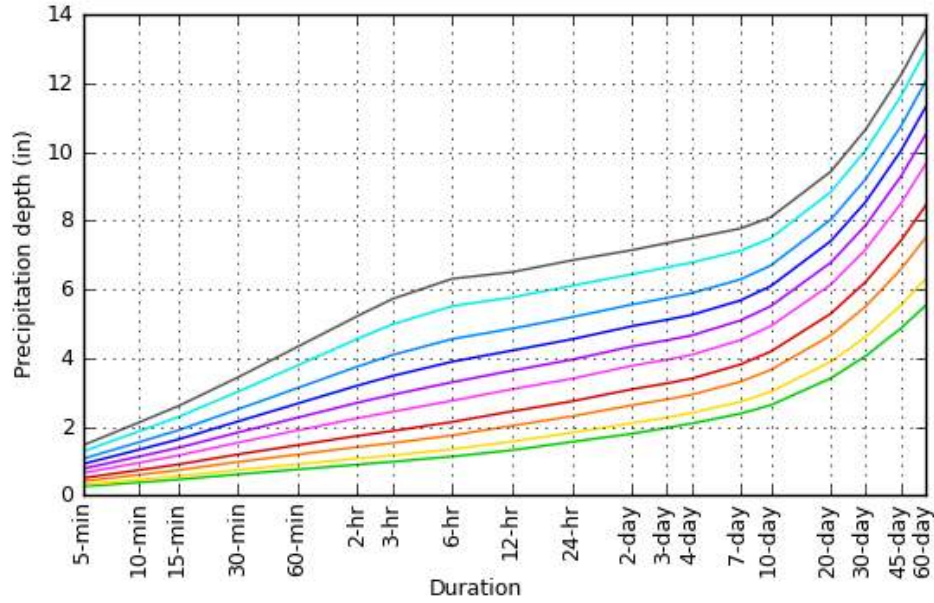
¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAA Atlas 14 document for more information.

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PF graphical

PDS-based depth-duration-frequency (DDF) curves

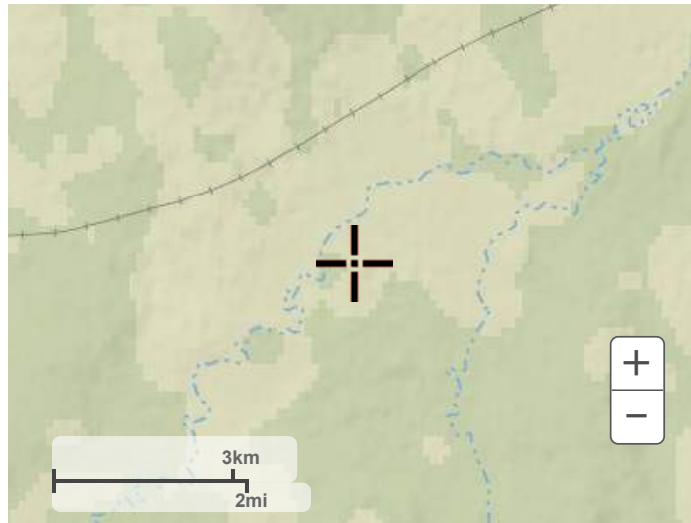
Latitude: 40.1686°, Longitude: -104.1629°



[Back to Top](#)

Maps & aerials

Small scale terrain



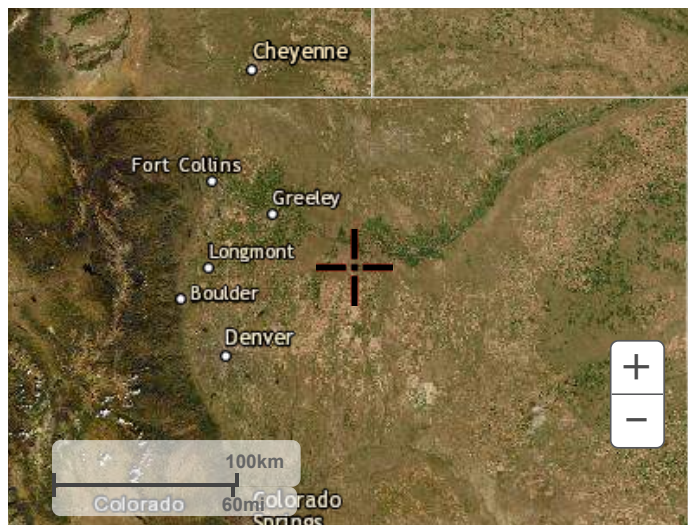
Large scale terrain



Large scale map



Large scale aerial



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Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

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Appendix B

Curve Number Table

Table 2. Semi-Arid Curve Numbers (adapted from NEH 630)

