

Appendix A

Design Specifications and Construction Considerations

Site-specific Repair Area Activities

Phase 4 Sites

Site 42, Yolo Bypass

General Characteristics	
Waterbody	Yolo Bypass
Bank (view downstream)	Right (West)
County	Yolo
Local Maintaining Agency	State Maintained Area 11 - Sacramento Maintenance Yard
Levee Problem Characteristics	
Levee Problem	Landside erosion
Levee Miles (LM)	LM 0.77
Repair Characteristics	
Repair Type	Landside stability
Work Limits (northing/easting)	NE 38.5633512508, -121.638286644 SE 38.5630411838, -121.638271396 SW 38.5630278318, -121.638614563 NW 38.5632885008, -121.638627517
Repair Length (linear feet)	75
Area of repair (acres)	0.09
Area of laydown (acres)	0.32
Estimated excavation (cubic yards)	978
Earthfill (cubic yards)	931
Aggregate base (tons)	71
Agricultural soil (tons)	89
Rockfill (tons)	0
Launch rock (tons)	0
Bedding material (cubic yards)	0
Truck Loads	1,099
Final bank slope (H:V)	3H:1V
OHWL (estimated elevation in feet)	N/A
Area of repair below OHWM (acres)	0
Area of repair above OHWM (acres)	0.09 (Entirely on landside levee slope)

Repair of the site will consist of removing the slide and interim repair materials down to below the slipout plane, replace and compact select levee fill material to achieve design profile and buttress toe with rockfill to above the landside flooding fetch line. In-water work required to place clean rock to buttress the slope fill.

The repair at Site 42 will include:

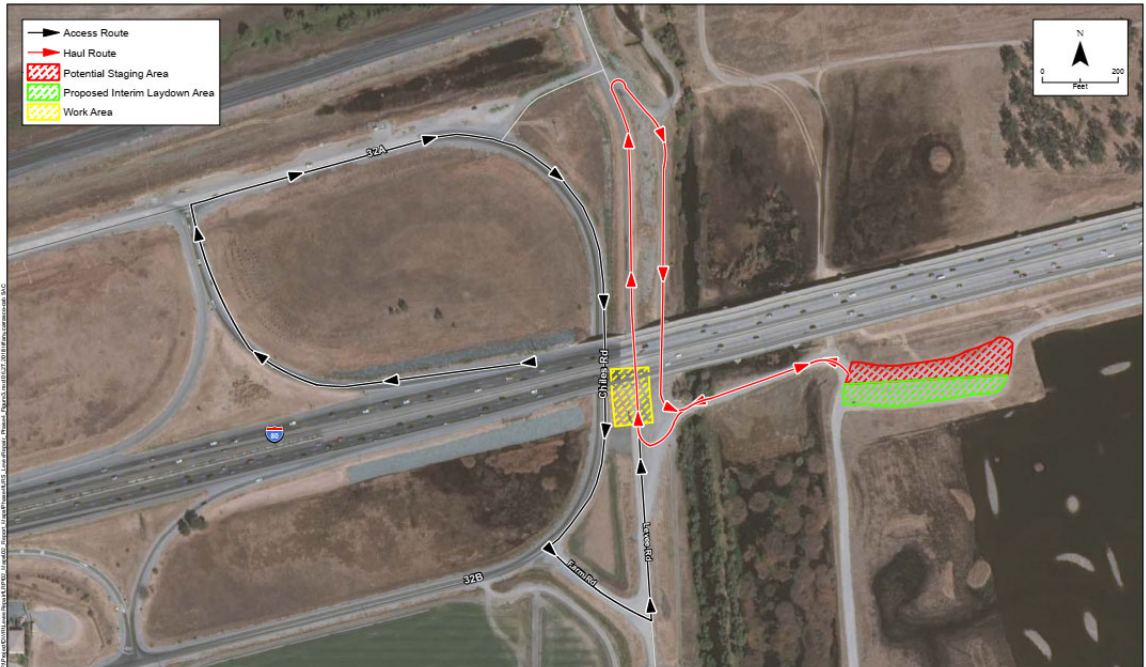
1. Using appropriate traffic control, access site from Chiles Road and from the levee crest.

2. Remove right-a-way fence, and all vegetation on repair slope.
3. Excavate and remove all soils disturbed by the instability to just below the slip plane from landside levee toe to approximately 20 feet from levee crest. Create a key trench at toe of levee for placement of rockfill.
4. Reshape and layback steep cuts and slopes.
5. Place geotextile on cleaned and shaped repair surface in advance of placing rock.
6. Place excavated material in the interim laydown area for review by Native American monitor.
7. Place rockfill in key and continue to place rockfill to top of excavated repair.
8. Alternative to placing rockfill over entire repair would be to place the geotextile and rockfill one to two feet above the maximum landside flood level then continue by compacting 6-inch lifts of earthfill until slope restoration has been achieved.
9. Remove excavated soil from the interim laydown area to contractor disposal area.
10. Tie rockfill in to slope.
11. Replace right-a-way fence.

