# comprehensive Data delivery README FILE

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| **Study Section** | Study 6.5: Geomorphology (GEO) |
| **Study Component** | (4) Assess Geomorphic Change Middle and Lower Susitna River Segments;  (5) Riverine Habitat versus Flow Relationship Middle Susitna River Segment |
| **Prepared By** | Tetra Tech, Inc. |
| **Data Collection and Processing By** | AeroMetric/US Air Force/USGS/Tetra Tech, Inc. |
| **Field Date Range** | July, September, October 2012; September, November 2013; July 1980; September 1983; August 1949; July 1951; August, September 1952; July 1953; July 1954 |

**Introduction:** The overall goal of the Geomorphology Study is to characterize the geomorphology of the Susitna River, and to evaluate the effects of the Project on the geomorphology and dynamics of the river by predicting the trend and magnitude of geomorphic response. More specifically, the purpose of the Geomorphology study, along with the Fluvial Geomorphology below Watana Dam Study (Study 6.6), is to assess the potential impact of the Project on the behavior of the river downstream of the proposed dam, with particular focus on potential changes in instream and riparian habitat.

The goal of the study component “Assess Geomorphic Change Middle and Lower Susitna River Segments” is to compare current, 1980s and 1950s geomorphic feature data from aerial photography analysis to characterize channel stability and change and the distribution of geomorphic features under unregulated flow conditions. The goal of the study component “Riverine Habitat versus Flow Relationship Middle Susitna River Segment” is to delineate current (2012) and 1980s riverine macrohabitat types and develop wetted habitat area data over a range of flows to quantify riverine macrohabitat surface area versus flow relationships.

As part of these two study components, historical aerial photography (1950s and 1980s) were acquired and current aerial photography (2012 and 2013) was flown and processed.

**Data Summary:** A summary of the coverage of the 2012 aerial photography and discharge during the aerial flight is provided in Table 1. Processing of the 2012 aerial photography is documented in *Mapping of Aquatic Macrohabitat Features at Selected Sites in the Middle and Lower Susitna River Segments from the 1980s and 2012,* noted as document 1 in the online report link below, and is also discussed in Study 6.5 Initial Study Report (noted as document 2 in the online report link). The delivered 2012 aerial photographs include:

* Digital color aerial photographs (RGB & CIR) at a scale of 1:12,000
* 4-band, 8-bit imagery
* Pixel resolution of 1 foot or better
* TIFF & MrSID format

The acquisition and processing of the 2013 aerial photography was presented in ISR Study 6.5 (Section 4.5.2.1.1.2). A summary of the coverage of the 2013 aerial photography is provided in Table 2. The delivered 2013 aerial photographs include:

* 4-band, 8-bit orthorectified (RGB & CIR) imagery
* TIFF & MrSIDformat
* Pixel resolution of 1 foot or better

The description of 1980s aerial photography (1980 and 1983) is presented in *Mapping of Aquatic Macrohabitat Features at Selected Sites in the Middle and Lower Susitna River Segments from the 1980s and 2012.* A summary of the 1980s aerial photography is provided in Table 3. The delivered 2013 aerial photographs include:

* RM000\_156\_1983: 0.5 ft and 1 ft resolution 8-bit single band greyscale aerial imagery
  + 1000\_scale
  + 2000\_scale
  + Indexes
  + MrSid
* RM\_82\_156\_1983: 0.5 ft resolution 8-bit single band greyscale aerial imagery
  + Index
  + Mosaic
  + Tiles
* RM149-253\_1980: 1 ft resolution 8-bit 4-band color aerial imagery
  + Index
  + Mosaic
  + Tiles

Digital versions of historical 1950s aerial photographs (1949, 1951, 1952, 1953, 1954) were acquired and orthorectified. A description of the 1950s aerials is provided in ISR Study 6.5 (Section 4.4.2.1.3). A summary of acquired 1950s aerial photography is provided in Table 4. 1950s aerial photography was derived from several US Air Force (USAF) projects, which ranged from 1949 to 1955. The USAF aerial photographs made available through the USGS Earth Resources Observation and Science (EROS) Center, an archive that can be searched on-line and ordered using the USGS Earth Explorer facility. They are also posted to the Susitna-Watana data website noted below. The 1950s aerial photographs were orthorectified (see ISR Study 6.5 Section 4.4.2.1.3.1 for further detail on this process). Orthophotos that were generated to cover the Area of Interest along the Susitna River came from eight epochs of photography: two dates in 1949, two dates in 1952, two dates in 1953 and single dates in 1951 and 1954. Orthophotos were delivered in the same tiling scheme used for the 2012 and 2013 orthophotos. Tiles were divided into sub-directories named for the date of the source photography for a particular set of orthophotos. The delivery includes:

* 8-bit single band grayscale aerial imagery
* Pixel resolution of 0.6 meter

Table . 2012 Aerial Photo Summary.

| **Aerial Coverage (PRM)** | | **Date** | **Discharge (cfs)** | |
| --- | --- | --- | --- | --- |
| **From** | **To** | **Gold Creek**  **(USGS gage 15292000)** | **Sunshine**  **(USGS gage 15292000)** |
| Upper Susitna River Segment | | | | |
| 265.2 | 231.7 | 10/20/2012 | 7,410 | --- |
| 242.3 | 187.1 | 9/30/2012 | 17,000 | --- |
| Middle Susitna River Segment | | | | |
| 187.1 | 143.6 | 9/30/2012 | 17,000 | --- |
| 143.6 | 141.4 | 9/30/2012 | 17,000 | --- |
| 143.6 | 102.4 | 9/10/2012 | 12,900 | --- |
| 118.9 | 102.4 | 7/27/2012 | 22,200 | --- |
| Lower Susitna River Segment | | | | |
| 102.4 | 63.1 | 7/27/2012 | --- | 54,700 |
| 102.4 | 77.7 | 9/10/2012 | --- | 37,900 |
| 77.7 | 69 | 9/30/2012 | --- | 47,400 |
| 72.2 | 69 | 10/10/2012 | --- | 54,100 |
| 69 | 33.5 | 10/10/2012 | --- | 54,100 |
| 33.5 | 22.5 | 9/30/2012 | --- | 47,400 |
| 22.5 | 0 | 10/10/2012 | --- | 54,100 |
| 77.7 | 0 | 9/30 - 10/1/2013 | --- | 47,400 to 41,200 |

Table . Summary of 2013 Aerial Photography.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Aerial Coverage (PRM)** | | **Date** | **Discharge (cfs)** | |
| **From** | **To** | **(MM/DD/YYYY)** | **Gold Creek**  **(USGS gage 15292000)** | **Sunshine**  **(USGS gage 15292000)** |
| Upper Susitna River Segment | | | | |
| 265.2 | 247.2 | 9/16/2013 | 19,200 | --- |
| 247.2 | 214.8 | 9/20/2013 | 15,300 | --- |
| 214.8 | 187.1 | 9/16/2013 | 19,200 | --- |
| Middle Susitna River Segment | | | | |
| 187.1 | 184.9 | 9/16/2013 | 19,200 | --- |
| 184.9 | 153.6 | 11/6/2013 | 6,2001 | --- |
| 153.6 | 106.8 | 9/24/2013 | 11,300 | --- |
| 106.8 | 102.4 | 9/20/2013 | 15,300 |  |
| Lower Susitna River Segment | | | | |
| 102.4 | 0 | 9/20/2013 | --- | 35,500 |
| Notes: | | |
| 1. USGS Gold Creek gage was not in operation on 11/6 due to ice cover, the average daily flow on 1/6 was extrapolated from the preceding week's daily discharges | | | | |

Table . Summary of 1980s Aerial Photography.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Aerial Coverage (PRM)** | | **Date** | **Discharge (cfs)** | |
| **From** | **To** | **(MM/DD/YYYY)** | **Gold Creek**  **(USGS gage 15292000)** | **Sunshine**  **(USGS gage 15292000)** |
| Upper Susitna River Segment | | | | |
| 251 | 187 | 7/19 and 7/20/1980 | 35,800 & 31,600 | --- |
| Middle Susitna River Segment | | | | |
| 187 | 152 | 7/19 and 7/20/1980 | 35,800 & 31,600 | --- |
| 159 | 102 | 9/6/1983 | 16,000 | --- |
| 158 | 102 | 9/11/1983 | 12,500 (12,200 published) | --- |
| Lower Susitna River Segment | | | | |
| 87 | 102 | 9/11/1983 | --- | 28,000 |
| 102 | 0 | 9/6/1983 | --- | 36,600 |

Table 4.4- . 1950s Aerial Photo Summary.