Class	Value	Classification Description	Curve Number				
			Soil Type*				
			A	B	C	D	W
Water	11	Open Water - areas of open water, generally with less than 25% cover of vegetation or soil.	98	98	98	98	100
	12	Perennial Ice/Snow - areas characterized by a perennial cover of ice and/or snow, generally greater than 25% of total cover.	98	98	98	98	100
Developed	21	Developed, Open Space - areas with a mixture of some constructed materials, but mostly vegetation in the form of lawn grasses. Impervious surfaces account for less than 20% of total cover. These areas most commonly include large-lot single-family housing units, parks, golf courses, and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes.	46	65	77	82	100
	22	Developed, Low Intensity - areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 20% to 49% percent of total cover. These areas most commonly include single-family housing units.	61	75	83	87	100
	23	Developed, Medium Intensity - areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 50% to 79% of the total cover. These areas most commonly include single-family housing units.	77	85	90	95	100
	24	Developed High Intensity -highly developed areas where people reside or work in high numbers. Examples include apartment complexes, row houses and commercial/industrial. Impervious surfaces account for 80% to 100% of the total cover.	89	92	94	95	100
Barren	31	Barren Land (Rock/Sand/Clay) - areas of bedrock, desert pavement, scarps, talus, slides, volcanic material, glacial debris, sand dunes, strip mines, gravel pits and other accumulations of earthen material. Generally, vegetation accounts for less than 15% of total cover.	77	86	91	94	100
Forest	41	Deciduous Forest - areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. More than 75% of the tree species shed foliage simultaneously in response to seasonal change.	43	55	70	77	100
	42	Evergreen Forest - areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. More than 75% of the tree species maintain their leaves all year. Canopy is never without green foliage.	43	55	70	77	100
	43	Mixed Forest - areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. Neither deciduous nor evergreen species are greater than 75% of total tree cover.	43	55	70	77	100
Shrubland	51	Dwarf Scrub - Alaska only areas dominated by shrubs less than 20 centimeters tall with shrub canopy typically greater than 20% of total vegetation. This type is often co-associated with grasses, sedges, herbs, and non-vascular vegetation.	55	71	81	89	100
	52	Shrub/Scrub - areas dominated by shrubs; less than 5 meters tall with shrub canopy typically greater than 20% of total vegetation. This class includes true shrubs, young trees in an early successional stage or trees stunted from environmental conditions.	55	71	81	89	100
Herbaceous	71	Grassland/Herbaceous - areas dominated by graminoid or herbaceous vegetation, generally greater than 80% of total vegetation. These areas are not subject to intensive management such as tilling, but can be utilized for grazing.	55	71	81	89	100
	72	Sedge/Herbaceous - Alaska only areas dominated by sedges and forbs, generally greater than 80% of total vegetation. This type can occur with significant other grasses or other grass like plants, and includes sedge tundra, and sedge tussock tundra.	55	71	81	89	100
	73	Lichens - Alaska only areas dominated by fruticose or foliose lichens generally greater than 80% of total vegetation.	55	71	81	89	100
	74	Moss - Alaska only areas dominated by mosses, generally greater than 80% of total vegetation.	55	71	81	89	100
Planted/Cultivated	81	Pasture/Hay - areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, typically on a perennial cycle. Pasture/hay vegetation accounts for greater than 20% of total vegetation.	55	71	81	89	100
	82	Cultivated Crops - areas used for the production of annual crops, such as corn, soybeans, vegetables, tobacco, and cotton, and also perennial woody crops such as orchards and vineyards. Crop vegetation accounts for greater than 20% of total vegetation. This class also includes all land being actively tilled.	67	78	85	89	100
	83	Small Grains	63	75	83	87	100
Wetlands	91	Woody Wetlands - areas where forest or shrubland vegetation accounts for greater than 20% of vegetative cover and the soil or substrate is periodically saturated with or covered with water.	45	66	77	83	100
	92	Emergent Herbaceous Wetlands - Areas where perennial herbaceous vegetation accounts for greater than 80% of vegetative cover and the soil or substrate is periodically saturated with or covered with water.	45	66	77	83	100

*A/D, B/D and C/D soils lumped as D soils, W denotes water

**Curve Numbers for NLCD Codes 41-43 have been increased from 30 to 43 as many of these areas are partially grazed Woods-grass combination.

The background of the page is a topographic map with red contour lines. A dashed red line runs vertically through the center of the map. A solid red dot is located on this dashed line in the lower-left quadrant, and a red 'X' is located on the dashed line in the upper-left quadrant.

Appendix C

FEMA Flood Insurance Rate Map (FIRM)

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify areas subject to flooding, particularly from local drainage sources or wind sea. The community map repository will be consulted for possible location of additional hazard information.

To obtain more detailed information in areas where Base Flood Elevations (BFEs) and/or Floodway Limits have been determined, users are encouraged to consult the Flood Insurance Study (FIS) report for the jurisdiction. BFEs and Floodway Limits shown in the Flood Insurance Study (FIS) report that accompany this FIRI. Users should be aware that BFEs shown on the FIS report represent rounded whole foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIS for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.7 North American Vertical Datum of 1988 (NAVD85). Users of this FIRI should be aware that coastal flood elevations are also provided in the Summary of Disturbance Elevations table in the Flood Insurance Study report for the jurisdiction. Elevations shown in the Summary of Disturbance Elevations table should be used for construction and/or floodplain management purposes where they are higher than the elevations shown on this FIS.

