Methow River
Twisp to Carlton Reach Assessment

APPENDIX

# A

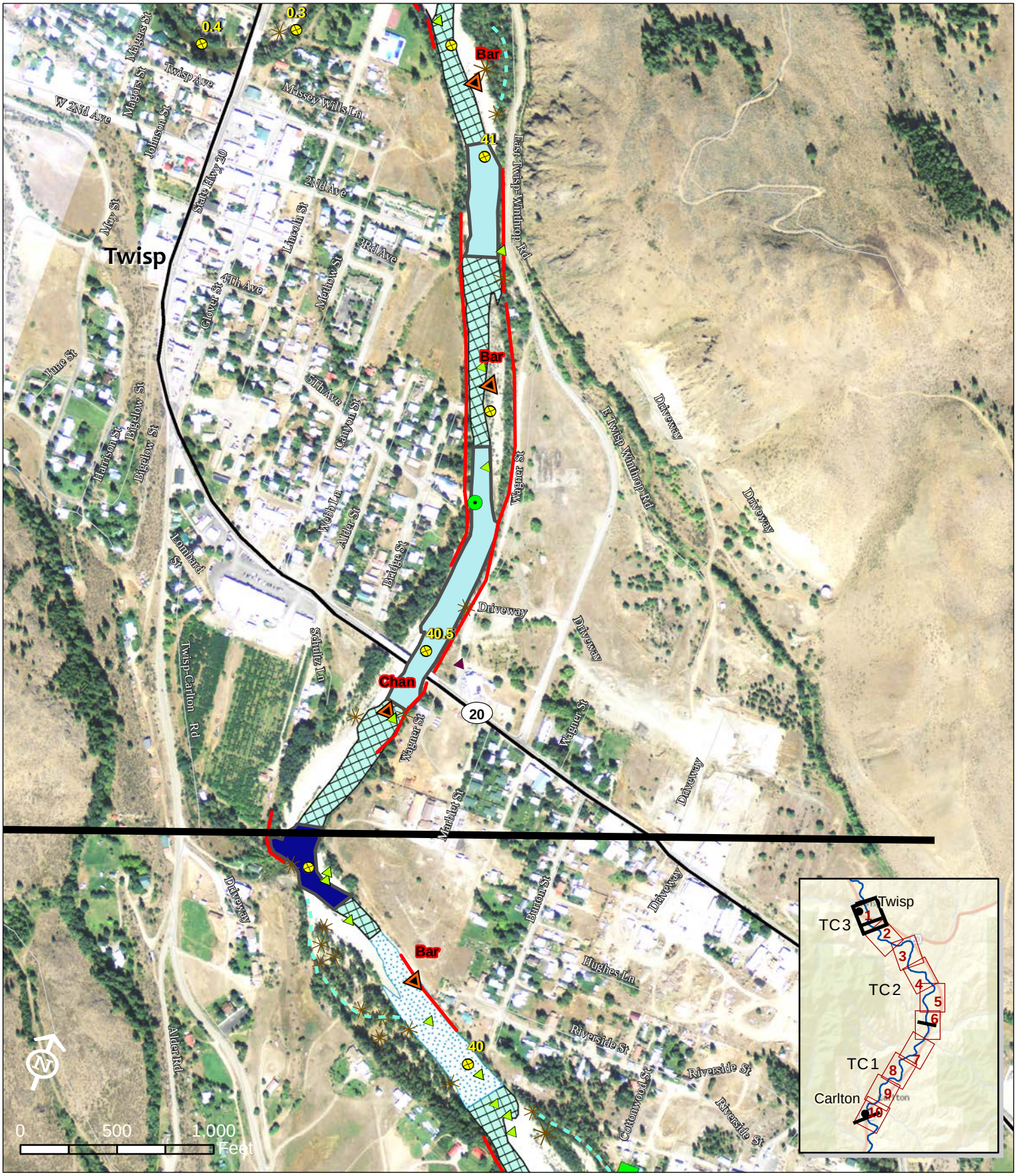
## TWISP TO CARLTON REACH ASSESSMENT MAP FOLIO

# Appendix A
# Twisp to Carlton Map Folio

Map images of the Twisp to Carlton Assessment Reach of the Methow River are provided in this appendix to facilitate understanding of existing conditions within the river channel, as well as to showcase the nature and relative locations of recommended restoration and protection actions, by sub-reach. The various conditions and actions are displayed in chapters, most of which have 10 panels covering the 13 miles of river channel, as described below:

1. Existing Conditions – This 10-page map folio provides an aerial photo as a backdrop to show locations of mapped habitat units, major highways, levees, and sections of the river bank that have been armored with riprap. Riprap locations were surveyed over two field efforts in 2014 and 2016. Other features include locations of known summer Chinook and steelhead spawning locations, from data provided by Mark Miller spanning the years 1991 to 1997 and 2006 to 2014.
2. Geomorphic Mapping (Existing Conditions) – This 10-page map folio provides an aerial image and shaded relief backdrop to show existing locations and extent of geomorphic surfaces mapped along the valley. Geomorphic mapping included identification of the “Inner” and “Outer” Zones, in line with the approach used Middle Methow Reach Assessment (Reclamation 2010).
3. Flood Inundation – This 10-page map folio displays a subset of hydraulic modeling results generated by Reclamation (2014). Modeled 100-year flood depths display floodplain landforms and corresponding floodplain inundation. The inundation limits of the 2-year flood are also shown. Mapped floodplain channels and their activation flows also provide key information for restoration of floodplain and off-channel features.
4. FLIR – This six-page map folio uses an aerial photo as a backdrop to show surface water temperatures and river miles from August 24, 2009, as derived from Forward Looking Infrared imagery (Watershed Sciences 2009, for Reclamation). Because there were few warm- or cool-water anomalies along the reach requiring detailed representation, the data are displayed at a reduced scale to better emphasize the overall upstream-to-downstream pattern of warming.
5. Methow Project Actions – This 10-page map folio uses an aerial photo as the backdrop to showcase the recommended protection and restoration actions for the 13 miles of river channel of this Reach Assessment. The mapping of protection and restoration actions corresponds to the restoration strategy tables and proposed project areas presented in the main body text.

# EXISTING CONDITIONS




BASEMAP: 2013 NAIP AERIAL

# Methow River - Twisp to Carlton Reach: EXISTING CONDITIONS

- River Miles
- Beaver Activity
- Chinook Spawning
- Lamprey Monitoring Sites
- Steelhead Redds
- Pebble Cts. (labeled type)
- Floodplain Channel
- Sub-reach Boundaries
- Existing Levees
- Existing Riprap
- Possible Water Quality Impacts

Channel Units
- Glide
- Riffle
- Side Channel

Pools (by residual depth (ft))
- 0 - 4
- 4 - 8
- 8 - 12

LWD Jams # Logs
- <10
- 10-40
- 40-80
- 80-100
- 100+



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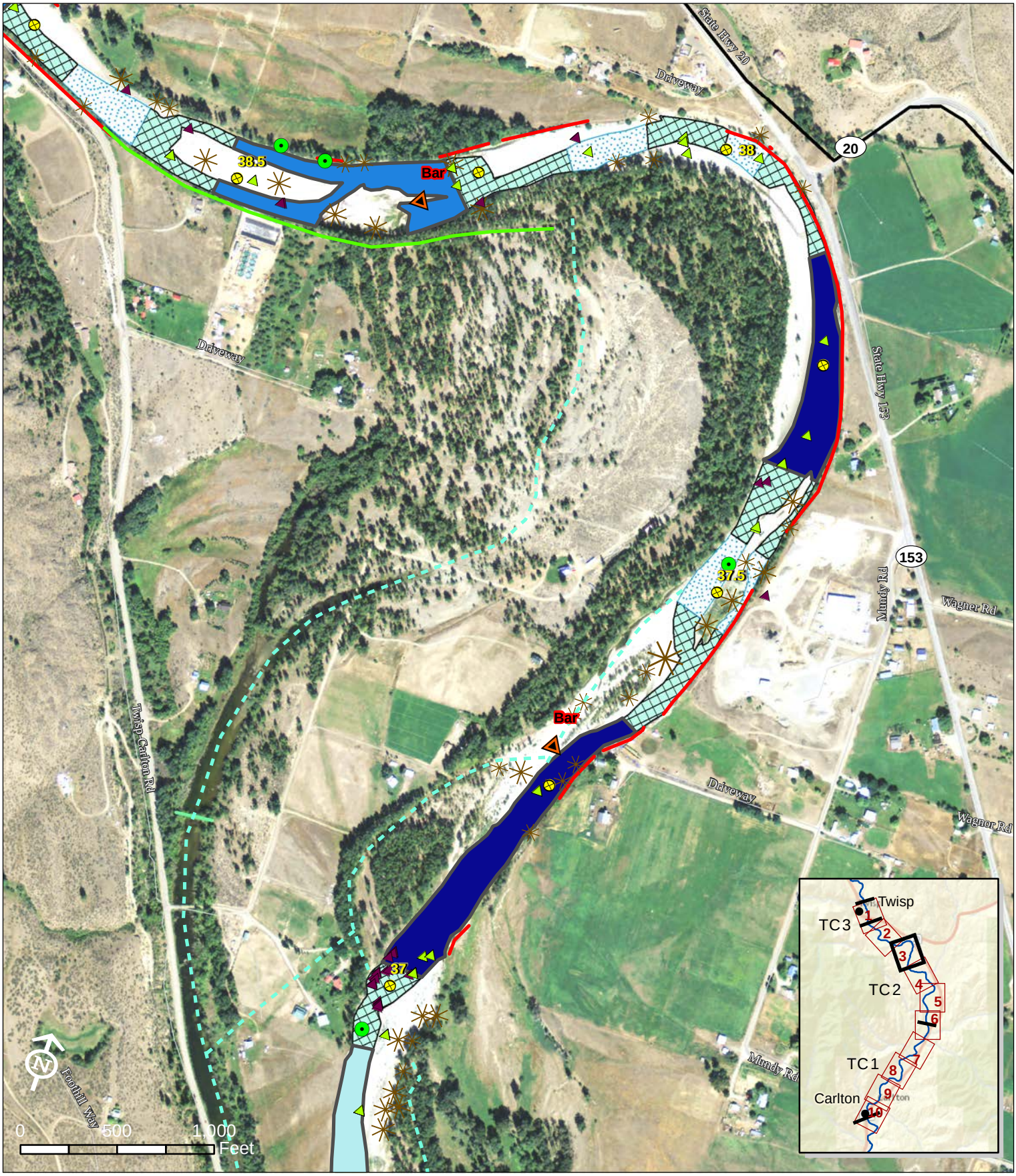


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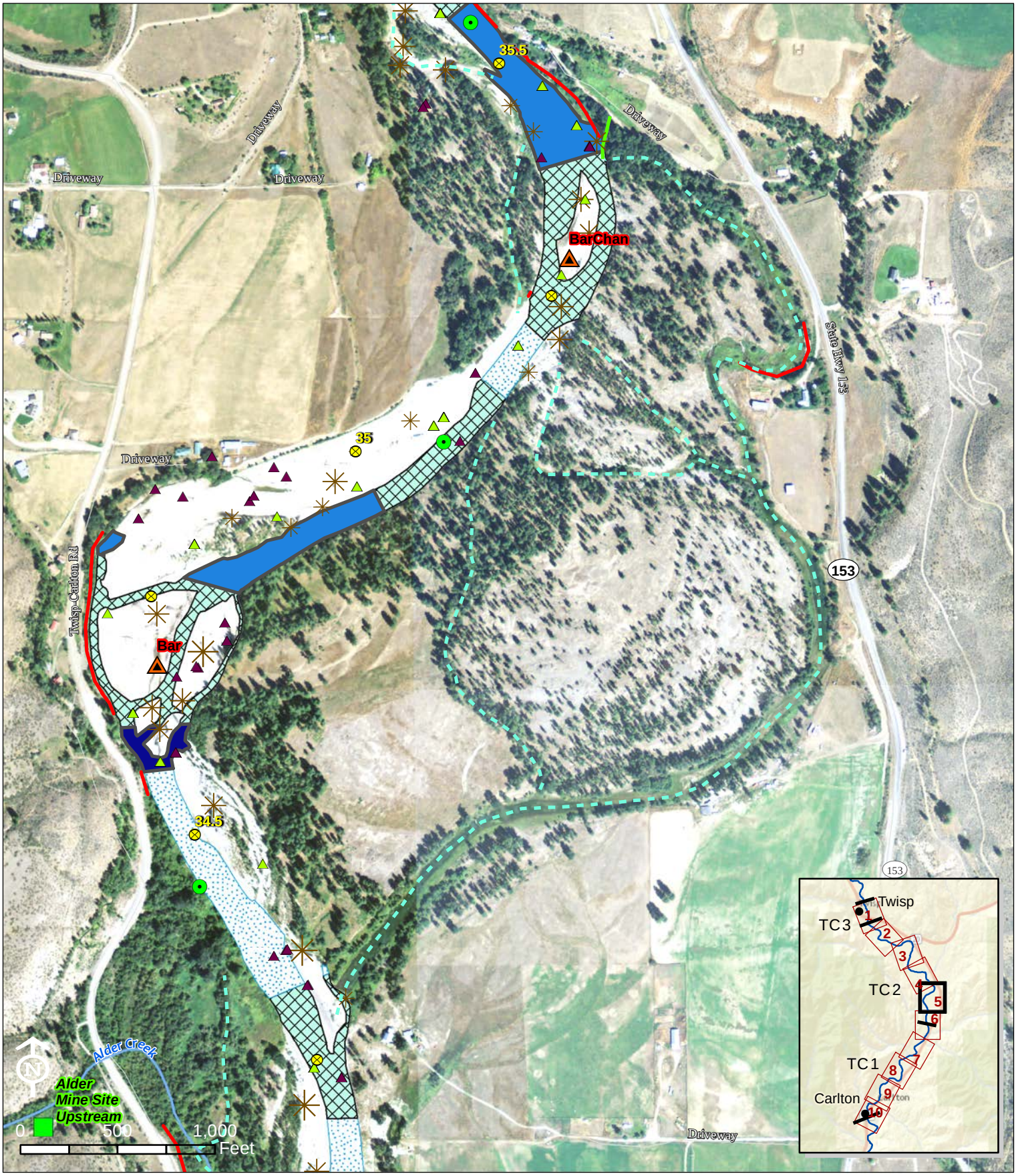


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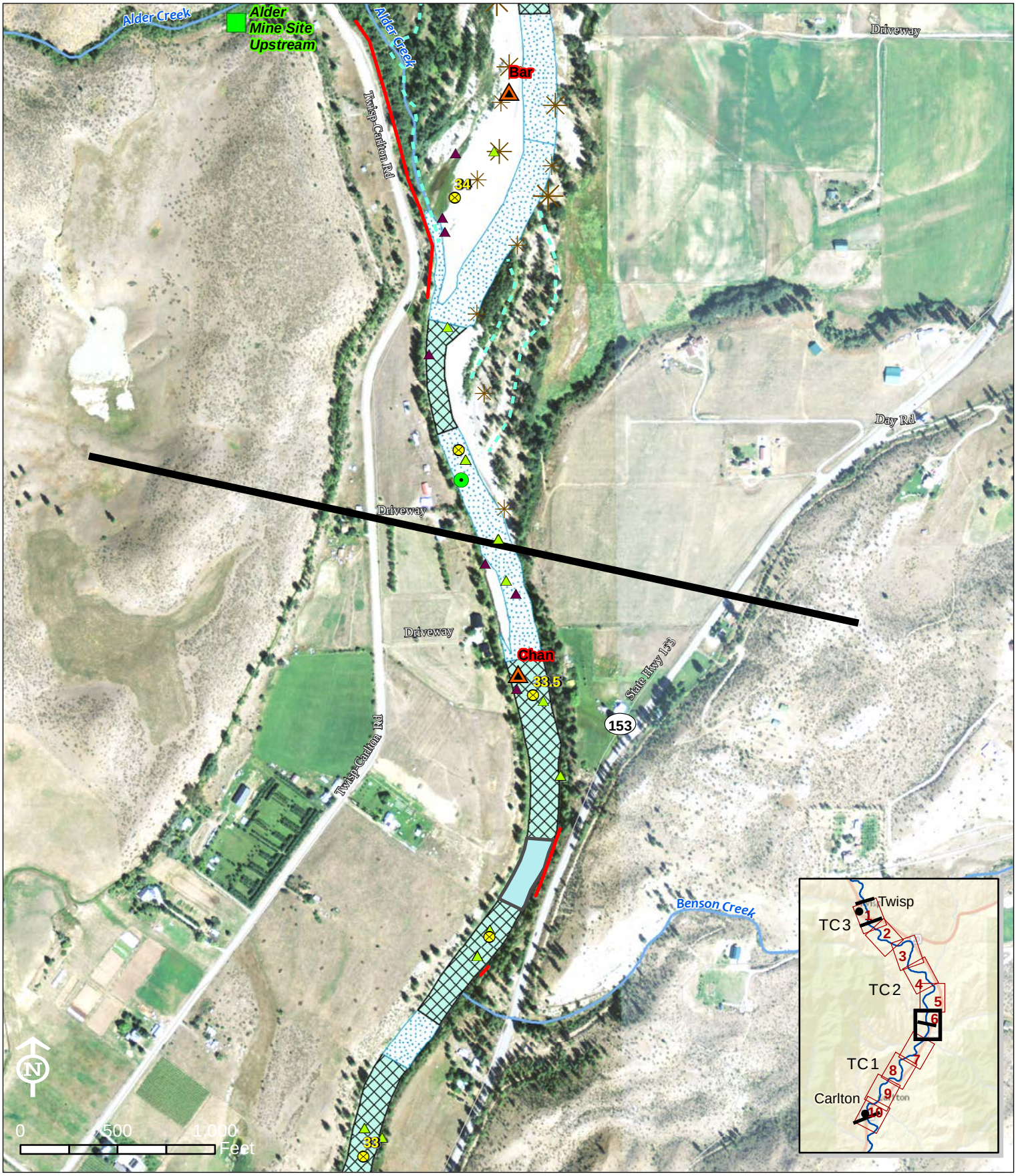


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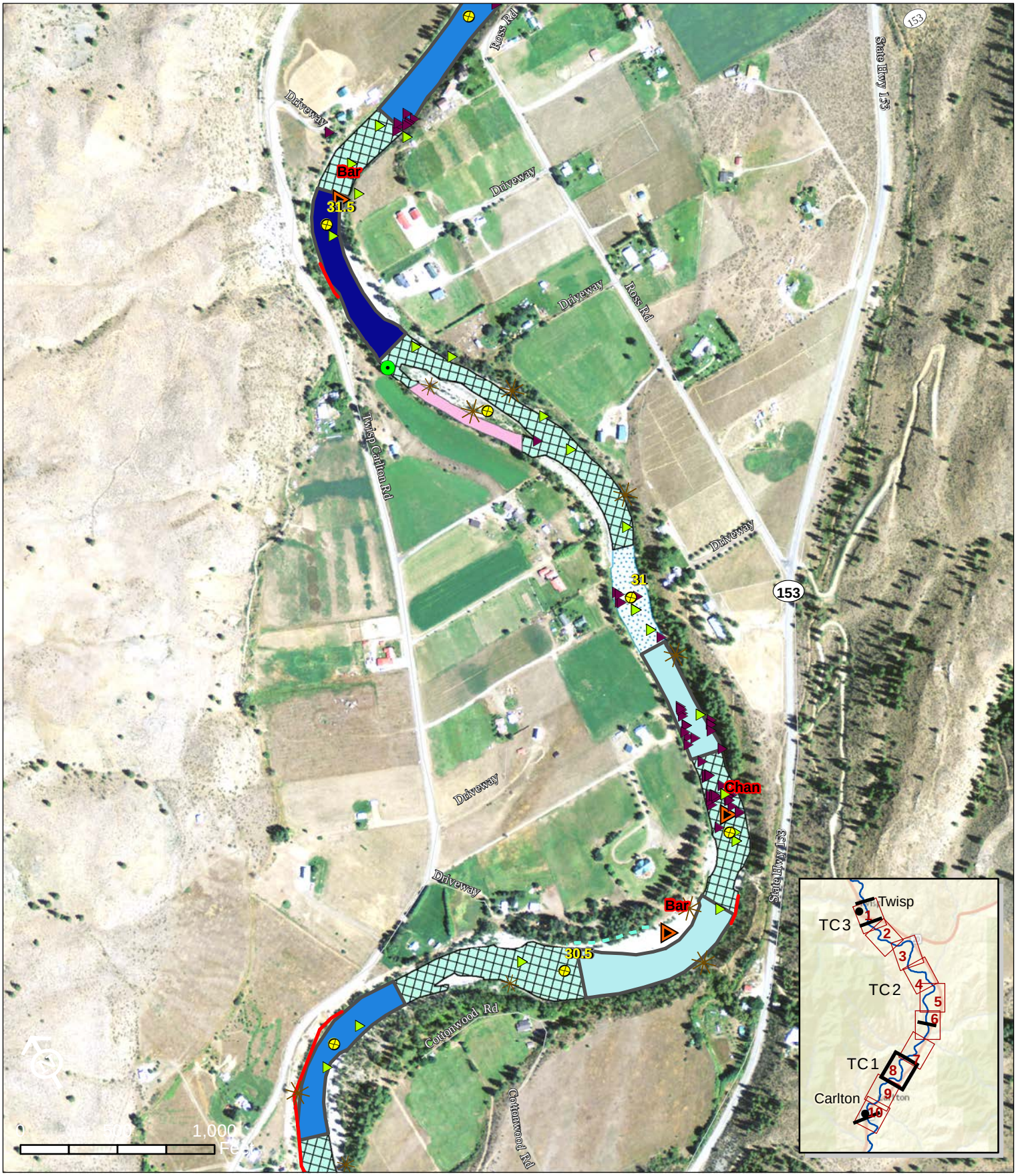


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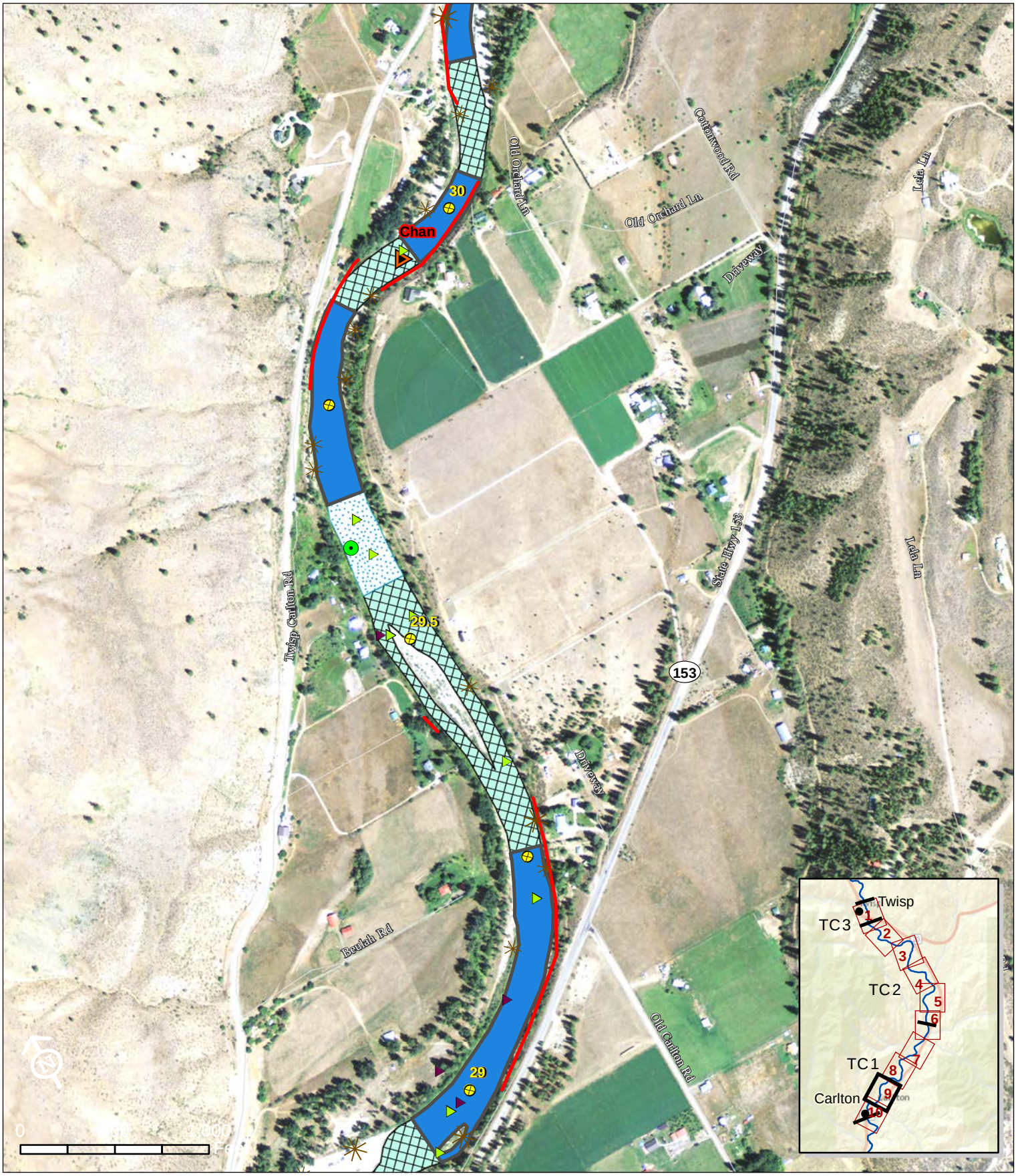


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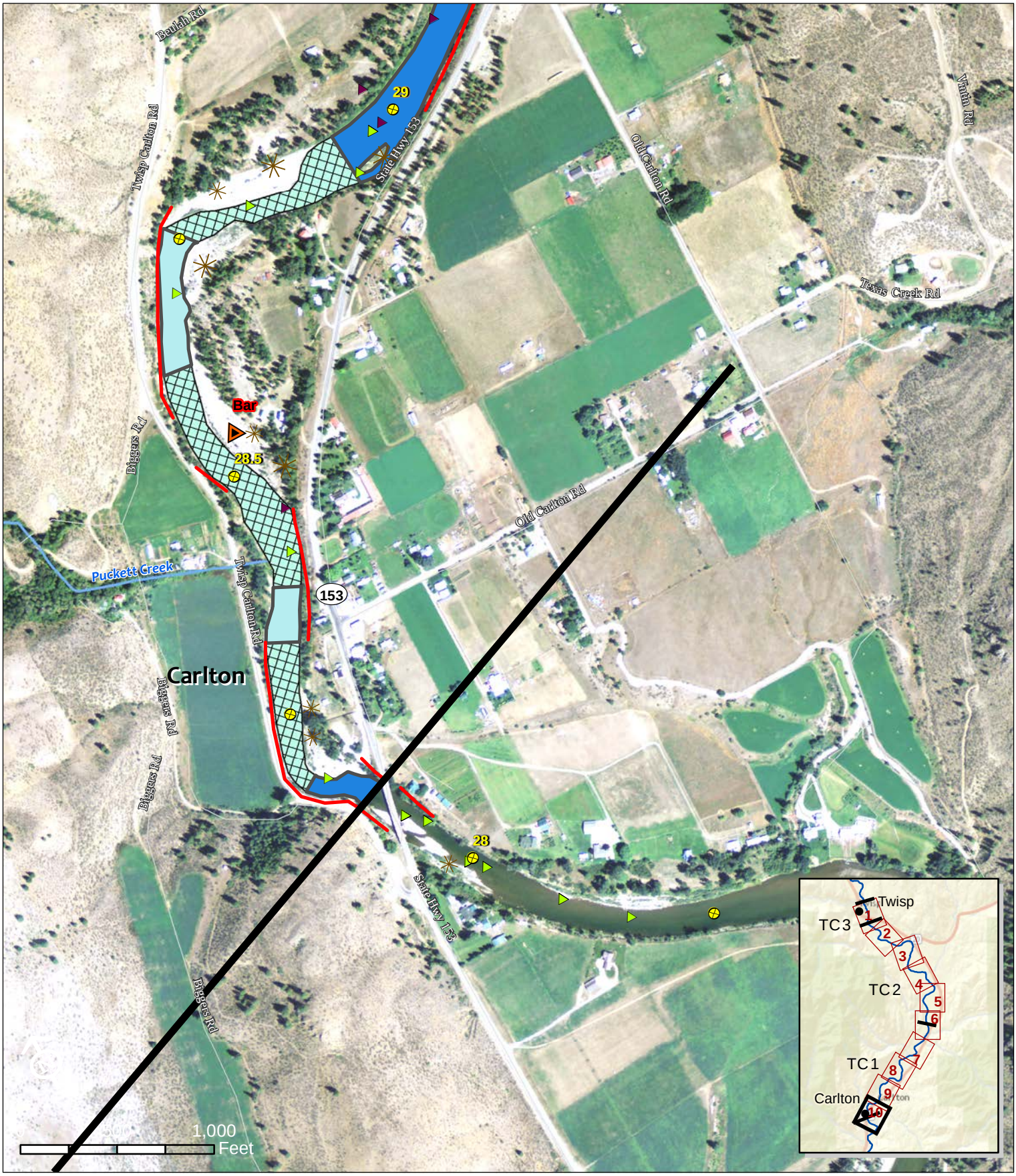