Estimated staging, species/habitat, and historical impacts:

- An existing graded waterside parking lot located in the adjacent wildlife preserve approximately 575 feet to the east of the project site is proposed for a staging and interim laydown area. The northern half is proposed as staging and southern half is proposed as laydown area. The levee crest above the repair location is approximately 55-feet wide and can also be utilized as a staging and interim laydown area.
- The project site occurs on disturbed land. There are potential jurisdictional wetlands in close proximity to the project area providing habitat to special status species giant gartersnake.
- A large colony of California for the Mexican free-tailed bat (*Tadarida brasiliensis*), according to the CDFW, is located approximately 0.19 miles north of the project repair area.

See **Figures A-2a** and **A-2b** for site location map and representative photographs, respectively.



SOURCE: DWR 2017

2017 Storm Damage DWR Rehabilitation Program / 130028.39

Figure A-1a
Site 42, Yolo Bypass – Site Location Map



Landside erosion site after interim emergency repairs. Straw waddles for surface erosions control are visible through vegetation.



Aerial view looking east with erosion site in the foreground.

SOURCE: DWR 2017

2017 Storm Damage DWR Rehabilitation Program / 130028.39

Figure A-1b
Site 42, Yolo Bypass - Representative Photographs

Site 44, Sacramento River

General Characteristics	
Waterbody	Sacramento River
Bank (view downstream)	Right (West)
County	Colusa
Local Maintaining Agency	Sacramento River West Side Levee District
Levee Problem Characteristics	
Levee Problem	Waterside Erosion
Levee Miles (LM)	LM 18.76
Repair Characteristics	
Repair Type	Erosion
Work Limits (northing/easting)	NE 38.9543949571, -121.840733127 SE 38.9541488905, -121.840541778 SW 38.9539711327, -121.840919529 NW 38.9542833425, -121.841163988
Repair Length (linear feet)	120
Area of repair (acres)	0.19
Area of laydown (acres)	1.69
Estimated excavation (cubic yards)	216
Earthfill (cubic yards)	0
Aggregate base (tons)	64
Agricultural soil (tons)	410
Rockfill (tons)	1,160
Launch rock (tons)	2,282
Bedding Material (cubic yards)	0
Truck Loads	319
Final bank slope (H:V)	1.5H:1V
OHWL (estimated elevation in feet)	26
Area of repair below OHWL (acres)	0.06
Area of repair above OHWL (acres)	0.13 (Entirely on waterside levee slope)

Repair of the site will incorporate rockfill to provide slope protection against further erosion and tie into existing upstream and downstream repairs. No dead trees/snags were noted for removal, however; small trees and brush may need to be removed. There is a potential need to mitigate water intake pipes within construction/repair area. In-water work is required to place clean rock to buttress the slope fill.

The repair at Site 44 will include:

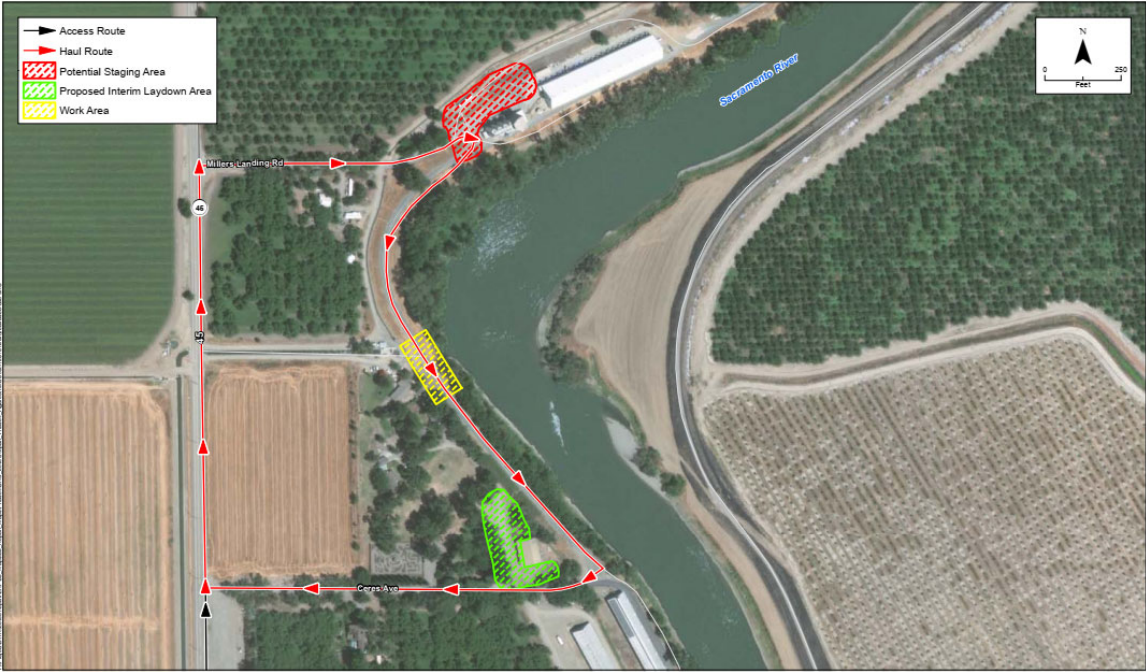
1. Access and construction by barge is not practical, therefore; site access and construction will be conducted from the levee crest road.
2. Identify trees and protect in place.
3. Remove brush, fallen trees, stumps, snags, dead and dying trees.
4. Excavate and remove all soils disturbed by the erosion and fallen trees. Excavate a key way for the placement of launch rock.
5. Place excavated material in the lay down area for review by Native American monitor.
6. Shape slope for stability.
7. Place geotextile on cleaned and shaped repair surface in advance of placing rock.
8. Place launch rock in key and bring to 1 foot above waterline.
9. Place rockfill and tie in to slope.
10. Remove excavated soil from interim laydown area to contractor disposal area.