Boundaries of the floodways were compiled at cross sections and interpolated between cross sections. The floodways were based on hydraulic calculations with respect to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for the jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by flood control structures. Refer to section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for the jurisdiction.

The projection used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The horizontal datum was NAD83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zone number, date, and the production of FIRI for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences will not affect the accuracy of the FIS.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988 (NAVD85). These flood elevations must be compared to structures and ground elevations referenced to the same vertical datum. For information regarding conversion between the National Geospatial Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geographic Survey website at <http://www.ngs.noaa.gov> or contact the National Geospatial Survey at the following address:

NGS Information Services
NCA, NNGS-12
National Geospatial Survey
CSCC-4022
1215 East-West Highway
Silver Spring, MD 20910-3022

To obtain current elevation, description, and/or location information for bench marks shown on this map, please contact the Information Services Branch of the National Geospatial Survey at (301) 713-3343 or visit <http://www.ngs.noaa.gov>.

Base Map information shown on the FIS was derived from multiple sources. Base map files were provided in digital format by Anderson Consulting Engineers, Inc. This information was compiled from National Geospatial Survey (2004), National Agriculture Image Program (2001), Bureau of Land Management (2001), U.S. Department of Commerce (2001). Additional information was where appropriate compiled at 1 meter resolution from aerial photography dated 2005.

This map reflects more detailed and up-to-date stream channel configurations and floodway delineations than those shown in the FIS for the jurisdiction. The floodway limits and floodway limits that were transferred from the original FIS map have been adjusted to conform to these more detailed configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report which contain information on hydraulic data may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Subsequent development, annexations or disannexations may have occurred after this map was published. Map users should contact appropriate community officials to verify current corporate limits.

Please refer to the necessary printed map index for an overview map of the county showing the layout of map panels, community map repository addresses, and a listing of communities with corresponding National Flood Insurance Program data for each community as well as a listing of the panels on which each community is depicted.

Contact FEMA Map Service Center (MSC) via the FEMA Map Information eXchange (FMIX) (1-877-325-2627) for information on available products associated with the FIS. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of the map. The MSC may also be reached by Fax at 1-800-358-8600 and its website at <http://www.fema.gov>.

If you have questions about this map, please contact the National Flood Insurance Program at general (866) 447-2277 or FIRM MAP at (478) 356-0227 or visit the FEMA website at <http://www.fema.gov>.

ATTENTION: The use of a structure that impacts flood hazards within the floodway has not been reviewed by Federal or State officials. If a structure that impacts flood hazards within the floodway is planned, the user should contact the local community official to update the flood hazard information (floodway limits) shown in the FIS. The previous effective date for the FIS and FIS report has been published from the previous effective date for the FIS.

Taylor Solar Phases 1 & 2 Boundary

PANEL SHOWN AT A SCALE OF 1"=500' ON MAP NUMBER 08087C0552

THIS PANEL SHOWN AT A SCALE OF 1"=1000' ON MAP NUMBER 08087C0555

LEGEND

SPECIAL FLOOD HAZARD AREAS (SPECIAL SUBJECT TO FLOODATION BY THE 1% ANNUAL CHANCE FLOOD)

The 1% annual chance flood (24-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Areas for the area subject to flooding by the 1% annual chance flood, based on Special Flood Hazard Areas Data A, B, X, AH, AO, AE, A1, V, and VE. The Base Flood Elevation is the water surface elevation of the 1% annual chance flood.

ZONE A No Base Flood Elevation determined. Base Flood Elevation is 0.

ZONE AE Flood depth of 1 to 3 feet (usually areas of starting). Base Flood Elevation shown.

ZONE AO Flood depth of 1 to 3 feet (usually areas between starting). Average flood depth of 1 to 3 feet (usually areas between starting). Average flood depth of 1 to 3 feet (usually areas between starting).

ZONE A1 Areas at potential risk for wave action or greater flood. Zone A1 areas are not in Special Flood Hazard Areas. Base Flood Elevation is based on Special Flood Hazard Areas. Base Flood Elevation is based on Special Flood Hazard Areas.

ZONE V Coastal flood zone with velocity based (wave action). Base Flood Elevation shown.

ZONE VE Coastal flood zone with velocity based (wave action). Base Flood Elevation shown.

ZONE X Coastal flood zone with velocity based (wave action). Base Flood Elevation shown.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain area that must be kept free of obstructions to maintain the 1% annual chance flood with a water surface elevation that does not exceed a pre-specified elevation of flood height.

OTHER FLOOD AREAS

ZONE B Areas of 1% annual chance flood, areas of 1% annual chance flood with average depths of less than 1 foot. Base Flood Elevation shown. Base Flood Elevation shown.

OTHER AREAS

ZONE B Areas adjacent to the 1% annual chance flood.

ZONE C Areas in which flood insurance is not available.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPRA)

OPRA areas and OPRA are generally located either in or adjacent to Special Flood Hazard Areas.

