

15 August 2005

**L54(2380)
JOMU/General**

Memorandum

To: Martha Lee, Superintendent, John Muir National Historic Site

**From: Marie Denn, Aquatic Ecologist, National Park Service Pacific West Region
Susan O'Neil, Natural Resources Specialist, San Francisco Bay Area Network of
National Parks**

Subject: Monitoring Alhambra Creek Morphology at Muir Gravesite

This memo describes ongoing monitoring and assessment of channel stability of Alhambra Creek in the vicinity of the John Muir gravesite.

I. Problem Summary and Background

John Muir's gravesite is protected by the National Park Service (NPS) as part of the John Muir National Historic Site (JOMU). Muir is buried in the Strenzel/Muir family graveyard - a 20' x 30' gated plot on the banks of Alhambra Creek in Martinez, CA. The graveyard sits within a 1.27-acre disjunct unit of JOMU. This land, planted in pear trees and originally part of the Strenzel/Muir fruit ranch, was acquired by the NPS in 2000.

In 2001 and 2002 NPS Water Resources Division (WRD) Hydrologist Richard Inglis visited the site to assess hazards to the graveyard from creek erosion. Inglis observed evidence of ongoing creek bed incision: a narrow channel with oversteepened banks and a lack of bedrock control. These observations caused concern about the potential for the graveyard to be eroded out of the bank by future deepening and widening of Alhambra Creek. Also, Inglis observed recent bank protection structures on the opposite side of Alhambra Creek. These were apparently installed by homeowners to protect private properties and direct erosive flows toward the NPS-owned bank. In a draft site-assessment (NPS 2002) Inglis recommended that the NPS monitor the site for channel and vegetation changes, as well as consider installation of engineered bank protection.

Inglis asked NPS Pacific West Region Geomorphologist, Paul Kennard, to visit the site to reassess the channel stability. On April 29th 2005 Kennard visited the site, along with Pacific West Region Aquatic Ecologist Marie Denn, and San Francisco Bay Area Network Natural Resources Specialist Susan O'Neil. The group considered:

- What is the risk that the Strenzel/Muir graveyard will be disturbed by Alhambra Creek erosion in the next several years?
- How should the NPS monitor creek morphology and stability?
- What should the NPS do if graveyard disturbance becomes imminent?

The group examined the condition of the creek through the NPS property, then walked downstream approximately ½ mile to where the creek passes by the John Swett Elementary

School, and upstream from the NPS property about 1/8 mile to a point where the creek is hardened with cement across its bed and banks. Kennard's assessment suggests that the graveyard is not at immediate risk of erosion due to (1) its location on an inside bend of the creek, and (2) a large mass-wasting site downstream of the NPS property which is contributing sand to the creek and keeping the bed level high. However, neighboring landowners appear to be continuing to install illegal revetment, which may destabilize the NPS creek bank. Kennard is currently preparing a report describing the geomorphic conditions of the creek and his assessment of risks to the gravesite.

The group recommended that the NPS actively monitor the status of the stream channel in order to continue to assess threats to NPS resources. The group also recommended that the NPS write a monitoring plan for the site. Ideally the plan will be detailed enough so that park staff and/or volunteers can implement monitoring with occasional assistance from regional or network natural resource staff. The plan should include monitoring of:

- *New illegal revetment* in the reach bordering the NPS property.
- *Geomorphology* of the channel. Particularly: is the channel continuing to incise, and at what rate? Is the channel widening or moving laterally in the reach bordering the NPS property? Are there visible signs of earth movement such as tension cracks, mass wasting, or bank seepage?
- *Stream flow* immediately upstream of the NPS property.
- *Vegetation* in the riparian community throughout the NPS property. Particularly: are large trees on the banks of the creek healthy?
- *Photomonitoring* conducted on the banks and from within the creek channel throughout the NPS property. This will augment quantitative geomorphology assessments and visual vegetation assessments.

Furthermore, the group recommended that the NPS develop a contingency plan for future gravesite erosion. This plan would outline potential management scenarios in the event that severe winter storms suddenly degrade the channel and put the gravesite at immediate risk. Options for protecting the gravesite from erosion include 'soft engineering' solutions, such as regrading the bank and intensively planting with riparian vegetation, and 'hard engineering' solutions such as installing stone or concrete revetment to stabilize the channel (see NPS 2002).

Finally, the group suggested that the NPS place a high priority on continuing involvement with community watershed groups, particularly the Alhambra Valley Creek Coalition, in order to seek watershed-scale solutions to channel degradation.