No overhead or underground utilities were observed.

Estimated staging, species/habitat, and historical impacts:

- Potential staging areas, with ample room for staging/laydown activities, are located at the end of each of the east-west access roads where they intersect with the levee. One is a large parking lot/driveway area associated with a nut processing facility adjacent to the levee located at the end of the north access road (Millers Landing Road). The other is a large farmhouse/orchard equipment parking area located at the end of the south access road (Ceres Avenue).
- Potential jurisdictional wetlands may be present along the lower bank of the repair site.

See **Figures A-3a** and **A-3b** for site location map and representative photographs, respectively.



SOURCE: DWR 2017

2017 Storm Damage DWR Rehabilitation Program / 130028.39

Figure A-2a
Site 44, Sacramento River – Site Location Map



View looking southwest at vertical erosion in levee.



Left. Downstream view of erosion and emergency rock repair at damaged site. Right. Exposed H-pile protruding from water approximately 4-feet from erosions site shoreline. H-pile may be part of submerged water intake structure and is submerged at higher flows.

SOURCE: DWR 2017

2017 Storm Damage DWR Rehabilitation Program / 130028.39

Figure A-2b
Site 44, Sacramento River - Representative Photographs

Site 46, Steamboat Slough

General Characteristics	
Waterbody	Steamboat Slough
Bank (view downstream)	Left (East)
County	Sacramento
Local Maintaining Agency	RD3 – Grand Island
Levee Problem Characteristics	
Levee Problem	Waterside erosion, downed tree
Levee Miles (LM)	LM 0.18
Repair Characteristics	
Repair Type	Erosion
Work Limits (northing/easting)	NE 38.3031962121, -121.577381085 SE 38.3029203203, -121.577138436 SW 38.3024682366, -121.577896924 NW 38.3027405159, -121.57815335
Repair Length (linear feet)	250
Area of repair (acres)	0.27
Area of laydown (acres)	0.77
Estimated excavation (cubic yards)	1,775
Earthfill (cubic yards)	0
Aggregate base (tons)	0
Agricultural soil (tons)	538
Rockfill (tons)	2,091
Launch rock (tons)	3,996
Bedding material (cubic yards)	0
Truck Loads	1,106
Final bank slope (H:V)	Portions of 1.75H:1V and 1.5H:1V
OHWL (estimated elevation in feet)	5
Area of repair below OHWL (square feet)	0.18
Area of repair above OHWL (square feet)	0.09 (Entirely on waterside levee slope)

Repair of the site will incorporate rockfill to provide slope stability and erosion protection. The erosion of the toe has caused one large oak tree and several smaller trees to fall into the slough resulting in more erosion of the bank and levee. These downed trees will require removal. Trees in the footprint that are not dead or dying may require protection from construction activities. A number of highly invasive black locust trees were also noted at the repair site and potential staging areas. It is recommended that all black locust trees be removed where feasible and their seed carefully handled during removal (to prevent further dispersal).

Repair at Site 46 will include:

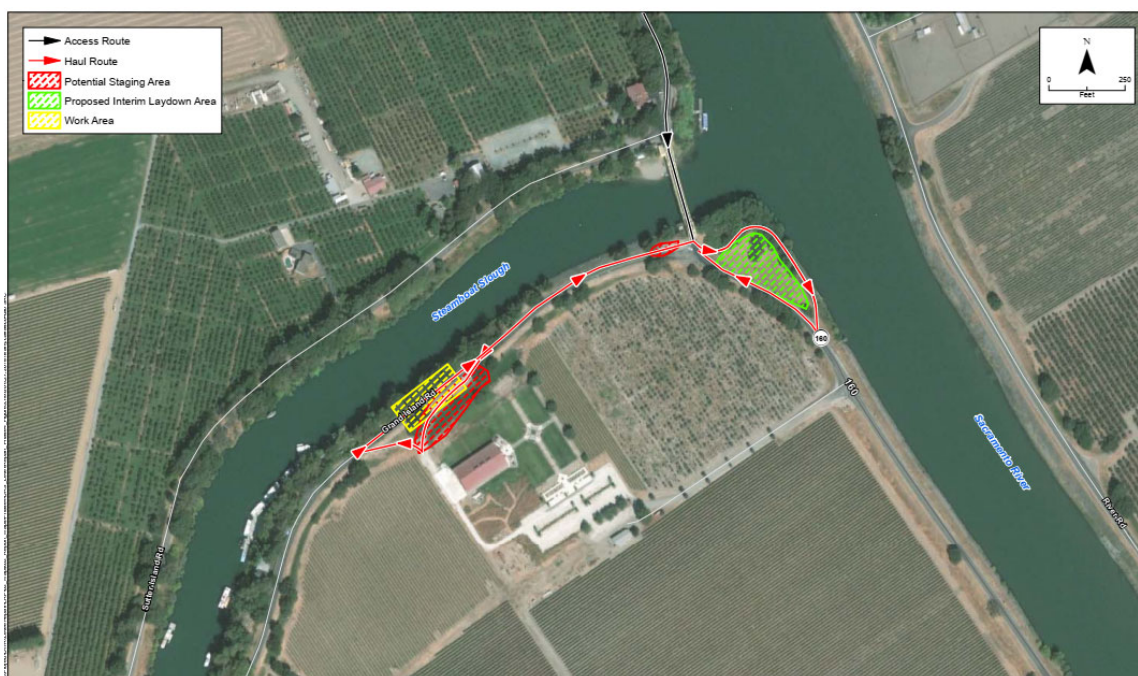
1. Enter the site from the levee road (Grand Island Road) or by Steamboat Slough if construction is by barge. Bathymetric surveys indicate the repair can be done by barge.
2. Identify trees and protect in place.
3. Remove brush, fallen trees, stumps, snags, dead and dying trees.
4. Excavate and remove all soils disturbed by the erosion and fallen tree(s). Excavate a key way for the placement of launch rock.
5. Place excavated material in the interim laydown area for review by Native American monitor.
6. Shape slope for stability.
7. Place geotextile on cleaned and shaped repair surface in advance of placing rock.
8. Place launch rock in key and bring to 1 foot above waterline.
9. Place rockfill and tie in to slope.
10. Remove excavated soil from interim laydown area to contractor disposal area

No signs of underground or overhead utilities were observed.

Estimated staging, species/habitat, and historical impacts:

- Three potential staging and/or interim laydown areas, with good access and ample room for staging/laydown activities, have been identified. One site is located on the land side of the repair site on the Grand Island Vineyard property. Two others are located adjacent to the intersection of Highway 160 and Grand Island Road. For land based operations, equipment and material deliveries can easily be made to the site via Highway 160. For barge based operations, equipment and material deliveries may be made to the site via the Sacramento River.
- The narrow base of the water side of the levee exhibits characteristics of potential emergent and riparian jurisdictional wetlands (presence of hydrophytic vegetation, wetland hydrology, and hydric soils).

See **Figures A-4a** and **A-4b** for site location map and representative photographs, respectively.



2017 Storm Damage DWR Rehabilitation Program / 130028.39

SOURCE: DWR 2017

Figure A-3a
Site 46, Steamboat Slough – Site Location Map



Aerial view looking south at waterside levee slope. Downed tree visible in foreground.



Aerial view looking southwest at erosion along waterside levee slope.

SOURCE: DWR 2017

2017 Storm Damage DWR Rehabilitation Program / 130028.39

Figure A-3b
Site 46, Steamboat Slough - Representative Photographs

Site 47, Steamboat Slough

General Characteristics	
Waterbody	Steamboat Slough
Bank (view downstream)	Left (East)
County	Sacramento
Local Maintaining Agency	RD3 – Grand Island
Levee Problem Characteristics	
Levee Problem	Waterside erosion
Levee Miles (LM)	LM 0.91
Repair Characteristics	
Repair Type	Erosion
Work Limits	NE 38.2934788312, -121.582202496 SE 38.2925680762, -121.582458118 SW 38.2926568386, -121.582968462 NW 38.2935684971, -121.582712564
Repair Length (linear feet)	270
Area of repair (acres)	0.44
Area of laydown (acres)	1.29
Estimated excavation (cubic yards)	1,144
Earthfill (cubic yards)	0
Aggregate base (tons)	0
Agricultural soil (tons)	972
Rockfill (tons)	3,782
Launch rock (tons)	4,301
Bedding material (cubic yards)	0
Truck loads	1,106
Final bank slope (H:V)	2H:1V
OHWL (estimated elevation in feet)	5
Area of repair below OHWL (acres)	0.29
Area of repair above OHWL (acres)	0.16 (Entirely on waterside levee slope)

Repair of the site will incorporate rockfill to provide slope stability and erosion protection. The erosion of the toe has caused several large and smaller trees to fall from the bank into the slough resulting in more erosion of the bank and levee. These downed trees will require removal. Large established trees in the footprint that are not dead or dying will require protection from construction activities; see environmental findings.