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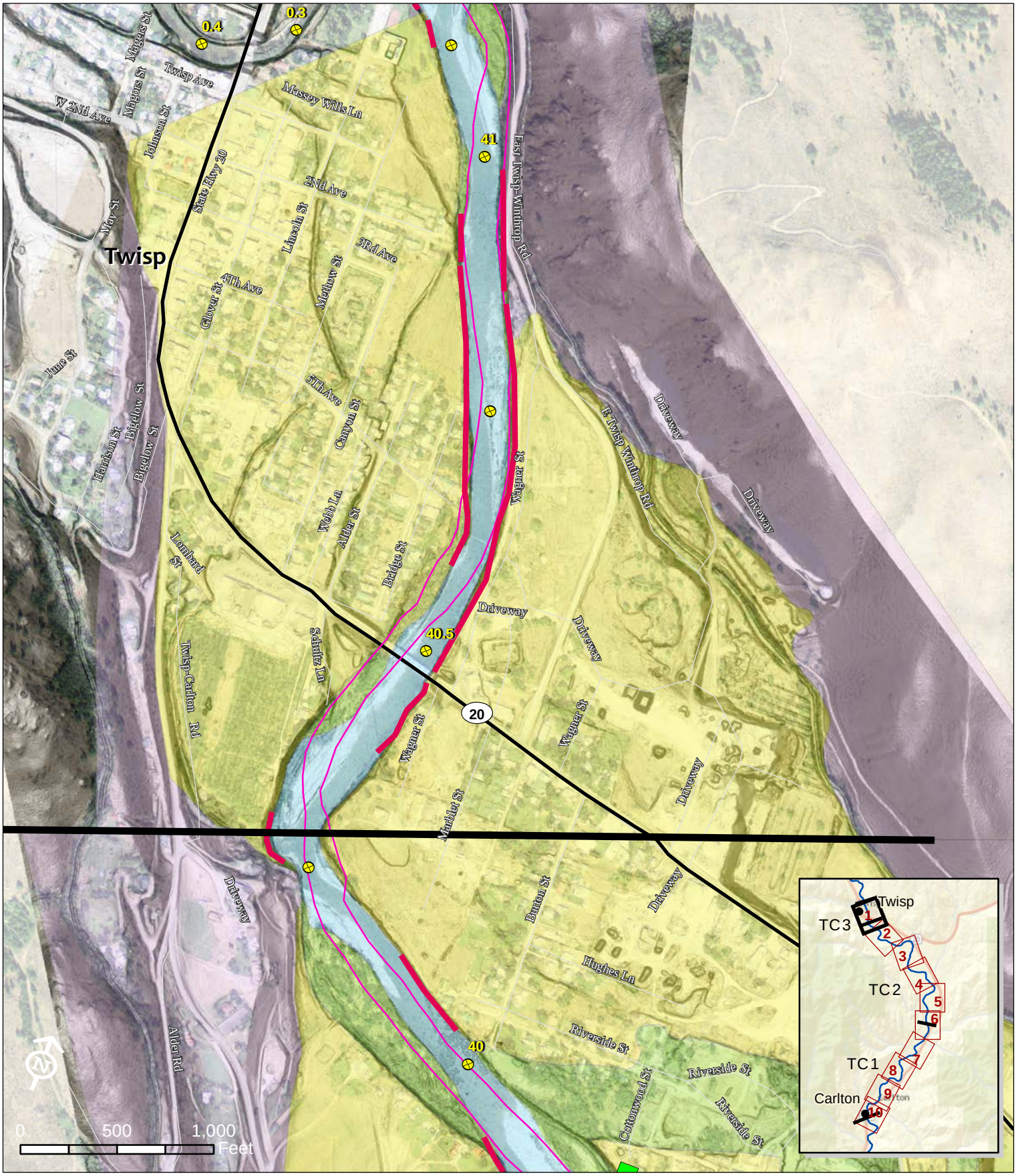
# GEOMORPHIC MAPPING




BASEMAP: 2013 NAIP AERIAL OVERLAIN ON LIDAR SHADED RELIEF

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**Geomorphic Mapping**

- Inner Zone
- Disconnected Inner Zone
- Outer Zone
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- Inactive Fluvial Surface
- Alluvial fan
- Bedrock-cored landform



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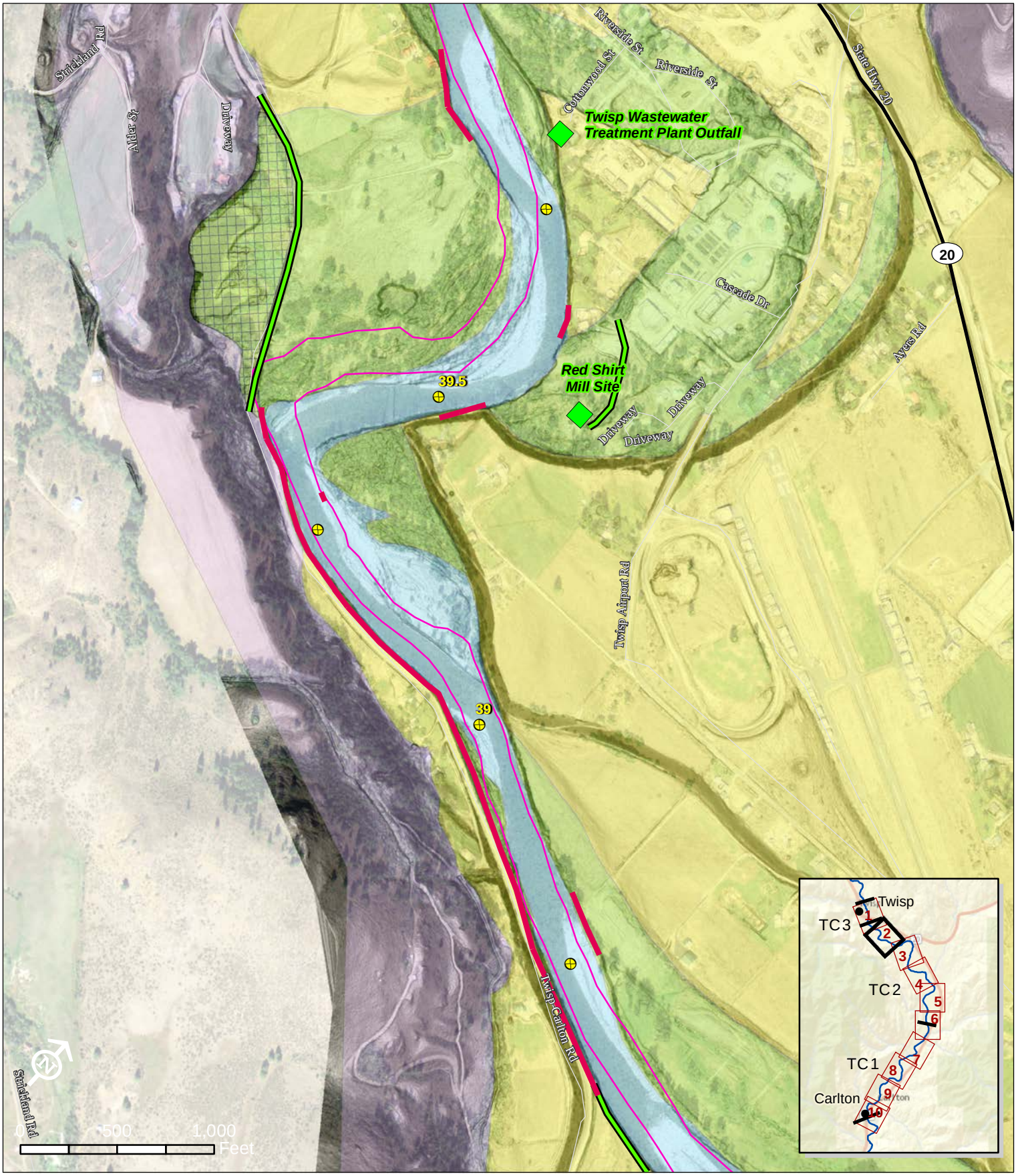


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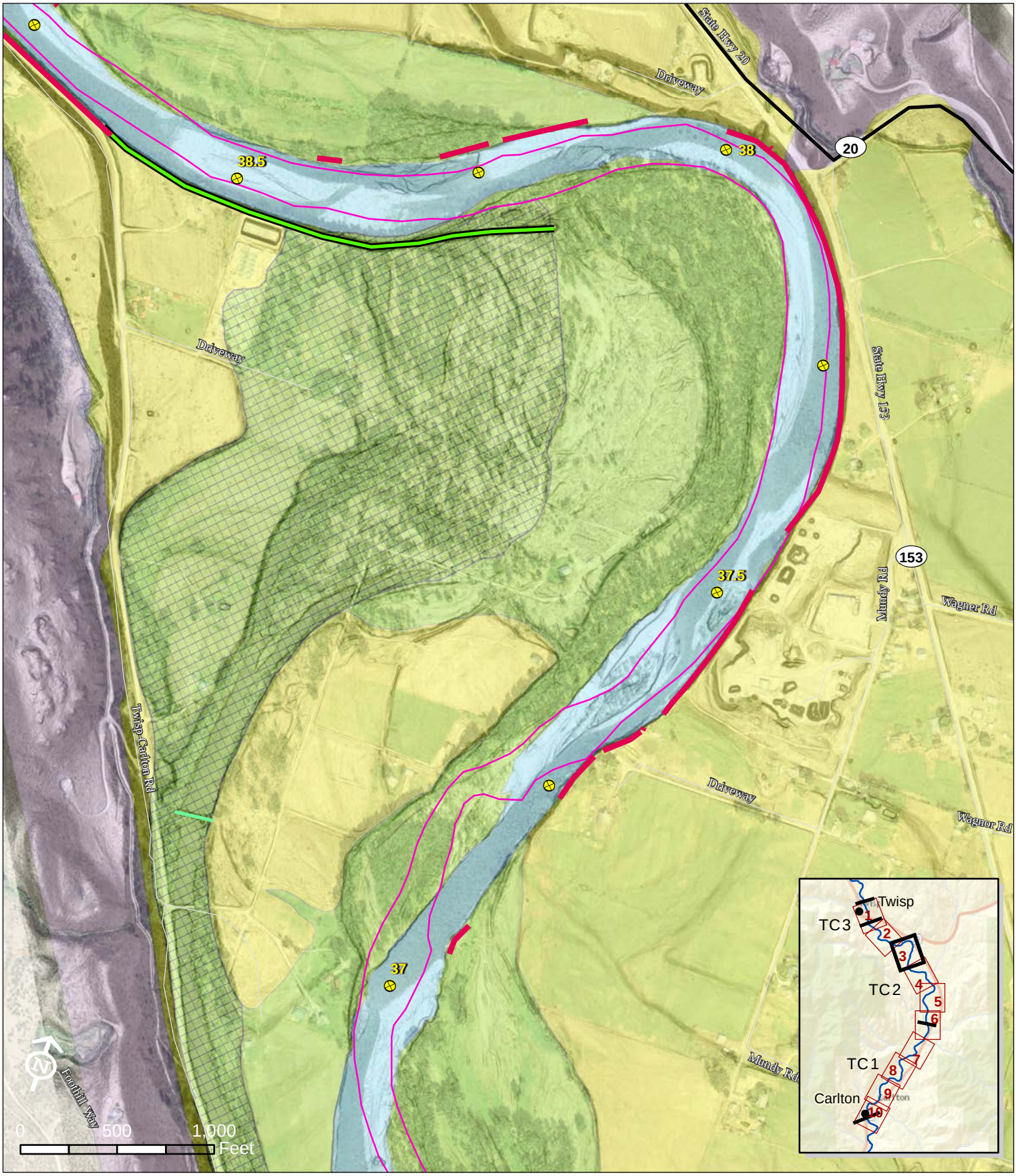


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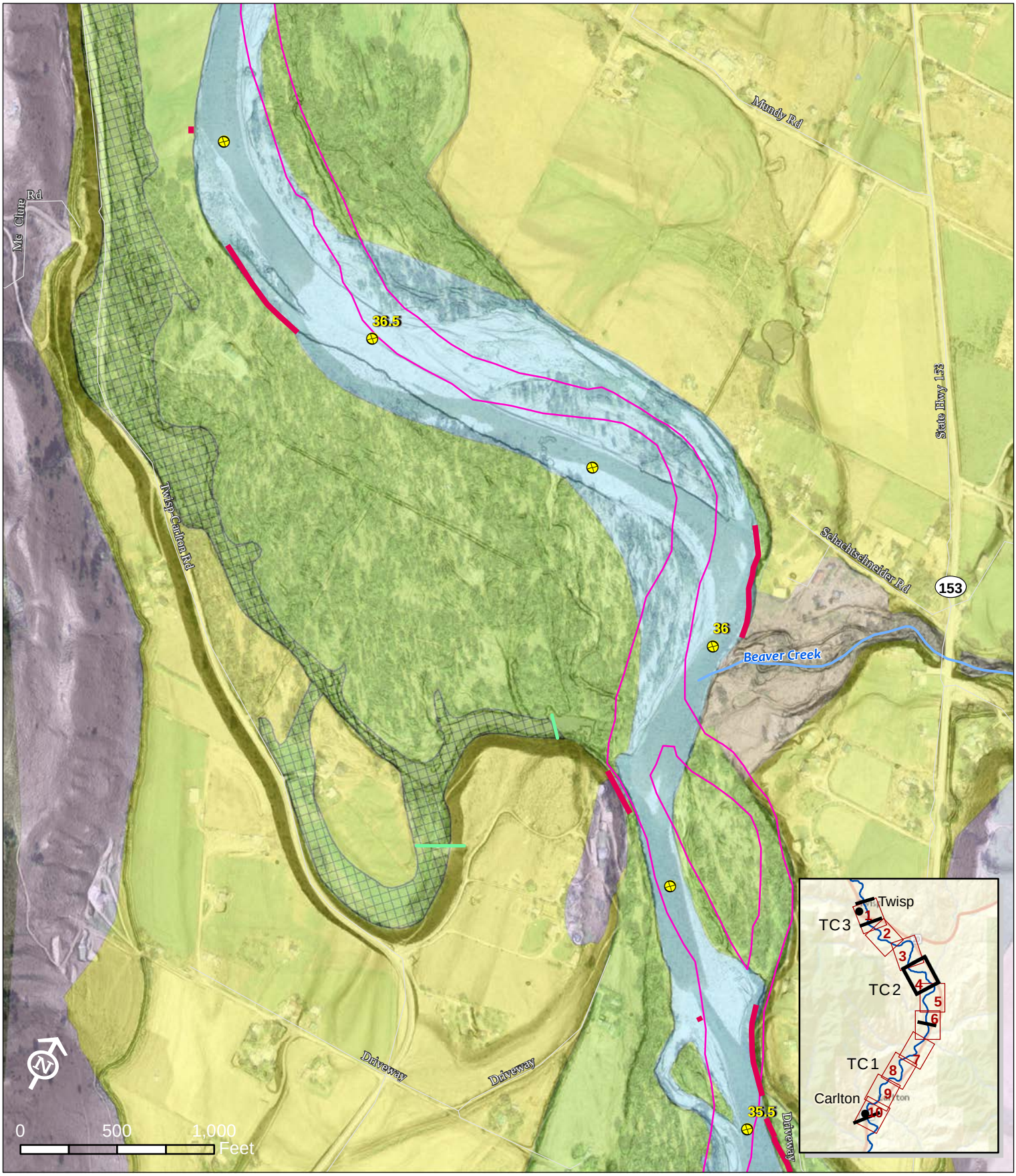


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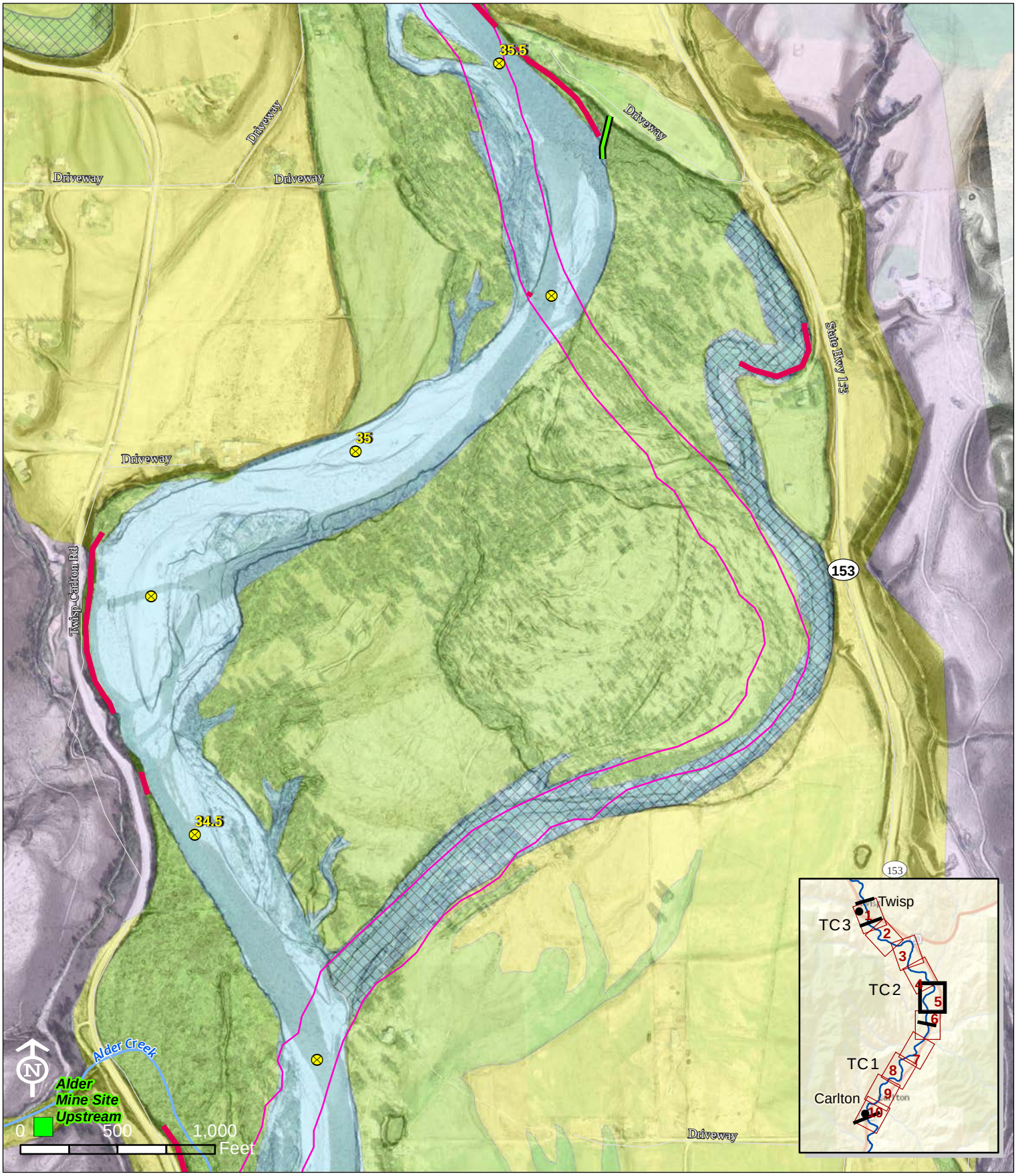


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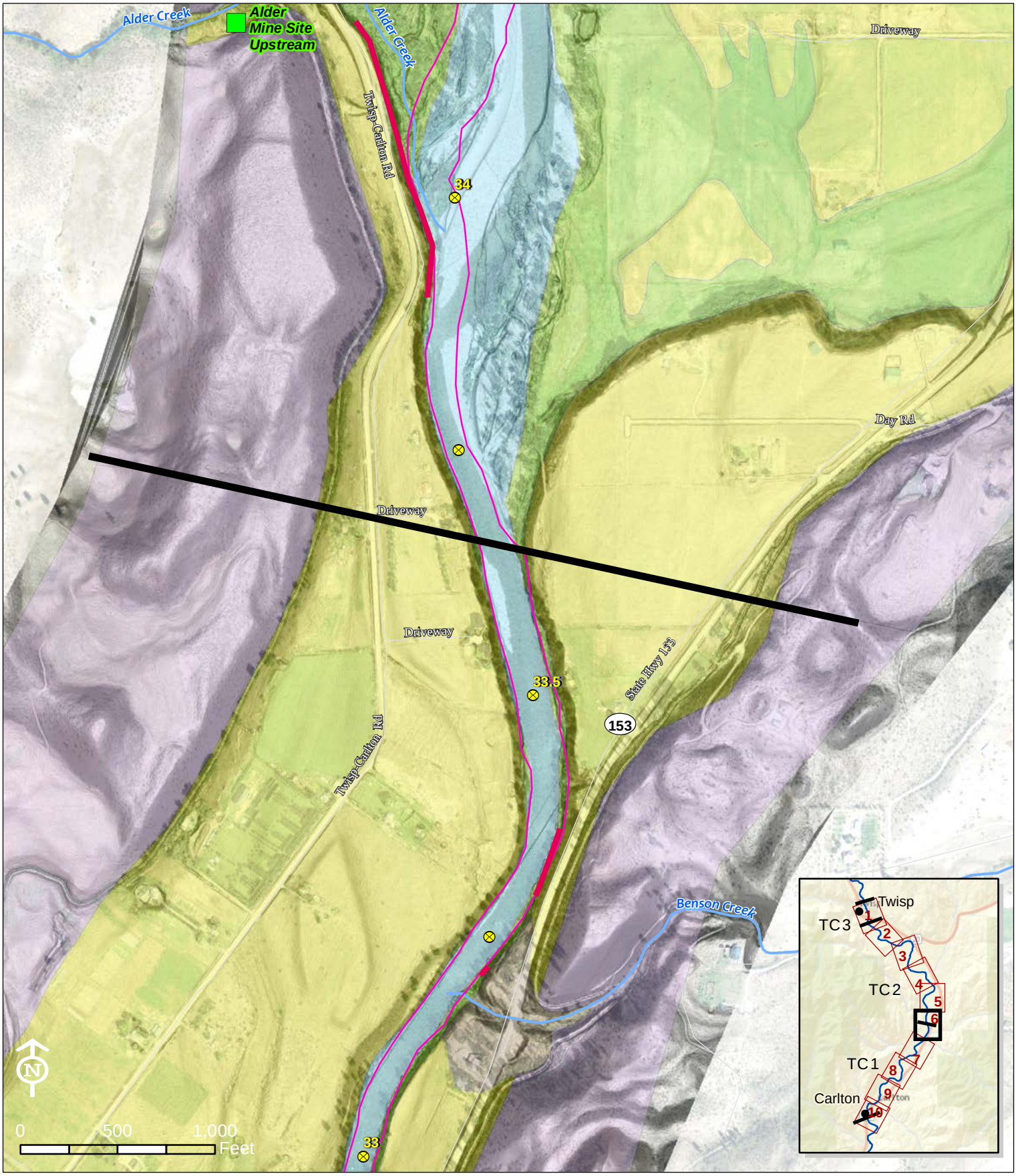


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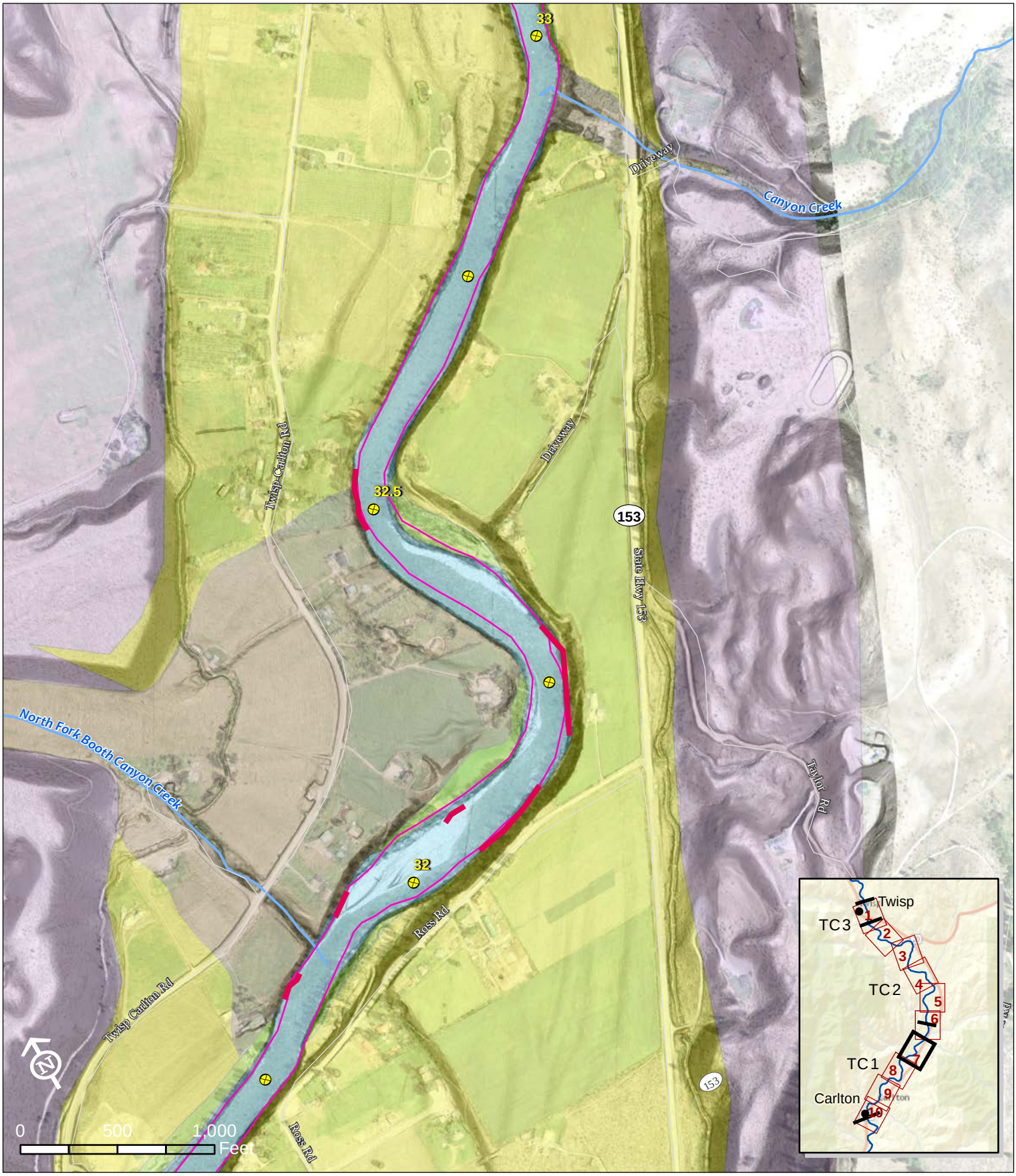


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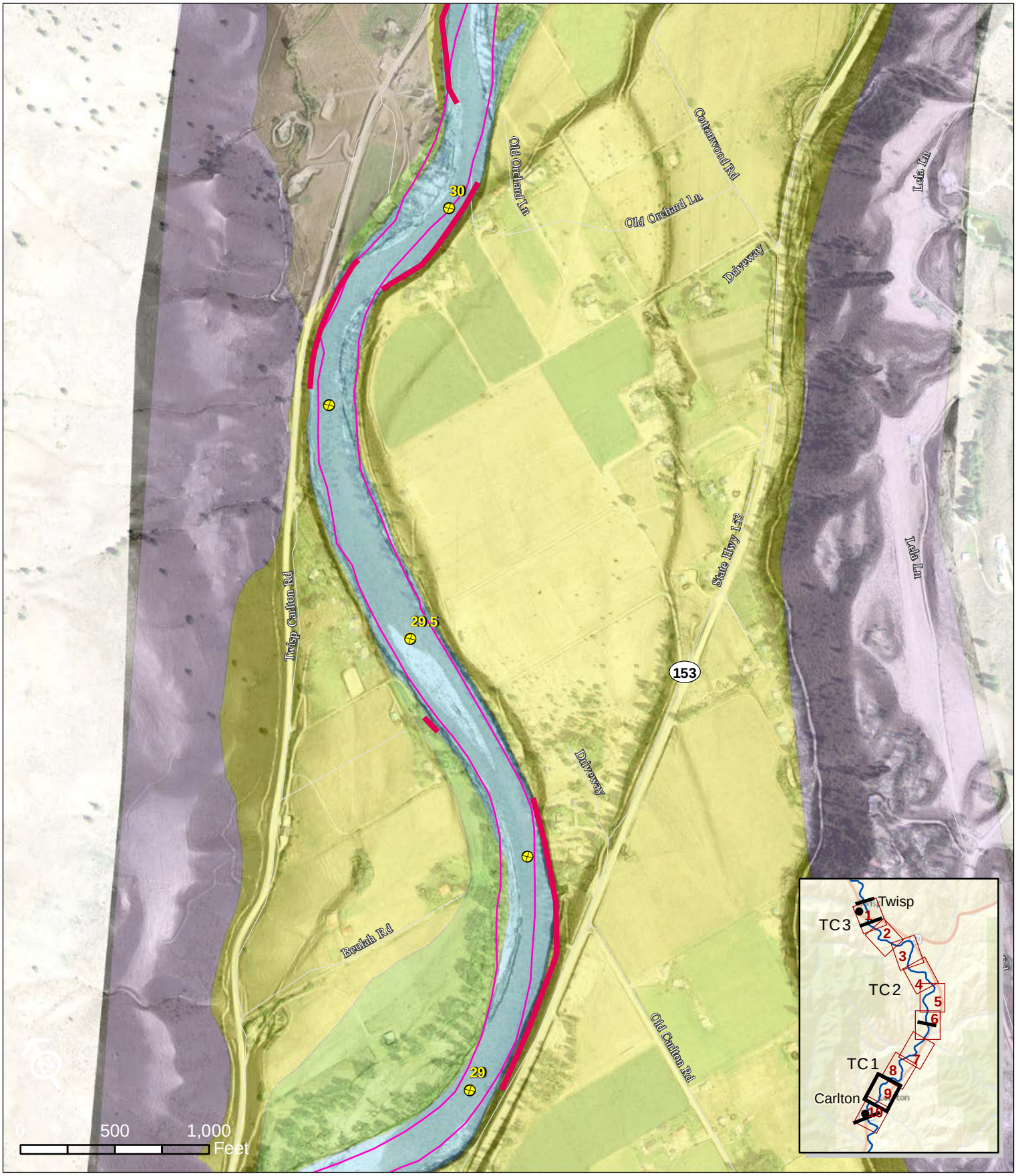