II. Channel Survey

On August 15th 2005 we (authors Denn and O'Neil) revisited the site to survey the creek channel. Inglis had previously mapped the channel in 2001 and 2002, but recommended resurveying with high-grade equipment (NPS 2002). We reoccupied two of Inglis' three cross-sections and surveyed the channel with a tripod-mounted survey-grade automatic level (Topcon ATG), a five meter graduated stadia rod, and a three hundred meter tape measure. Right-bank endpoints of the two cross-sections, on the NPS-owned side of Alhambra Creek, were permanently marked with brass monuments. We determined the UTM coordinates of the right-bank endpoints with a Trimble GeoExplorer III GPS unit, and recorded the azimuth and distance to the left-bank

endpoints across the channel. Left-bank endpoints are temporarily marked with metal pins. Data and photos from the surveys are in Appendix A of this document.

In 2001 and 2002 Inglis had surveyed a third cross-section downstream of the gravesite. Subsequently that section of the bank was heavily modified with the installation of a 1.5-meter diameter culvert that carries stormwater runoff under the NPS-owned property to discharge into Alhambra Creek. Installation of the culvert demanded heavy armoring of the bank with concrete and stone. Currently this section of bank is under consideration for further modification: the Central Contra Costa Sanitation District proposes to install a sewer line through the culvert right-of-way and under Alhambra Creek as part of a neighborhood development upstream. We determined that reoccupying the third 2001/2002 Inglis cross-section was impossible due to the substantial recent bank modification. Furthermore, the property owner across the channel from the NPS property requested that we conduct no further surveys on his bank. Finally, we concluded that a survey of a 'half cross-section' on NPS-owned property alone would have limited utility, particularly due to the potential for future bank modification. Instead, in order to allow the NPS to monitor any future channel bed downcutting, we measured the elevation of the creek bed at the point where the culvert discharges into the creek. The elevation of the channel bed was measured relative to a fixed-elevation structure: a known point on the railing of the graveyard fence. Data and photos from the measurement are in Appendix B of this document.

III. Recommended Future Monitoring and Action

- The Alhambra Valley Creek Coalition is seeking funding to conduct a survey of a ½-mile stretch of the creek - from upstream of the NPS site (where Alhambra Valley Road crosses the creek), down the creek to the John Swett Elementary School. Survey data reported in this document will be provided to the Coalition to supplement that effort.
- The NPS should continue to work with the Alhambra Creek Valley Coalition and the Alhambra Watershed Council to monitor for and remove any illegal revetment in the creek which may cause creek degradation.
- The survey reported in this document should be repeated annually for five years after any channel modification (e.g. sewer line installation), and biennially thereafter (NPS 2002). Resurveying will allow the NPS to evaluate whether the creek is downcutting, moving laterally, or widening. Evidence of rapid creek erosion will indicate the need for engineered bank protection structures to protect the graveyard. Costs for the survey are modest: two employees for one day of field work and one day of data analysis and reporting.
- JOMU may wish to continue to solicit technical assistance from WRD and the Pacific West Region regarding gravesite erosion and monitoring of Alhambra Creek, particularly prior to or during any creek bank disturbance associated with infrastructure installation. It is critical to prevent further downcutting of the channel throughout the NPS reach of Alhambra Creek; WRD and Region staff can assist the park with mitigation requirements for any future creek modification work.

IV. NPS Water Resources Division Reports and Memoranda

(NPS) National Park Service, 2002. *Stability of Alhambra Creek near the John Muir Gravesite, John Muir National Historic Site*. Draft report prepared by Richard Inglis, Hydrologist, National Park Service Water Resources Division. Fort Collins, CO. Report on file at National Park Service, Water Resources Division. 33 pp. and appendices.

National Park Service, 2003. *Trip Report - Travel to John Muir NHS and Eugene O'Neill NHS August 19-21, 2003*. Memorandum prepared by Richard Inglis, Hydrologist, National Park Service Water Resources Division. Fort Collins, CO. Memorandum on file at National Park Service, Water Resources Division. 4 pp.

