MEMORANDUM AND ADDENDUM

Amendment to Bradley Lake Hydroelectric Project (FERC No. 8221), Bradley Lake Expansion Project

Martin River/Dixon Glacier Sediment Regime and Updated Analysis of Operations Effects on Martin River Geomorphology

Date:	June 16, 2026
Author:	Kathy Dubé (Watershed GeoDynamics geomorphologist)
Purpose:	Summarize data on potential volume, timing, and grain size of sediment emanating from the terminus of the Dixon Glacier (input to Martin River at Dixon Diversion site); and update the analysis of effects of proposed operations on Martin River geomorphology.

1.0 BACKGROUND

The proposed Bradley Lake Expansion Project (Project) includes a proposal to divert water from the Martin River immediately downstream from the current terminus of the Dixon Glacier. Information on the volume, timing, and grain size of sediment emanating from the Dixon Glacier will help plan for infrastructure design, proposed sediment flushing regimes, and flushing flow releases to move sediment through the impoundment and into/through the Martin River. This memorandum summarizes information provided in the January 2026 *Geomorphology and Sediment Transport Study Report* (Watershed GeoDynamics 2026) and provides additional information on the potential sediment regime from the Dixon Glacier as well as an updated analysis of Project operations on Martin River geomorphology to replace Section 5.7.1.2 in the 2026 report. Responses to a comment received on the draft report are appended to this memorandum.

2.0 METHODS

Methods for Dixon Glacier sediment supply include:

- Summarizing data from studies on glacial sediment production from other Alaskan and alpine glaciers (e.g., literature review);
- Comparing Light Detection and Ranging (LiDAR) data from October 13, 2022, and May 2, 2024, for the Martin River valley and long-term aggradation depths

measured along the Martin River to determine net change in sediment storage (NV5 Global, Inc. 2023, 2024);

- Sub-surface grain size sampling along the Martin River to provide data on grain size distribution of sediment stored in the Martin River valley; and
- Analyzing the long-term synthetic/measured average daily flow record for the East Fork Martin River (EFMR) provided by DOWL.

Methods for the analysis of updates to Project operations include:

- Using sediment flushing data provided by DOWL to determine flows and days with sediment flushes into the Martin River (email communication from Andrew Johnson, DOWL, to Betsy McGregory, Kleinschmidt, and Kathy Dubé, Watershed GeoDynamics, dated June 2, 2026).

Details of these methods can be found in Section 4.1 of Watershed GeoDynamics (2026).

3.0 RESULTS

3.1 Application of Sediment Production Rates from Alaskan and Alpine Glaciers to the Dixon Glacier

There are no direct measurements of sediment output from the Dixon Glacier. Sediment production estimates from other glaciers are summarized below and applied to the current 19-square-mile area of the Dixon Glacier.

3.1.1 Basal Erosion Rates

Measurements of basal erosion on Alaskan glaciers range from 10 to 100 millimeters per year (Hallet et al. 1996). If it is assumed that, over the long term, sediment output from the 19-square-mile Dixon Glacier is constant and falls within these basal erosion rates, average total sediment output (fine-grained suspended load plus coarser grained bedload) could range from 610,000–6,100,000 cubic yards per year.

3.1.2 Headwater Glaciers in the Eklutna Valley

Brabets (1993) measured suspended and bedload sediment in the East Fork and West Fork Eklutna River north of Anchorage between 1985 and 1987. The Eklutna River is fed by small headwater glaciers, with a series of small glaciers covering approximately 20 percent of the East Fork basin (7.6 square miles of glacier) and a larger glacier covering approximately 50 percent of the West Fork basin (12.7 square miles of glacier) at the time of the study. Streamflow and sediment sampling locations were at United States Geological Survey (USGS) gages approximately 1 mile (West Fork) to 8 miles (East Fork) downstream from the glacier termini and thus recorded fluvial sediment transport amounts with the influence from the upstream glacier(s). Suspended sediment measurements were made two to three times daily, and bedload sampling occurred every few weeks during the runoff periods for the 3 years.

Average annual suspended load over the 3-year period was 2,849 tons per square mile of glacier area for the East Fork and 3,698 tons per square mile of glacier area for the West Fork, with average annual bedload of 711 tons per square mile of glacier area for the East Fork and 351 for the West Fork. The ratio of bedload to total load ranged from 7 to 26 percent and averaged 20 percent for the East Fork and 9 percent for the West Fork.

Applying these measured stream volumes to the 19-square-mile Dixon Glacier and using 1.35 tons per cubic yard to convert from tons to cubic yards yields an average annual 40,100–52,050 cubic yards of suspended load and 4,950–10,000 cubic yards per year of bedload.

The grain size of bedload in the East Fork and West Fork streams varied from very coarse sand to fine gravel, much finer than the sediment in the Martin River.

Brabets (1993) computed sediment load as a function of discharge for both suspended load and bedload with exponents ranging from 1.97–3.14 for suspended load and 1.71–1.76 for bedload (Figure 3-1).

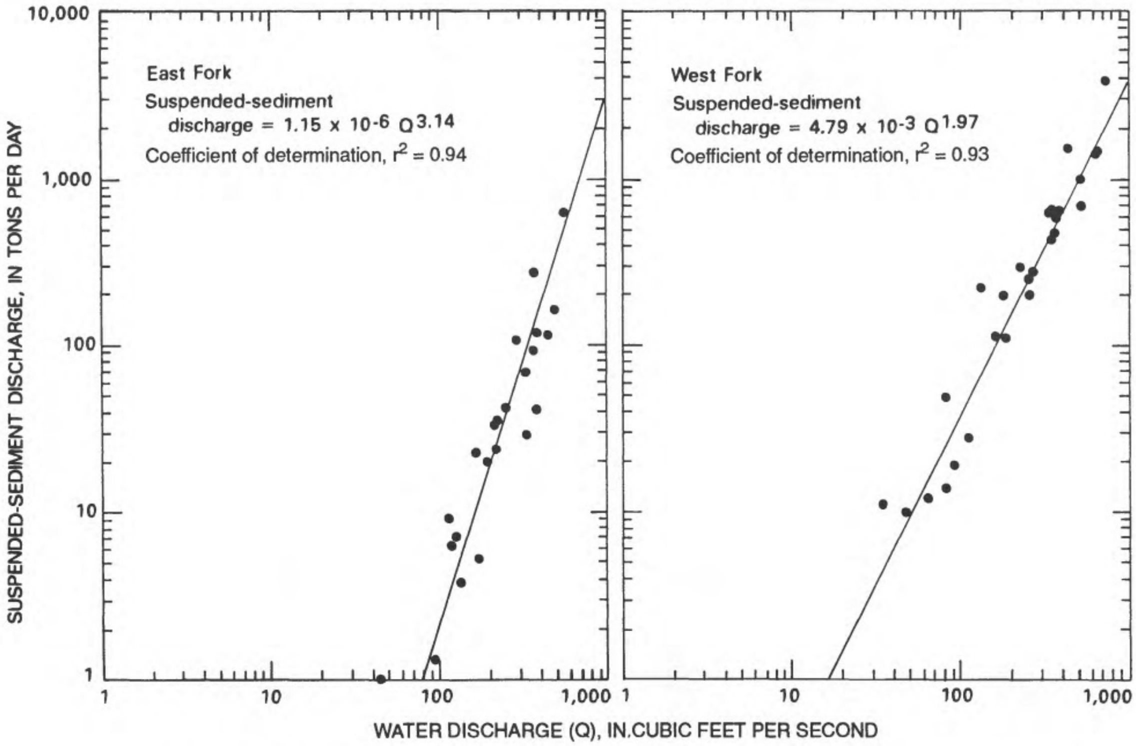


Figure 23.--Suspended-sediment discharge and water discharge for East Fork and West Fork Eklutna Creeks.