- Proprietor boundary
- Floodway boundary
- Zone B boundary
- CBRS and OPRA boundaries

BOUNDARY LINES

- Boundary between Special Flood Hazard Areas of different flood profiles, flood depth or flood velocity.
- Base Flood Elevation and other elevation control.
- Base Flood Elevation and other elevation control.
- Base Flood Elevation and other elevation control.

REFERENCES

- Referenced to the North American Vertical Datum of 1988 (NAVD 88).

GRAPHIC REPRESENTATIONS

- 4"=1"=300'
- 10"=1"=300'
- 10"=1"=300'
- 10"=1"=300'

MAP REPOSITORIES

- Local Map Repository for this map

EFFECTIVE DATE OF COUNTRY FLOOD INSURANCE RATE MAP: APRIL 4, 2018

For community map repository address or community map, refer to the Community Map Repository List located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in the community, contact your insurance agent or call the National Flood Insurance Program at 1-800-358-8600.

MAP SCALE 1" = 300'

NATIONAL FLOOD INSURANCE PROGRAM

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0570

FIRM

FLOOD INSURANCE RATE MAP

MORGAN COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 575 OF 6875

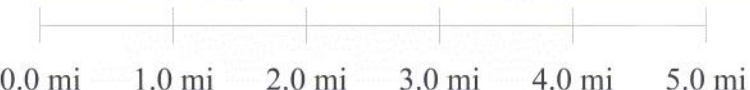
(SEE MAP INDEX FOR FIRM PANEL LOCATION)

COMMUNITY	SUBJECT	PARCEL	SUBJECT
MORGAN COUNTY	0570	0570	1

MAP NUMBER 08087C0575D

EFFECTIVE DATE APRIL 4, 2018

Federal Emergency Management Agency



The background of the page is a topographic map with red contour lines. A dashed red line runs vertically through the center, with a solid red dot at the bottom and a red 'x' marker further up.