National Park Service, 2004. *Trip Report for Travel to Golden Gate National Recreation Area (GOGA), Point Reyes National Seashore (PORE), John Muir NHS and the Presidio of San Francisco, March 29-April 2, 2004*. Memorandum prepared by Joel Wagner, Wetland Program Lead, and Richard Inglis, Hydrologist, National Park Service Water Resources Division. Fort Collins, CO. Memorandum on file at National Park Service, Water Resources Division. 15 pp.

cc:

Rick Smith, Assistant Superintendent, John Muir National Historic Site
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Richard Inglis, Hydrologist, NPS Water Resources Division
Paul Kennard, Fluvial Geomorphologist, NPS Pacific West Region

Appendix A: Alhambra Creek Cross-Section Surveys

Cross-Section 1



Photo1: Location of right-bank endpoint XS1

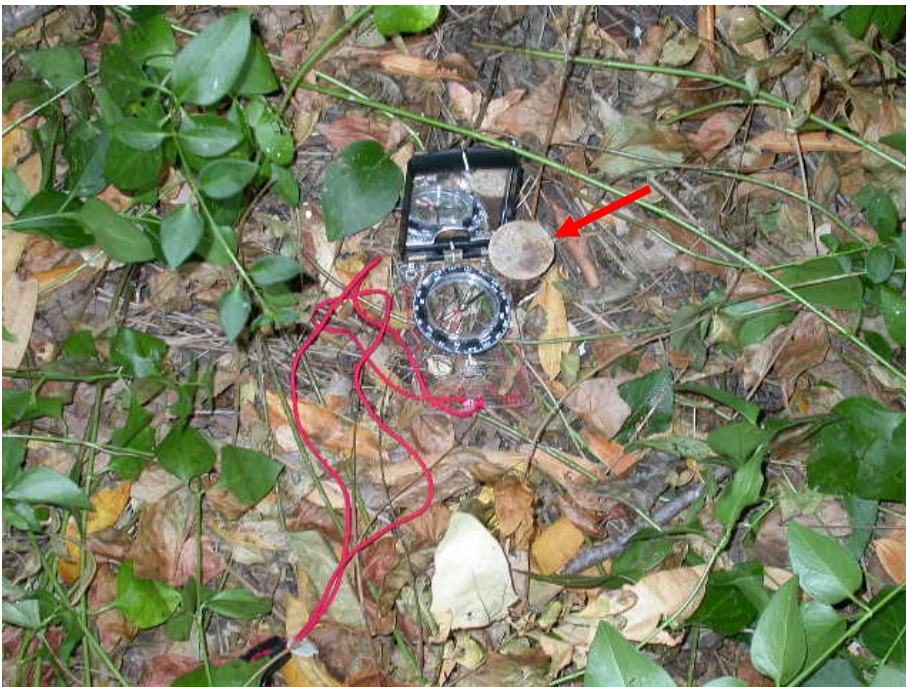


Photo 2: Close up of right-bank monument XS1 (brass cap)



Photo 3: Location of left-bank endpoint for XS1

Right Bank Endpoint

This cross-section endpoint is on the NPS-owned bank, above the channel on the floodplain. It's marked with a brass monument.

Location:

Northing:	4203770.24m
Easting:	576981.54m

Left Bank Endpoint

From the right bank monument, the left bank endpoint is 14.02 meters away at 164° (true-north corrected). The endpoint is marked with a temporary metal 'chain pin.'

Cross-Section Survey

The right bank monument is assigned an arbitrary elevation of 5 meters; all other elevations are reported relative to that baseline.

tape (m)	rod (m)
0.00	5.00
0.30	4.99
0.61	4.85
0.91	4.63
1.22	4.43
1.52	4.22
1.83	3.99
2.13	3.85
2.44	3.72
2.74	3.61
3.05	3.54
3.35	3.47
3.66	3.47
3.96	3.49
4.27	3.46
4.57	3.44

tape (m)	rod (m)
4.88	3.38
5.18	3.33
5.49	3.31
5.79	3.30
6.10	3.25
6.40	3.22
6.71	3.03
6.86	2.52
7.01	2.39
7.32	2.15
7.62	1.74
7.92	1.53
8.23	1.13
8.53	0.78
8.84	0.71
9.14	0.62

tape (m)	rod (m)
9.45	0.44
9.75	0.37
9.94	0.36
10.06	0.39
10.52	0.56
10.70	0.61
10.97	0.69
11.28	0.92
11.58	1.07
11.89	1.16
12.19	1.48
12.50	1.72
12.80	1.92
13.11	1.99
13.41	2.20
13.72	2.40
14.02	2.67

Cross-Section 2



Photo 4: Location of right-bank endpoint XS2



Photo 5: Close up of right-bank monument XS2 (brass cap) with temporary red-and-white chain pin