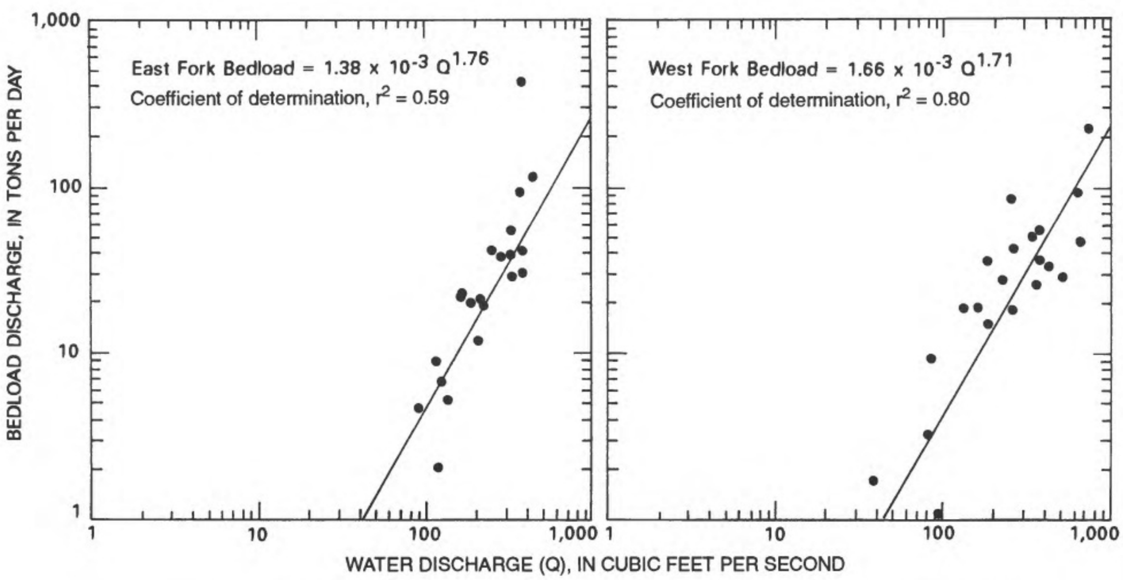


Figure 26.--Bedload discharge and water discharge for East Fork and West Fork Eklutna Creeks.

Source: Brabets (1993).

Figure 3-1 Suspended and bedload to water discharge relationships, East Fork and West Fork Eklutna creeks.

3.1.3 Italian Alpine Glacial Stream

Bonfrisco et al. (2025) measured suspended and bedload sediment in a glacier-fed stream in the Italian Alps, with similar methods to the Eklutna River measurements. In the Italian study, glacial ice covered approximately 14 percent of the basin area. Total annual sediment supply measured between 2014 and 2020 ranged between 11,100–22,000 cubic yards per square mile of glacier area with bedload comprising 4–12.5 percent of the total load on an annual basis.

Applying these rates to the 19 square miles of the Dixon Glacier glacial ice yields an average annual total sediment supply of 212,000–417,000 cubic yards and 13,400–26,600 cubic yards of coarse sediment.

Bonfrisco et al. (2025) also found that both suspended and bedload varied greatly and displayed complex hysteresis cycles on an hourly basis that were unrelated to water discharge. While both suspended and bedload discharge increased as water discharge increased, study results indicated that bedload was proportionally higher during lower water discharges, particularly at the end of the glacial melt season.

3.2 Change in Sediment Storage Volumes in the Martin River Valley

3.2.1 Long-term Aggradation Rates

Based on field observations and aerial photograph analyses, the Martin River valley has been aggrading, likely a result of a pulse of sediment following the Little Ice Age advance as well as ongoing supply from the Dixon Glacier (Watershed GeoDynamics 2026). Aggradation of at least 5 feet over 32 years was measured in the Martin River delta (at the mouth of the river), and 5 to 8 feet of aggradation have been measured along the river valley downstream from the East Fork/West Fork confluence over a similar time period. Applying the 5 feet of aggradation to the active river corridor yields 4,600,000 cubic yards of sediment. Based on sub-surface grain size sampling, approximately 80 percent of this volume (3,700,000 cubic yards) is likely coarse sediment (gravel and larger; see Section 3.3). If the timeframe for this aggradation is 30–40 years, this is the equivalent of 92,000–123,000 cubic yards of coarse sediment per year. It is likely that some portion of this volume is the result of erosion of Little Ice Age deposits stored within the EFMR, so these volumes should be considered as extreme upper bounds of the average sediment supply from the Dixon Glacier.

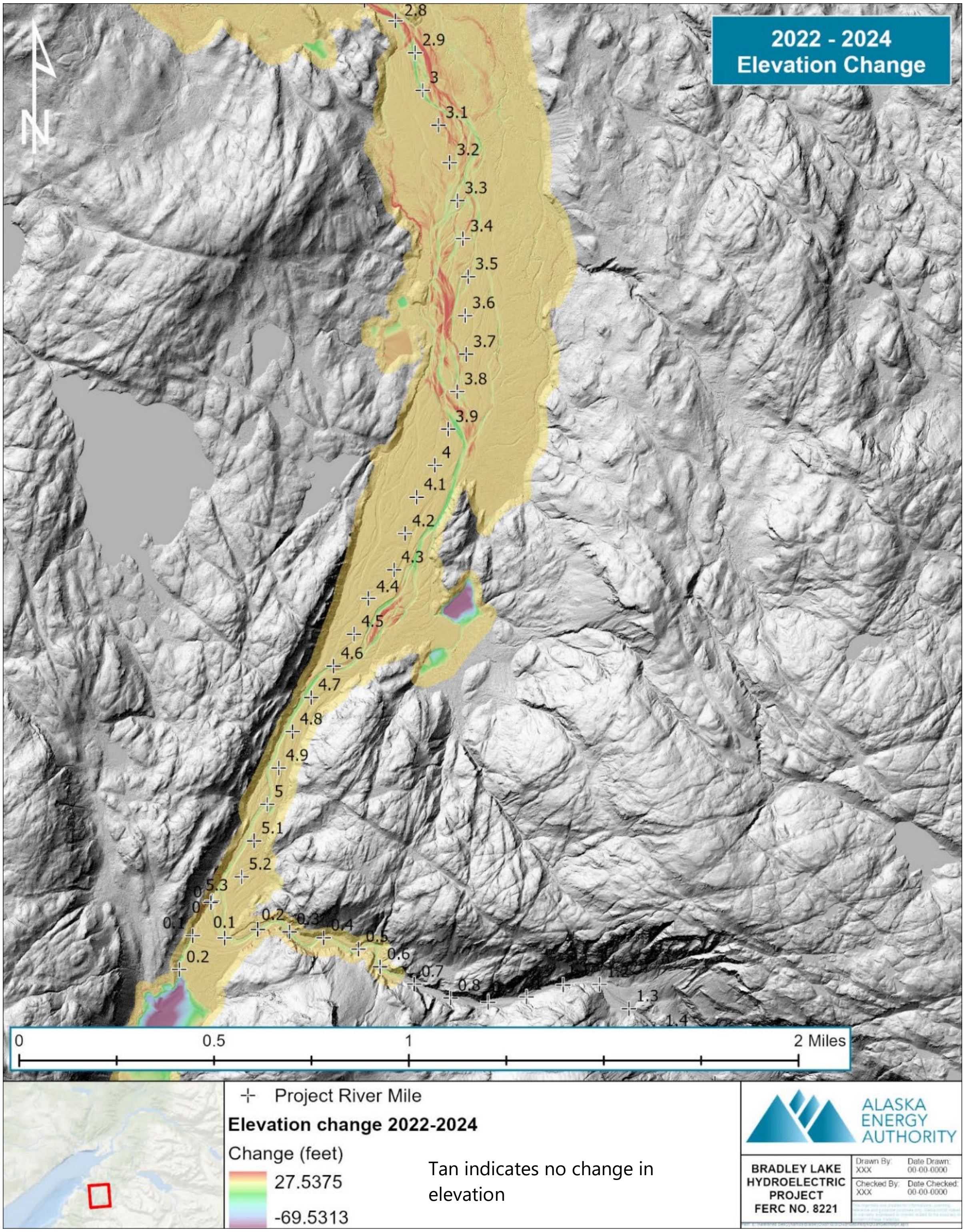
3.2.2 2022-2024 LiDAR

LiDAR data were collected for the Martin River valley in October 2022 and May 2024. Comparison of these two datasets provides a measure of net change in stored sediment volume, and thus input from the Dixon Glacier during 2023.