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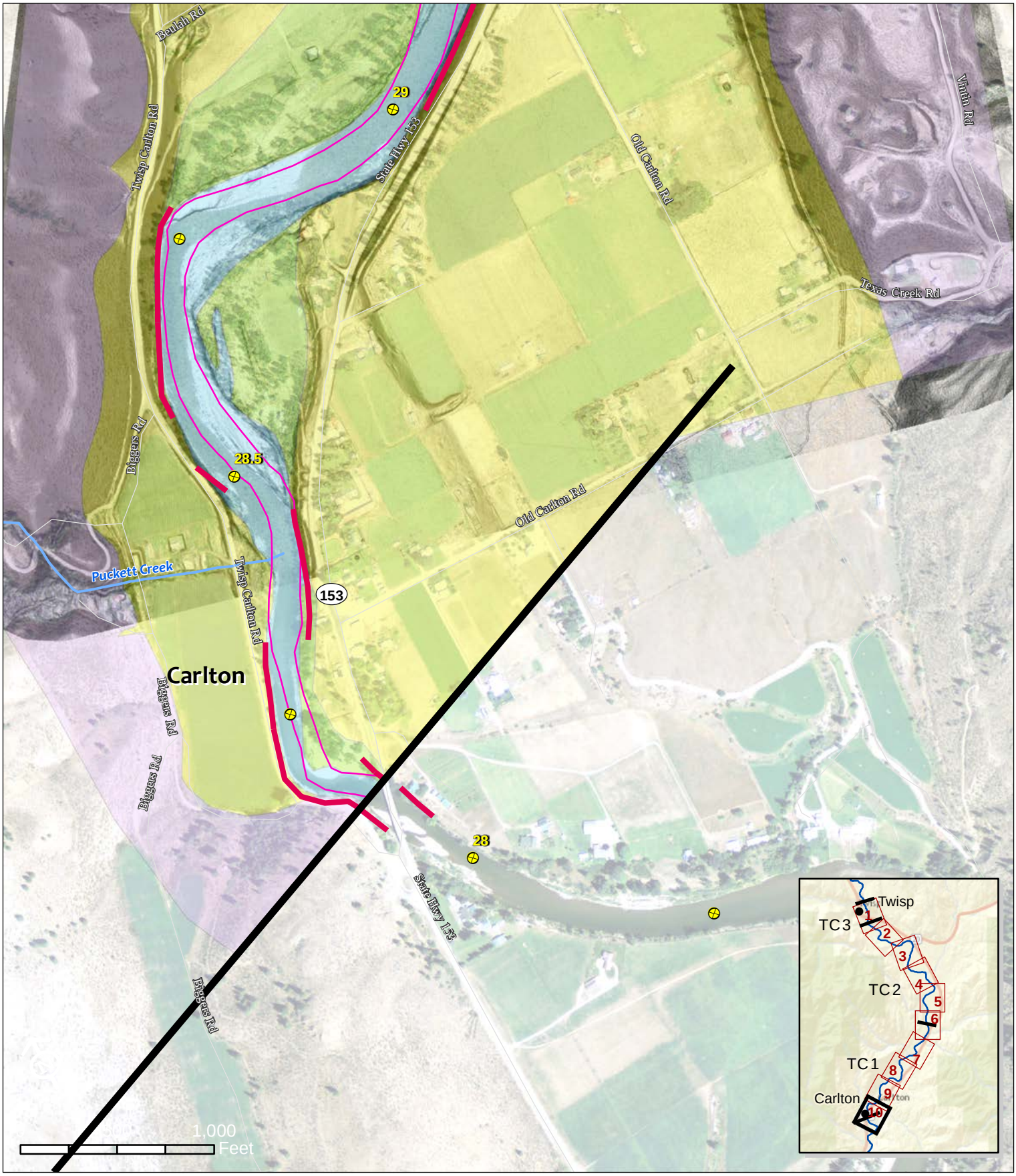


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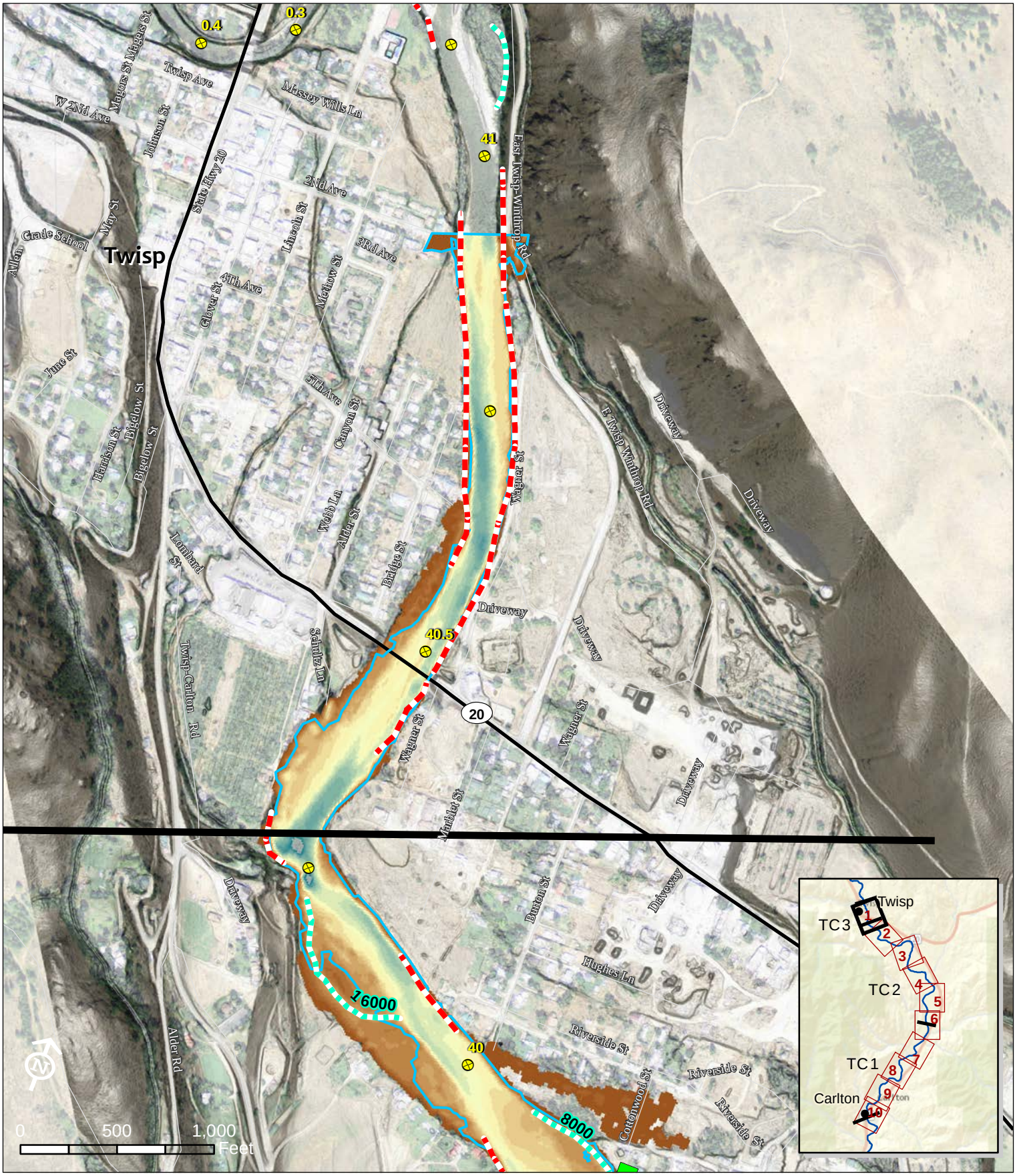
# FLOOD INUNDATION




BASEMAP: 2013 NAIP AERIAL OVERLAIN ON LIDAR SHADED RELIEF

# Methow River - Twisp to Carlton Reach: FLOOD INUNDATION

- River Miles
- Floodplain Channel (w/ Qact* shown)
- Sub-reach Boundaries
- 2-yr Flood Inundation
- Existing Levees
- Existing Riprap
- Possible Water Quality Impacts

**100-yr flood depth**

0 5 10 15 20

HYDRAULIC MODELING RESULTS SHOWN ARE FROM RECLAMATION (2014)

*Qact = Activation discharge (minimum discharge at which floodplain channel is fully connected from inlet to outlet).



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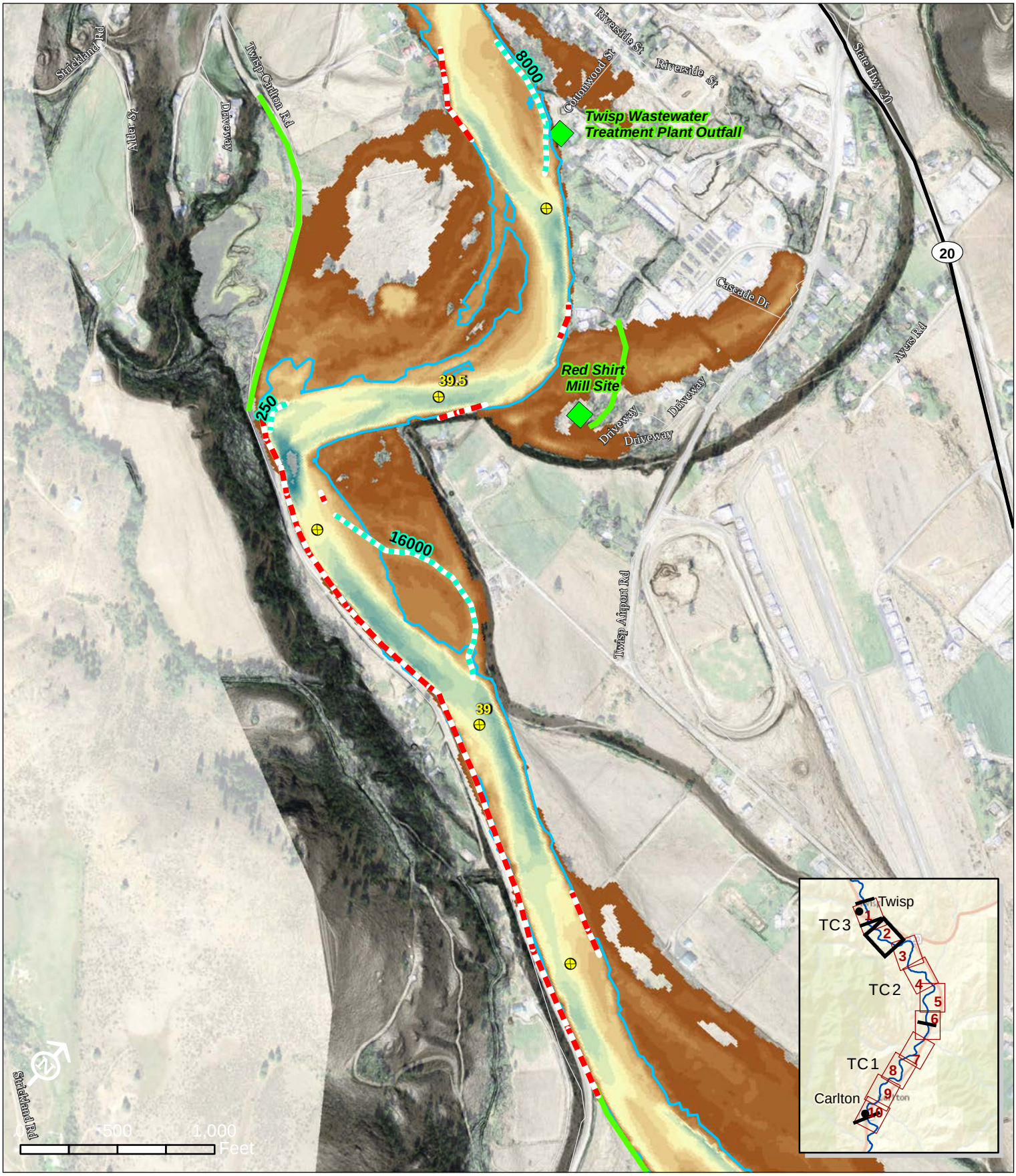


BASEMAP: 2013 NAIP AERIAL OVERLAIN ON LIDAR SHADED RELIEF

# Methow River - Twisp to Carlton Reach: FLOOD INUNDATION

- River Miles
- Floodplain
- Channel (w/ Qact* shown)
- Sub-reach Boundaries
- 2-yr Flood Inundation
- Existing Levees
- Existing Riprap
- Possible Water Quality Impacts

**100-yr flood depth**

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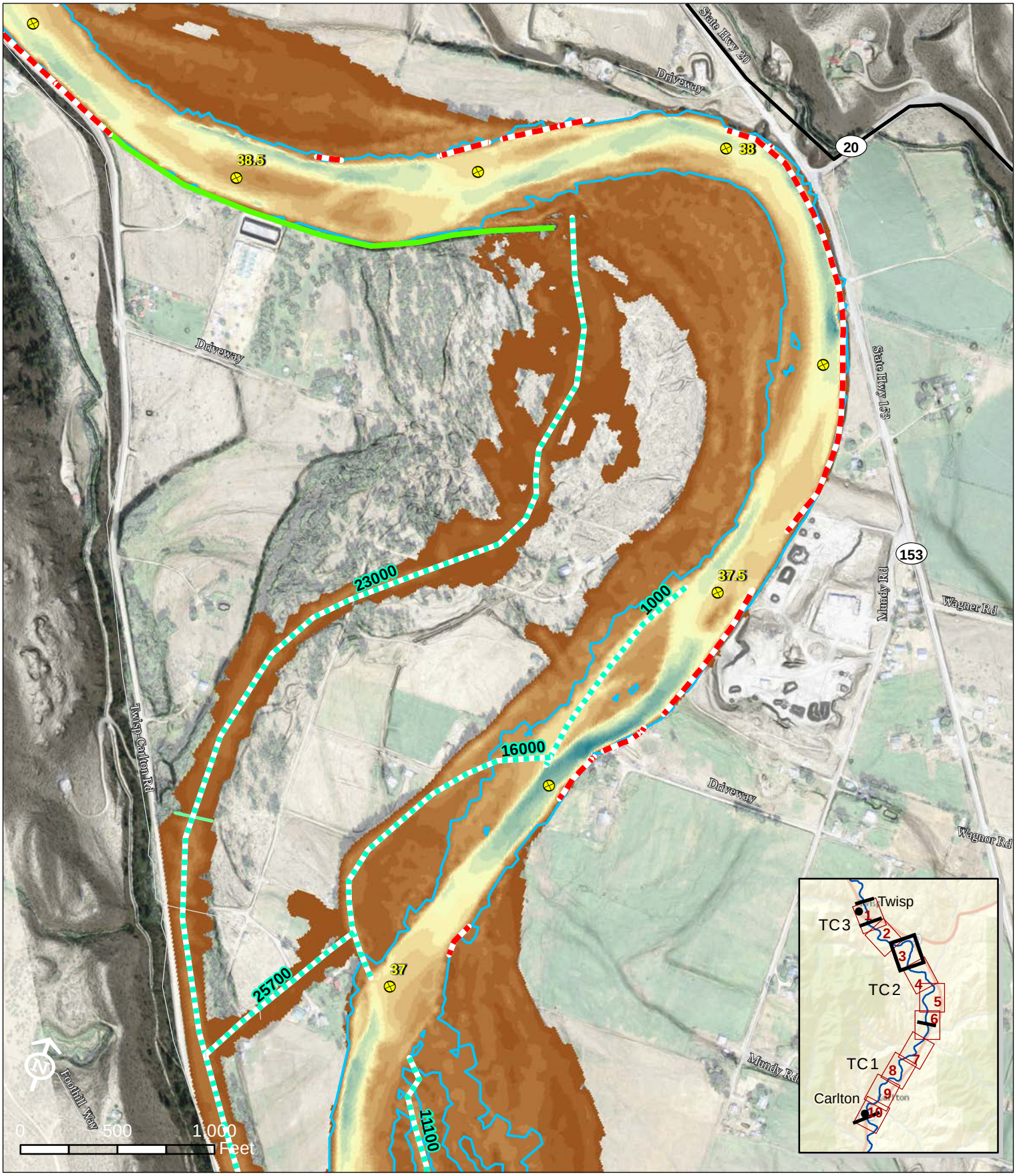


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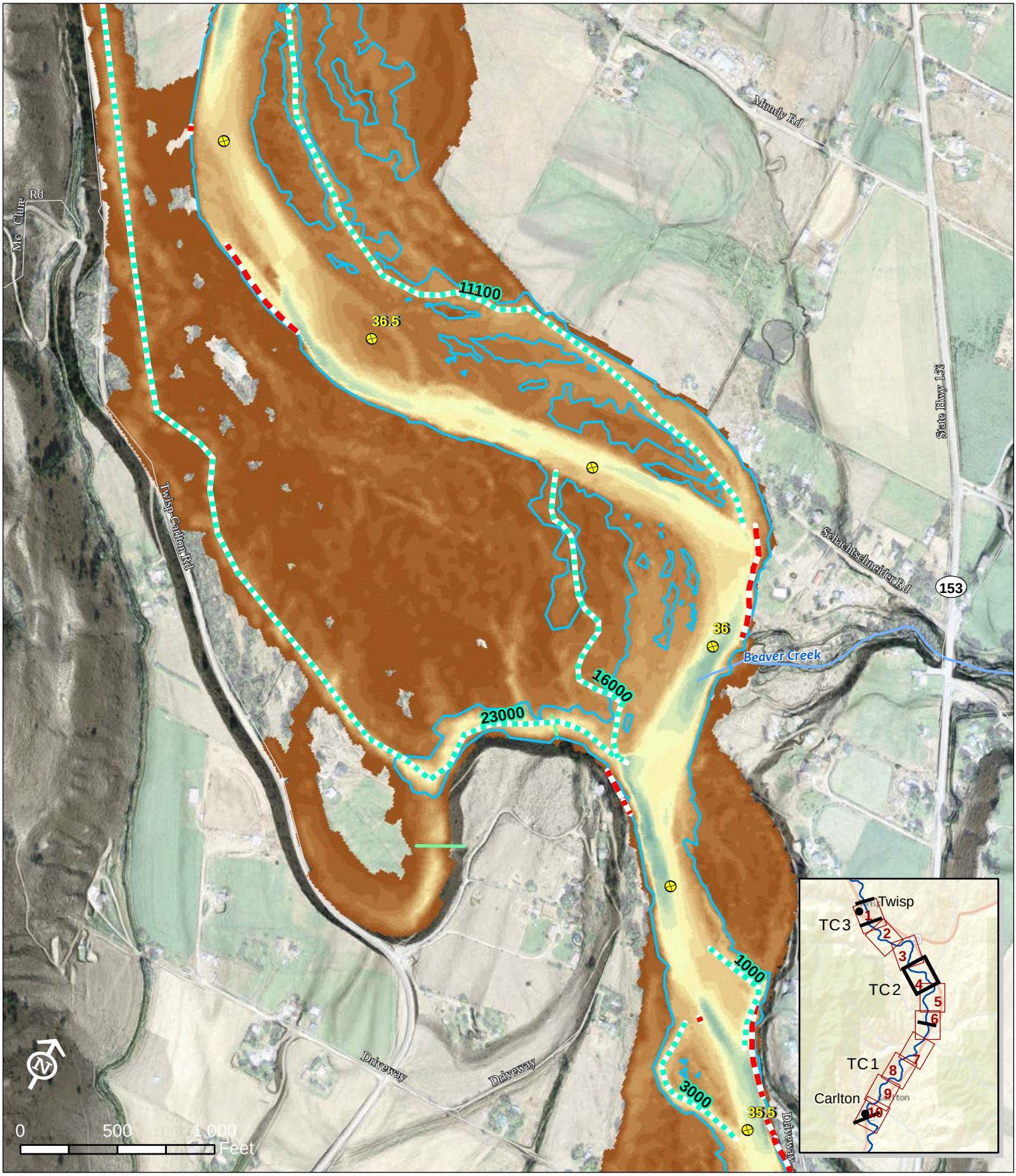


BASEMAP: 2013 NAIP AERIAL OVERLAIN ON LIDAR SHADED RELIEF

# Methow River - Twisp to Carlton Reach: FLOOD INUNDATION

- River Miles
- Floodplain Channel (w/ Qact* shown)
- Sub-reach Boundaries
- 2-yr Flood Inundation
- Existing Levees
- Existing Riprap
- Possible Water Quality Impacts
- Dam

**100-yr flood depth**

0 5 10 15 20

HYDRAULIC MODELING RESULTS SHOWN ARE FROM RECLAMATION (2014)

*Qact = Activation discharge (minimum discharge at which floodplain channel is fully connected from inlet to outlet).



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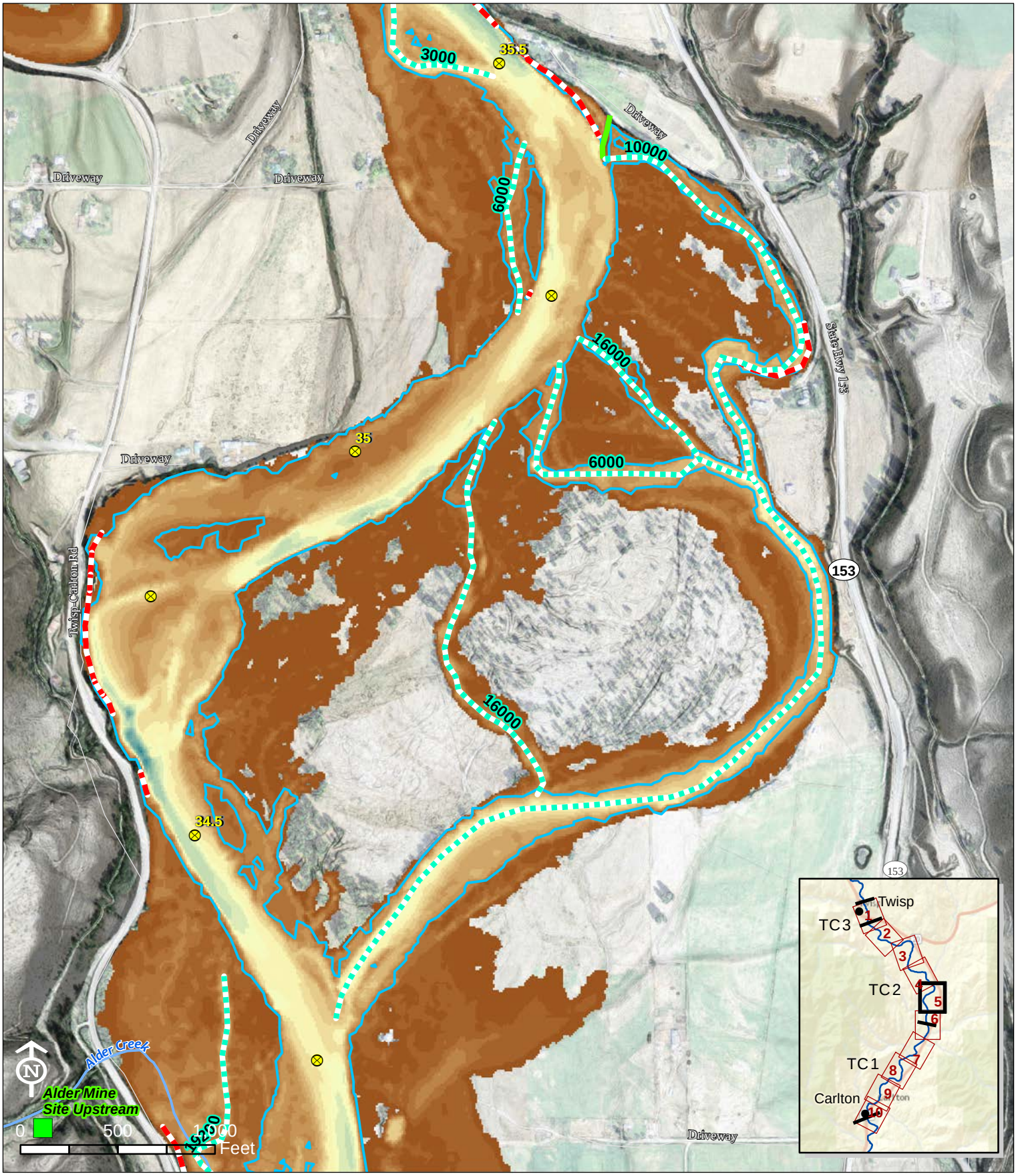


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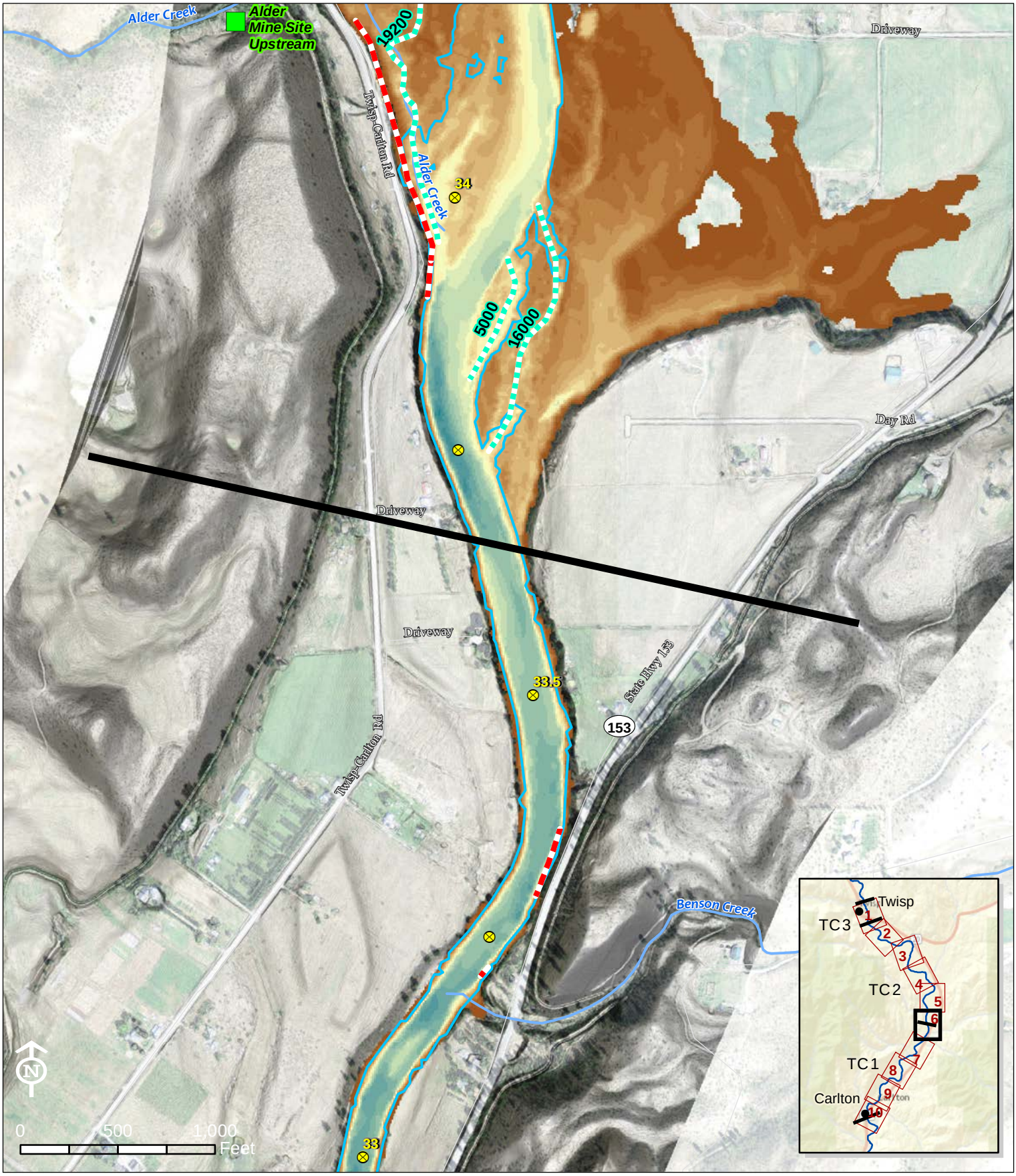