Appendix D

USGS StreamStats Reports

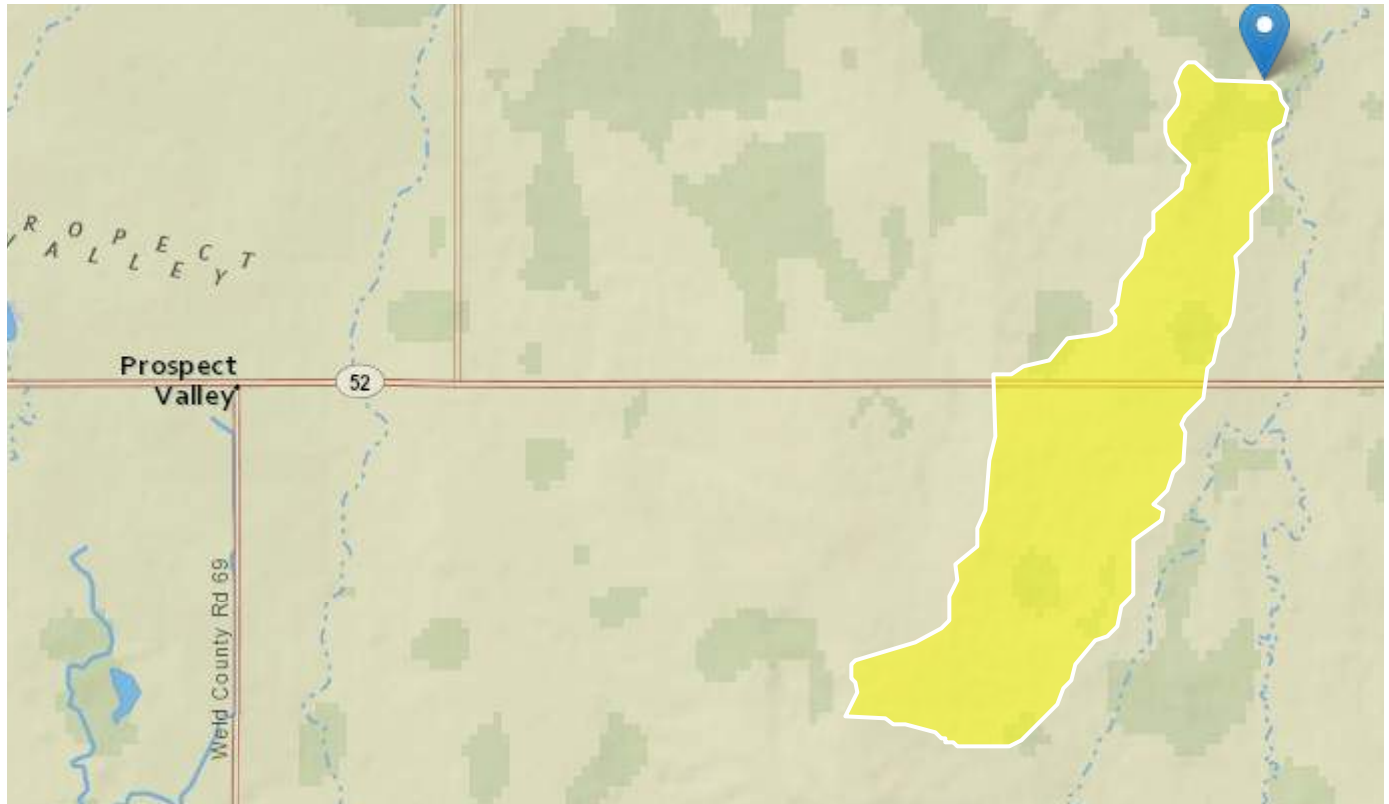
Jack Rabbit Creek StreamStats Report

Region ID: CO

Workspace ID: CO20220126180819041000

Clicked Point (Latitude, Longitude): 40.11290, -104.23792

Time: 2022-01-26 11:08:42 -0700



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	8.33	square miles
I6H100Y	6-hour precipitation that is expected to occur on average once in 100 years	3.89	inches
STATSCLAY	Percentage of clay soils from STATSGO	22.01	percent
OUTLETELEV	Elevation of the stream outlet in feet above NAVD88	4733	feet

Peak-Flow Statistics Parameters [Foothills Region Peak Flow 2016 5099]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	8.33	square miles	0.6	2850
I6H100Y	6 Hour 100 Year Precipitation	3.89	inches	2.38	4.89
STATSCLAY	STATSGO Percentage of Clay Soils	22.01	percent	9.87	37.5
OUTLETELEV	Elevation of Gage	4733	feet	4290	8270

Peak-Flow Statistics Flow Report [Foothills Region Peak Flow 2016 5099]

PII: Prediction Interval-Lower, Plu: Prediction Interval-Upper, ASEp: Average Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	ASEp
50-percent AEP flood	192	ft ³ /s	117
20-percent AEP flood	644	ft ³ /s	87
10-percent AEP flood	1180	ft ³ /s	80
4-percent AEP flood	2200	ft ³ /s	80
2-percent AEP flood	3250	ft ³ /s	83
1-percent AEP flood	4660	ft ³ /s	88
0.5-percent AEP flood	6390	ft ³ /s	94
0.2-percent AEP flood	9290	ft ³ /s	104

Peak-Flow Statistics Citations

Kohn, M.S., Stevens, M.R., Harden, T.M., Godaire, J.E., Klinger, R.E., and Mommandi, A., 2016, Paleoflood investigations to improve peak-streamflow regional-regression equations for natural streamflow in eastern Colorado, 2015: U.S. Geological Survey Scientific Investigations Report 2016–5099, 58 p. (<http://dx.doi.org/10.3133/sir20165099>)

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USGS Product Names Disclaimer: Any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