Elevation changes between 2022 and 2024 LiDAR data in the Martin River valley are shown on Figure 3-2 and Figure 3-3. Areas of aggradation (deposition) appear in red tones on the figures, and areas of degradation (erosion) appear in green tones. Yellow tones indicate little topographic change. Note that the 2022 LiDAR elevation data show the top water surface elevation of rivers and ponds, whereas the 2024 LiDAR data include bathymetric data and show the bottom elevation of rivers and ponds. Therefore, river channels and ponds appear in green/blue/purple colors indicating water depth rather than erosion.

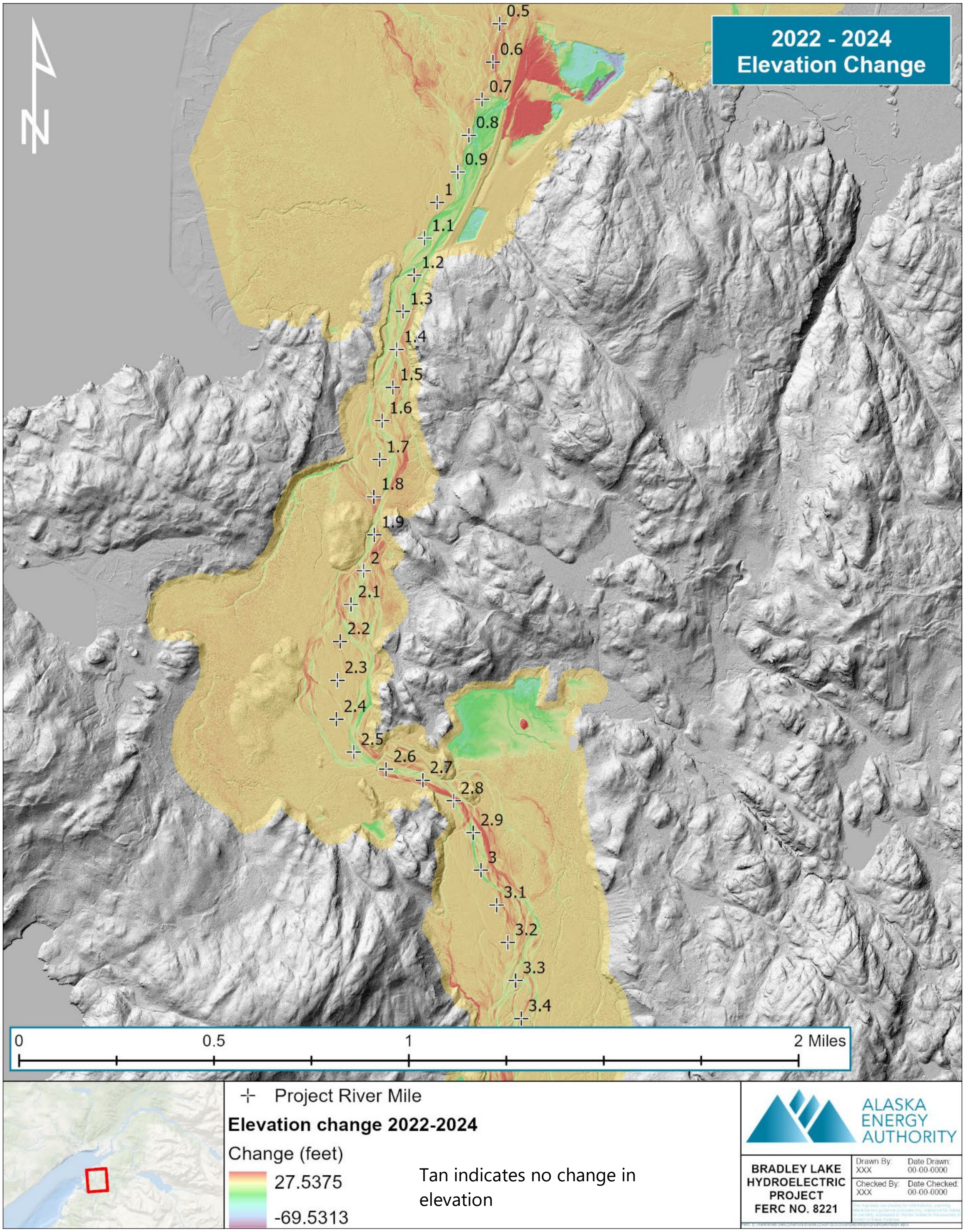
The 2022-2024 comparison shows little change upstream from River Mile (RM)[1] 4.5, discrete areas of deposition and erosion representing migration of the braided river channels between RM 2.5 and RM 4.5, and more diffuse erosion and deposition between RM 1.2 and RM 2.5. Downstream from RM 1.2, the net channel incision resulting from the drop in base level following the August 2023 right bank levee breach is shown, along with deposition in the former delta area near RM 0.5-RM 0.7 that presumably occurred prior to the levee breach, and deposition in two lobes in the former lower and middle mitigation ponds east of the levee breach.

[1] The Martin River is discussed in terms of "Project" river miles, which have been established for the purposes of the Bradley Lake Expansion Project (formerly Dixon Diversion Project). Because the Martin River is constantly changing, it does not have standard recognized river mile markers; note that figures using the label "RM" for the Martin River are still showing Project river miles.



Note: red = areas of aggradation (deposition); green = areas of degradation (erosion); yellow = little topographic change; green/blue/purple = water depth rather than erosion.

Figure 3-2 Martin River upper valley elevation changes, 2022–2024.



Note: red = areas of aggradation (deposition); green = areas of degradation (erosion); yellow = little topographic change; green/blue/purple = water depth rather than erosion.

Figure 3-3 Martin River lower valley elevation changes, 2022–2024.

The 2022-2024 net change in elevation in the Martin River active channel/valley was summed by geomorphic unit to show trends in sediment deposition or erosion along the river (Figure 3-4). A correction was made within the river channel to account for the difference between the 2022 water surface elevation versus the 2024 bottom of channel elevation (i.e., the difference due to the volume of water within the river channel was not included in the analysis). The net change shows a small amount of net erosion in the upper, confined areas of the river (Geomorphic Units 8b and 9; upstream from RM 3.9), net deposition as the valley widens and the river spreads out in Geomorphic Unit 8a, minor net changes through RM 1.4, channel erosion in response to the headcut upstream from the levee breach in Geomorphic Units 2 and 3, and a large amount of deposition in the new delta that built into the former mitigation ponds. There was net deposition in the former delta area (labeled "old delta" on Figure 3-4) between the October 2022 LiDAR acquisition and the early August 2023 levee breach; an average of 0.12 foot of aggradation is spread across the entire old delta area. This rate is consistent with the long-term estimate of 0.16 foot per year of aggradation in the delta area.