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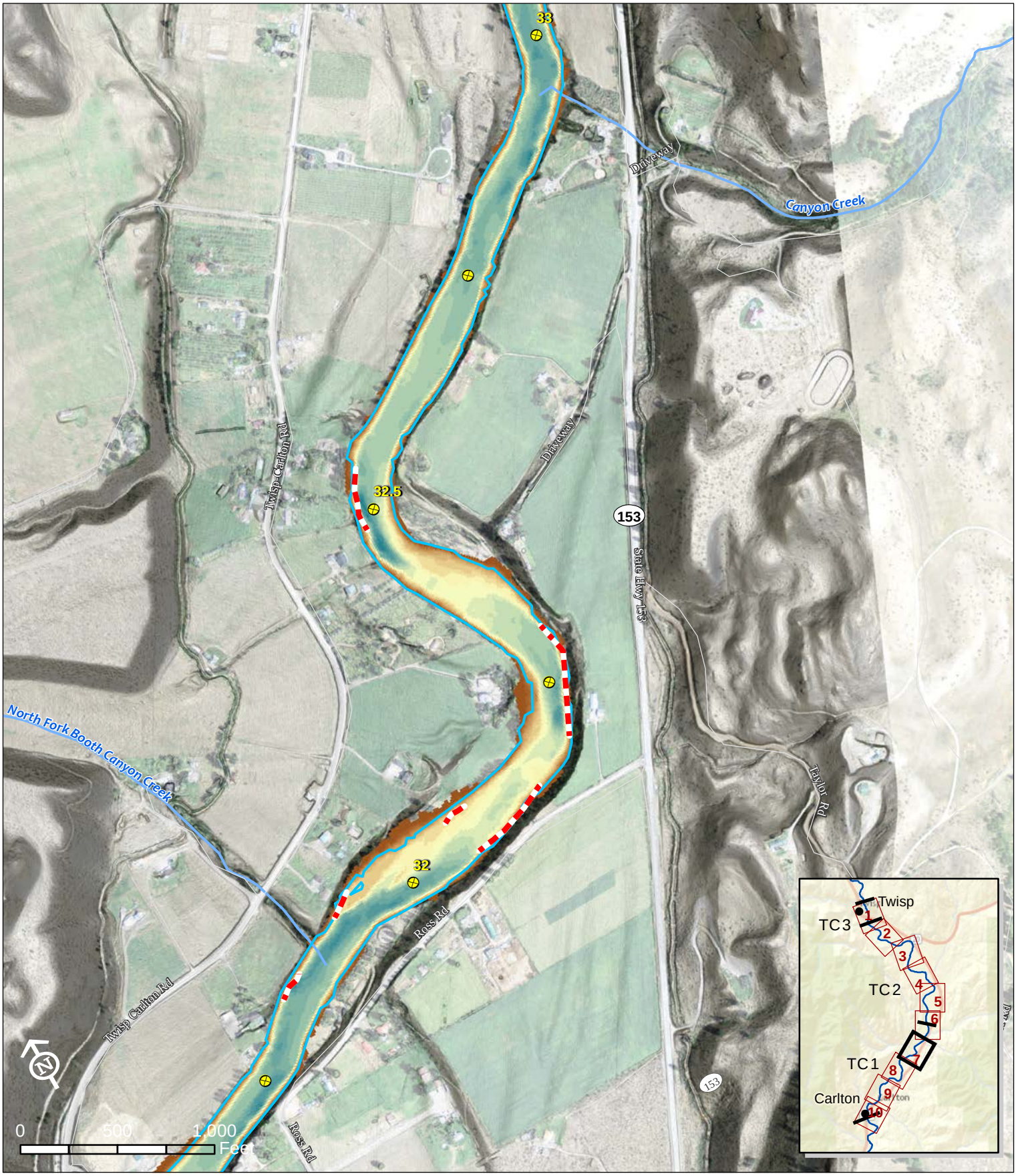


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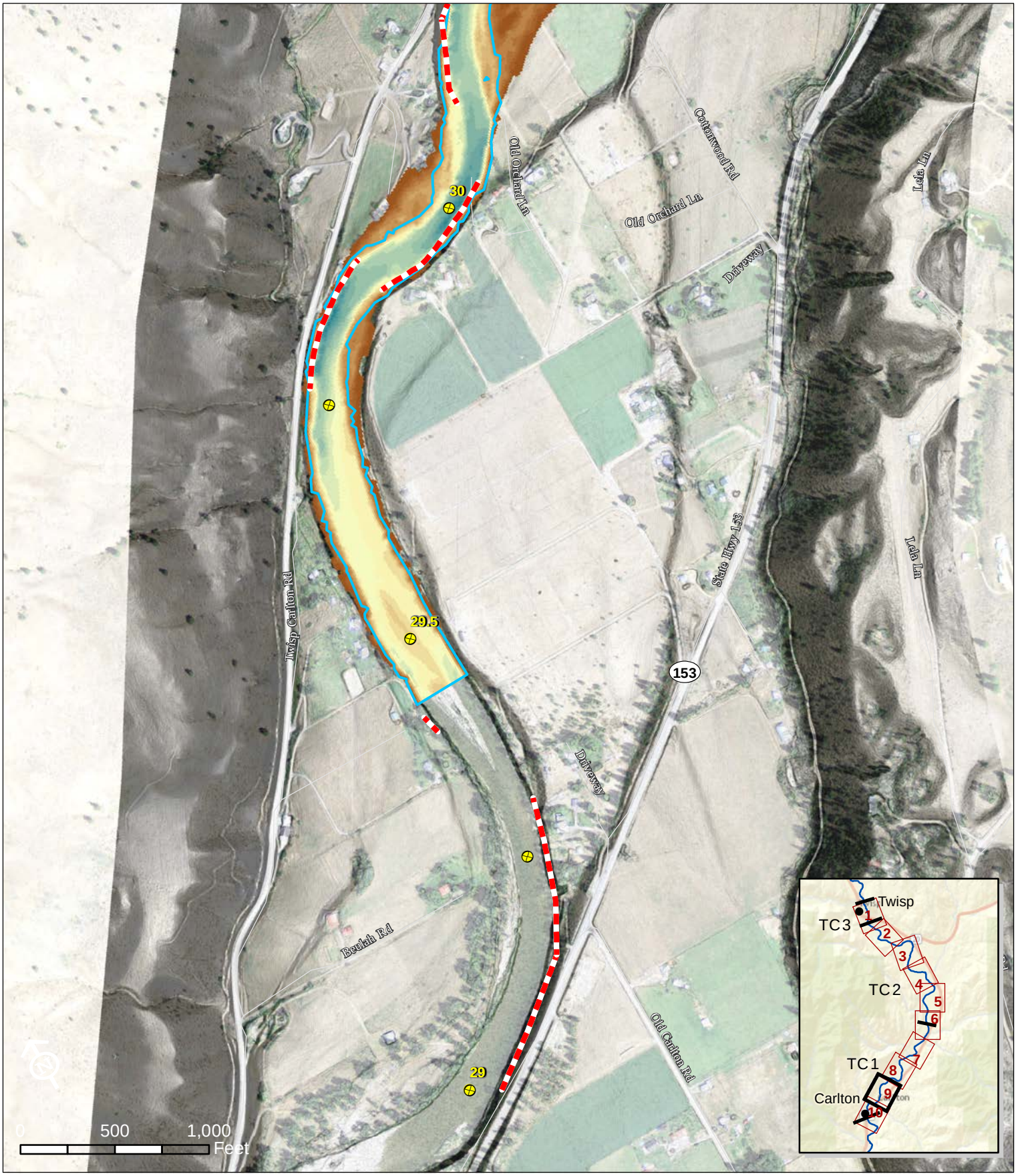


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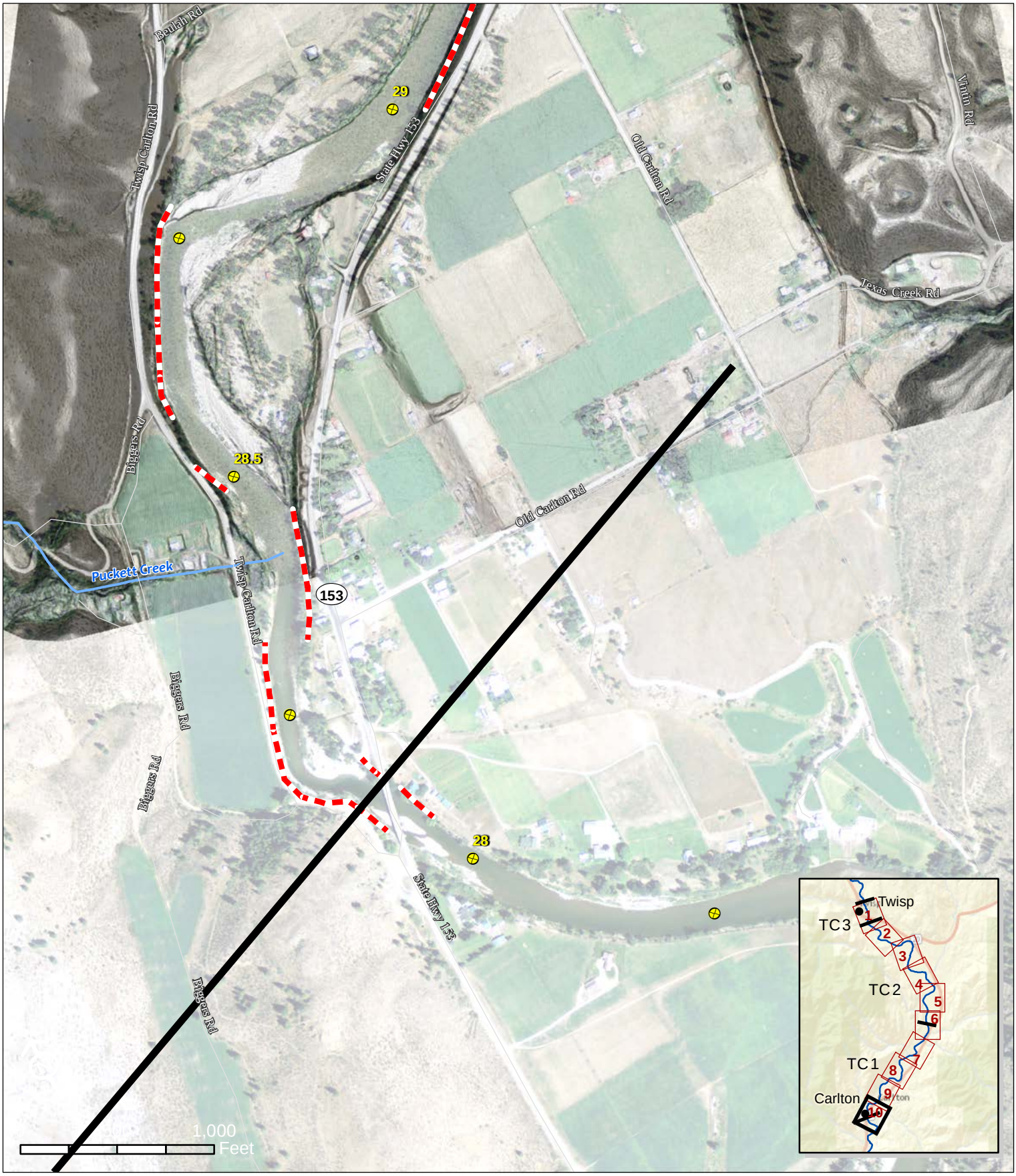


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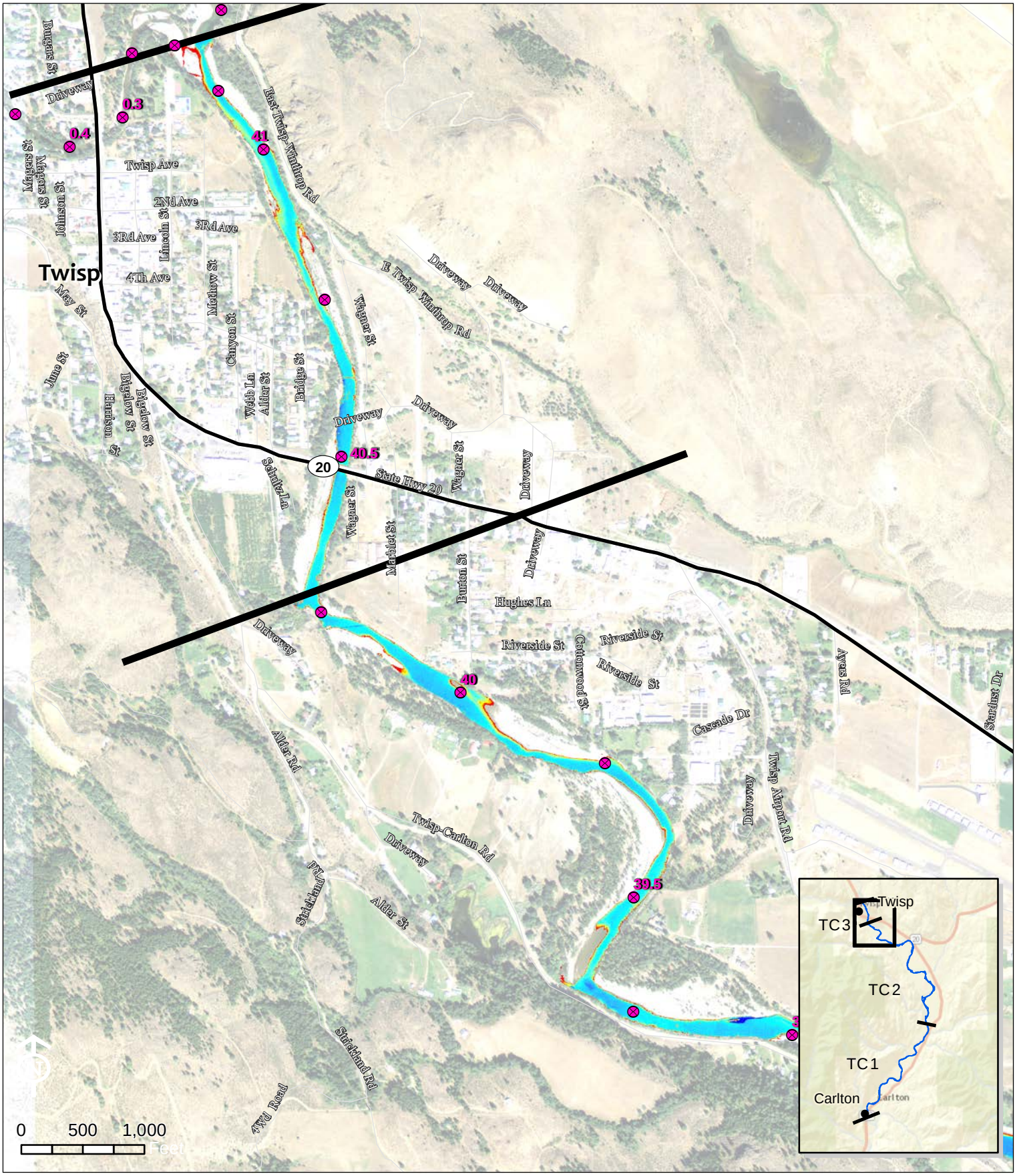
FLIR




BASEMAP: 2013 NAIP AERIAL

# Methow River - Twisp to Carlton Reach: FLIR TEMPERATURE SURVEY (2009)

River Miles

Sub-reach Boundaries

**Deg C x 10**

190 180 170 160



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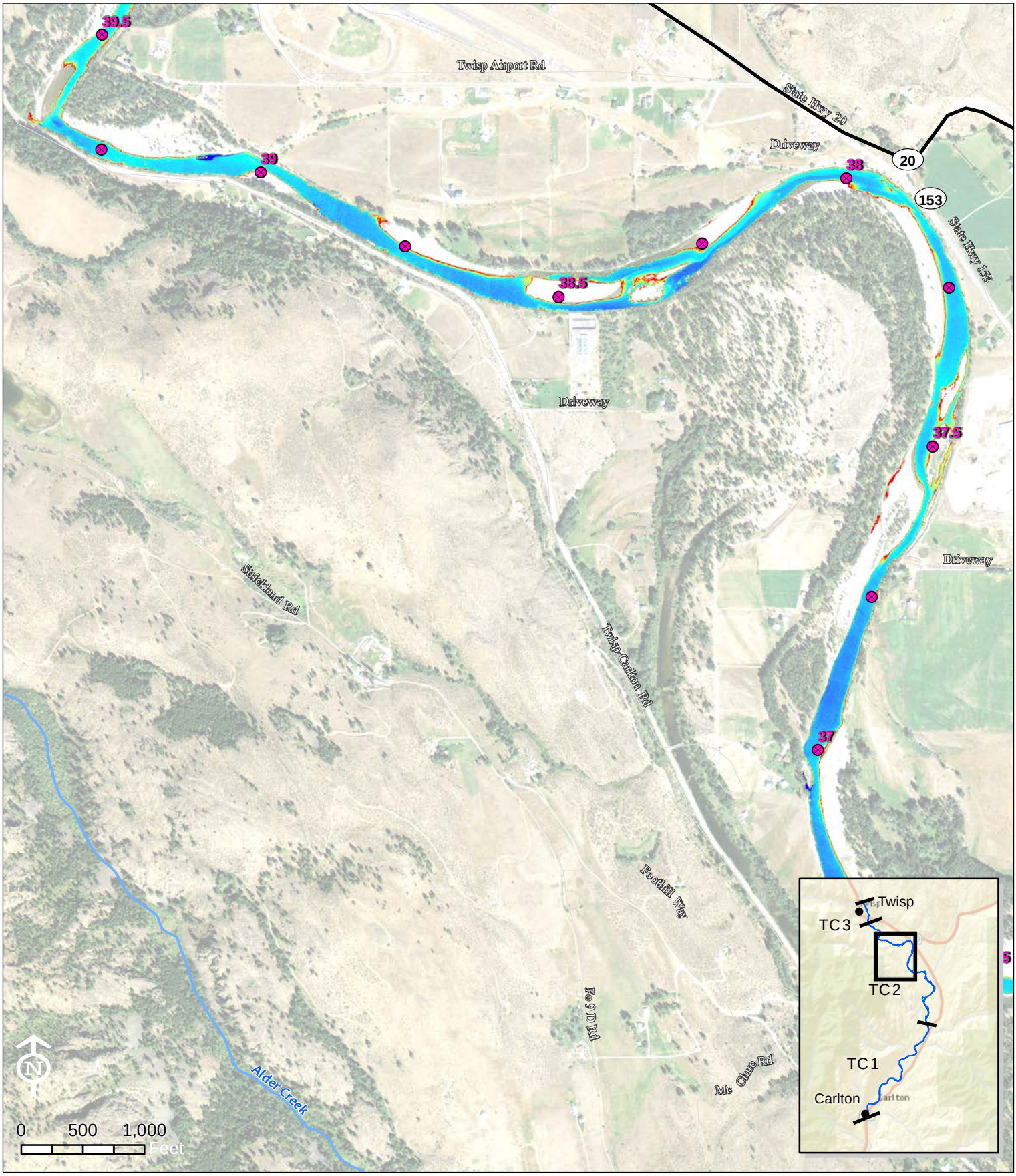


BASEMAP: 2013 NAIP AERIAL

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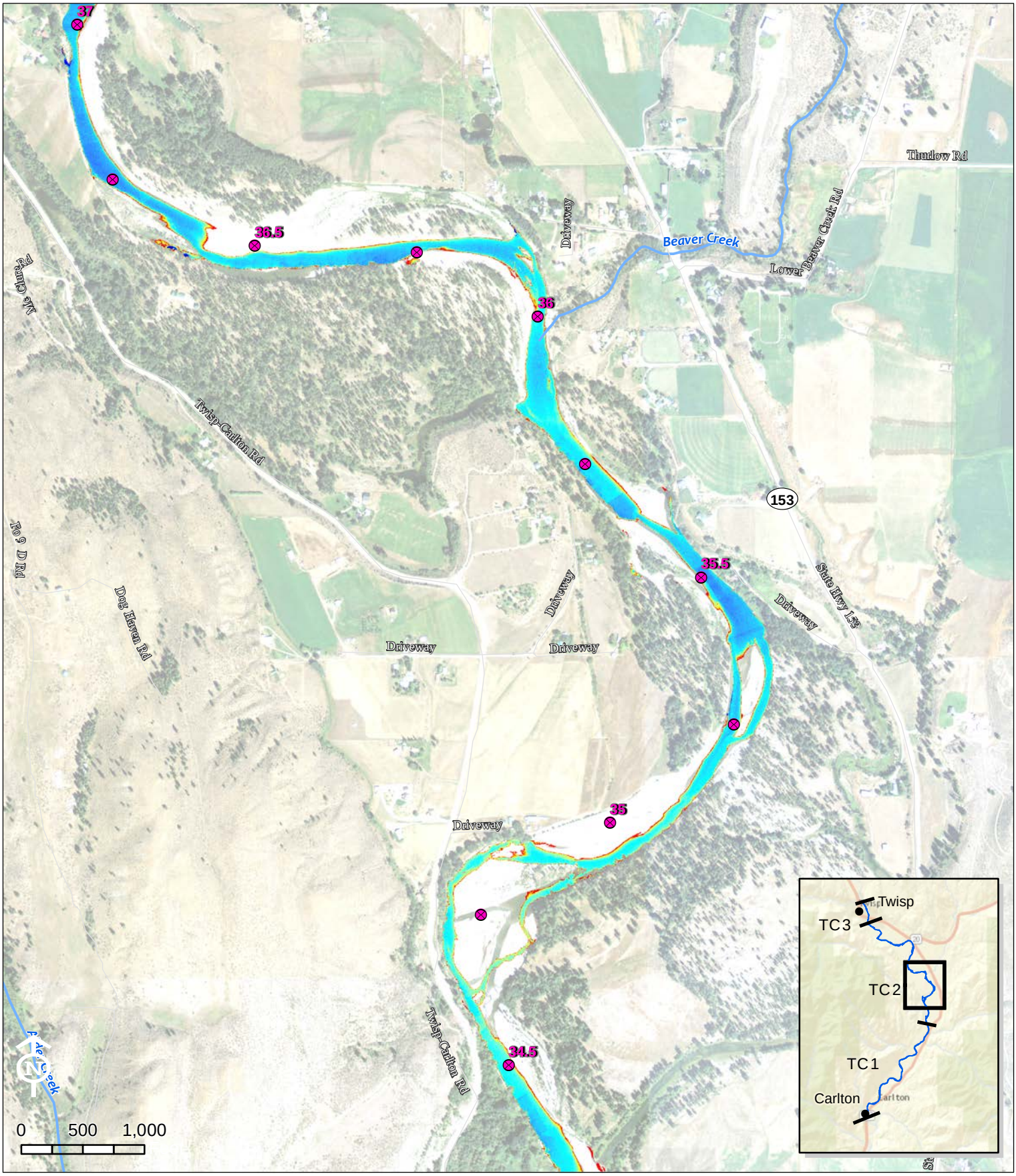


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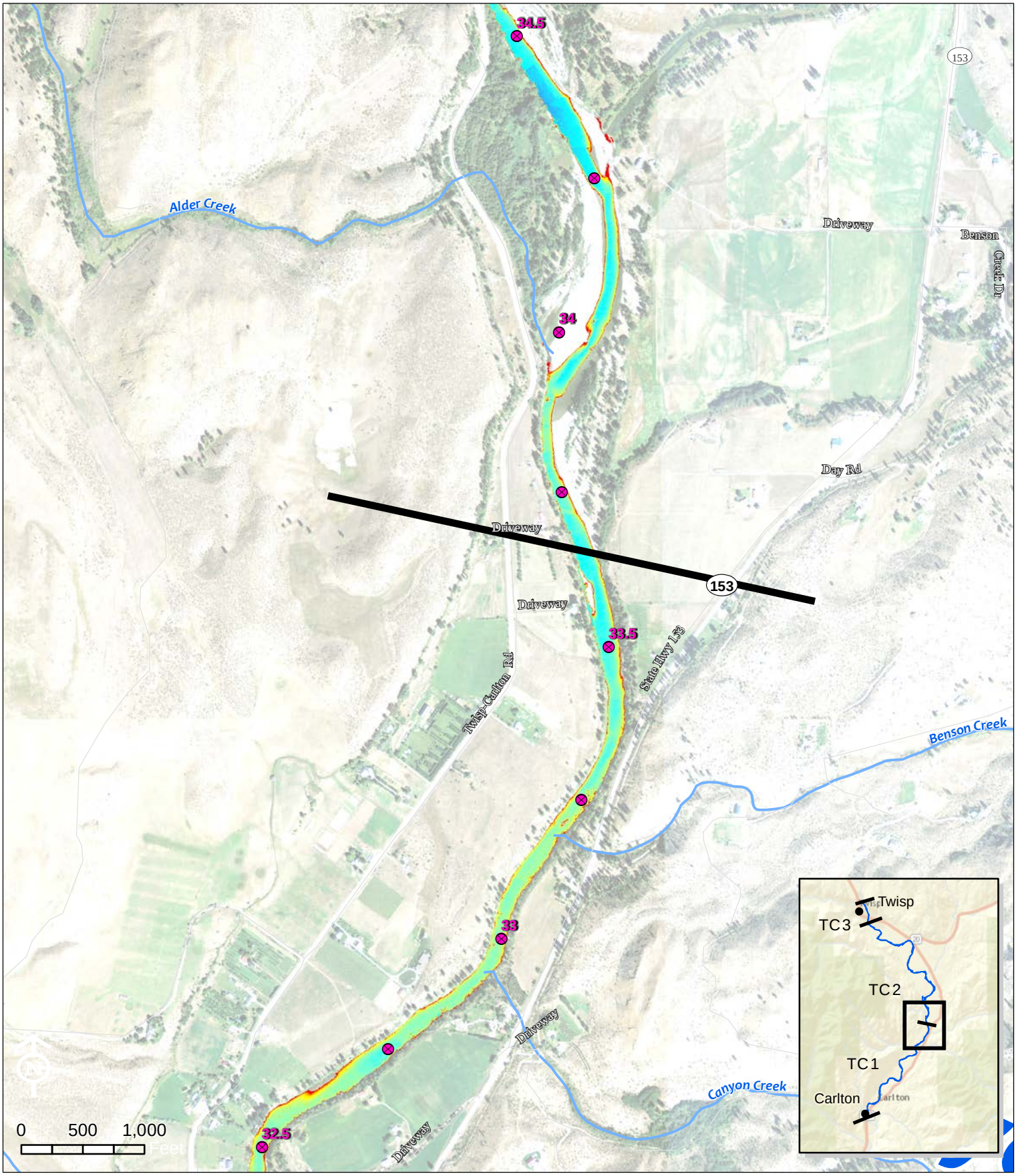


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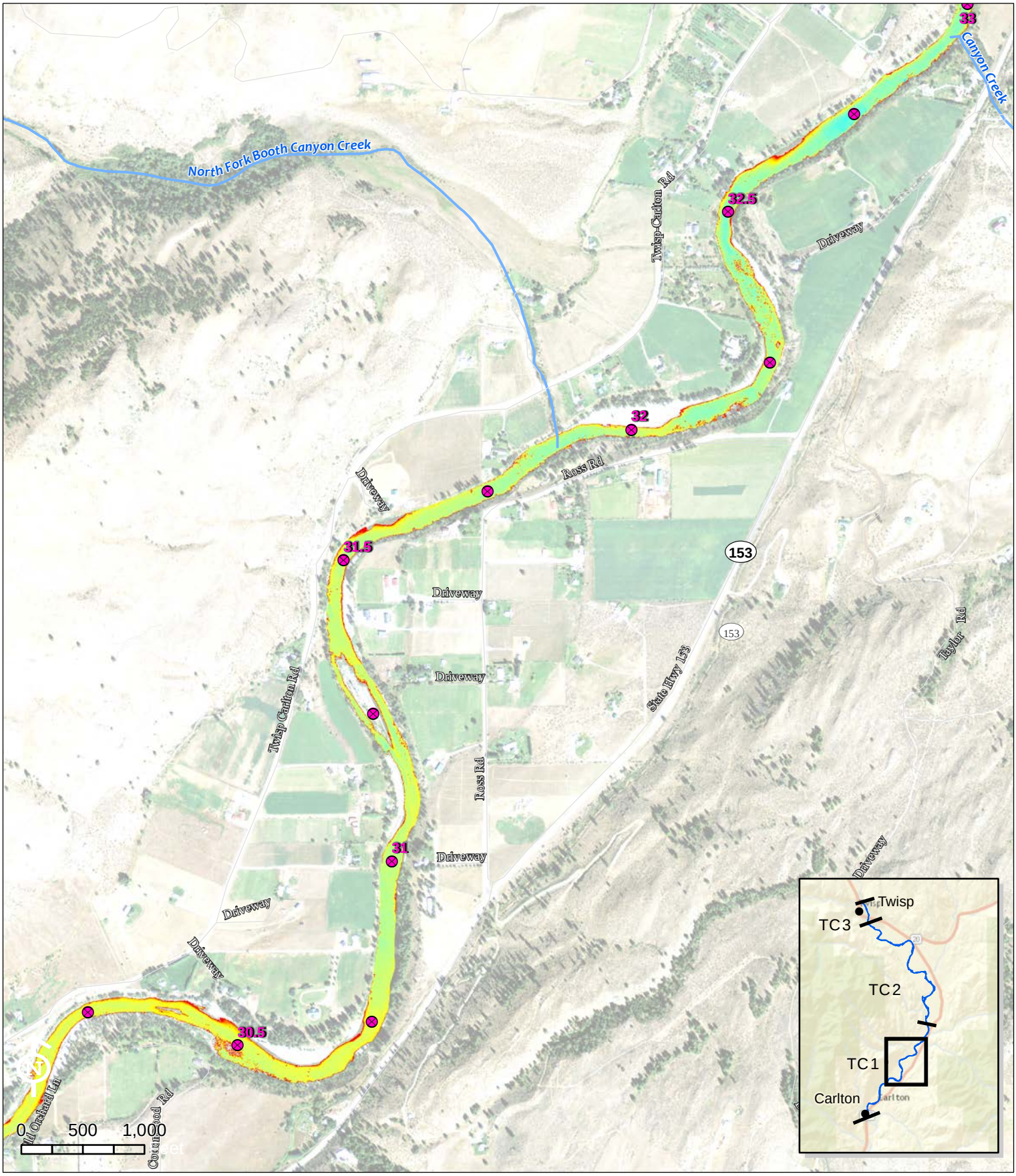