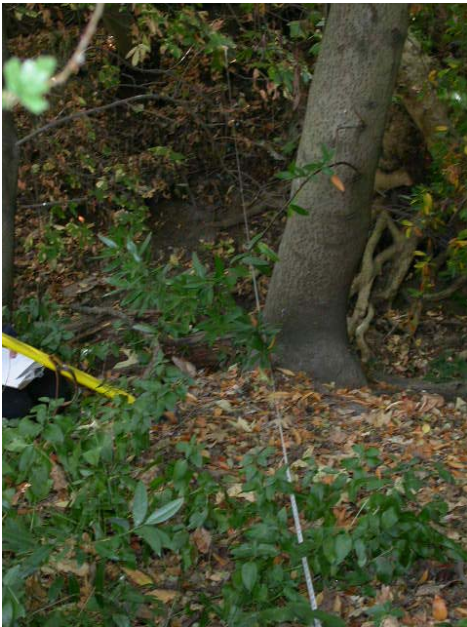


Photo 6: Tape runs to the left of the bay tree on the bank
(photo from right-bank endpoint toward left-bank endpoint)



Photo 7: Location of left-bank endpoint for XS2

Right Bank Endpoint

The endpoint for cross-section 2 is on the NPS-owned bank, directly next to the southeast corner post of the graveyard. It's marked with a brass monument (the chain pin shown in photo above has been removed).

Location:

Northing :	4203776.86m
Easting:	577003.01m

Left Bank Endpoint

From the right bank monument, the left bank endpoint is 17.07 meters away at 144° (true-north corrected). The endpoint is marked temporarily with a metal chain pin.

Cross-Section Survey

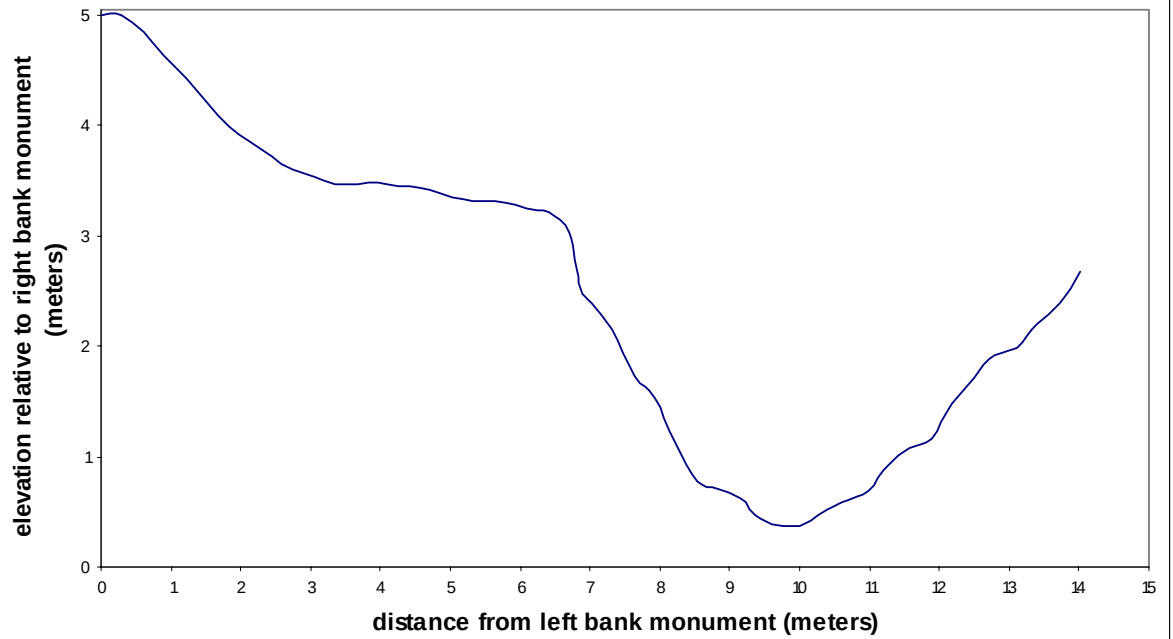
The right bank monument is assigned an arbitrary elevation of 5 meters; all other elevations are reported relative to that baseline.