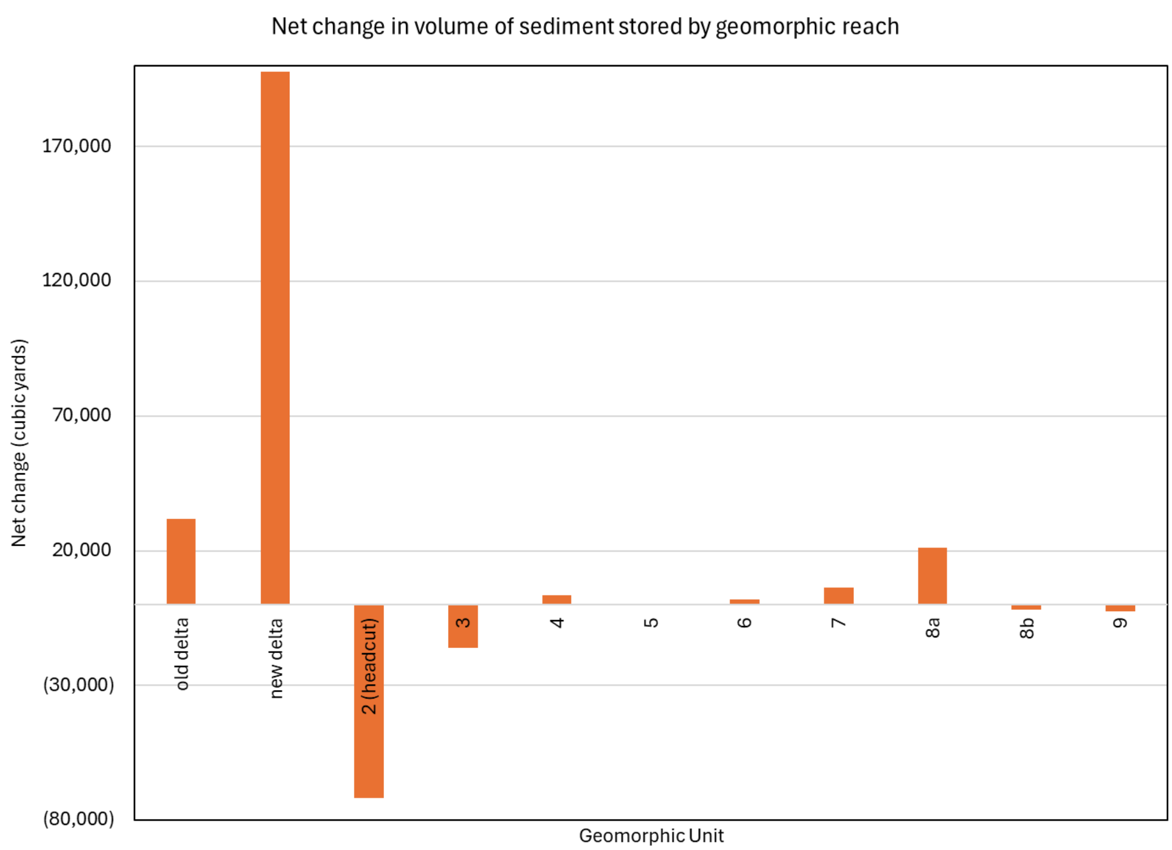


Figure 3-4 Net change in volume of sediment stored in the Martin River active channel/valley by geomorphic reach, October 2022 to May 2024.

This net change in sediment storage volume across the Martin River valley provides a measure of the amount of sediment supplied from the Dixon Glacier for the October 2022 through May 2024 time period (Table 3-1). The net change was converted to an estimate of the coarse sediment (gravel and larger) based on sub-surface sediment sampling that showed an average of 84 percent of the sub-surface material was coarse (see Section 3.3) and an assumed 50 percent of the new delta was coarse material since it is likely that a higher portion of the sand fraction would have settled within the ponds as the delta prograded into those areas.

Table 3-1 2023 change in volume, Martin River active channel area.

Area	Net Change (cubic yards)	Estimated coarse sediment (cubic yards)
Former delta (tidewater to levee breach RM 0.7)	31,890	26,800
New delta/pond filling	197,920	99,000
Headcut (RM 0.7-RM 1.4)	-87,930 (decrease in volume)	-73,900
Within channel (RM 1.4 to canyon)	28,910	24,300
Net change in volume	**170,790**	**76,200**

The net estimated coarse sediment volume of 76,200 cubic yards occurred between October 2022 and May 2024 and is representative of 1 year of sediment supply. Sediment supply between years varies substantially based on the volume of glacial meltwater and movement of sub-glacial streams and stored sub-glacial sediment. As shown by timelapse camera analysis, bedload movement, and likely substantial input of coarse sediment, occurs primarily when flows exceed 1,000 cubic feet per second (cfs), with greater changes as flow increases (Watershed GeoDynamics 2026). However, based on turbidity measurements in the EFMR, fine-sediment supply does not track directly with water discharge (see Section 3.4), so it is likely that coarse sediment input also does not directly correlate with water discharge.

The flow in the Martin River between LiDAR acquisition dates is shown in Figure 3-5. Flow exceeded 1,000 cfs on 31 days during this period and exceeded 2,000 cfs for 6 days, which is twice as many days as average over the long-term 1979-2024 synthetic hydrograph record (Table 3-2).

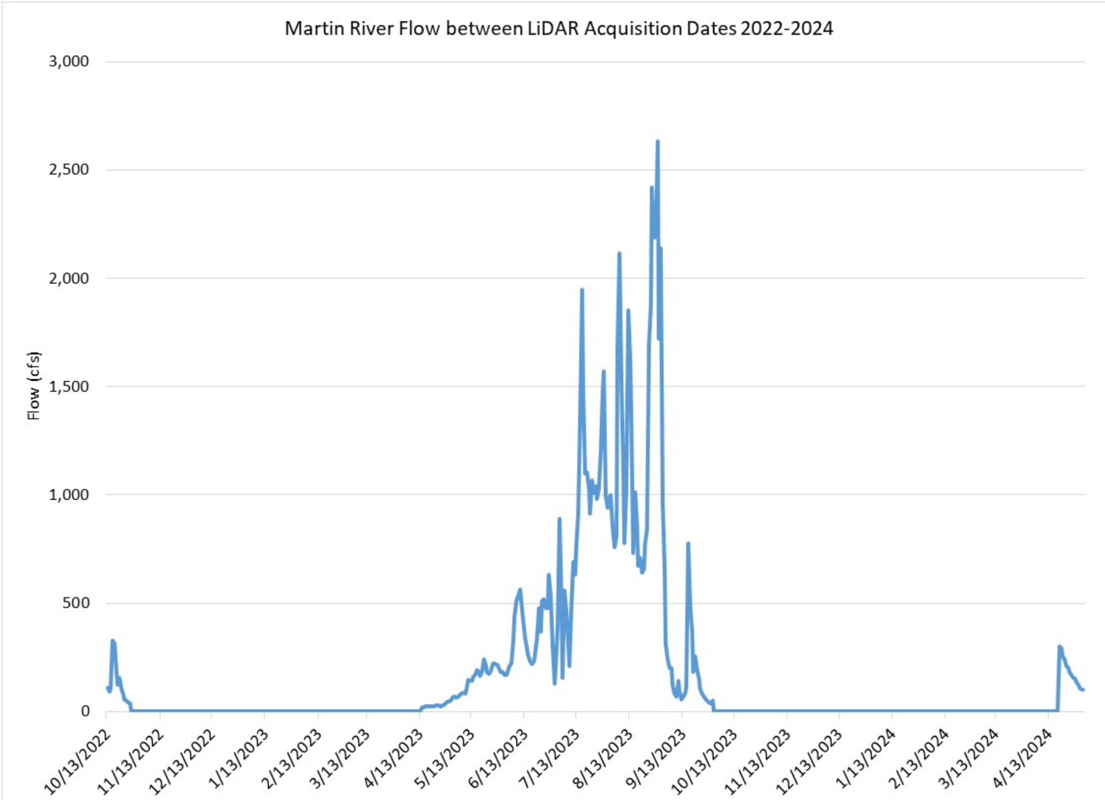


Figure 3-5 Martin River flow between LiDAR flights.

Table 3-2 Number of days with high flows based on synthetic/measured flow at constriction.

Time Period	Average days/yr over 1,000 cfs	Average days/yr over 1,500 cfs	Average days/yr over 2,000 cfs
October 1979 – December 2024	25	7	3
October 2022 – May 2024	31	15	6

Further analysis of the long-term synthetic hydrograph based on the number of days per year that flows exceeded the 1,000, 1,500, and 2,000 cfs criteria shows that the 2023 analysis period was comparable to a 29, 12, and 14 percent exceedance for these three flow criteria, respectively (Figure 3-6). If it is assumed that coarse sediment load is directly proportional to the probability of peak flow events, the 2023 time period could represent a volume only exceeded in 15 percent of the years. A corresponding average year coarse sediment production rate would be 22,400 cubic yards. It is likely that coarse sediment load is not directly proportional to peak flow events but instead is exponentially related to peak flows (e.g., Figure 3-1), so that the average coarse sediment volume would be less than 22,400 cubic yards.