Application Version: 4.6.2

StreamStats Services Version: 1.2.22

NSS Services Version: 2.1.2

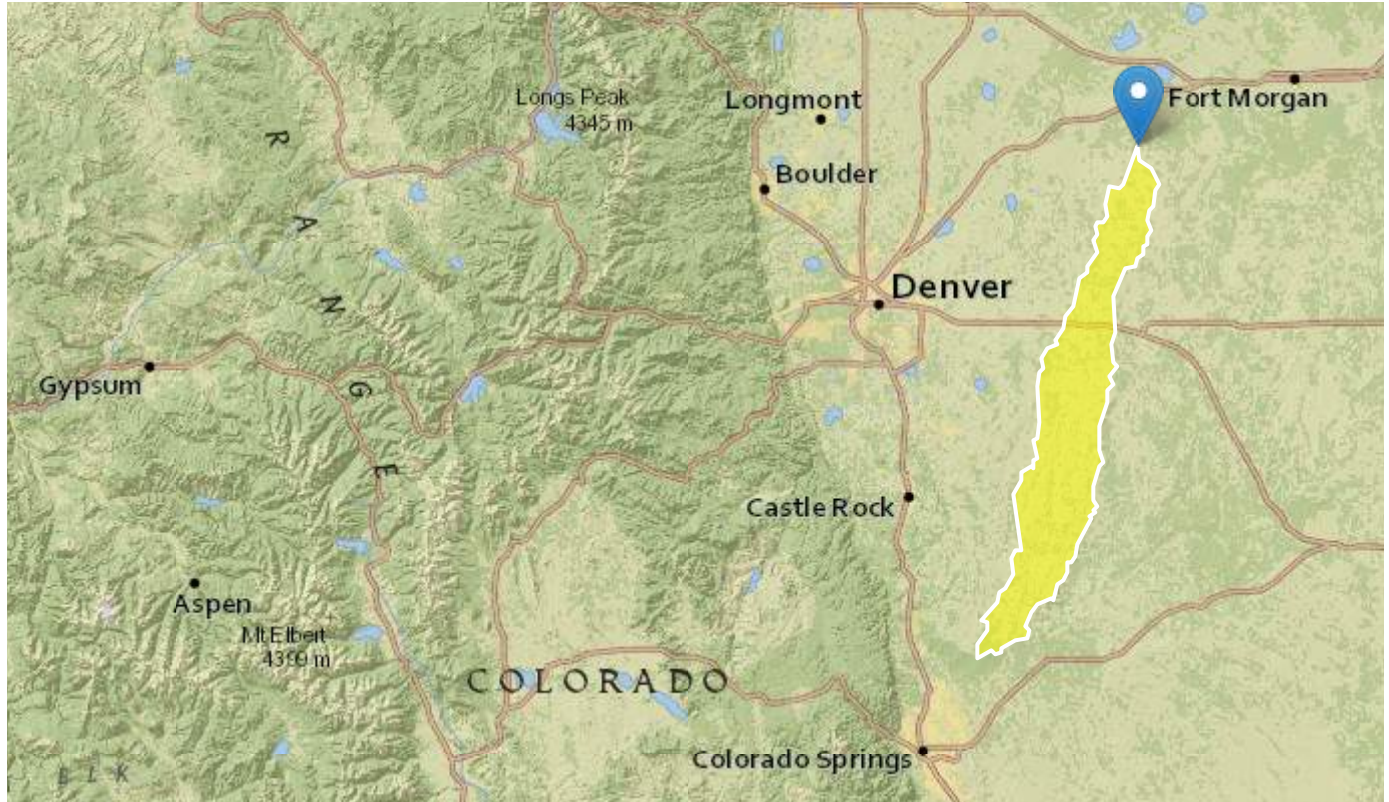
Kiowa Creek StreamStats Report

Region ID: CO

Workspace ID: CO20220126181728352000

Clicked Point (Latitude, Longitude): 40.11266, -104.23086

Time: 2022-01-26 11:17:52 -0700



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	585	square miles
I6H100Y	6-hour precipitation that is expected to occur on average once in 100 years	3.82	inches
STATSCLAY	Percentage of clay soils from STATSGO	17.97	percent
OUTLETELEV	Elevation of the stream outlet in feet above NAVD88	4734	feet

Peak-Flow Statistics Parameters [Foothills Region Peak Flow 2016 5099]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	585	square miles	0.6	2850
I6H100Y	6 Hour 100 Year Precipitation	3.82	inches	2.38	4.89
STATSCLAY	STATSGO Percentage of Clay Soils	17.97	percent	9.87	37.5
OUTLETELEV	Elevation of Gage	4734	feet	4290	8270

Peak-Flow Statistics Flow Report [Foothills Region Peak Flow 2016 5099]

PII: Prediction Interval-Lower, Plu: Prediction Interval-Upper, ASEp: Average Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	ASEp
50-percent AEP flood	2260	ft ³ /s	117
20-percent AEP flood	6410	ft ³ /s	87
10-percent AEP flood	11100	ft ³ /s	80
4-percent AEP flood	20000	ft ³ /s	80
2-percent AEP flood	28900	ft ³ /s	83
1-percent AEP flood	40700	ft ³ /s	88
0.5-percent AEP flood	55000	ft ³ /s	94
0.2-percent AEP flood	78100	ft ³ /s	104

Peak-Flow Statistics Citations

Kohn, M.S., Stevens, M.R., Harden, T.M., Godaire, J.E., Klinger, R.E., and Mommandi, A., 2016, Paleoflood investigations to improve peak-streamflow regional-regression equations for natural streamflow in eastern Colorado, 2015: U.S. Geological Survey Scientific Investigations Report 2016–5099, 58 p. (<http://dx.doi.org/10.3133/sir20165099>)