The repair at Site 47 will include:

1. Enter the site from the levee road (Grand Island Road) or by Steamboat Slough if construction is by barge. Bathymetric surveys indicate the repair can be done by barge.

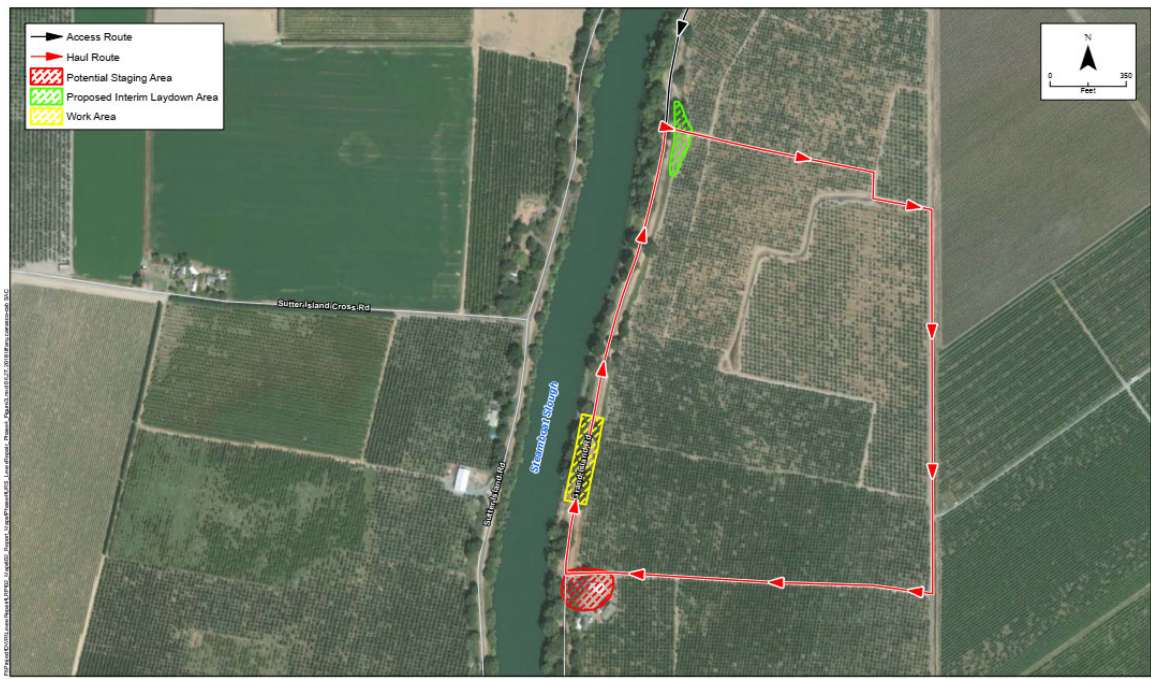
2. Remove brush, fallen trees, stumps, snags, dead and dying trees. Removal of most live trees will not be necessary.
3. Protect existing trees and water delivery system from the construction repair efforts.
4. Excavate and remove all soils disturbed by the erosion and fallen tree(s). Excavate a key way for the placement of launch rock.
5. Place excavated material in the interim laydown area for review by Native American monitor.
6. Shape slope for stability.
7. Place geotextile on cleaned and shaped repair surface in advance of placing rock.
8. Place launch rock in key and bring to 1 foot above waterline.
9. Place rockfill and tie in to slope.
10. Remove excavated soil from interim laydown area to contractor disposal area.

No signs of underground or overhead utilities were observed. However, one levee penetration was observed at the downstream terminus of the erosion damage site. It is a water intake system for delivering water to the land side. Due to its proximity to repair site footprint, this water delivery system will need to be protected from construction activities.

Estimated staging, species/habitat, and historical impacts:

- Two proposed areas have been identified as potential staging and interim laydown areas. Both sites are currently used for parking and staging areas for farm activities. Both sites are located on the land side adjacent to the levee and have access ramps. The proposed staging area is located near a farmhouse approximately 500 feet to the south on Grand Island Road. The proposed interim laydown area is located approximately 1800 north on Grand Island Road. For land based operations, equipment and material deliveries can be made to the site via Highway 160 to Grand Island Road. Bathymetric surveys indicate, materials, deliveries, and construction activities can be conducted by barge with deliveries arriving to the site via the Sacramento River approximately 0.95 miles upstream.
- The water side of the narrow base of the levee exhibits characteristics of potential emergent and riparian jurisdictional wetlands (presence of hydrophytic vegetation, wetland hydrology, and hydric soils).

See **Figures A-5a** and **A-5b** for site location map and representative photographs, respectively.



SOURCE: DWR 2017

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Figure A-4a
Site 47, Steamboat Slough – Site Location Map



Aerial view of waterside levee slope looking at the upstream end of the erosion damage site. Erosion damage begins at the end of the rock protection, visible on the left side of the photo, placed during emergency repairs.