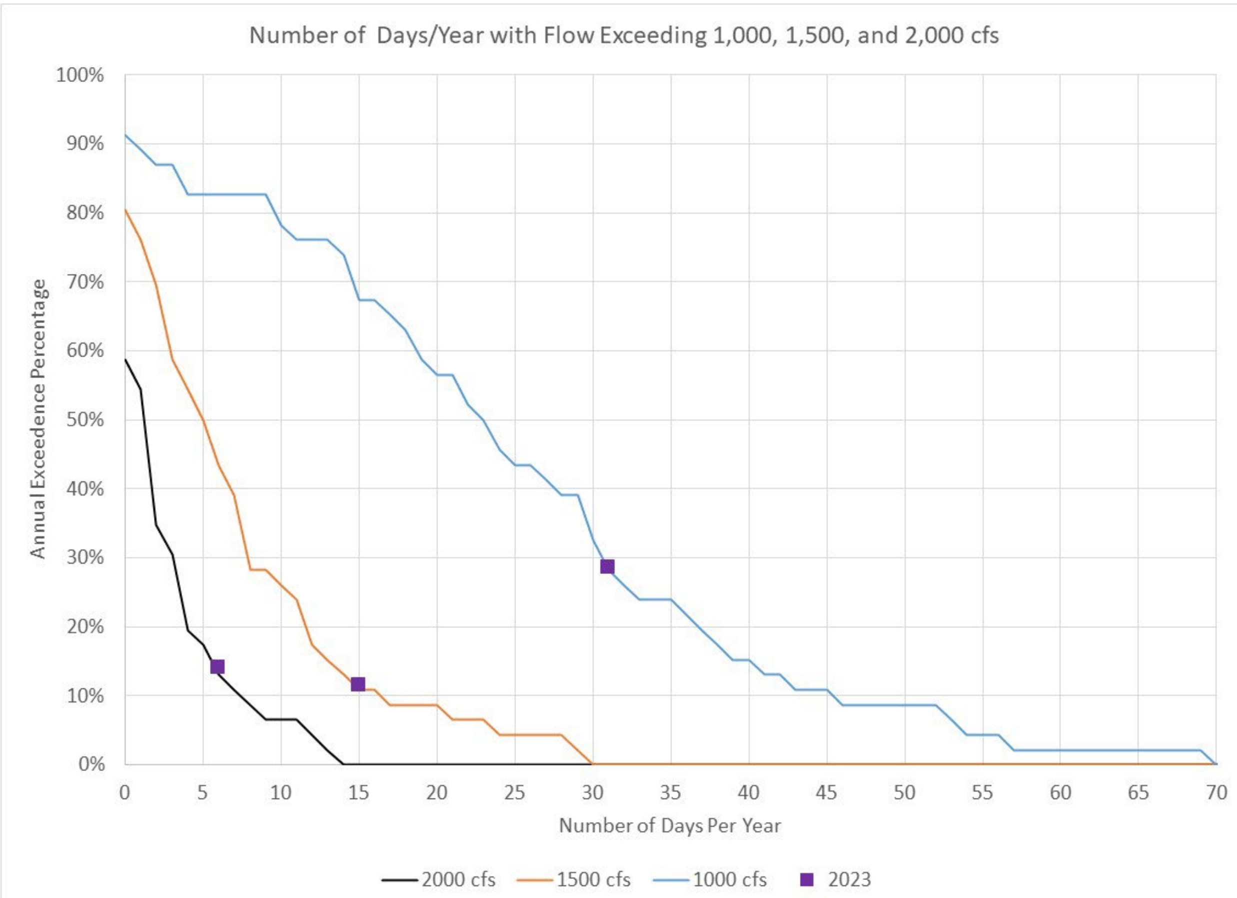


Figure 3-6 Number of days per year with flows exceeding 1,000, 1,500, and 2,000 cfs based on Martin River synthetic hydrograph (1979-2024).

3.3 Sub-Surface Grain Size Distribution in the Martin River Valley and Dixon Till Deposits

There are no direct data from the Dixon Glacier to provide guidance for partitioning the total glacial sediment output into fine-grained (suspended load) and coarse-grained sediment (bedload). Data from other glacier systems suggest that underlying bedrock characteristics such as hardness and composition affect the ratio, but total sediment load in other glacial systems ranges from 5–50 percent bedload (coarse sand to boulder) with the remainder suspended load (fine sand, silt, clay). Observations of till just downstream from the current terminus of the Dixon Glacier in October 2025 are likely representative of the mix of coarse material supplied from the glacier. A particle size distribution was not made on the till, but it appears to be typical of alpine till, with an unconsolidated sandy matrix and a mix of larger gravel/cobble/boulder particles within the matrix (Photo 3-1).

Photo 3-1 Till deposits at the terminus of the Dixon Glacier, October 3, 2025.

Lacking direct data on the grain size distribution of Dixon Glacier sediment output, the grain size distribution of sub-surface sediments sampled within the Martin River valley was used to partition sediment accumulations into fine (smaller than 2 millimeters) and coarse (larger than 2 millimeters) sediment within the Martin River valley as described in previous sections. The grain size distribution along the Martin River (RM 0.7–RM 3.8) was relatively consistent, with a median grain diameter of 17–20 millimeters and 12–28 percent sand/fines (average 16 percent) as shown in Figure 3-7 and Figure 3-8.

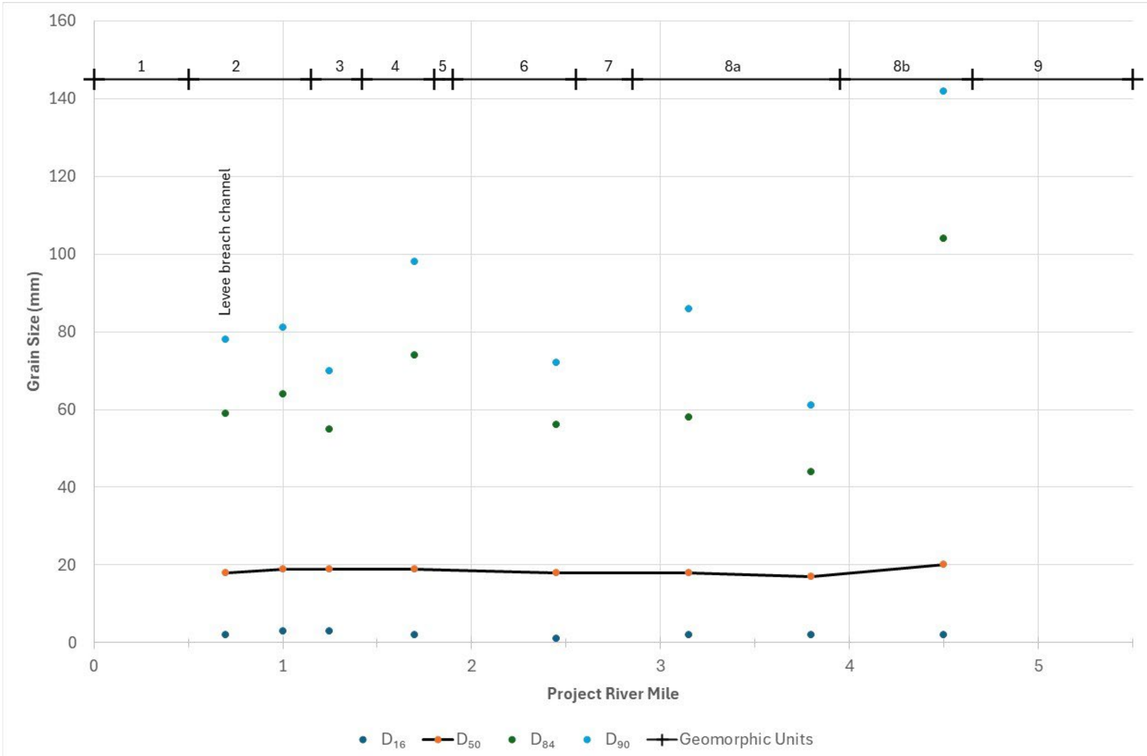


Figure 3-7 Martin River longitudinal variations in sub-surface sample grain size.