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Application Version: 4.6.2

StreamStats Services Version: 1.2.22

NSS Services Version: 2.1.2

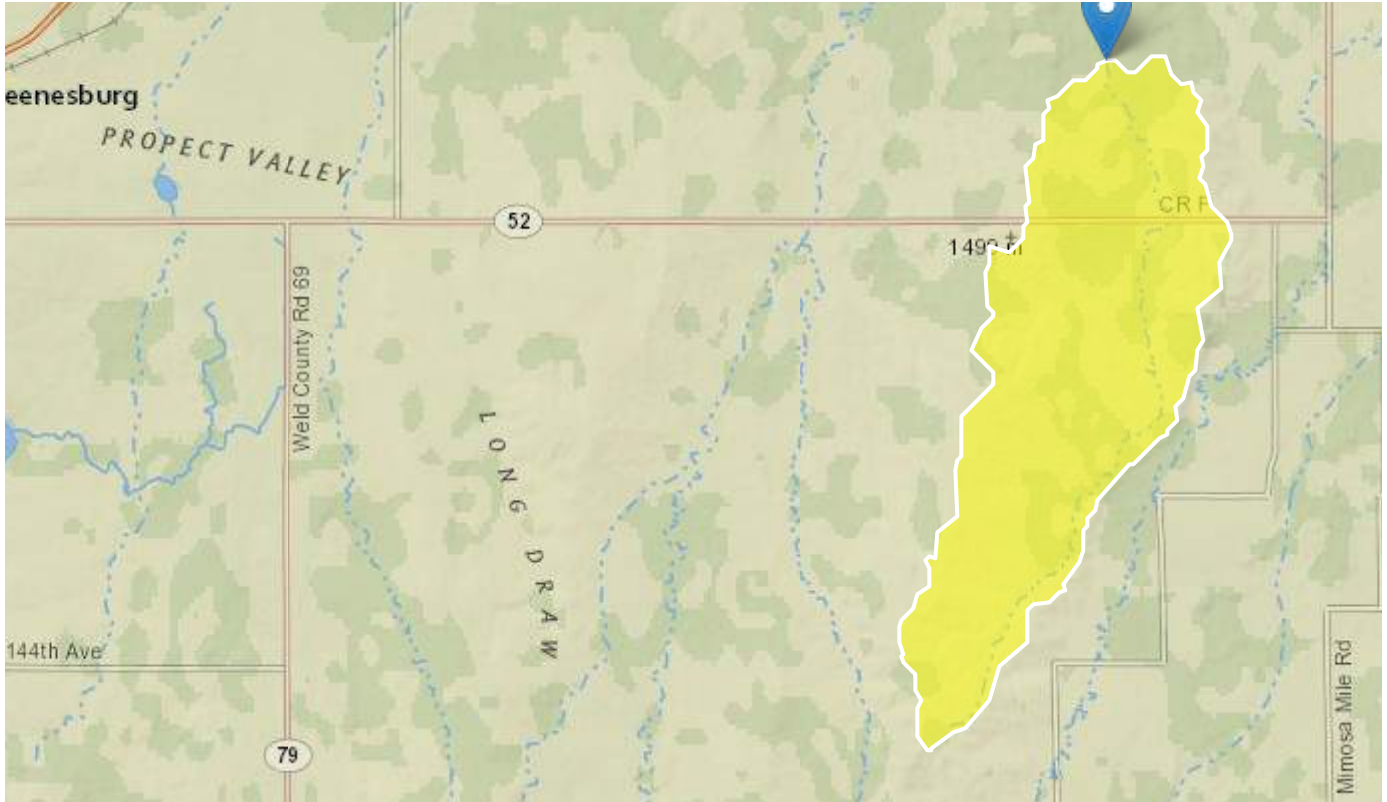
Rock Creek StreamStats Report

Region ID: CO

Workspace ID: CO20220126184549617000

Clicked Point (Latitude, Longitude): 40.11540, -104.13307

Time: 2022-01-26 11:46:10 -0700



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	35.9	square miles
I6H100Y	6-hour precipitation that is expected to occur on average once in 100 years	3.9	inches
STATSCLAY	Percentage of clay soils from STATSGO	24.18	percent
OUTLETELEV	Elevation of the stream outlet in feet above NAVD88	4667	feet

Peak-Flow Statistics Parameters [Foothills Region Peak Flow 2016 5099]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	35.9	square miles	0.6	2850
I6H100Y	6 Hour 100 Year Precipitation	3.9	inches	2.38	4.89
STATSCLAY	STATSGO Percentage of Clay Soils	24.18	percent	9.87	37.5
OUTLETELEV	Elevation of Gage	4667	feet	4290	8270

Peak-Flow Statistics Flow Report [Foothills Region Peak Flow 2016 5099]

PII: Prediction Interval-Lower, Plu: Prediction Interval-Upper, ASEp: Average Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	ASEp
50-percent AEP flood	540	ft ³ /s	117
20-percent AEP flood	1760	ft ³ /s	87
10-percent AEP flood	3210	ft ³ /s	80
4-percent AEP flood	5960	ft ³ /s	80
2-percent AEP flood	8780	ft ³ /s	83
1-percent AEP flood	12500	ft ³ /s	88
0.5-percent AEP flood	17200	ft ³ /s	94
0.2-percent AEP flood	24900	ft ³ /s	104

Peak-Flow Statistics Citations

Kohn, M.S., Stevens, M.R., Harden, T.M., Godaire, J.E., Klinger, R.E., and Mommandi, A., 2016, Paleoflood investigations to improve peak-streamflow regional-regression equations for natural streamflow in eastern Colorado, 2015: U.S. Geological Survey Scientific Investigations Report 2016–5099, 58 p. (<http://dx.doi.org/10.3133/sir20165099>)