Aerial view looking at water intake pipe, rock slope protection, and dead trees in erosion damage site.

SOURCE: DWR 2017

2017 Storm Damage DWR Rehabilitation Program / 130028.39

Figure A-4b
Site 47, Steamboat Slough – Representative Photographs

Site 48, Sacramento River

General Characteristics	
Waterbody	Sacramento River
Bank (view downstream)	Right (West)
County	Yolo
Local Maintaining Agency	RD150 – Merrit Island
Levee Problem Characteristics	
Levee Problem	Waterside erosion, downed tree
Levee Miles (LM)	LM 3.42
Repair Characteristics	
Repair Type	Erosion
Work Limits (northing/easting)	NE 38.3575024036, -121.528469768 SE 38.3572159903, -121.528109389 SW 38.3564941206, -121.529047284 NW 38.3567713715, -121.52939628
Repair Length (linear feet)	345
Area of repair (acres)	0.51
Area of laydown (acres)	1.56
Estimated excavation (cubic yards)	0
Earthfill (cubic yards)	0
Aggregate base (tons)	0
Agricultural soil (tons)	485
Rockfill (tons)	1,888
Launch Rock (tons)	8,145
Bedding material (cubic yards)	0
Truck Loads	526
Final bank slope (H:V)	1.5H:1V
OHWL (estimated elevation in feet)	9
Area of repair below OHWL (acres)	0.5
Area of repair above OHWL (acres)	0.01 (Entirely on waterside levee slope)

Repair of the site will incorporate rockfill to provide slope protection against further erosion and tie into existing upstream and downstream repairs. No dead trees/snags in the water were noted for removal, however; small trees and brush may need to be removed.

The repair at Site 48 will include:

1. Enter the site from the levee road (South River Road). Bathymetric survey indicates the repair can be done by barge via the Sacramento River.
2. Identify trees and protect in place. Remove brush, temporary erosion mitigations, fallen trees, stumps, snags, dead and dying trees.

3. Excavate and remove all soils disturbed by the erosion and fallen tree(s). Excavate a key way for the placement of launch rock.
4. Place excavated material in the interim laydown area for review by Native American monitor.
5. Shape slope for stability.
6. Place geotextile on cleaned and shaped repair surface in advance of placing rock.
7. Place launch rock in key and bring to 1 foot above waterline.
8. Place rockfill and tie in to slope.
9. Remove excavated soil from interim laydown area to contractor disposal area.

No utilities (overhead or underground) or levee penetrations were observed within the repair footprint.

Estimated staging, species/habitat, and historical impacts:

- The propose staging and interim laydown area is the property surrounding an abandoned barn and adjacent Pylman Vineyard farm equipment are (39500 South River Road) located approximately 1800 feet upriver. The area is on private property and will require permission from the land owner.
- The narrow base of the water side of the levee exhibits characteristics of potential emergent and riparian jurisdictional wetlands (presence of hydrophytic vegetation, wetland hydrology, and hydric soils).

See **Figures A-6a** and **A-6b** for site location map and representative photographs, respectively.



2017 Storm Damage DWR Rehabilitation Program / 130028.39
SOURCE: DWR 2017

Figure A-5a
Site 48, Sacramento River – Site Location Map



View of repair site with rock slope protection visible along water side levee toe. Cracking of highway pavement appears to be associated with the levee erosion damage.



Vegetation along waterside of levee at erosion repair site.

SOURCE: DWR 2017

2017 Storm Damage DWR Rehabilitation Program / 130028.39

Figure A-5b
Site 48, Sacramento River – Representative Photograph

Site 49, Elk Slough

General Characteristics	
Waterbody	Elk Slough
Bank (view downstream)	Left (East)
County	Yolo
Local Maintaining Agency	RD150 – Merrit Island
Levee Problem Characteristics	
Levee Problem	Waterside erosion
Levee Miles (LM)	LM 4.39
Repair Characteristics	
Repair Type	Erosion
Work Limits (northing/easting)	NE 38.3744704792, -121.548623509 SE 38.3742680085, -121.54862493 SW 38.3741943785, -121.549721931 NW 38.3744748653, -121.549720378
Repair Length (linear feet)	280
Area of repair (acres)	0.2
Area of laydown (acres)	0.50
Estimated excavation (cubic yards)	200
Earthfill (cubic yards)	0
Aggregate base (tons)	0
Agricultural soil (tons)	0
Rockfill (tons)	0
Launch rock (tons)	2,609
Bedding material (cubic yards)	0
Truck Loads	245
Final bank slope (H:V)	1.5H:1V
OHWL (estimated elevation in feet)	5
Area of repair below OHWL (acres)	0.11
Area of repair above OHWL (acres)	0.09 (Entirely on waterside levee slope)

The repair footprint has one downed tree and root ball in the slough that will be removed. Trees in the footprint that are not dead or dying may require protection from construction activities. Repair of the site will incorporate rebuilding any missing portion of the levee prism with compacted select levee fill material and blanketed with rockfill to provide erosion protection.