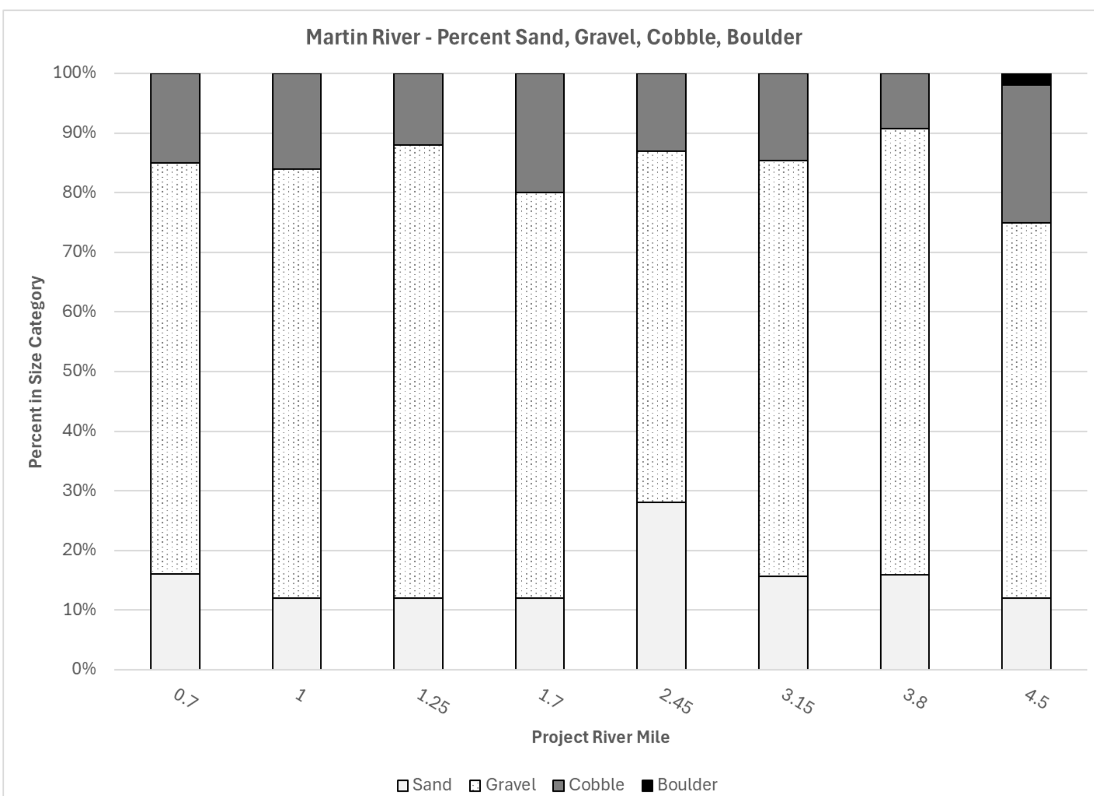


Figure 3-8 Martin River percent sand, gravel, cobble, and boulder in sub-surface samples.

3.4 Relationship between Flow and Turbidity, East Fork Martin River

USGS monitored stage and turbidity at the mouth of the EFMR during 2024 and 2025 (Figure 3-9). The turbidity sensors did not always function, but the available data provide insights into variations in fine sediment production, and likely coarse sediment supply, from the Dixon Glacier. Turbidity values increased markedly during high gage heights (e.g., high flows) as expected but also exhibited increases during other times with only minor increases in gage height. These data show the variability, episodic nature, and difficulty in predicting sediment input from the Dixon Glacier based solely on water discharge.

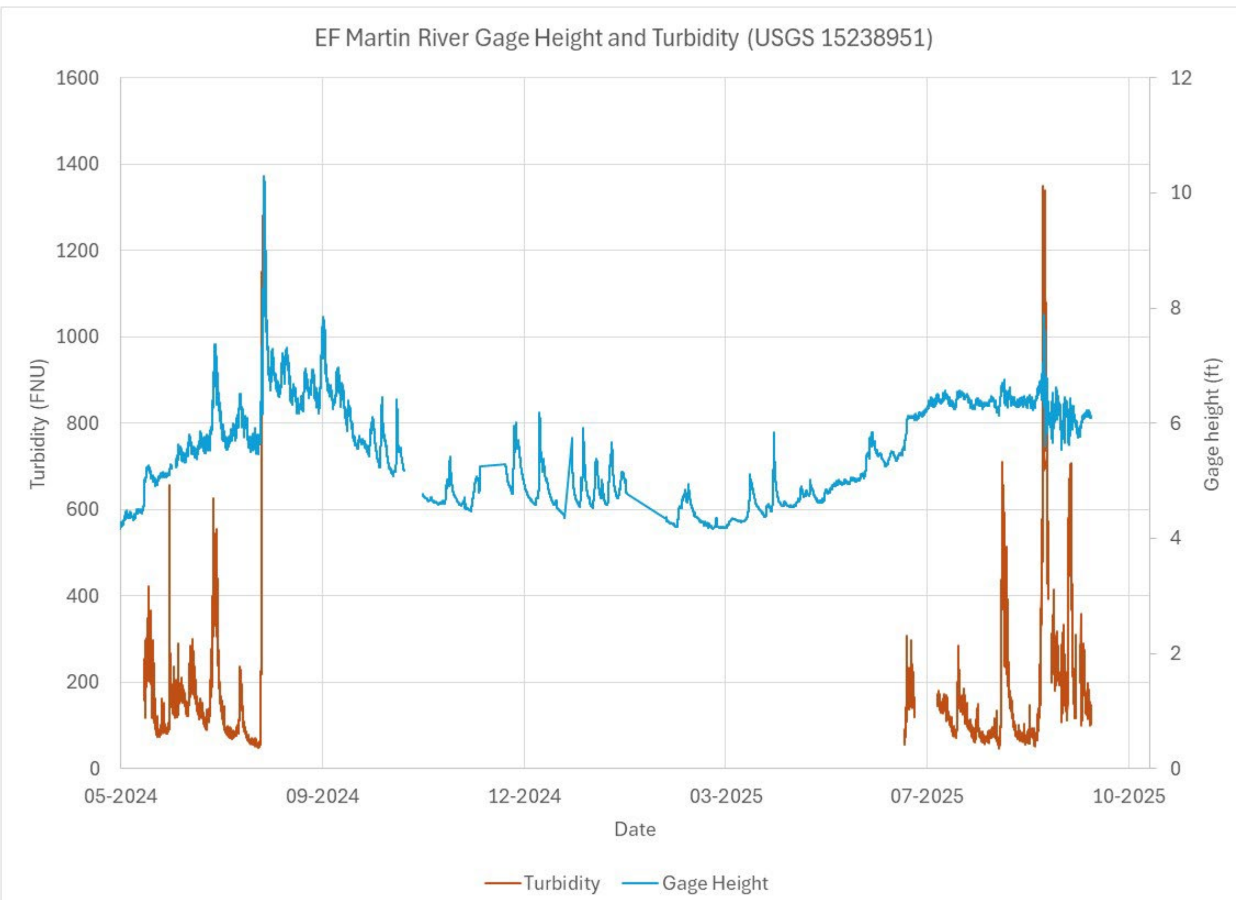


Figure 3-9 East Fork Martin River at mouth (USGS Gage No. 15238951) flow and turbidity measurements.

3.5 Summary of Sediment Supply Estimates

A summary of the estimated total sediment and coarse sediment (over 2 millimeters) supply from the Dixon Glacier is shown in Table 3-3. Measurements from streams (e.g., Eklutna and Italian Alps) likely underestimate loads at the terminus of the glacier since coarser sediments likely were deposited and stored within the stream channels between the glacier termini and the points of measurement.

Estimates from long-term aggradation within the Martin River valley include erosion of sediment stored during the Little Ice Age and likely over-estimate current supply rates from the Dixon Glacier.