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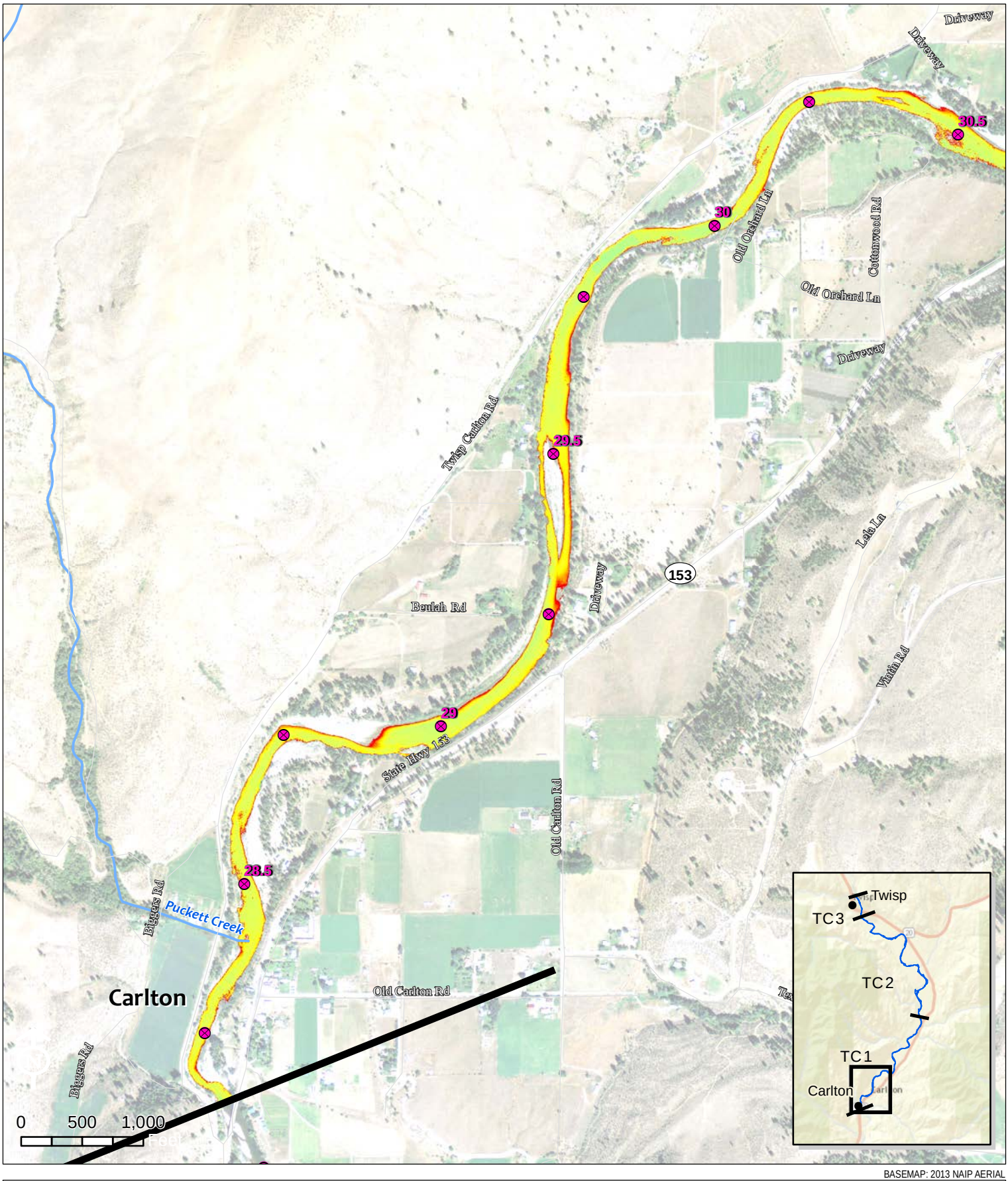


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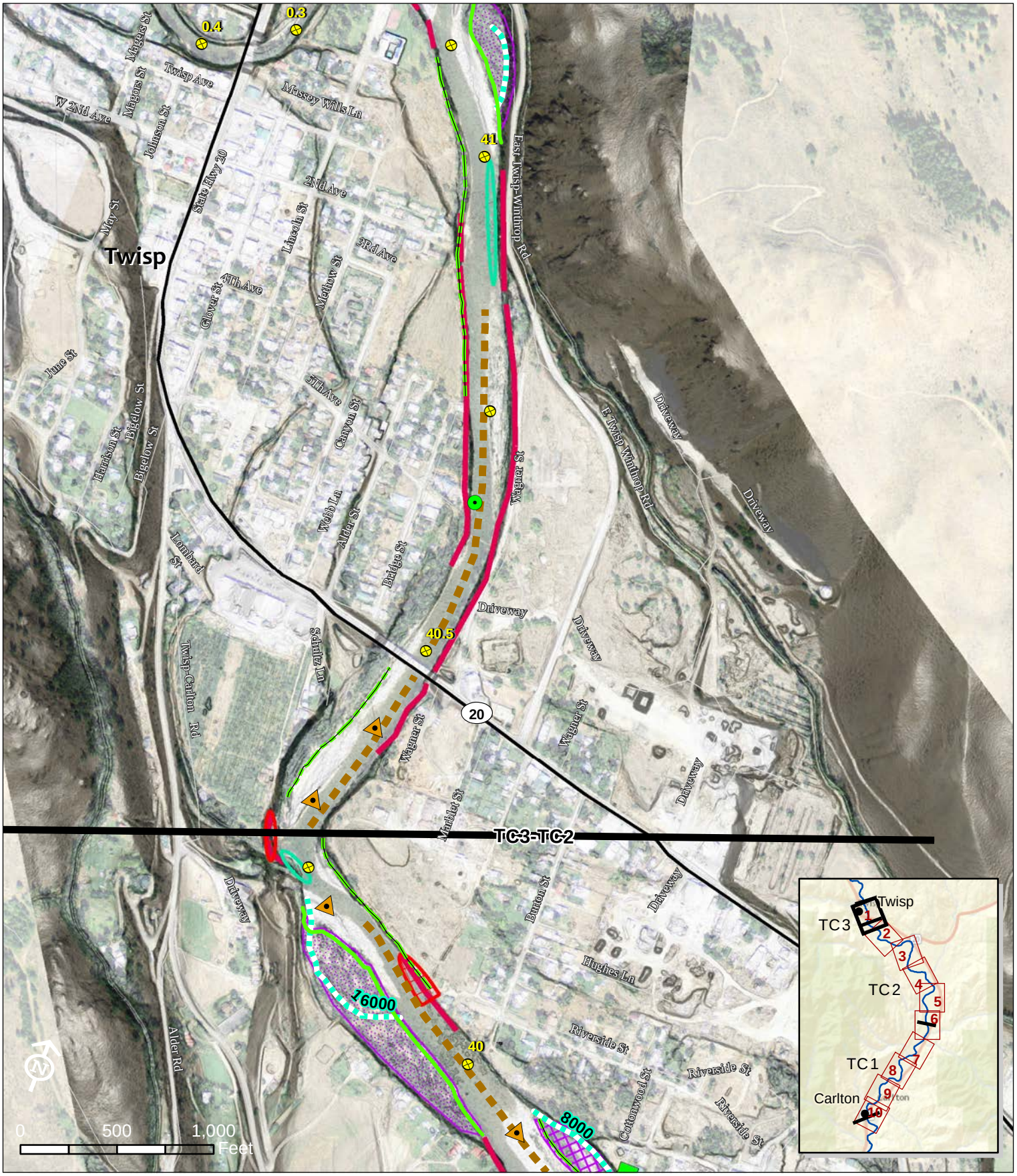
# RESTORATION PROJECT ACTIONS




BASEMAP: 2013 NAIP AERIAL OVERLAIN ON LIDAR SHADED RELIEF

# Methow River - Twisp to Carlton Reach: RESTORATION PROJECT ACTIONS

EXISTING FEATURES

- River Miles
- Beaver Activity
- Floodplain Channel (w/ Qact* shown)
- Sub-reach Boundaries
- Existing Levees/Disconnecting Features
- Existing Riprap
- Possible Water Quality Impacts

RESTORATION ACTIONS

- In-Channel Wood Placement - Flow Splitting
- In-Channel Wood Placement - Habitat Focus

**Riparian Actions**

- Protect
- Planting
- Boulder Clusters
- Floodplain Protection
- Floodplain Reconnection
- Riprap/Levee Removal

Restoration mapping shows general zones of possible restoration actions. Riparian projects are mapped along banklines to show the longitudinal extent of possible actions, but the lateral project extents are not included.

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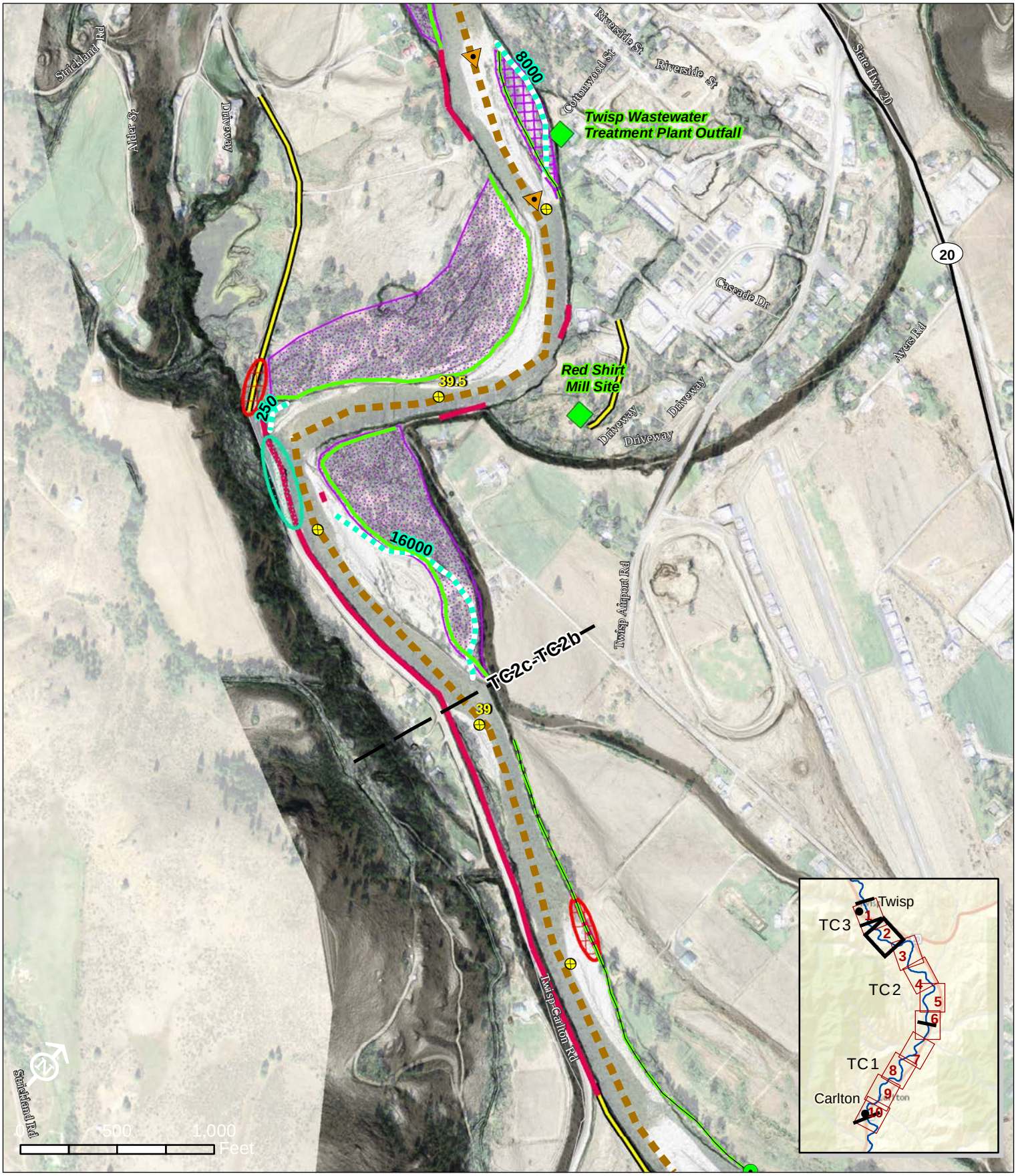


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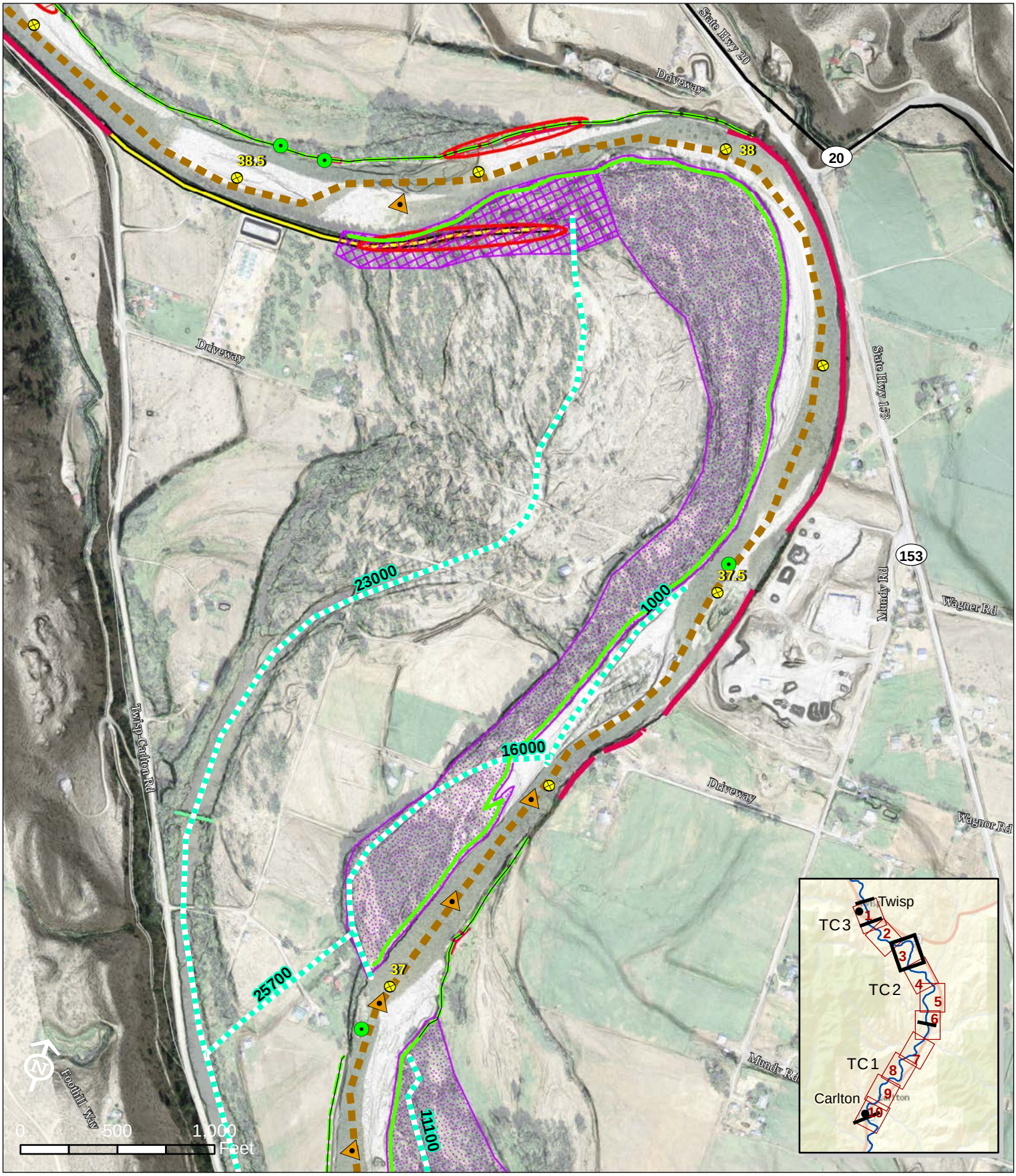


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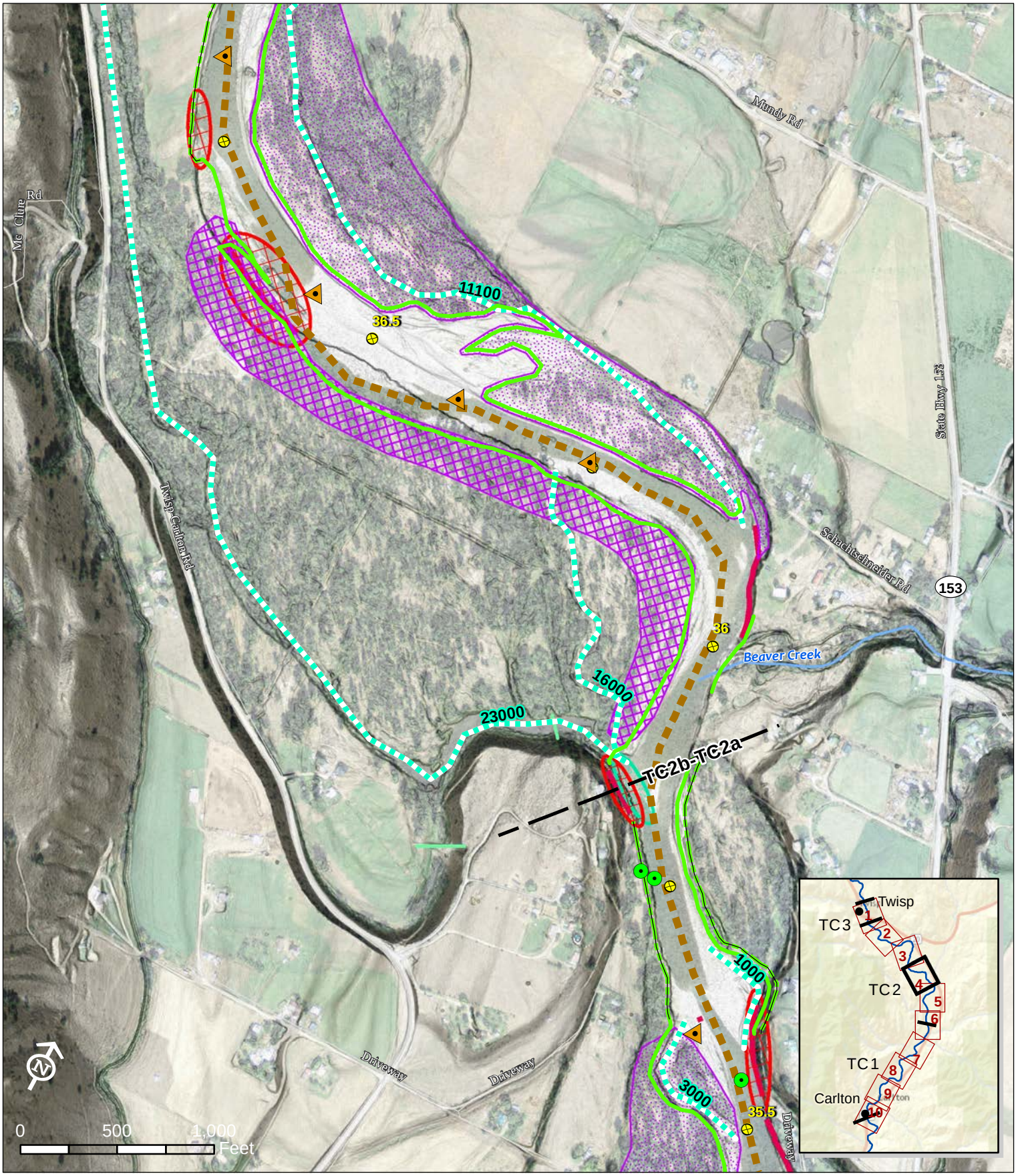


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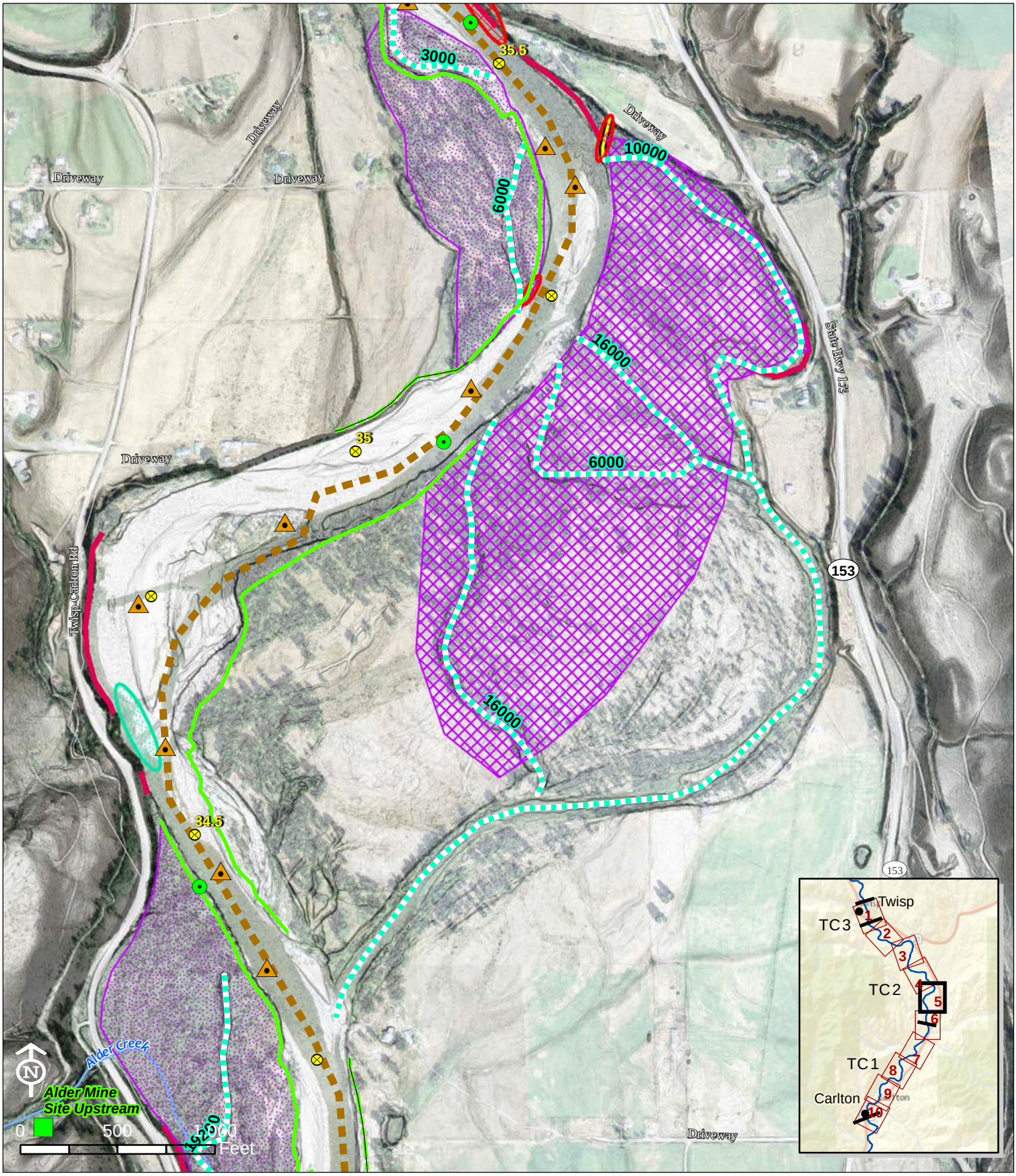


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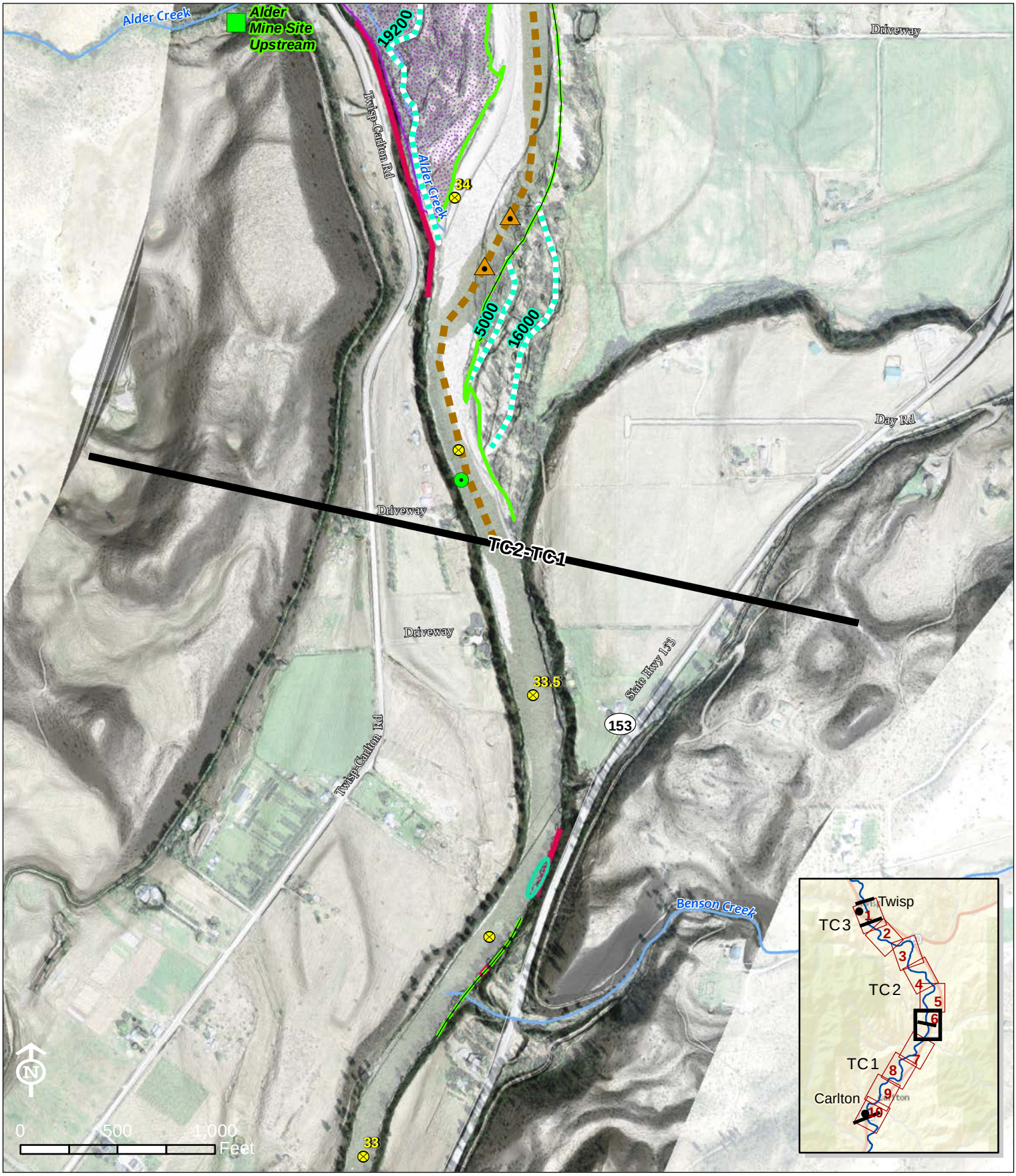