The repair at Site 49 will include:

1. Enter the site from the levee road (County Road 144).
2. Identify trees and powerlines and protect in place.

3. Remove brush and fallen tree and follow environmental guidelines due to existing elderberry groupings within the work area.
4. Excavate and remove soils disturbed by the erosion and fallen tree.
5. Place excavated material in the interim laydown area for review by Native American monitor.
6. Shape slope for stability.
7. Replace and compact lost levee material to design profile.
8. Excavate a key way for the placement of launch rock.
9. Place geotextile on cleaned, shaped and repaired surfaces in advance of placing rock.
10. Place launch rock in key and bring to 1 foot above waterline.
11. Place rockfill (erosion protection) and tie in to slope.
12. Remove excavated soil from interim laydown area to contractor disposal area.

There is an overhead powerline that crosses the slough and the left levee near the upstream end of the repair site. This will need to be avoided/protected during construction.

Estimated staging, species/habitat, and historical impacts:

- The landside toe area between the levee and adjacent field can be accessed from a ramp/driveway east of the repair site; however, the property owner requested that his existing driveway not be used. The potential staging area is a field west of the property owner's facilities. During previous construction activities the owner's driveway was used for a detour route. The owner expressed that this not be allowed during future construction activities. Access to/from the laydown area would be to construct a temporary road up the land side embankment.
- No jurisdictional wetland delineation is recommended.
- Elderberry shrub grows at this site.

See **Figures A-7a** and **A-7b** for site location map and representative photographs, respectively.



SOURCE: DWR 2017

Figure A-6a
Site 49, Elk Slough – Site Location Map



View from levee crest looking at waterside levee toe of erosion damage site. Downed tree in slough will be removed.



Aerial view looking at erosion site. Potential staging area in the background to the right.

2017 Storm Damage DWR Rehabilitation Program / 130028.39

SOURCE: DWR 2017

Figure A-6b
Site 49, Elk Slough – Representative Photographs

Site 50, Elk Slough

General Characteristics	
Waterbody	Elk Slough
Bank (view downstream)	Left (East)
County	Yolo
Local Maintaining Agency	RD150 – Merrit Island
Levee Problem Characteristics	
Levee Problem	Waterside erosion
Levee Miles (LM)	LM 4.47
Repair Characteristics	
Repair Type	Erosion
Work Limits (northing/easting)	NE 38.3746370031, -121.54686338 SE 38.3743671346, -121.54682193 SW 38.3742224218, -121.548327503 NW 38.3744924286, -121.548369091
Repair Length (linear feet)	410
Area of repair (acres)	0.29
Area of laydown (acres)	0.50
Estimated excavation (cubic yards)	343
Earthfill (cubic yards)	0
Aggregate base (tons)	53
Agricultural soil (tons)	0
Rockfill (tons_	0
Launch rock (tons)	532
Bedding material (cubic yards)	0
Truck Loads	51
Final bank slope (H:V)	1.5H:1V
OHWL (estimated elevation in feet)	5
Area of repair below OHWL (acres)	0.17
Area of repair above OHWL (acres)	0.12 (Entirely on waterside levee slope)

The repair footprint has at least two downed trees in the channel that are amplifying the erosion damage and will be removed. Trees in the footprint that are not dead or dying will require protection.

The repair at Site 50 will include:

1. Enter the site from the levee road (County Road 144).
2. Remove brush and fallen trees/snags.
3. Protect existing trees.
4. Excavate and remove all soils disturbed by the erosion and fallen tree.

5. Shape slope for stability.
6. Replace and compact lost levee material to design profile. Repair of the site should incorporate rebuilding any missing portion of the levee prism with compacted select levee fill material, blanketed with rockfill to provide erosion protection.
7. Excavate a key way for the placement of launch rock.
8. Place excavated material at the laydown area for review by Native American monitors.
9. Place geotextile on cleaned, shaped and repaired surfaces in advance of placing rock.
10. Place launch rock in key and bring to 1 foot above waterline.
11. Place rockfill (erosion protection) and tie in to slope.
12. Remove excavated soil to a designated disposal area after it has been reviewed by Native American Monitors.

No signs of underground or overhead utilities were observed.

Estimated staging, species/habitat, and historical impacts:

- A potential staging area, with good access and ample room for staging/laydown activities, has been identified nearby, across the road from LMA-130 in an adjacent field starting at the land side levee toe. During the site visit the owner offered the use of this field. It could be accessed from a ramp/driveway directly across from this repair site; however, the property owner requested that his existing driveway not be used. The potential staging area is a field west of the property owner's facilities. Access to/from the laydown area would be to construct a temporary road and ramp up the land side embankment.
- No jurisdictional wetland delineation is recommended.
- Elderberry shrub grows at this site.

See **Figures A-8a** and **A-8b** for site location map and representative photographs, respectively.