The comparison of LiDAR data between 2022 and 2024 provides the most accurate estimate of sediment supply during this period, but this is the record of just 1 year and had a higher-than-average number of high flow periods. Conversion of this value to an average annual rate is not precise but was estimated at 22,400 cubic yards based on a linear relationship between peak flow events and sediment discharge. Conversion to an average annual rate using a non-linear relationship between flow and sediment discharge would yield a different average annual rate.

Table 3-3 Summary of Dixon Glacier sediment supply estimates.

Source of Data	Average Annual Total Load (cubic yards)	Average Annual Coarse Sediment Load (cubic yards)
Basal erosion rate	610,00–6,100,000	30,000–300,000
Eklutna stream measurements	50,000–57,000	4,950–10,000
Italian Alps stream measurements	212,000–417,000	13,400–26,600
Long-term Martin River valley aggradation	N/A	92,000–123,000 (include erosion of stored LIA sediment)
2022-2024 LiDAR comparison	N/A	76,200 total volume for this time period
		Excluding headcut/new delta: 47,800 (converted to average annual hydrograph: 40,000)

N/A = not applicable.

Sediment supply from the Dixon Glacier has been and will continue to be episodic based on the volume of glacial melt and the sub-glacial meltwater environment, with more sediment supply expected in later summer/fall than earlier in the summer as the glacier warms through the melt season and becomes less firmly attached to the bed (Engel et al. 2024). The sub-glacial environment and plumbing of alpine glaciers is complex, and observations of the recently de-glaciated areas of the Dixon Glacier suggest that pockets of till exist between areas of scraped and polished bedrock. As these pockets are encountered by sub-glacial meltwater or uncovered as the glacier retreats, they could episodically provide larger sources of sediment to the Martin River.

3.6 Updated Project Operations Analysis

The 2026 *Geomorphology and Sediment Transport Study Report* was completed in January 2026 (Watershed GeoDynamics 2026). The report analyzed potential effects of operation of the Dixon Diversion based on the assumption that all water up to a tunnel capacity of 1,650 cfs (except for a minimum instream flow of 100 cfs) would be diverted into the tunnel to Bradley Lake. As a result, it was assumed that flows in the EFMR would only exceed the minimum 100 cfs flow on days with flows over 1,650 cfs. Since January, Project operations have been refined to address changes to the minimum instream flow and methods to handle sediment accumulations at the diversion structure.

The updated sediment flushing operations assessed for this memorandum are as follows:

> Inflow to the Dixon Diversion would carry significant sediment loads that would deposit within the diversion pool. For sediment management, the pool can be conceptually divided into two areas:
>
> **Front Side Area:** Extending from the EFMR diversion pool inlet along the sediment guide wall to the diversion dam.
>
> **Back Side Area:** Extending from the downstream end of the sediment guide wall to the forebay berm sill.
>
> Coarser grained sediment (sand, gravel, cobble, and boulder) would deposit rapidly upon entering the diversion pool, primarily within the front side area, forming a delta. Finer grained sediment (clays, silts, and some sands) would remain suspended longer and are expected to deposit in low-velocity zones, including

eddies near the diversion dam (front side area) and along the back side of the sediment guide wall (back side area).

As sediment accumulates, periodic flushing would be required to maintain diversion operations. Two flushing methods would be used:

Hydraulic Flushing (Front Side Area): Flushing would be performed by lowering the Obermeyer spillway gates during periods of sufficiently high inflow to mobilize and transport deposited sediment downstream in the EFMR.

Mechanical Removal (Back Side Area): Sediment in the back side area would be mechanically moved using on-site equipment during periods of low river discharge or in conjunction with hydraulic flushing. The sediment material would be placed in the Front Side Area immediately upstream of the gates for subsequent downstream transport during a hydraulic flushing event.

During most flushing operations, water would not be diverted to Bradley Lake. Following sediment removal sufficient to restore operations, the Obermeyer gates would be closed, and normal diversion operations would resume. Hydraulic flushing duration will depend on the EFMR inflow rate; however, typical flushing is expected to last approximately 24 hours at an average discharge of approximately 1,250 cfs.

The following section updates Section 5.7.1.2 from the 2026 geomorphology report based on these updated operation plans.

3.6.1 Changes to Flow and Bedload Transport Potential

Martin River flow and bedload transport potential would change as a result of Project operations. Proposed operations include a varied minimum instream flow release into the EFMR, diverting flow above the minimum instream flow (up to 1,650 cfs tunnel capacity) into the diversion tunnel to Bradley Lake, and hydraulic flushing of sediment accumulated in the diversion pool on an as-needed basis.[2] These operations would reduce flow and bedload transport capacity in the Martin River.

[2] There is also a proposed protection, mitigation, and enhancement (PM&E) measure for a release of 1,000 cfs channel maintenance flow in 3 out of 10 years, but based on the assessment of sediment flushing requirements, the channel maintenance flow was met by the sediment flushing flows.

Using a 46-year (1980-2025) synthetic flow record for the EFMR and assuming a flow of 1,000 cfs is required to mobilize the bed in the Martin River downstream from the EFMR/West Form Martin River (WFMR) confluence, the average number of days per year with bedload transport was calculated for historical and with-diversion conditions. Figure 3-0 shows historical synthetic flows (blue line), the Martin River 1,000 cfs threshold for bedload transport (yellow line), and the maximum tunnel capacity of 1,650 cfs (orange line). Under historical conditions, bedload transport in the Martin River is estimated to have occurred an average of 25 days per year (flows above the yellow line). As shown in Figure 3-10, bedload transport is episodic, with some years having frequent bedload transport and a few with little or no bedload transport under historical conditions.

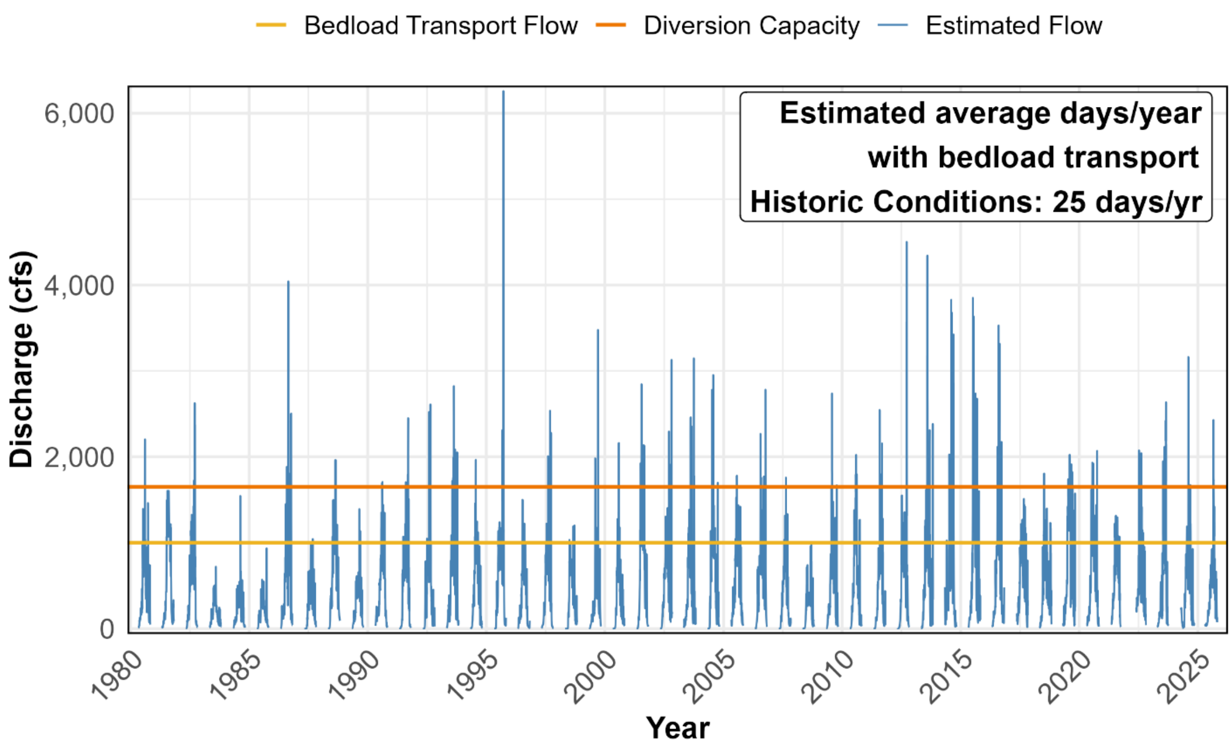


Figure 3-10 Potential changes in Martin River flow and sediment transport capacity.