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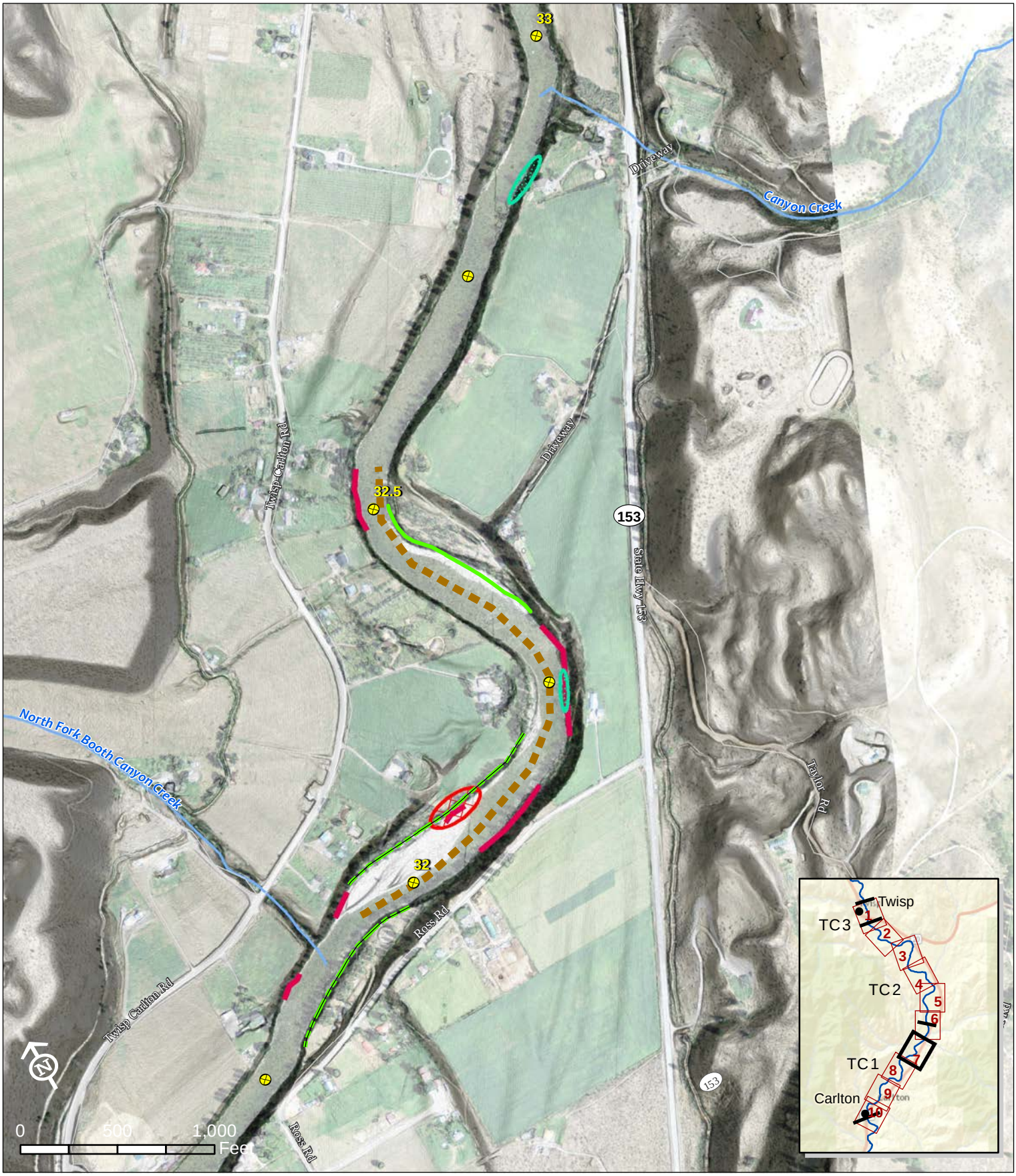


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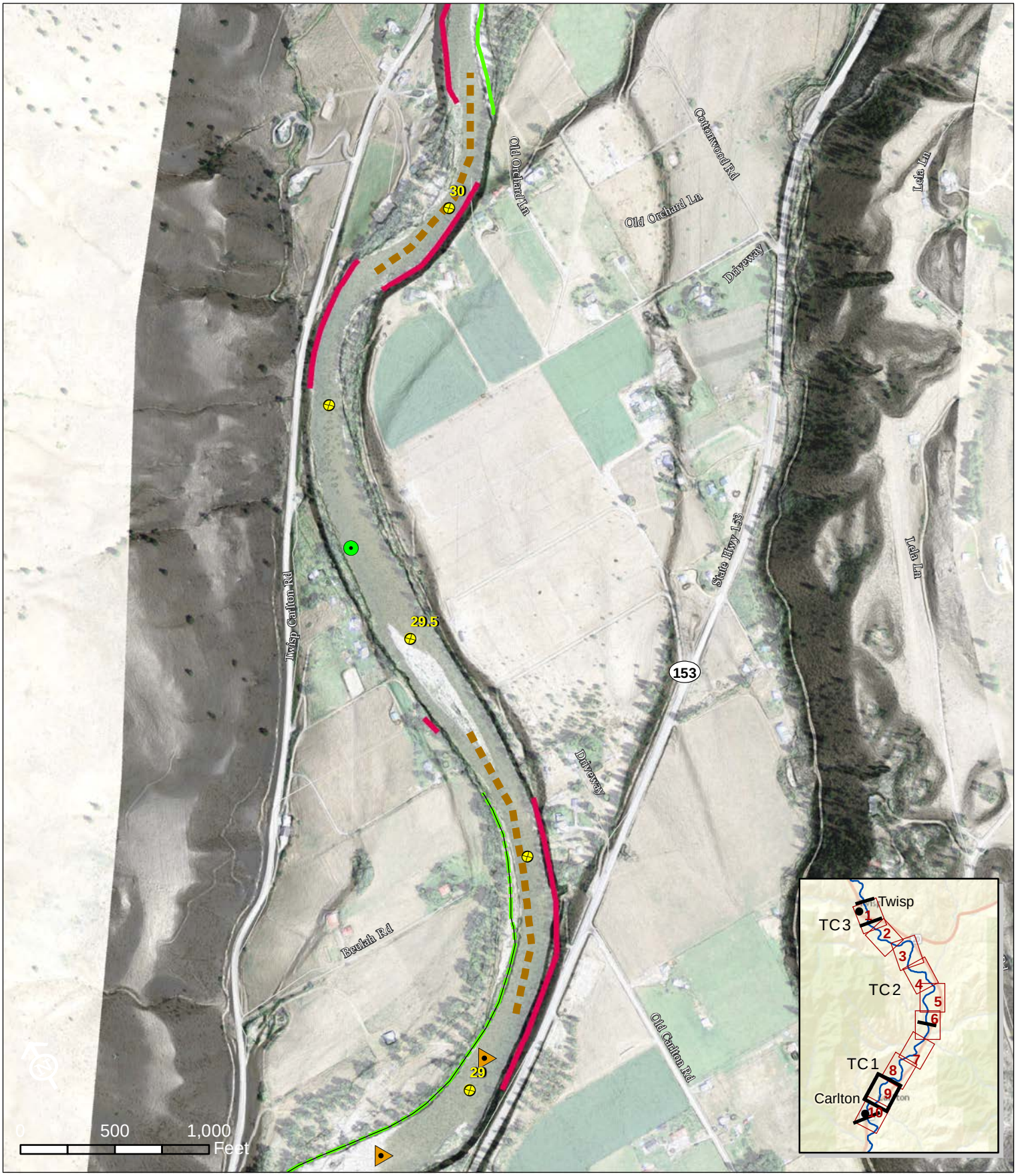


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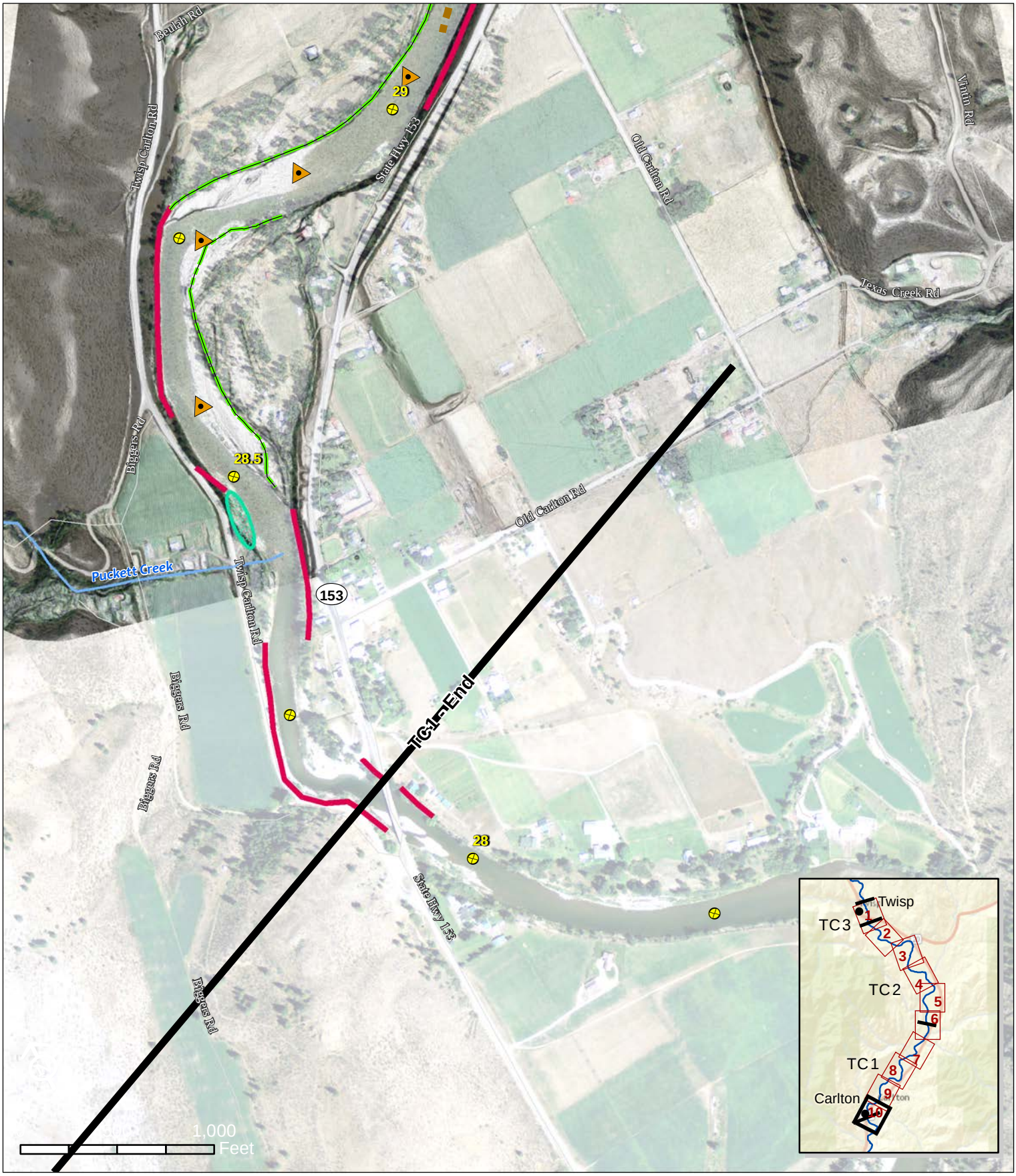


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Restoration mapping shows general zones of possible restoration actions. Riparian projects are mapped along banklines to show the longitudinal extent of possible actions, but the lateral project extents are not included.

*Qact = Activation discharge based on BOR (2014) modeling results. Qact is the minimum discharge at which the floodplain channel is hydraulically connected from inlet to outlet.



Z:\Shared\Projects\Twisp2Carlton\GIS\mxd\Mapbooks_2016Appendix\Methow_RestorationMaps_wpolyFall_2016.mxd

Methow River
Twisp to Carlton Reach Assessment

APPENDIX

# B

## HABITAT SURVEY METHODS AND RESULTS

# Appendix B Habitat Survey Methods and Results

## B.1 Habitat Survey Methods

The habitat survey, completed from September 12–14, 2016, employed a modified form of the United States Forest Service (USFS) Stream Inventory approach (2015). The USFS method focuses on mapping and characterization of habitat units, broadly characterized into fast (riffles and glides) and slow water (pools) units, as well as perennial side channels. The USFS approach specifies measurements and characterizations of the channel and floodplain, and the frequencies at which these data should be collected. USFS developed the method specifically for inventory of wadeable streams, so modifications to the approach were required for large channels like the Methow River. While certain cross-sections of the Methow River were wadeable during the field visit, field teams floated the reach in inflatable kayaks. Below is a list of modifications made to specific measurements that deviate from the standard USFS implemented during the Twisp to Carlton Reach Assessment:

> **Width measurements (bankfull and wetted)**: Measured using a range finder, as opposed to a tape. In line with the USFS approach, bankfull widths were collected for fast-water units only, and wetted widths were collected for all habitat units.

> **Depth measurements (bankfull and wetted)**: Collected using graduated paddles. Bankfull depth measurements along cross-sections comprised five, roughly evenly-spaced measurements as allowed by flow. Bankfull depths were collected in only fast-water units. Wetted measurements were collected for all units. In cases where the wetted depth exceeded the length of graduated paddle (7 feet), surveyors conservatively estimated depth.

> **Pebble counts** were collected at a frequency of one to two per sub-reach to infill between previously sampled areas by Reclamation. All samples were collected along cross-channel transects at wadeable riffles.

> Extents of features like bank hardening and eroding banks were mapped, as opposed to simply recording presence or absence for each habitat unit.

To maintain data quality, surveyors were responsible for a consistent set of measurements throughout the field effort.

The remainder of this appendix provides summarized and raw forms of the habitat survey data, allowing for a comparison at reach, sub-reach, and habitat unit scales. Data analysis and interpretations are discussed within the main report body. The habitat survey data are summarized in the following formats:

> Table of statistical results by sub-reach

> Graphical summary: A series of eight graphs developed to allow for visual comparison of key habitat metrics along the Assessment Reach. Some of these graphs are copies of in-text figures, but are presented here for side-by-side comparison

> Sub-reach-specific pebble count data

> Photographs of key features and representative sections of each sub-reach

> Tables of field-collected habitat unit data

## B.2 Habitat Survey Data Summary Table

**Table B-1 Summary of Geomorphic, Habitat, and Vegetation Data by Sub-reach**

| | TC3 | TC2 | TC1 |
|---|---|---|---|
| **River Miles** | 40.3–41.3 | 33.7–40.3 | 28.1–33.7 |
| **Geomorphic Characteristics** | | | |
| Sinuosity | 1.09 | 1.33 | 1.24 |
| Gradient (%) | 0.38% | 0.27% | 0.25% |
| Dominant Channel Morphology (Montgomery and Buffington, 1997) | Pool-riffle | Pool-riffle/Plane-bed | Pool-riffle |
| Mean Floodprone Width (ft) | 471 | 1448 | 292 |
| **Wetted Channel Dimensions - Averages** | | | |
| *Width (ft)* | | | |
| Pools | 90 | 118 | 126 |
| Riffles | 98 | 96 | 147 |
| Glides | - | 126 | 161 |
| *Mean Depth (ft)* | | | |
| Pools | 3.5 | 3.6 | 3.4 |
| Riffles | 2.2 | 1.6 | 1.4 |
| Glides | - | 2.0 | 2.0 |
| *Max Depth (ft)* | | | |
| Pools | 5.3 | 7.9 | 6.7 |
| Riffles | 3.3 | 3.1 | 2.6 |
| Glides | - | 3.5 | 3.4 |
| *Residual Depths (Pools)* | | | |
| Max Residual Depth (ft, sub-reach average) | 3.1 | 6.3 | 4.9 |
| % < 3 ft | 50% | 0% | 13% |
| % 3–6 ft | 50% | 57% | 56% |
| % 6–9 ft | 0% | 29% | 31% |
| % >9 ft | 0% | 14% | 0% |
| **Bankfull Channel Dimensions - Averages** | | | |
| *Width (ft)* | | | |
| Riffles | 207 | 302 | 198 |
| Glides | - | 278 | 176 |
| *Max Depth (ft)* | | | |
| Riffles | 8.9 | 7.0 | 6.6 |
| Glides | - | 7.4 | 7.4 |

**Table B-1 Summary of Geomorphic, Habitat, and Vegetation Data by Sub-reach**

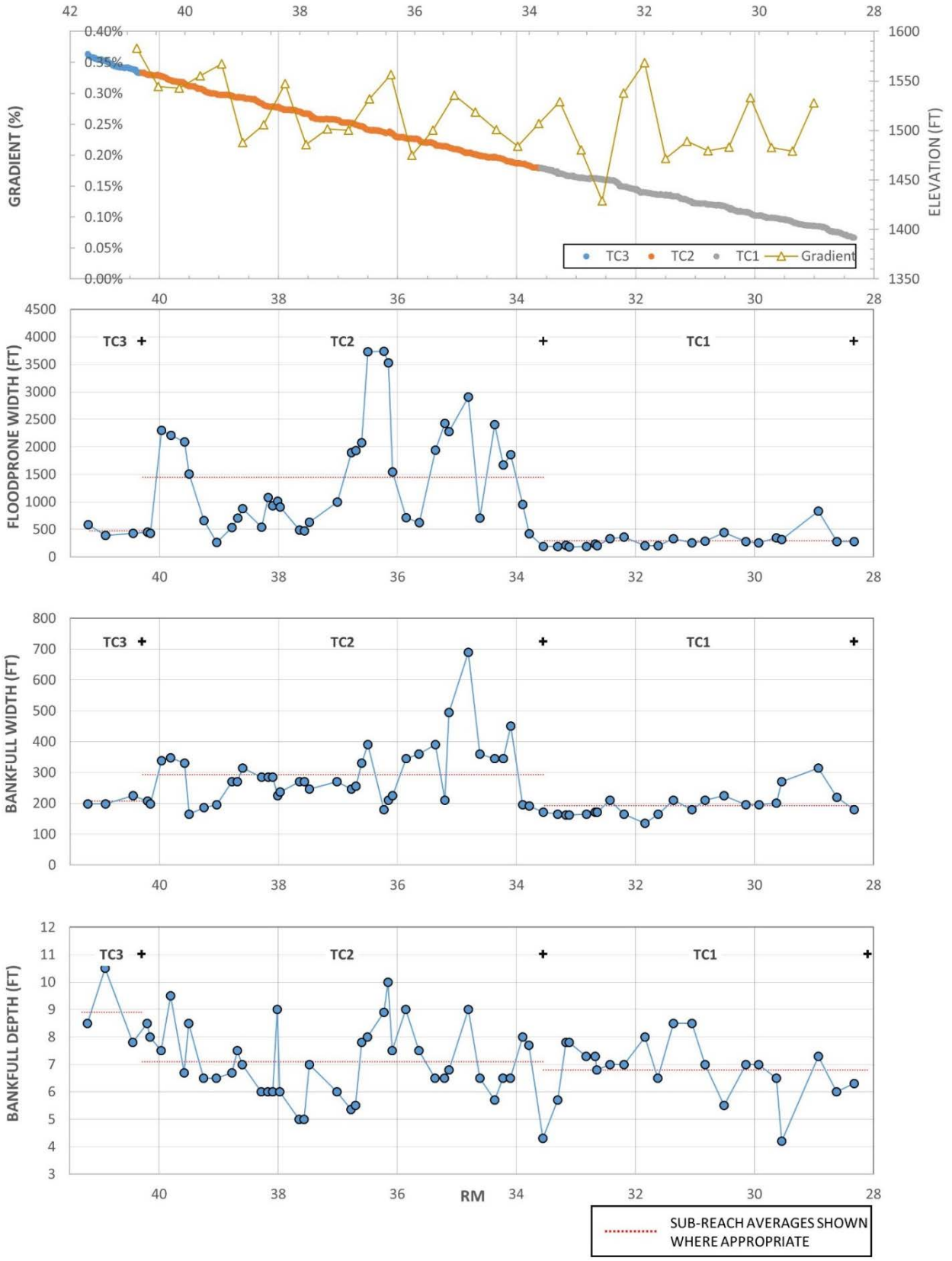
| | TC3 | TC2 | TC1 |
|---|---|---|---|
| *Mean Depth (ft) – average of 5 measurements* | | | |
| Riffles | 6.4 | 4.5 | 4.9 |
| Glides | - | 4.9 | 6.8 |
| *Width to Depth Ratio (ft) – (Width/Mean Depth)* | | | |
| Riffles | 34.0 | 70.6 | 42.6 |
| Glides | - | 64.9 | 31.6 |
| **% Habitat Unit Area** | | | |
| Pool | 36% | 33% | 37% |
| Riffle | 64% | 38% | 53% |
| Glide | 0% | 28% | 9% |
| Side Channel | 0% | 0% | 1% |
| **Habitat Unit Spacing** | | | |
| Riffle Spacing (ft) | 2,055 | 1,482 | 1,778 |
| Riffle Spacing (multiples of bankfull width) | 9.9 | 5.1 | 9.2 |
| Pool Spacing | 1,620 | 2,348 | 2,200 |
| Pool Spacing (multiples of bankfull width) | 7.8 | 8.0 | 11.4 |
| Pool Frequency (#/mile) | 3.3 | 2.2 | 2.4 |
| | 3% | 12% | 5% |
| **In-Channel Wood** | | | |
| Small Pieces per Mile (6–12-in. diam., >20-ft long, as surveyed) | 5 | 78 | 20 |
| Medium Pieces per Mile (12–20-in. diam., >35-ft long, as surveyed) | 1 | 28 | 10 |
| Large Pieces per Mile (>20-in. diam., >35-ft long, as surveyed) | 1 | 23 | 11 |
| NOAA Large Pieces per Mile (>12-in. diam., >35-ft long, for comparison with targets) | 2 | 51 | 21 |
| Key Pieces per Mile (>10.75 $m^3$ volume w/rootwad, Fox and Bolton, 2007) | <1 | <5 | <3 |
| **Riparian Vegetation** | | | |
| *Overstory Size Class* | | | |
| No Vegetation | 0% | 6% | 3% |
| Grassland/Forb (no DBH) | 0% | 0% | 0% |
| Shrub/Seedling (1–4.9 in. DBH) | 0% | 1% | 0% |
| Sapling/Pole (5–8.9 in. DBH) | 0% | 1% | 0% |
| Small Trees (9–20.9 in. DBH) | 80% | 32% | 17% |
| Large Trees Condition (21–31.9 in. DBH) | 20% | 60% | 81% |

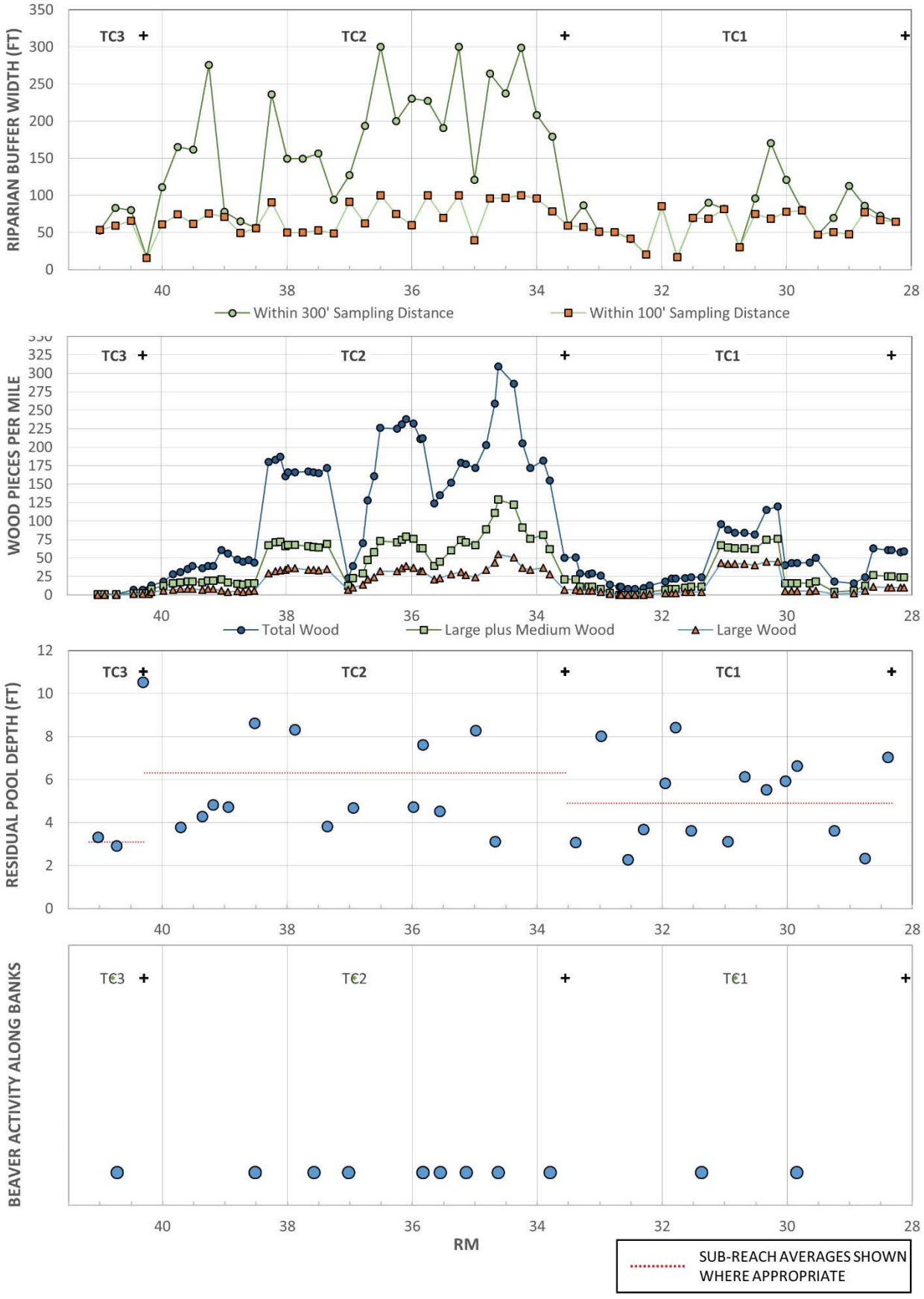
**Table B-1 Summary of Geomorphic, Habitat, and Vegetation Data by Sub-reach**

| | TC3 | TC2 | TC1 |
|---|---|---|---|
| Mature Trees Condition (>32 in. DBH) | 0% | 0% | 0% |
| *Canopy Cover (%)* | | | |
| Within 100-ft of active channel | 59% | 71% | 58% |
| Within 300-ft of active channel | 24% | 58% | 24% |
| **Bed Substrate** | | | |
| *Pebble Counts Size Percentiles (mm)* | | | |
| D50 | 119 | 71 | 64 |
| D84 | 274 | 130 | 137 |
| D95 | 386 | 171 | 200 |
| *Ocular Estimate - % Sand/Fines* | | | |
| Pools | 10% | 17% | 16% |
| Riffles | 10% | 12% | 12% |
| Glides | - | 15% | 17% |
| *Ocular Estimate - % Gravel* | | | |
| Pools | 23% | 34% | 28% |
| Riffles | 27% | 40% | 34% |
| Glides | - | 41% | 35% |
| *Ocular Estimate - % Cobble* | | | |
| Pools | 50% | 35% | 38% |
| Riffles | 43% | 41% | 43% |
| Glides | - | 38% | 43% |
| *Ocular Estimate - % Boulder* | | | |
| Pools | 17% | 10% | 18% |
| Riffles | 20% | 7% | 10% |
| Glides | - | 6% | 5% |
| *Ocular Estimate - % Boulder* | | | |
| Pools | 1% | 5% | 1% |
| Riffles | 0% | 0% | 0% |
| Glides | - | 0% | 0% |

## B.3 Graphical Summary

The following two pages contain a series of charts organized to facilitate visual comparison of various habitat metrics along the Assessment Reach. X-axes identify the river mile (RM) and are presented at same scale. Captions follow the graphs to maintain visual continuity.


GRADIENT (%)
ELEVATION (FT)
TC3
TC2
TC1
Gradient
FLOODPRONE WIDTH (FT)
BANKFULL WIDTH (FT)
BANKFULL DEPTH (FT)
RM
SUB-REACH AVERAGES SHOWN WHERE APPROPRIATE


RIPARIAN BUFFER WIDTH (FT)
TC3
TC2
TC1
Within 300' Sampling Distance
Within 100' Sampling Distance
WOOD PIECES PER MILE
Total Wood
Large plus Medium Wood
Large Wood
RESIDUAL POOL DEPTH (FT)
BEAVER ACTIVITY ALONG BANKS
RM
SUB-REACH AVERAGES SHOWN WHERE APPROPRIATE

**1st chart:** **Longitudinal profile of the Assessment Reach. Measurements are taken from the 2006 LiDAR water surface. Gradients are measured over 4,000-foot sections.**

**2nd chart:** **Flood-prone width along the Assessment Reach. Flood-prone width is the valley width measured at an elevation of 2 times maximum bankfull depth.**

**3rd chart:** **Bankfull width along the Assessment Reach as measured at riffles and glides only.**

**4th chart:** **Bankfull depth along the Assessment Reach as measured at riffles and glides only.**

**5th chart:** **Average widths of riparian vegetation as measured using 100-foot and 300-foot sampling buffers. Sampling encompassed 100 feet or 300 feet on both banks – the average of the two banks is reported.**

**6th chart:** **Wood pieces per mile along the Assessment Reach (based on 2016 habitat survey). Total wood counts include any piece over 20 feet long and 6 inches in diameter. Medium wood pieces are greater than 35 feet long and 12 inches in diameter. Large wood pieces are greater than 35 feet long and 20 inches in diameter. Points record the number of woody debris pieces from that point and upstream for a mile**

**7th chart:** **Residual pool depths measured along the Assessment Reach. Sub-reach boundaries are shown with black crosses, and reach average depths are shown with red horizontal lines.**

**8th chart:** **Locations of beaver activity along the assessment reach (also shown in existing conditions maps, Appendix A).**

## B.4 Pebble Count Data

The following tables and graphs display grain size distributions collected using pebble count techniques along the assessment reach. Data are distinguished by samples collected on emergent bars and along channel cross-sections.