| **Aerial Coverage (PRM)** | | **Date** | **Discharge (cfs)** | |  |
| --- | --- | --- | --- | --- | --- |
| **From** | **To** | **(MM/DD/YYYY)** | **Gold Creek**  **(USGS gage 15292000)** | **Sunshine1**  **(USGS gage 15292000)** |  |
| Middle Susitna River Segment | | | | |  | |
| 191.5 | 187 | 8/15/1949 | 25,800 | -- |  |
| 187 | 158.5 | 8/15/1949 | 25,800 | -- |  |
| 158.9 | 158.5 | 8/10/1949 | 29,900 | -- |  |
| 158.5 | 151.8 | 8/10/1949 | 29,900 | -- |  |
| 151.8 | 140.9 | 8/10/1949 | 29,900 | -- |  |
| 151.8 | 102 | 7/3/1951 | 19,000 | -- |  |
| Lower Susitna River Segment | | | | |  | |
| 102 | 33.4 | 7/3/1951 | (19,000)² | *45,100*¹ |  |
| 45.2 | 40 | 7/11/1954 | (19,000) | *47,200* |  |
| 40³ | 38.5³ | 7/11/1954³ | (19,000) | *47,200* |  |
| 38.3 | 33.4 | 7/23/1953 | (19,300) | *48,000* |  |
| 33.4 | 28.5 | 7/23/1953 | (19,300) | *48,000* |  |
| 31.3 | 28.5 | 7/25/1953 | (20,000) | *49,800* |  |
| 28.5 | 27.4 | 7/25/1953 | (20,000) | *49,800* |  |
| 27.4 | 26 | 7/25/1953 | (20,000) | *49,800* |  |
| 27.4 | 21.5 | 8/12/1952 | (24,400) | *61,400* |  |
| 21.5 | 20.6 | 8/12/1952 | (24,400) | *61,400* |  |
| 21.5 | 0 | 9/2/1952 | (28,700) | *70,600* |  |
| Notes: |
| 1. Discharges shown in italics are synthesized flows from the extended flow record developed by the USGS (2013) and may not reflect actual flows | | | | | | |
| 1. Discharges in parentheses are measured flows at Gold Creek and were used to develop the USGS extended flow record (USGS 2012) | | | | | | |
| 1. 07/11/1954 Aerial photos only used on the river right floodplain | | | | |

**Data Organization:** Indicated in data summary.

**Software or Hardware Considerations:** None.

**Online Data Link:** All aerial photography datasets are located at the Geographic Information Network of Alaska (GINA) hosted website for Susitna-Watana Project data.

**2012 Aerial Photography** is nested under “Raster Data” and found at the following url: <http://suwa.portal.gina.alaska.edu/raster-data>

Or can be accessed directly at: <http://suwa.portal.gina.alaska.edu/catalogs/6991-2012-riverflow-geomorphology>

**2013 Aerial Photography** is nested under “Raster Data” and found at the following url: <http://suwa.portal.gina.alaska.edu/raster-data>

Or can be accessed directly at: <http://suwa.portal.gina.alaska.edu/catalogs/7204-2013-susitna-aerial-ortho-imagery>

**1980s Aerial Photography** is nested under “Raster Data” and found at the following url: <http://suwa.portal.gina.alaska.edu/raster-data>

The **1983 imagery** can be accessed directly at: <http://gis.suhydro.org/pub/1980s_Ortho_Aerials/PRM000-PRM159_06SEP1983/>

<http://gis.suhydro.org/pub/1980s_Ortho_Aerials/PRM87-PRM158_11SEP1983/>

The **1980 imagery** can be accessed directly at: <http://gis.suhydro.org/pub/1980s_Ortho_Aerials/PRM152-PRM251_19-20JUL1980/>

**1950s Aerial Photography** is nested under “Raster Data” and found at the following url: <http://suwa.portal.gina.alaska.edu/raster-data>

Or can be accessed directly at: <http://suwa.portal.gina.alaska.edu/catalogs/7063-1950s-usgs-historical-susitna-imagery>

**Online Report Link:**

1. “Mapping of Aquatic Macrohabitat Types at Selected Sites in the Middle and Lower Susitna River Segmetns from 1980s and 2012 Aerials” under “2012 Environmental Studies” at <http://www.susitna-watanahydro.org/type/documents/>
2. Study 6.5 Initial Study Report:

“6.5 Geomorphology Study: Part A 1 of 3” under June 3, 2014; Initial Study Report – Part A, B, and C at <http://www.susitna-watanahydro.org/type/documents/>

**[[1]](#endnote-1)**

1. **Data Distributor Contact Information:**

   Alaska Energy Authority, 813 West Northern Lights Boulevard, Anchorage, AK 99503

   Voice: 907-771-3000, Email: [SUWAhelp@aidea.org](mailto:SUWAhelp@aidea.org)

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