The net effect of decreased flow in the EFMR and mainstem Martin River and episodic input of coarse-grained sediment from the EFMR during sediment flushing procedures will depend upon the magnitude and timing of flows and sediment flushes. Currently proposed sediment flushing procedures are to flush sediment on an as-needed basis when sediment deposits appear to be accumulating in the diversion pool to an extent that may affect Project operations (e.g., sediment appears to be depositing close to the forebay/intake tunnel). The estimated flow regime for the EFMR under with-diversion conditions is shown in Figure 3-11 (based on the same historic 46-year synthetic hydrograph as Figure 3-10 and an analysis of sediment input and flushing performed by DOWL). A median of 14 sediment flushes of the diversion area (range from 3-35) per year are estimated to occur over this time period and an assumed average coarse sediment load of 40,000 cubic yards per year. The average discharge during flush events is 1,250 cfs, though some flows under 1,000 cfs result in sediment flushing from the diversion area (DOWL 2026). Figure 3-11 states 11 days per year with bedload transport, which only considers flushing flows at or above 1,000 cfs because that is the minimum estimated flow for bedload transport in the mainstem Martin River, rather than the diversion area and EFMR. Due to the large uncertainty around the actual volume and timing of sediment input from the glacier, flushing events could be more or less frequent than anticipated. Even if no sediment flushing flows occurred, peak flows in excess of the tunnel capacity would still pass into the EFMR. Based on the 45-year synthetic flow this would result in flows above 1,000 cfs an average of one day/year.

Based on two-dimensional (2D) hydraulic modeling of potential flushing events, flows of 500 cfs would flush most cobble and finer material through the diversion pool, and flows of 1,000 cfs would flush all cobble (but not boulder-sized material). Typical flushing duration is 24 hours.

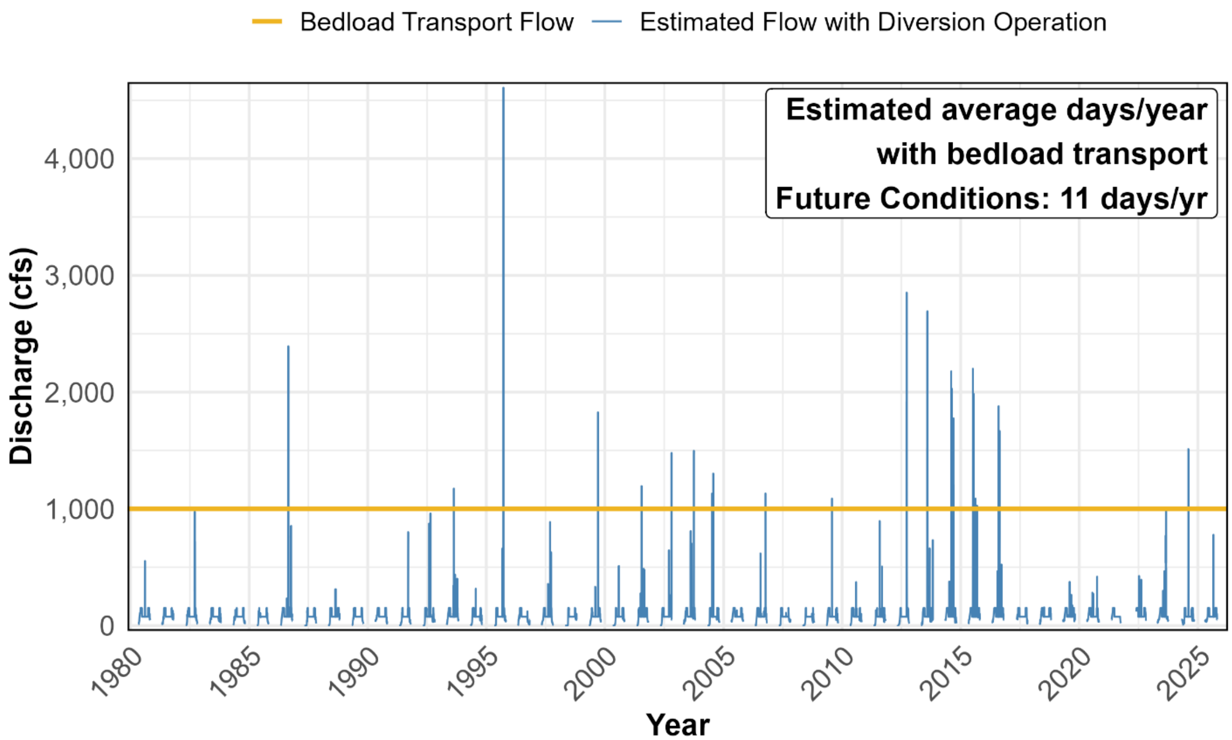


Figure 3-11 East Fork Martin River flow with proposed Project operations.

Based on visual observations of existing bed material in the EFMR canyon, it is anticipated that most of the flushed material would be transported through the canyon (average 6.7 percent gradient). Based on 2D hydraulic modeling, larger material (cobble/boulders) would likely be deposited near the EFMR/WFMR confluence under a sediment flush flow of 500 cfs but would be transported farther downstream to approximately RM 3.5-RM 4.5 under a flow of 1,000 cfs. Note that the duration of actual sediment flushes may vary. If sediment is deposited in the upper reaches of the mainstem Martin River following a sediment flush at a lower flow (e.g., 500 cfs), it likely would not remain there for very long because the next sediment flush event would transport accumulated sediment downstream. Based on observations in the Martin River during fall time periods, fine- to medium-gravel accumulations may occur within the river channel on the waning limbs of peak flow events, and finer sediment deposition may occur in side channels or areas of slow-moving water.

To help ensure flushed sediment moves through the river system if there are several years with low sediment flushing events, a flushing flow regime of 1,000 cfs for 12 hours three times in a 10-year period has been proposed as part of protection, mitigation, and enhancement (PM&E) measures. This level of flushing flow would likely occur as part of the sediment flushing regime or with inflows that exceed the tunnel capacity. If not, flow releases from the diversion dam would be used to provide the recommended sediment movement. Furthermore, due to uncertainty around the exact amount and timing of sediment flushes and exact flows to transport bed material through the Martin River, monitoring sediment accumulations and grain size in the Martin River has been proposed as part of PM&E measures to assess the actual effects of the proposed flow regime and the ability to maintain a passage corridor for aquatic species to tributary and off-channel habitats.

4.0 REFERENCES

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COMMENT MATRIX

No.	Entity	Section of AEA Document	Location of Comment in Stakeholder Letter	Stakeholder Comment
1	USFWS	Enclosure: Page 1, 5th paragraph	The evolution to a single channel system seems likely, however braided characteristics are still possible with the occasional large peak flows and movement of coarse material (Watershed GeoDynamics 2026, page 5-66). How much confidence is there with the estimate of 30,000 cubic yards of coarse sediment per year? What would be the range of channel conditions and subsequent impacts to connectivity if the amount of coarse sediment is much higher?	As noted in Section 6.0 of the 2025 Geomorphology Study Report and proposed PM&E measures (see Exhibit E of the FAA), there is uncertainty around the estimated 30,000 cubic yards of coarse sediment per year and around the effectiveness of proposed sediment flushing and flushing flows. In addition, there will be a wide annual variation in coarse sediment yield as under current conditions. For this reason, monitoring of connectivity and sediment accumulation is proposed as part of PM&E measures (see *Draft Martin River Monitoring Plan* Exhibit E Appendix E13). AEA has redefined and will continue to redefine, as necessary, sediment flushing and flushing flows as more data become available and through continued consultation with regulatory agencies.