**Table B-2 Data Summary of Pebble Counts Collected on Bars Throughout the Assessment Reach**

| Sub-reach | RM | SO # (habitat unit ID) | Collector | D35 | D50 | D84 | D95 |
|---|---|---|---|---|---|---|---|
| TC3 | 41.1 | 1 | Reclamation | 73 | 120 | 315 | 460 |
| TC3 | 40.8 | 3 | Reclamation | 106 | 164 | 335 | 443 |
| TC2 | 40.1 | 8 | Reclamation | 116 | 138 | 199 | 246 |
| TC2 | 39.0 | 17 | Reclamation | 29 | 47 | 143 | 197 |
| TC2 | 38.3 | 22 | Reclamation | 90 | 108 | 190 | 233 |
| TC2 | 37.3 | 32 | Reclamation | 30 | 56 | 141 | 173 |
| TC2 | 36.3 | 38 | Reclamation | 29 | 46 | 109 | 149 |
| TC2 | 35.3 | 47 | Reclamation | 34 | 40 | 88 | 141 |
| TC2 | 34.6 | 200 | Reclamation | 83 | 102 | 151 | 173 |
| TC2 | 34.1 | 204 | Reclamation | 50 | 61 | 101 | 128 |
| TC1 | 32.0 | 220 | Reclamation | 36 | 56 | 120 | 164 |
| TC1 | 31.5 | 225 | Reclamation | 35 | 53 | 161 | 245 |
| TC1 | 30.6 | 231 | Reclamation | 53 | 98 | 170 | 237 |

**Table B-2 Data Summary of Pebble Counts Collected on Bars Throughout the Assessment Reach**

| Sub-reach | RM | SO # (habitat unit ID) | Collector | D35 | D50 | D84 | D95 |
|---|---|---|---|---|---|---|---|
| TC1 | 28.5 | 243 | Reclamation | 12 | 32 | 163 | 256 |

**Table B-3 Data Summary of Pebble Counts Collected along Channel Cross-Sections throughout the Assessment Reach**

| Sub-reach | RM | SO # (habitat unit ID) | Collector | D35 | D50 | D84 | D95 |
|---|---|---|---|---|---|---|---|
| TC3 | 40.4 | 5 | CCFEG/Cardno | 53 | 74 | 173 | 253 |
| TC2 | 36.8 | 35 | CCFEG/Cardno | 53 | 68 | 118 | 165 |
| TC2 | 36.3 | 38 | Reclamation | 28 | 37 | 72 | 108 |
| TC2 | 35.8 | 44 | Reclamation | 37 | 50 | 86 | 116 |
| TC2 | 35.3 | 47 | Reclamation | 61 | 92 | 163 | 226 |
| TC1 | 33.5 | 208 | CCFEG/Cardno | 66 | 79 | 142 | 221 |
| TC1 | 30.8 | 230 | CCFEG/Cardno | 41 | 50 | 81 | 111 |
| TC1 | 29.9 | 236 | CCFEG/Cardno | 69 | 81 | 122 | 165 |

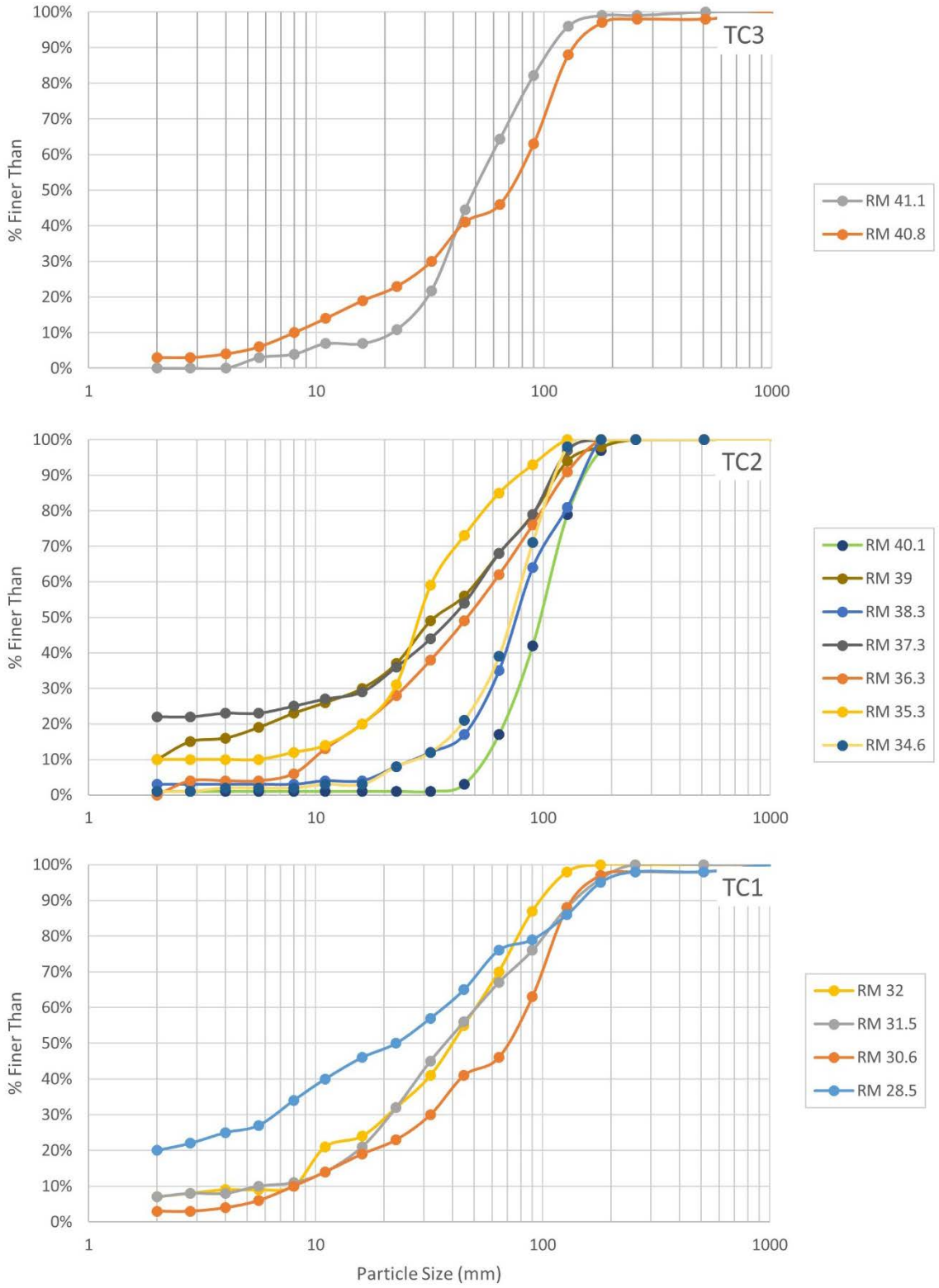



**Figure B-1** **Grain size distributions of pebble counts collected on bars along each sub-reach. Pebble counts include those collected by Reclamation (2008).**

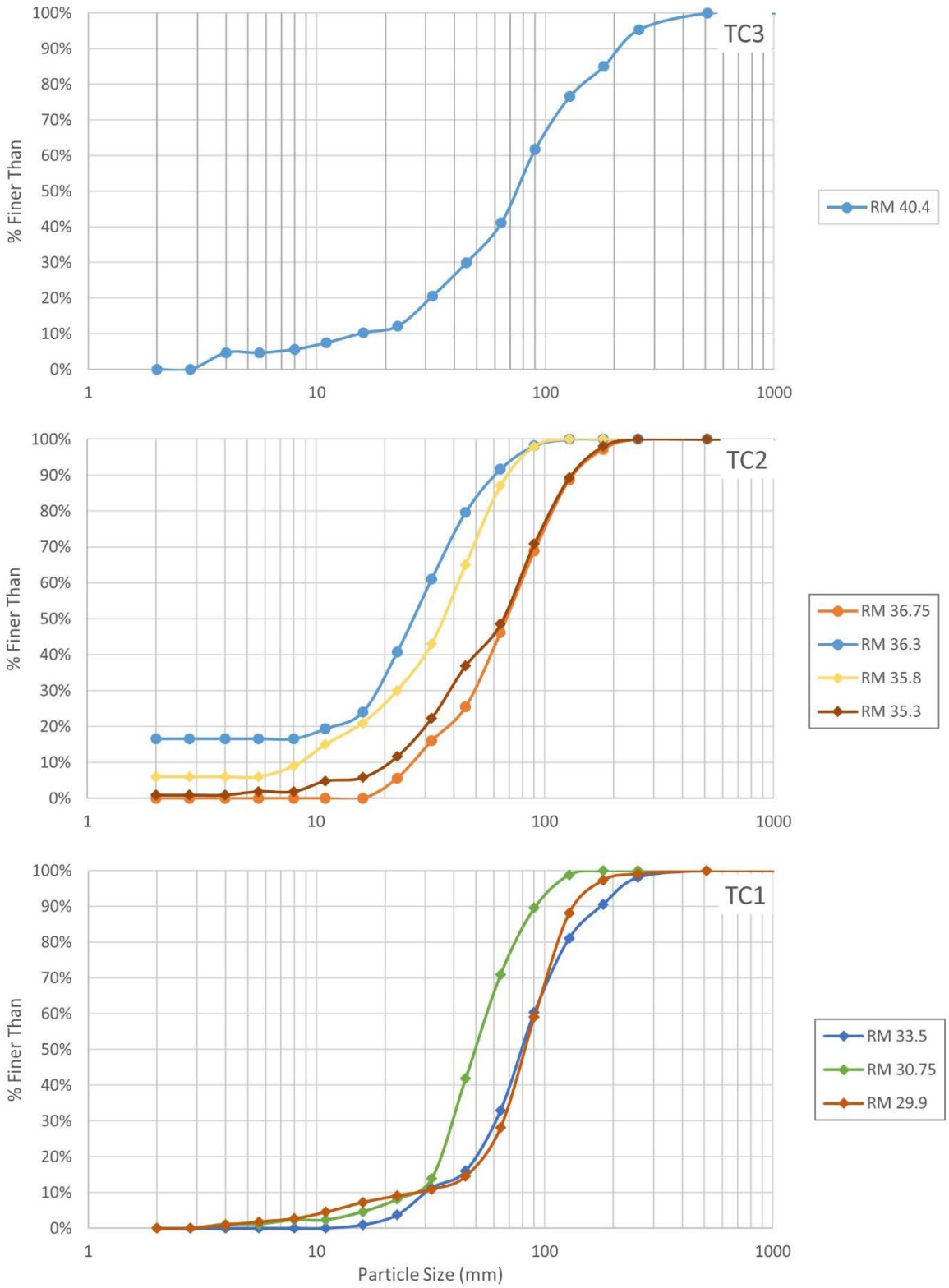



**Figure B-2** **Grain size distributions of pebble counts collected along cross-channel transects for each sub-reach. Pebble counts include those collected by Reclamation (2008) and for this Assessment in 2016.**

## B.5 Sub-reach Photographs

The sub-sections below provide images of characteristic sections and key features within each sub-reach. Discharges at the USGS gage at Twisp ranged from 280-290 cfs on the dates of the survey (September 12-14, 2016).

### B.5.1 Sub-reach TC3 Photographs

**Figure B-3 RM 41.3 – Looking upstream from the upper Assessment Reach boundary with the Twisp River entering from the left.**

**Figure B-4** **RM 41.3 – Looking downstream at a representative reach. Note bedrock valley wall on the left.**

**Figure B-4** **RM 40.8 – Looking downstream at a representative reach. Note coarse-grained bar with abundant cobbles and boulders.**

**Figure B-6** **RM 40.4 – Looking upstream at the Highway 20 bridge crossing. Pebble count data collected at this location in 2016.**

**Figure B-7** **RM 40.4 – Looking downstream at the bottom section of TC3 (end of sub-reach at bend visible in distance)**

### B.5.2 Sub-reach TC2 Photographs

**Figure B-8 RM 40.25 – Looking at right bank bedrock outcrop and associated pool at upper boundary of TC2.**

**Figure B-9 RM 38.3 – Looking upstream at a pool and split flow in the distance (photo left).**

**Figure B-10 RM 38.25 – Looking downstream at a split flow.**

**Figure B-11 RM 37.8 – Looking upstream at section along Highway 153 (and associated riprap).**

**Figure B-12 RM 37.45 – Looking upstream at a flow split and riffle habitat.**

**Figure B-13 RM 37.3 – Looking downstream at riffle habitat.**

**Figure B-14 RM 36.9 – Looking downstream at a long eroding bank devoid of riparian vegetation**

**Figure B-15 RM 36.1 – Looking upstream at sharp bend and shallow flow split.**

**Figure B-16 RM 35.4 – Looking at right bank log jam.**

**Figure B-17 RM 35.1 – Looking upstream at a zone of bank erosion and wood recruitment near the Silver Side Channel.**

**Figure B-18 RM 34.75 – Looking downstream in a section with extensive bars and gravel deposition in the Silver Side Channel.**

**Figure B-19 RM 34.5 – Looking upstream at a representative section near Silver Side Channel. Note bedrock outcrop on photo left.**

**Figure B-20 RM 34.25 – Looking at the outlet of the Silver Side Channel restoration project.**


**Figure B-21 RM 34 – Looking upstream at an unconfined section in the lower portion of TC2. Note riparian vegetation.**

### B.5.3 Sub-reach TC1 Photographs

**Figure B-22 RM 33.3 – Looking downstream at a highly typical section of TC3. Note high terraces at the channel margins, simple channel form, and greater proportion of ponderosa pines relative to sub-reaches upstream.**

**Figure B-23 RM 33.1 – Looking downstream at a riffle unit.**

**Figure B-24 RM 32.3 – Looking upstream at a particularly boulder-rich riffle unit.**

**Figure B-25 RM 29.6 – Looking upstream at a depositional section.**

**Figure B-26 RM 29.5 – Looking at right bank beaver activity.**

**Figure B-27 RM 29.4 – Looking downstream at a perennial side channel on river right.**

## B.6 Habitat Unit Data

The data tables on the following pages provide survey data collected for individual habitat units. Individual tables are provided for each sub-reach.

The metrics contained in the tables are largely self-explanatory, with exception of the Sequence Order (SO) Number and riparian vegetation coding. The SO number is simply the ID number assigned to the habitat unit during field mapping. Sequence order numbers are contained in GIS/KML files provided with this assessment. Riparian vegetation codes for size and species classes are shown in the tables B-4 and B-5 immediately below.

**Table B-4 Riparian vegetation size class codes used in the following data tables.**

| Code | Description |
|---|---|
| NV | No Vegetation |
| GF | Grassland/Forb (no DBH) |
| SS | Shrub/Seedling (1-4.9 in. DBH) |
| SP | Sapling/Pole (5-8.9 in. DBH) |
| ST | Small Trees (9-20.9 in. DBH) |
| LT | Large Trees Condition (21-31.9 in. DBH) |
| MT | Mature Trees Condition (>32 in DBH) |

**Table B-5 Riparian vegetation species class codes used in the following data tables.**

| Code | Description |
|---|---|
| HC | Cottonwood, ash, poplar |
| CP | Ponderosa pine |
| HW | Willow |
| NV | No Vegetation |

**Sub-reach TC3 Habitat Unit Data**

*Twisp to Carlton Reach Assessment*

| | | | | | | | | Wetted Channel Dimensions | | | | | Woody Material Counts | | | Bankfull Dimensions | | | | | | Eroding Banks (length, ft) | | | Riparian Vegetation Info | | | | Water Temp | | Substrate % (Visual Est.) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sub-Reach | Sequence Order Number | Channel Unit Type Code | Channel Unit Type | Forcing Agent | Flow Split ? | Upper Boundary RM | Channel Unit Length (ft, along thalweg) | Wet Width (ft) | Max Depth | Avg Depth | Pool Crest Depth | Residual Pool Depth | S | M | L | BF Width (feet) | Max BFD (feet) | Avg BFD (feet) | Area (acres) | W/D | Floodprone Width (ft) | Total | Left Bank | Right Bank | Left Bank Size Class | Left Bank Overstory Type | Right Bank Size Class | Right Bank Overstory Type | degC | Time | SA | GR | CO | BO | BR |
| TC3 | **1** | FT | Riffle | - | - | 41.20 | 995 | 75 | 3.5 | 2.5 | NA | NA | 0 | 1 | 0 | 198 | 8.5 | 5.2 | 5.2 | 38.0 | 590 | 269 | 0 | 269 | LT | HC | LT | HC | 14.5 | 1450 | 10 | 20 | 40 | 30 | 0 |
| TC3 | **2** | S | Pool | - | - | 41.02 | 595 | 105 | 5.5 | 4 | 2.2 | 3.3 | 0 | 0 | 0 | 186 | NA | NA | 2.3 | NA | 0 | 0 | 0 | 0 | ST | HC | ST | HC | 15 | 1606 | 10 | 20 | 40 | 29 | 1 |
| TC3 | **3** | FT | Riffle | - | - | 40.91 | 1015 | 129 | 4 | 2.5 | NA | NA | 0 | 0 | 0 | 198 | 10.5 | 8.5 | 4.3 | 23.3 | 392 | 0 | 0 | 0 | ST | HC | ST | HC | 14.5 | 1628 | 10 | 20 | 40 | 30 | 0 |
| TC3 | **4** | S | Pool | - | - | 40.72 | 1485 | 75 | 5 | 3 | 2.1 | 2.9 | 5 | 0 | 1 | NA | NA | NA | 5.2 | NA | 0 | 0 | 0 | 0 | ST | HC | ST | HC | 15 | 1650 | 10 | 25 | 60 | 5 | 0 |
| TC3 | **5** | FT | Riffle | - | - | 40.45 | 795 | 90 | 2.5 | 1.5 | NA | NA | 0 | 0 | 0 | 225 | 7.8 | 5.6 | 3.9 | 40.5 | 432 | 0 | 0 | 0 | ST | HC | ST | HC | 15 | 1656 | 10 | 40 | 50 | 0 | 0 |

**Sub-reach TC2 Habitat Unit Data**

*Twisp to Carlton Reach Assessment*

| | | | | | | | | Wetted Channel Dimensions | | | | | Woody Material Counts | | | Bankfull Dimensions | | | | | | Eroding Banks (length, ft) | | | Riparian Vegetation Info | | | | Water Temp | | Substrate % (Visual Est.) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sub-Reach | Sequence Order Number | Channel Unit Type Code | Channel Unit Type | Forcing Agent | Flow Split ? | Upper Boundary RM | Channel Unit Length (ft, along thalweg) | Wet Width (ft) | Max Depth | Avg Depth | Pool Crest Depth | Residual Pool Depth | S | M | L | BF Width (feet) | Max BFD (feet) | Avg BFD (feet) | Area (acres) | W/D | Floodprone Width (ft) | Total | Left Bank | Right Bank | Left Bank Size Class | Left Bank Overstory Type | Right Bank Size Class | Right Bank Overstory Type | degC | Time | SA | GR | CO | BO | BR |
| TC2 | **6** | S | Pool | Bedrock | - | 40.30 | 520 | 111 | 12 | 6 | 1.5 | 10.5 | 0 | 0 | 0 | NA | NA | NA | 2.3 | NA | NA | 0 | 0 | 0 | ST | HC | ST | HC | 14.5 | 1702 | 22 | 11 | 11 | 11 | 44 |
| TC2 | **7** | FT | Riffle | - | - | 40.20 | 240 | 72 | 3 | 1.5 | NA | NA | 0 | 3 | 3 | 207 | 8.5 | 6.2 | 1.1 | 33.7 | 452 | 238 | 238 | 0 | ST | HC | ST | HC | 14.5 | 1705 | 9 | 45 | 36 | 9 | 0 |
| TC2 | **8** | FN | Glide | - | - | 40.16 | 1020 | 114 | 4 | 3 | NA | NA | 1 | 3 | 2 | 198 | 8.0 | 5.4 | 4.2 | 36.9 | 428 | 247 | 247 | 0 | ST | HC | ST | HC | 15 | 1710 | 17 | 44 | 28 | 11 | 0 |
| TC2 | **9** | FT | Riffle | - | - | 39.97 | 845 | 63 | 2.5 | 1.5 | NA | NA | 6 | 3 | 1 | 339 | 7.5 | 5.6 | 4.5 | 61.1 | 2303 | 300 | 0 | 300 | ST | HC | ST | HC | 15.5 | 1721 | 10 | 35 | 50 | 5 | 0 |
| TC2 | **10** | FN | Glide | - | - | 39.81 | 630 | 114 | 3.5 | 2.5 | NA | NA | 2 | 0 | 1 | 348 | 9.5 | 7.6 | 2.8 | 45.8 | 2212 | 219 | 0 | 219 | ST | HC | ST | HC | 15 | 1735 | 10 | 50 | 40 | 0 | 0 |
| TC2 | **11** | S | Pool | - | - | 39.69 | 625 | 135 | 6.5 | 3.5 | 2.75 | 3.75 | 3 | 1 | 0 | NA | NA | NA | 2.8 | NA | NA | 237 | 237 | 0 | ST | HC | ST | HC | 15 | 1745 | 10 | 45 | 35 | 10 | 0 |
| TC2 | **12** | FT | Riffle | - | - | 39.58 | 400 | 102 | 2.5 | 1.5 | NA | NA | 4 | 0 | 0 | 330 | 6.7 | 4.5 | 1.8 | 72.7 | 2090 | 356 | 356 | 0 | ST | HC | ST | HC | 15 | 1755 | 10 | 50 | 30 | 10 | 0 |
| TC2 | **13** | FN | Glide | - | - | 39.50 | 850 | 120 | 3.75 | 2.75 | NA | NA | 3 | 0 | 0 | 165 | 8.5 | 6.1 | 4.8 | 27.1 | 1506 | 0 | 0 | 0 | ST | HC | ST | HC | 15 | 1800 | - | - | - | - | - |
| TC2 | **14** | S | Pool | Bedrock | - | 39.35 | 495 | 102 | 12 | 4 | 2 | 10 | 1 | 1 | 1 | 186 | NA | NA | 2.4 | NA | NA | 0 | 0 | 0 | LT | CP | LT | HC | 11 | 843 | 15 | 35 | 27 | 15 | 8 |
| TC2 | **15** | FT | Riffle | - | - | 39.25 | 435 | 90 | 2.25 | 1.25 | NA | NA | 0 | 0 | 0 | 186 | 6.5 | 4.3 | 3.0 | 42.9 | 662 | 0 | 0 | 0 | LT | CP | LT | HC | 11 | 851 | 10 | 20 | 30 | 40 | 0 |
| TC2 | **16** | S | Pool | - | - | 39.17 | 725 | 159 | 5.75 | 3 | 1.5 | 4.25 | 20 | 7 | 1 | 159 | NA | NA | 5.0 | NA | NA | 0 | 0 | 0 | LT | HC | ST | HC | 10.5 | 908 | 10 | 40 | 50 | 0 | 0 |
| TC2 | **17** | FT | Riffle | - | - | 39.04 | 560 | 117 | 3.5 | 1.75 | NA | NA | 0 | 1 | 0 | 195 | 6.5 | 4.0 | 2.5 | 49.2 | 263 | 314 | 314 | 0 | LT | HC | LT | HC | 11 | 917 | 10 | 35 | 50 | 5 | 0 |
| TC2 | **18** | S | Pool | - | - | 38.93 | 830 | 120 | 6 | 2.75 | 1.2 | 4.8 | 0 | 0 | 2 | NA | NA | NA | 3.4 | NA | NA | 0 | 0 | 0 | ST | HW | LT | HC | 11 | 922 | 10 | 30 | 50 | 10 | 0 |
| TC2 | **19** | FT | Riffle | - | - | 38.78 | 490 | 108 | 2.8 | 1.5 | NA | NA | 0 | 0 | 0 | 270 | 6.7 | 4.0 | 2.5 | 68.1 | 536 | 0 | 0 | 0 | LT | C | LT | HC | 11 | 932 | 5 | 45 | 40 | 10 | 0 |
| TC2 | **20** | FN | Glide | - | - | 38.69 | 475 | 108 | 4 | 2.5 | NA | NA | 0 | 1 | 1 | 270 | 7.5 | 4.3 | 2.3 | 62.5 | 706 | 0 | 0 | 0 | LT | C | LT | HC | 11 | 941 | 10 | 20 | 50 | 20 | 0 |
| TC2 | **21** | FT | Riffle | - | Y | 38.60 | 485 | 75 | 3 | 1.5 | NA | NA | 0 | 0 | 1 | 315 | 7.0 | 3.6 | 3.2 | 87.5 | 877 | 0 | 0 | 0 | LT | C | LT | HC | 11.5 | 956 | 15 | 40 | 40 | 5 | 0 |
| TC2 | **22** | S | Pool | - | - | 38.51 | 1215 | 120 | 6 | 3 | 1.3 | 4.7 | 92 | 28 | 23 | NA | NA | NA | 9.4 | NA | NA | 0 | 0 | 0 | LT | C | LT | HC | 11 | 1002 | 20 | 35 | 40 | 5 | 0 |
| TC2 | **23** | FT | Riffle | - | Y | 38.29 | 605 | 75 | 2 | 1 | NA | NA | 0 | 2 | 4 | 285 | 6.0 | 5.3 | 3.3 | 53.8 | 540 | 0 | 0 | 0 | LT | C | LT | HC | 11 | 1023 | 10 | 50 | 30 | 10 | 0 |
| TC2 | **24** | FN | Glide | - | - | 38.17 | 420 | 105 | 2.75 | 1.75 | NA | NA | 3 | 0 | 1 | 285 | 6.0 | 5.3 | 1.9 | 53.8 | 1080 | 0 | 0 | 0 | LT | C | LT | HC | 11 | 1040 | 10 | 50 | 30 | 10 | 0 |
| TC2 | **25** | FT | Riffle | - | - | 38.10 | 425 | 120 | 2.5 | 1.5 | NA | NA | 0 | 0 | 2 | 285 | 6.0 | 5.3 | 2.1 | 53.8 | 934 | 418 | 418 | 0 | NV | NV | LT | HC | 11 | 1043 | 11 | 53 | 32 | 5 | 0 |
| TC2 | **26** | FN | Glide | - | - | 38.02 | 220 | 132 | 2.75 | 1.75 | NA | NA | 3 | 0 | 2 | 225 | 9.0 | 5.4 | 1.0 | 41.8 | 1013 | 0 | 0 | 0 | LT | C | LT | HC | 11 | 1045 | 5 | 45 | 45 | 5 | 0 |
| TC2 | **27** | FT | Riffle | - | - | 37.98 | 590 | 123 | 6.5 | 3 | NA | NA | 0 | 1 | 0 | 237 | 6.0 | 3.8 | 2.6 | 62.4 | 908 | 0 | 0 | 0 | SP | HC | LT | HC | 11.5 | 1059 | 5 | 40 | 45 | 5 | 5 |
| TC2 | **28** | S | Pool | Bedrock | - | 37.87 | 1180 | 105 | 10 | 4.5 | 1.4 | 8.6 | 3 | 0 | 0 | NA | NA | NA | 7.5 | NA | NA | 103 | 103 | 0 | NV | NV | LT | HC | 11.5 | 1100 | 5 | 45 | 40 | 5 | 5 |
| TC2 | **29** | FT | Riffle | - | Y | 37.65 | 440 | 84 | 2.5 | 1.25 | NA | NA | 0 | 0 | 1 | 270 | 5.0 | 2.1 | 2.6 | 128.6 | 492 | 479 | 479 | 0 | ST | HC | LT | CP | 15 | 1108 | 5 | 45 | 45 | 5 | 0 |
| TC2 | **30** | FN | Glide | - | - | 37.57 | 460 | 84 | 1 | 0.5 | NA | NA | 0 | 0 | 0 | 270 | 5.0 | 2.1 | 3.0 | 128.6 | 475 | 455 | 455 | 0 | LT | C | SS | HC | 12 | 1113 | 10 | 40 | 40 | 10 | 0 |
| TC2 | **31** | FT | Riffle | - | - | 37.48 | 695 | 69 | 2.75 | 1.75 | NA | NA | 2 | 3 | 2 | 246 | 7.0 | 4.8 | 4.8 | 51.8 | 632 | 642 | 642 | 0 | NV | V | ST | HC | 12 | 1117 | 10 | 40 | 40 | 10 | 0 |
| TC2 | **32** | S | Pool | - | - | 37.35 | 1820 | 96 | 10 | 3 | 1.7 | 8.3 | 3 | 1 | 2 | NA | NA | NA | 9.2 | NA | NA | 0 | 0 | 0 | LT | HC | ST | HC | 12 | 1129 | 10 | 40 | 40 | 10 | 0 |
| TC2 | **33** | FT | Riffle | - | - | 37.01 | 440 | 81 | 2.75 | 1.5 | NA | NA | 8 | 8 | 5 | 270 | 6.0 | 3.7 | 3.3 | 73.0 | 1000 | 0 | 0 | 0 | LT | HC | LT | HC | 12 | 1140 | 10 | 45 | 40 | 5 | 0 |
| TC2 | **34** | S | Pool | - | - | 36.93 | 830 | 129 | 5.2 | 2.75 | 1.4 | 3.8 | 25 | 3 | 4 | NA | NA | NA | 5.0 | NA | NA | 0 | 0 | 0 | LT | HC | NV | NV | 12.5 | 1233 | 10 | 40 | 40 | 10 | 0 |
| TC2 | **35** | FT | Riffle | - | - | 36.78 | 420 | 192 | 1.75 | 0.75 | NA | NA | 40 | 11 | 7 | 246 | 5.4 | 4.2 | 2.5 | 58.5 | 1897 | 0 | 0 | 0 | ST | HC | LT | HC | 12.5 | 1257 | 20 | 40 | 40 | 0 | 0 |
| TC2 | **36** | FN | Glide | - | - | 36.70 | 540 | 138 | 3.25 | 1.5 | NA | NA | 25 | 8 | 3 | 255 | 5.5 | 3.6 | 3.4 | 70.1 | 1932 | 0 | 0 | 0 | LT | HC | LT | HC | 12.5 | 1302 | 20 | 30 | 50 | 0 | 0 |
| TC2 | **37** | FT | Riffle | - | - | 36.60 | 540 | 99 | 3 | 1.25 | NA | NA | 50 | 7 | 9 | 330 | 7.8 | 4.2 | 4.0 | 78.6 | 2072 | 0 | 0 | 0 | ST | HC | LT | HC | 14 | 1311 | 33 | 33 | 30 | 3 | 0 |
| TC2 | **38** | FN | Glide | - | - | 36.50 | 1475 | 120 | 5 | 2.75 | NA | NA | 3 | 1 | 2 | 390 | 8.0 | 3.3 | 12.5 | 117.0 | 3733 | 0 | 0 | 0 | LT | HC | LT | HC | 13.5 | 1319 | 32 | 33 | 30 | 5 | 0 |
| TC2 | **39** | FT | Riffle | - | - | 36.23 | 395 | 81 | 3 | 1.5 | NA | NA | 2 | 0 | 4 | 180 | 8.9 | 7.0 | 2.1 | 25.8 | 3741 | 0 | 0 | 0 | ST | HC | LT | HC | 14 | 1327 | 5 | 40 | 50 | 5 | 0 |
| TC2 | **40** | FN | Glide | - | - | 36.15 | 375 | 150 | 4.5 | 2.25 | NA | NA | 3 | 1 | 3 | 210 | 10.0 | 7.5 | 2.6 | 28.0 | 3525 | 0 | 0 | 0 | LT | HC | ST | HC | 14 | 1337 | 10 | 40 | 50 | 0 | 0 |
| TC2 | **41** | FT | Riffle | - | - | 36.08 | 610 | 81 | 5 | 2.5 | NA | NA | 0 | 0 | 0 | 225 | 7.5 | 4.9 | 3.9 | 45.9 | 1543 | 112 | 112 | 0 | LT | HC | LT | HC | 14 | 1342 | 10 | 40 | 40 | 10 | 0 |
| TC2 | **42** | S | Pool | - | - | 35.97 | 605 | 75 | 5.75 | 3 | 1.1 | 4.65 | 0 | 0 | 0 | NA | NA | NA | 3.5 | NA | NA | 77 | 77 | 0 | LT | HC | LT | HC | 14 | 1348 | 30 | 33 | 33 | 3 | 0 |
| TC2 | **43** | FT | Riffle | - | - | 35.86 | 195 | 60 | 6 | 3 | NA | NA | 1 | 0 | 0 | 345 | 9.0 | 4.9 | 1.3 | 70.2 | 716 | 0 | 0 | 0 | LT | HC | ST | HC | 14 | 1352 | 20 | 35 | 40 | 5 | 0 |
| TC2 | **44** | S | Pool | - | - | 35.82 | 995 | 129 | 6.2 | 3.5 | 1.5 | 4.7 | 1 | 1 | 0 | NA | NA | NA | 5.0 | NA | NA | 270 | 0 | 270 | LT | HC | LT | CP | 14 | 1358 | 40 | 10 | 20 | 30 | 0 |
| TC2 | **45** | FT | Riffle | - | - | 35.64 | 475 | 75 | 2.5 | 1.5 | NA | NA | 30 | 12 | 5 | 360 | 7.5 | 4.6 | 4.5 | 78.9 | 625 | 0 | 0 | 0 | LT | HC | LT | HC | 14 | 1406 | 10 | 45 | 45 | 0 | 0 |
| TC2 | **46** | S | Pool | - | - | 35.55 | 1000 | 135 | 9 | 3.5 | 1.4 | 7.6 | 52 | 17 | 14 | NA | NA | NA | 6.2 | NA | NA | 6 | 6 | 0 | LT | HC | LT | HC | 14.5 | 1418 | 10 | 35 | 35 | 20 | 0 |
| TC2 | **47** | FT | Riffle | - | Y | 35.36 | 855 | 48 | 3.25 | 1.75 | NA | NA | 16 | 12 | 5 | 390 | 6.5 | 4.1 | 6.9 | 96.1 | 1938 | 794 | 700 | 94 | LT | HC | LT | HC | 14.5 | 1428 | 10 | 40 | 50 | 0 | 0 |
| TC2 | **48** | FN | Glide | - | - | 35.21 | 385 | 150 | 3.75 | 1.25 | NA | NA | 3 | 1 | 0 | 210 | 6.5 | 4.8 | 2.0 | 44.2 | 2429 | 7 | 0 | 7 | LT | HC | LT | HC | 14.5 | 1452 | 10 | 50 | 40 | 0 | 0 |
| TC2 | **49** | FT | Riffle | - | - | 35.13 | 850 | 105 | 3.5 | 1.5 | NA | NA | 2 | 0 | 0 | 495 | 6.8 | 3.7 | 6.9 | 132.6 | 2275 | 976 | 976 | 0 | LT | CP | NV | NV | 15 | 1500 | 10 | 50 | 40 | 0 | 0 |
| TC2 | **50** | S | Pool | - | - | 34.98 | 900 | 120 | 6.5 | 4 | 2 | 4.5 | 10 | 12 | 10 | NA | NA | NA | 13.5 | NA | NA | 750 | 750 | 0 | LT | CP | NV | NV | 15 | 1502 | 10 | 40 | 50 | 0 | 0 |
| TC2 | **200** | FT | Riffle | - | - | 34.81 | 770 | 120 | 3 | 2 | NA | NA | 34 | 12 | 10 | 690 | 9.0 | 5.1 | 11.7 | 135.3 | 2905 | 0 | 0 | 0 | LT | CP | LT | HW | 11 | 930 | 10 | 25 | 50 | 15 | 0 |
| TC2 | **201** | S | Pool | Bedrock | - | 34.67 | 275 | 120 | 10 | 4 | 1.75 | 8.25 | 33 | 8 | 11 | NA | NA | NA | 1.5 | NA | NA | 0 | 0 | 0 | ST | HC | ST | HW | 11 | 950 | 30 | 30 | 25 | 5 | 10 |
| TC2 | **202** | FN | Glide | - | - | 34.62 | 1360 | 132 | 3 | 2 | NA | NA | 14 | 9 | 1 | 360 | 6.5 | 4.7 | 6.7 | 77.3 | 708 | 146 | 0 | 146 | ST | HC | ST | HW | 11.5 | 1010 | 25 | 35 | 35 | 5 | 0 |
| TC2 | **203** | FT | Riffle | - | - | 34.36 | 760 | 174 | 1.75 | 1 | NA | NA | 2 | 0 | 0 | 345 | 5.7 | 3.8 | 5.0 | 91.3 | 2404 | 437 | 252 | 184 | ST | HC | ST | HW | 11.5 | 1030 | 10 | 45 | 45 | 0 | 0 |
| TC2 | **204** | FN | Glide | - | - | 34.22 | 670 | 168 | 3 | 1.5 | NA | NA | 1 | 1 | 2 | 345 | 6.5 | 4.1 | 4.7 | 83.5 | 1674 | 687 | 687 | 0 | LT | HC | ST | HC | 11.5 | 1040 | 10 | 45 | 45 | 0 | 0 |
| TC2 | **205** | FN | Glide | - | - | 34.10 | 1105 | 150 | 2.5 | 2 | NA | NA | 7 | 2 | 3 | 450 | 6.5 | 3.7 | 8.7 | 123.3 | 1859 | 346 | 346 | 0 | ST | HC | LT | CP | 11.5 | 1050 | 20 | 50 | 30 | 0 | 0 |
| TC2 | **206** | FT | Riffle | - | - | 33.89 | 575 | 84 | 3.5 | 2 | NA | NA | 2 | 2 | 1 | 195 | 8.0 | 4.6 | 2.6 | 42.5 | 951 | 0 | 0 | 0 | LT | CP | LT | CP | 12 | 1120 | 25 | 30 | 40 | 5 | 0 |
| TC2 | **207** | FN | Glide | - | - | 33.79 | 1275 | 111 | 5 | 2.5 | NA | NA | 3 | 0 | 0 | 192 | 7.7 | 5.6 | 5.2 | 34.1 | 420 | 0 | 0 | 0 | LT | CP | LT | CP | 12.5 | 1125 | 15 | 40 | 25 | 20 | 0 |