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Application Version: 4.6.2

StreamStats Services Version: 1.2.22

NSS Services Version: 2.1.2

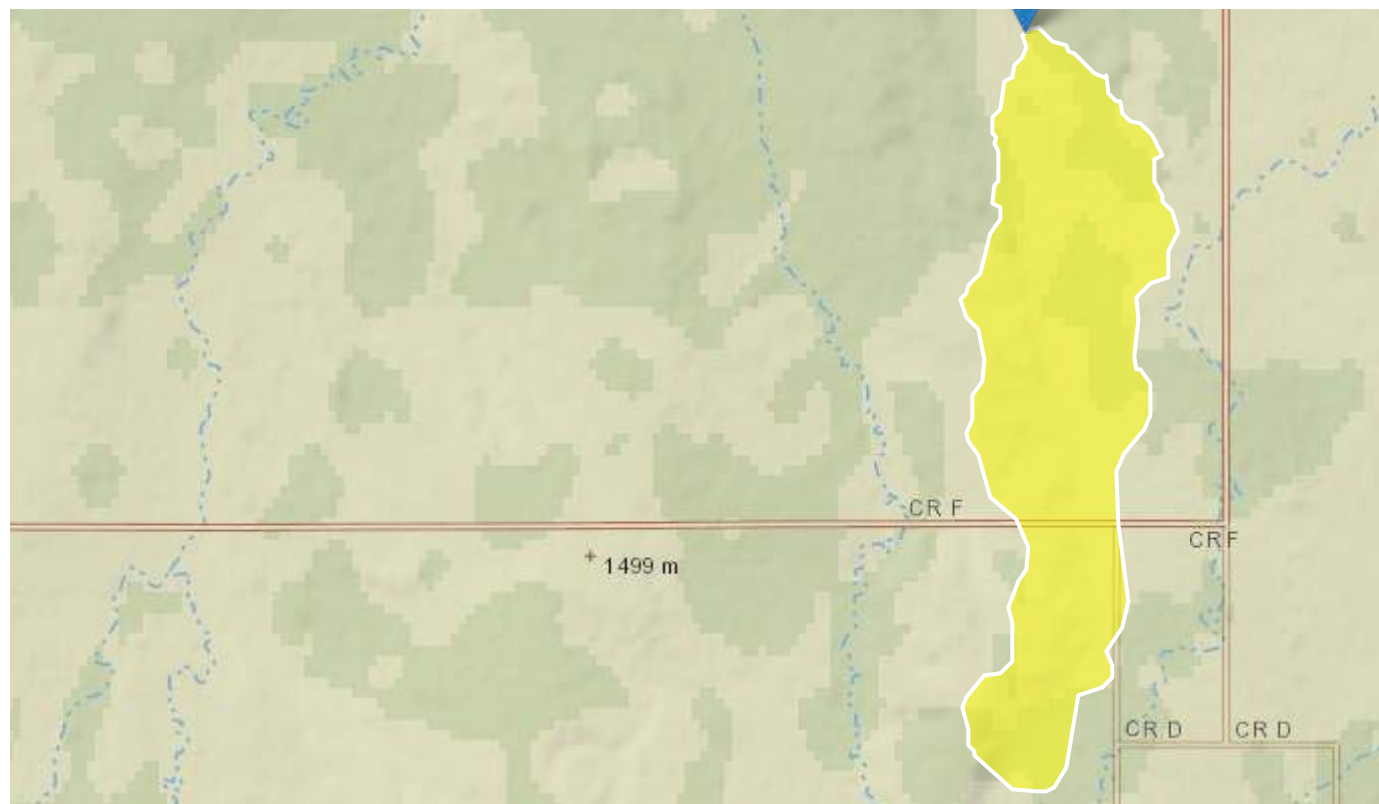
Eastern Tributary StreamStats Report

Region ID: CO

Workspace ID: CO20220126185734682000

Clicked Point (Latitude, Longitude): 40.13799, -104.09089

Time: 2022-01-26 11:58:02 -0700



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	8.2	square miles
I6H100Y	6-hour precipitation that is expected to occur on average once in 100 years	3.9	inches
STATSCLAY	Percentage of clay soils from STATSGO	17.27	percent
OUTLETELEV	Elevation of the stream outlet in feet above NAVD88	4630	feet

Peak-Flow Statistics Parameters [Foothills Region Peak Flow 2016 5099]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	8.2	square miles	0.6	2850
I6H100Y	6 Hour 100 Year Precipitation	3.9	inches	2.38	4.89
STATSCLAY	STATSGO Percentage of Clay Soils	17.27	percent	9.87	37.5
OUTLETELEV	Elevation of Gage	4630	feet	4290	8270

Peak-Flow Statistics Flow Report [Foothills Region Peak Flow 2016 5099]

PII: Prediction Interval-Lower, Plu: Prediction Interval-Upper, ASEp: Average Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	ASEp
50-percent AEP flood	165	ft ³ /s	117
20-percent AEP flood	548	ft ³ /s	87
10-percent AEP flood	1000	ft ³ /s	80
4-percent AEP flood	1860	ft ³ /s	80
2-percent AEP flood	2750	ft ³ /s	83
1-percent AEP flood	3940	ft ³ /s	88
0.5-percent AEP flood	5400	ft ³ /s	94
0.2-percent AEP flood	7850	ft ³ /s	104

Peak-Flow Statistics Citations

Kohn, M.S., Stevens, M.R., Harden, T.M., Godaire, J.E., Klinger, R.E., and Mommandi, A., 2016, Paleoflood investigations to improve peak-streamflow regional-regression equations for natural streamflow in eastern Colorado, 2015: U.S. Geological Survey Scientific Investigations Report 2016–5099, 58 p. (<http://dx.doi.org/10.3133/sir20165099>)

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Application Version: 4.6.2

StreamStats Services Version: 1.2.22

NSS Services Version: 2.1.2