<i>tape (m)</i>	<i>rod (m)</i>
0.00	4.84
0.30	4.82
0.61	4.80
0.91	4.79
1.22	4.76
1.52	4.76
1.83	4.72
2.13	4.68
2.44	4.64
2.74	4.61
3.05	4.56
3.35	4.53
3.66	4.49
4.37	4.44
4.57	4.40
4.88	4.38
5.18	4.35

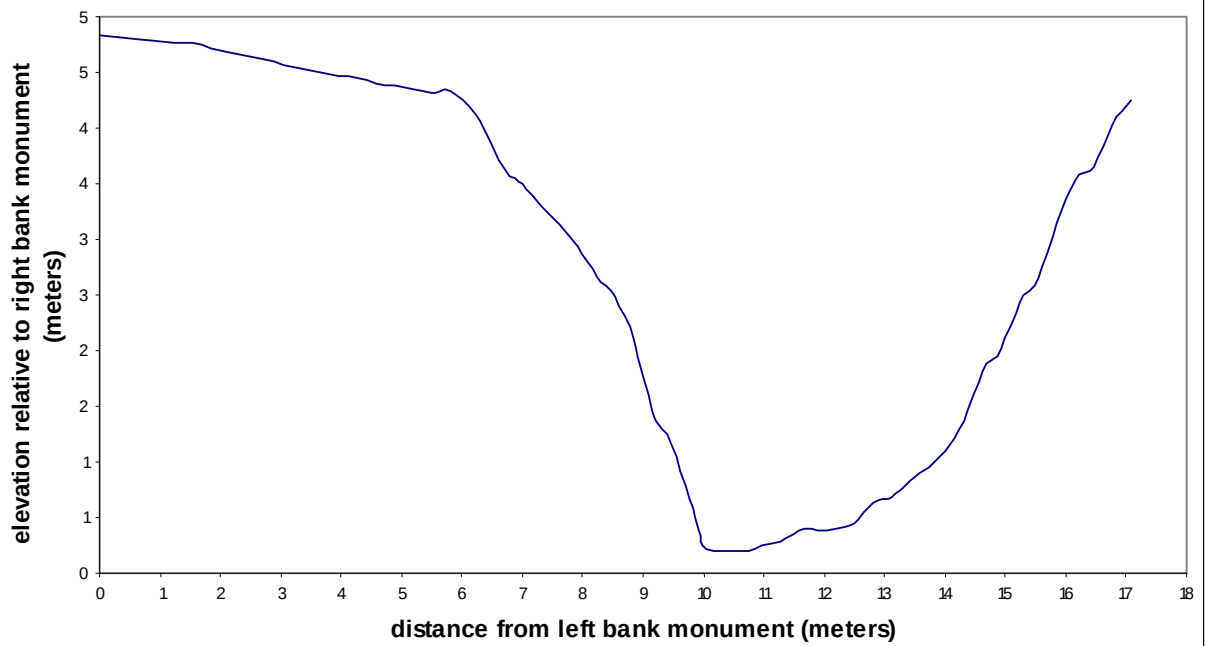
<i>tape (m)</i>	<i>rod (m)</i>
5.79	4.33
6.25	4.11
6.74	3.62
7.01	3.50
7.32	3.30
7.62	3.13
7.92	2.94
8.23	2.67
8.84	2.10
9.14	1.45
9.45	1.17
9.75	0.67
9.94	0.38
10.06	0.22
10.67	0.20
10.97	0.25
11.28	0.28

<i>tape (m)</i>	<i>rod (m)</i>
11.89	0.38
12.19	0.40
12.50	0.45
13.11	0.68
13.41	0.83
13.72	0.95
14.02	1.09
14.33	1.36
14.63	1.81
14.94	2.01
15.24	2.43
15.54	2.66
15.85	3.15
16.15	3.53
16.46	3.65
16.76	4.04
17.07	4.26

Alhambra Creek at John Muir Gravesite XS1



Alhambra Creek at John Muir Gravesite XS2



Appendix B: Elevation of Alhambra Creek Thalweg at Stormwater Culvert

The elevation of the lowest point in Alhambra Creek opposite the stormwater culvert was surveyed relative to the bottom rail of the northwest corner of the graveyard fence. The thalweg is 5.25 meters below the top of the rail.



Photo 8: Stormwater culvert



Photo 9: Position of survey point in Alhambra Creek



Photo 10: Location of reference point for measurement of creek bed elevation
(rod sits on top of the bottom rail of the fence)

Appendix C: Newly-Installed Revetment in Alhambra Creek opposite Muir Gravesite

NPS Bank



Photo 11: Looking downstream at toe of NPS bank below gravesite



NPS Bank

Photo 12: Looking upstream, from just downstream of the gravesite