**Sub-reach TC1 Habitat Unit Data**

*Twisp to Carlton Reach Assessment*

| | | | | | | | | Wetted Channel Dimensions | | | | | Woody Material Counts | | | Bankfull Dimensions | | | | | | Eroding Banks (length, ft) | | | Riparian Vegetation Info | | | | Water Temp | | Substrate % (Visual Est.) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sub-Reach | Sequence Order Number | Channel Unit Type Code | Channel Unit Type | Forcing Agent | Flow Split ? | Upper Boundary RM | Channel Unit Length (ft, along thalweg) | Wet Width (ft) | Max Depth | Avg Depth | Pool Crest Depth | Residual Pool Depth | S | M | L | BF Width (feet) | Max BFD (feet) | Avg BFD (feet) | Area (acres) | W/D | Floodprone Width (ft) | Total | Left Bank | Right Bank | Left Bank Size Class | Left Bank Overstory Type | Right Bank Size Class | Right Bank Overstory Type | degC | Time | SA | GR | CO | BO | BR |
| TC1 | **208** | FT | Riffle | - | - | 33.55 | 950 | 150 | 2.25 | 1.5 | NA | NA | 1 | 0 | 0 | 171 | 4.3 | 3.3 | 3.5 | 52.5 | 193 | 0 | 0 | 0 | LT | CP | LT | CP | 12.5 | 1130 | 10 | 25 | 60 | 5 | 0 |
| TC1 | **209** | S | Pool | - | - | 33.38 | 380 | 147 | 5.5 | 2.5 | 2.4 | 3.1 | 2 | 0 | 0 | NA | NA | NA | 1.1 | NA | NA | 0 | 0 | 0 | LT | HC | LT | CP | 12.5 | 1135 | 10 | 40 | 40 | 10 | 0 |
| TC1 | **210** | FT | Riffle | - | - | 33.30 | 740 | 150 | 2.5 | 1.5 | NA | NA | 1 | 0 | 0 | 165 | 5.7 | 4.2 | 2.3 | 39.6 | 193 | 251 | 0 | 251 | LT | HC | LT | CP | 12.5 | 1213 | 10 | 25 | 60 | 5 | 0 |
| TC1 | **211** | FN | Glide | - | - | 33.17 | 285 | 129 | 2.75 | 2 | NA | NA | 1 | 0 | 0 | 162 | 7.8 | 5.4 | 1.0 | 29.8 | 214 | 0 | 0 | 0 | LT | CP | LT | CP | 12.5 | 1230 | 30 | 35 | 35 | 0 | 0 |
| TC1 | **212** | FT | Riffle | - | - | 33.11 | 765 | 129 | 1.75 | 1 | NA | NA | 1 | 0 | 0 | 162 | 7.8 | 5.4 | 2.4 | 29.8 | 179 | 0 | 0 | 0 | LT | CP | LT | CP | 13 | 1240 | 10 | 40 | 40 | 10 | 0 |
| TC1 | **213** | S | Pool | Bedrock | - | 32.97 | 790 | 129 | 4.8 | 3 | 1.75 | 3.05 | 0 | 0 | 0 | 162 | NA | NA | 2.7 | NA | NA | 0 | 0 | 0 | LT | CP | LT | CP | 13 | 1245 | 10 | 30 | 30 | 30 | 0 |
| TC1 | **214** | FN | Glide | - | - | 32.83 | 795 | 150 | 3.6 | 2.25 | NA | NA | 2 | 0 | 0 | 165 | 7.3 | 5.4 | 3.0 | 30.3 | 187 | 0 | 0 | 0 | LT | CP | LT | CP | 13 | 1250 | 15 | 30 | 45 | 10 | 0 |
| TC1 | **215** | FT | Riffle | - | - | 32.68 | 170 | 156 | 3 | 1.5 | NA | NA | 0 | 0 | 0 | 171 | 7.3 | 5.4 | 0.7 | 31.4 | 236 | 0 | 0 | 0 | LT | CP | LT | CP | 13 | 1255 | 10 | 40 | 50 | 0 | 0 |
| TC1 | **216** | FN | Glide | - | - | 32.65 | 590 | 171 | 3.5 | 1.75 | NA | NA | 0 | 0 | 0 | 171 | 6.8 | 5.1 | 2.1 | 33.3 | 203 | 0 | 0 | 0 | ST | CP | LT | HC | 13 | 1256 | 10 | 40 | 45 | 5 | 0 |
| TC1 | **217** | S | Pool | - | - | 32.54 | 585 | 132 | 10 | 4.5 | 2 | 8 | 0 | 0 | 0 | NA | NA | NA | 1.9 | NA | NA | 0 | 0 | 0 | ST | CP | LT | HC | 13 | 1305 | 30 | 20 | 30 | 20 | 0 |
| TC1 | **218** | FT | Riffle | - | - | 32.43 | 740 | 180 | 3.5 | 2 | NA | NA | 2 | 2 | 0 | 210 | 7.0 | 4.9 | 3.4 | 42.7 | 332 | 0 | 0 | 0 | LT | HC | LT | HC | 13 | 1315 | 10 | 35 | 40 | 15 | 0 |
| TC1 | **219** | S | Pool | - | - | 32.29 | 535 | 135 | 4.5 | 3 | 2.25 | 2.25 | 2 | 1 | 1 | NA | NA | NA | 1.9 | NA | NA | 0 | 0 | 0 | ST | HC | LT | HC | 13 | 1320 | 10 | 20 | 50 | 20 | 0 |
| TC1 | **220** | FT | Riffle | - | - | 32.19 | 1340 | 132 | 3 | 2 | NA | NA | 5 | 2 | 1 | 165 | 7.0 | 5.9 | 6.7 | 27.9 | 358 | 301 | 301 | 0 | LT | CP | LT | HC | 13.5 | 1328 | 15 | 30 | 50 | 5 | 0 |
| TC1 | **221** | S | Pool | - | - | 31.94 | 555 | 117 | 5.75 | 2.75 | 2.1 | 3.65 | 3 | 1 | 0 | NA | NA | NA | 2.0 | NA | NA | 18 | 18 | 0 | LT | CP | LT | HC | | | 20 | 25 | 50 | 5 | 0 |
| TC1 | **222** | FT | Riffle | - | - | 31.84 | 335 | 120 | 1.5 | 0.75 | NA | NA | 0 | 0 | 0 | 135 | 8.0 | 6.3 | 1.2 | 21.4 | 201 | 0 | 0 | 0 | LT | CP | LT | HC | | | 15 | 40 | 40 | 5 | 0 |
| TC1 | **223** | S | Pool | - | - | 31.78 | 845 | 132 | 7 | 3 | 1.2 | 5.8 | 1 | 0 | 2 | NA | NA | NA | 2.8 | NA | NA | 106 | 106 | 0 | ST | HC | LT | CP | 14 | 1343 | 15 | 50 | 30 | 5 | 0 |
| TC1 | **224** | FT | Riffle | - | - | 31.62 | 490 | 159 | 3 | 1.25 | NA | NA | 0 | 1 | 0 | 165 | 6.5 | 5.2 | 1.8 | 31.7 | 204 | 91 | 0 | 91 | ST | HC | NV | NV | 14 | 1345 | 20 | 40 | 40 | 0 | 0 |
| TC1 | **225** | S | Pool | - | - | 31.53 | 910 | 120 | 10 | 5 | 1.6 | 8.4 | 0 | 0 | 0 | NA | NA | NA | 3.8 | NA | NA | 0 | 0 | 0 | LT | CP | LT | CP | 14 | 1350 | 10 | 15 | 40 | 20 | 15 |
| TC1 | **226** | FT | Riffle | - | - | 31.36 | 1685 | 120 | 3 | 1.25 | NA | NA | 20 | 20 | 40 | 210 | 8.5 | 5.2 | 6.3 | 40.4 | 333 | 69 | 69 | 0 | ST | HW | LT | HC | 14 | 1359 | 10 | 25 | 60 | 5 | 0 |
| TC1 | **227** | SIDEF | Side Channel - Fast | - | - | 31.32 | 605 | 42 | 2.75 | 1.5 | NA | NA | 0 | 0 | 0 | 48 | NA | NA | 0.9 | NA | 333 | 0 | 0 | 0 | ST | HW | LT | HC | | | 5 | 30 | 50 | 15 | 0 |
| TC1 | **228** | FN | Glide | - | - | 31.05 | 580 | 162 | 4.5 | 2.5 | NA | NA | 0 | 0 | 0 | 180 | 8.5 | 6.3 | 1.9 | 28.8 | 253 | 0 | 0 | 0 | LT | CP | LT | CP | 14 | 1415 | 20 | 30 | 40 | 10 | 0 |
| TC1 | **229** | S | Pool | - | - | 30.94 | 605 | 150 | 4.5 | 3 | 0.9 | 3.6 | 0 | 0 | 0 | NA | NA | NA | 2.0 | NA | NA | 0 | 0 | 0 | LT | CP | LT | CP | 14 | 1419 | 30 | 40 | 20 | 10 | 0 |
| TC1 | **230** | FT | Riffle | - | - | 30.83 | 845 | 198 | 1.5 | 0.5 | NA | NA | 0 | 0 | 0 | 210 | 7.0 | 6.0 | 3.1 | 35.0 | 288 | 0 | 0 | 0 | LT | CP | LT | CP | 14.5 | 1419 | 20 | 50 | 30 | 0 | 0 |
| TC1 | **231** | S | Pool | - | - | 30.67 | 880 | 111 | 5 | 2.5 | 1.9 | 3.1 | 0 | 2 | 0 | NA | NA | NA | 4.6 | NA | NA | 122 | 122 | 0 | ST | HC | LT | CP | 14.5 | 1448 | 20 | 30 | 50 | 0 | 0 |
| TC1 | **232** | FT | Riffle | - | - | 30.51 | 1000 | 165 | 1.75 | 1.25 | NA | NA | 20 | 8 | 5 | 225 | 5.5 | 5.0 | 4.7 | 45.0 | 446 | 484 | 484 | 0 | ST | HC | LT | HC | 14.5 | 1450 | 10 | 45 | 40 | 5 | 0 |
| TC1 | **233** | S | Pool | - | - | 30.33 | 995 | 135 | 7.5 | 3 | 1.4 | 6.1 | 4 | 1 | 0 | NA | NA | NA | 3.1 | NA | NA | 0 | 0 | 0 | ST | HC | ST | HC | 15 | 1458 | 10 | 35 | 50 | 5 | 0 |
| TC1 | **234** | FT | Riffle | - | - | 30.14 | 635 | 129 | 3 | 0.75 | NA | NA | 0 | 0 | 0 | 195 | 7.0 | 5.3 | 2.3 | 36.8 | 282 | 0 | 0 | 0 | LT | HC | LT | HC | 15 | 1505 | 10 | 30 | 40 | 20 | 0 |
| TC1 | **235** | S | Pool | - | - | 30.02 | 525 | 111 | 7.5 | 3.5 | 2 | 5.5 | 3 | 0 | 0 | NA | NA | NA | 1.8 | NA | NA | 0 | 0 | 0 | LT | HC | LT | HC | 15 | 1512 | 20 | 20 | 40 | 20 | 0 |
| TC1 | **236** | FT | Riffle | - | - | 29.93 | 485 | 111 | 2.5 | 1.25 | NA | NA | 0 | 0 | 0 | 195 | 7.0 | 5.3 | 1.7 | 36.8 | 259 | 0 | 0 | 0 | LT | CP | LT | HC | 15 | 1516 | 20 | 20 | 40 | 20 | 0 |
| TC1 | **237** | S | Pool | - | - | 29.84 | 1100 | 120 | 8 | 4 | 2.1 | 5.9 | 1 | 0 | 0 | NA | NA | NA | 4.1 | NA | NA | 0 | 0 | 0 | LT | HC | LT | HC | 15 | 1517 | 15 | 25 | 40 | 20 | 0 |
| TC1 | **238** | FN | Glide | - | - | 29.63 | 500 | 195 | 2.5 | 1.5 | NA | NA | 4 | 1 | 1 | 201 | 6.5 | 5.6 | 2.6 | 35.7 | 344 | 992 | 0 | 992 | LT | CP | LT | HC | 15 | 1527 | 10 | 38 | 50 | 2 | 0 |
| TC1 | **239** | FT | Riffle | - | - | 29.54 | 1625 | 270 | 2.5 | 1.75 | NA | NA | 2 | 1 | 0 | 270 | 4.2 | 3.2 | 8.5 | 83.9 | 316 | 0 | 0 | 0 | LT | CP | LT | HC | 15.5 | 1538 | 10 | 45 | 40 | 5 | 0 |
| TC1 | **240** | S | Pool | - | - | 29.24 | 1705 | 156 | 8 | 4 | 1.4 | 6.6 | 3 | 2 | 1 | NA | NA | NA | 7.7 | NA | NA | 0 | 0 | 0 | LT | CP | LT | HC | 15.5 | 1618 | 10 | 40 | 40 | 10 | 0 |
| TC1 | **241** | FT | Riffle | - | - | 28.92 | 945 | 99 | 3.5 | 1.75 | NA | NA | 2 | 2 | 4 | 315 | 7.3 | 4.3 | 5.5 | 73.6 | 836 | 217 | 217 | 0 | LT | HC | LT | HC | 15.5 | 1630 | 10 | 35 | 40 | 15 | 0 |
| TC1 | **242** | S | Pool | - | - | 28.75 | 710 | 135 | 5.3 | 3 | 1.7 | 3.6 | 25 | 10 | 5 | NA | NA | NA | 2.8 | NA | NA | 67 | 67 | 0 | LT | HC | LT | HC | 15.5 | 1639 | 5 | 25 | 35 | 35 | 0 |
| TC1 | **243** | FT | Riffle | - | - | 28.62 | 1285 | 117 | 4 | 2 | NA | NA | 4 | 0 | 0 | 219 | 6.0 | 4.0 | 6.6 | 54.8 | 278 | 0 | 0 | 0 | LT | CP | LT | HC | 15.5 | 1649 | 10 | 35 | 35 | 20 | 0 |
| TC1 | **244** | S | Pool | - | - | 28.38 | 285 | 108 | 4.5 | 2 | 2.2 | 2.3 | 0 | 0 | 0 | NA | NA | NA | 1.0 | NA | NA | 224 | 0 | 224 | LT | HC | LT | HC | 15.5 | 1700 | 15 | 20 | 25 | 40 | 0 |
| TC1 | **245** | FT | Riffle | - | - | 28.33 | 770 | 120 | 2.5 | 1.5 | NA | NA | 0 | 0 | 0 | 180 | 6.3 | 4.3 | 2.3 | 41.5 | 280 | 0 | 0 | 0 | ST | HC | ST | HC | 15.5 | 1705 | 10 | 20 | 30 | 40 | 0 |
| TC1 | **246** | S | Pool | - | - | 28.18 | 325 | 75 | 9 | 5 | 2 | 7 | 1 | 0 | 0 | NA | NA | NA | 1.0 | NA | NA | 0 | 0 | 0 | LT | HC | NV | NV | 15.5 | 1715 | 20 | 10 | 40 | 30 | 0 |

Methow River
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# APPENDIX C

# TARGET CONDITIONS AND EXISTING CONFITIONS RATING CRITERIA

The following table (Table C-1) provides definitions for condition ratings of “Adequate,” “At-Risk,” and “Unacceptable,” as discussed in Section 3.5.7 in the main body of the report.

**Table C-1**

| Condition/Process | Ecological Concern | Source | Condition Rating Definition | | |
|---|---|---|---|---|---|
| | | | Adequate (Target Condtion) | At-Risk | Unacceptable |
| Floodplain Connectivity | Side Channel and Wetland Conditions | NMFS 1996 | Off-channel areas are frequently hydrologically linked to main channel; overbank flows occur and maintain wetland functions, riparian vegetation, and succession | Reduced linkage of wetland, floodplains, and riparian areas to main channel; overbank flows are reduced relative to historical frequency, as evidenced by moderate degradation of wetland function and riparian vegetation/succession | Severe reduction in hydrologic connectivity between off-channel, wetland, floodplain and riparian areas; wetland extent drastically reduced and riparian vegetation/succession altered significantly |
| Off-channel Habitat | Side Channel and Wetland Conditions | NMFS 1996 | Backwaters with cover, and low energy off-channel areas (ponds, oxbows, etc.) | Some backwaters and high energy side channels | Few or no backwaters; no off-channel ponds |
| Channel Migration | Side Channel and Wetland Conditions/Instream Structural Complexity/ Bed and Channel Form | Reclamation 2011 | Channel is migrating at or near natural rates | Limited amount of channel migration is occurring at a faster/slower rate relative to natural rates, but significant change in channel width or planform is not detectable; LWD is still being recruited | Little or no channel migration is occurring because of human actions preventing reworking of the floodplain and LWD recruitment; or channel migration is occurring at an accelerated rate such that channel width has at least doubled, possibly resulting in a channel planform change, and sediment supply has noticeably increased from bank erosion |
| Wood Frequency | Instream Structural Complexity | Fox and Bolton 2007 | >80 pieces/mile, >12" diameter and >35 feet length and adequate sources of woody debris recruitment in riparian areas | Currently meets standards for adequate, but lacks potential sources from riparian areas of woody debris recruitment to maintain that standard | Does not meet standards for adequate and lacks potential LWD recruitment |
| Key Piece Frequency | Instream Structural Complexity | Fox and Bolton 2007 | >16 key pieces/mile with minimum volume of 10.75 $m^3$ (roughly a 35' log, 3.5' diameter, and 7' diameter rootwad) | Currently meets standards for adequate, but lacks potential sources from riparian areas of woody debris recruitment to maintain that standard | Does not meet standards for adequate and lacks potential LWD recruitment |
| Pool Frequency | Bed and Channel Form | USFS 1994; NMFS 1996 | Meets standard of one pool per 6 channel widths and LWD recruitment standards for properly functioning habit | Meets pool frequency standards, but LWD recruitment inadequate to maintain pools over time | Does not meet the pool frequency standards |

**Table C-1**

| Condition/Process | Ecological Concern | Source | Condition Rating Definition | | |
|---|---|---|---|---|---|
| | | | Adequate (Target Condtion) | At-Risk | Unacceptable |
| Pool Quality | Bed and Channel Form | NMFS 1996 | Pools >1 meter deep with good cover and cool water; minor reduction of pool volume by fine sediment | Few deeper pools greater than 1 meter present or inadequate cover/temperature; moderate reduction of pool volume by fine sediment | No deep pools >1 meter and inadequate cover/temperature; major reduction of pool volume by fine sediment |
| Canopy Cover within 100' | Riparian Condition | Reclamation 2011 | Trees and shrubs within one site potential tree height distance have >80% canopy cover that provides thermal shading to the river | Trees and shrubs within one site potential tree height distance have 50–80% canopy cover that provides thermal shading to the river | Trees and shrubs within one site potential tree height distance have >50% canopy cover that provides thermal shading to the river |
| Riparian Age Composition | Riparian Condition | Reclamation 2011 | >80% mature trees (medium-large) in the riparian buffer zone (defined as a 30-meter belt along each bank) that are available for recruitment by the river via channel migration | 50–80% mature trees (medium-large) in the riparian buffer zone (defined as a 30-meter belt along each bank) that are available for recruitment by the river via channel migration | <50% mature trees (medium-large) in the riparian buffer zone (defined as a 30-meter belt along each bank) that are available for recruitment by the river via channel migration |