SOURCE: DWR 2017

Figure A-7a
Site 50, Elk Slough LMA-131 – Site Location Map



View of bank slope erosion and associated cracking of road along levee crest.



Aerial of erosion site with downed tree and in water snag.

SOURCE: DWR 2017

2017 Storm Damage DWR Rehabilitation Program / 130028.39

Figure A-7b
Site 50, Elk Slough – Representative Photographs

Site 51, Elk Slough

General Characteristics	
Waterbody	Elk Slough
Bank (view downstream)	Left (East)
County	Yolo
Local Maintaining Agency	RD150 – Merrit Island
Levee Problem Characteristics	
Levee Problem	Watersideerosion, seepage
Levee Miles (LM)	LM 5.4
Repair Characteristics	
Repair Type	Erosion
Work Limits (northing/easting)	NE 38.382184771, -121.544473848 SE 38.3819596509, -121.544572183 SW 38.3820818004, -121.545023611 NW 38.3823069029, -121.544925335
Repair Length (linear feet)	55
Area of repair (acres)	0.04
Area of laydown (acres)	0.85
Estimated excavation (cubic yards)	38
Earthfill (cubic yards)	0
Aggregate base (tons)	53
Agricultural soil (tons)	0
Rockfill (tons)	0
Launch Rock (tons)	532
Bedding materials (cubic yards)	0
Truck Loads	51
Final bank slope (H:V)	1.5H:1V
OHWL (estimated elevation in feet)	5
Area of repair below OHWL (acres)	0.02
Area of repair above OHWL (acres)	0.02 (Entirely on waterside levee slope)

The repair footprint consists of one downed tree that has landed in the channel. This tree will be removed to decrease potential erosion damage/process. Trees in the footprint that are not dead or dying may require protection. In-water work required to place clean rock to buttress the slope fill.

The repair at Site 51 will include:

1. Enter the site from the levee patrol (crest) road via County Road 144.
2. Remove brush and fallen trees/snags. Trees in the water beyond the repair area shall remain in place. Follow environmental guidelines due to exiting Elderberry shrub groupings with in the work area. Identify trees and protect in place.

3. Excavate and remove soils disturbed by the erosion and fallen tree.
4. Shape slope for stability.
5. Replace and compact lost levee material to design profile. Repair and rebuild any missing portion of the levee prism with compacted select levee fill material, blanketed with rockfill to provide erosion protection.
6. Excavate a key way for the placement of launch rock.
7. Place excavated material in interim lay down area for review by Native American monitor.
8. Place geotextile on cleaned, shaped and repaired surfaces in advance of placing rock.
9. Place launch rock in key and bring to 1 foot above waterline.
10. Place rockfill (erosion protection) and tie in to slope.
11. Remove excavated soils from interim laydown area to contractor disposal area.

There are no overhead utilities in or near the site. Additionally, no signs of levee penetrations, needing to be avoided or protected during construction, were observed.

Estimated staging, species/habitat, and historical impacts:

- A potential staging area, with good access and ample room for staging/laydown activities, has been identified nearby. The site is the patrol (crest) road and landside slope area adjacent to the erosion damage site. The landside slope is gentle at 4H:1V, thus access to/from this portion of the staging/laydown area may not require the construction of a temporary road/ramp up the land side embankment.
- No jurisdictional wetland delineation is recommended.
- Elderberry shrub grows at this site.

See **Figures A-9a** and **A-9b** for site location map and representative photographs, respectively.



SOURCE: DWR 2017

2017 Storm Damage DWR Rehabilitation Program / 130028.39

Figure A-8a
Site 51, Elk Slough – Site Location Map



Aerial view of erosions damage site. Hole in bank left by root ball is obscured by vegetation.



View of downed oak tree and exposed root ball at erosion site.

SOURCE: DWR 2017

2017 Storm Damage DWR Rehabilitation Program / 130028.39

Figure A-8b
Site 51, Elk Slough – Representative Photographs

Site 52, Elk Slough

General Characteristics	
Waterbody	Elk Slough
Bank (view downstream)	Left (East)
County	Yolo
Local Maintaining Agency	RD150 – Merritt Island
Levee Problem Characteristics	
Levee Problem	Waterside erosion
Levee Miles (LM)	LM 8.05
Repair Characteristics	
Repair Type	Erosion
Work Limits (northing/easting)	NE 38.4094626977, -121.539188616 SE 38.4092434451, -121.539136445 SW 38.4091676993, -121.539650871 NW 38.4093868949, -121.539703025
Repair Length (linear feet)	105
Area of repair (acres)	0.09
Area of laydown (acres)	1.08
Estimated excavation (cubic yards)	93
Earthfill (cubic yards)	0
Aggregate base (tons)	58
Agricultural soil (tons)	0
Rockfill (tons)	0
Launch rock (tons)	1,218
Bedding material (cubic yards)	0
Truck Loads	117
Final bank slope (H:V)	1.5H:1V
OHWL (estimated elevation in feet)	4
Area of repair below OHWL (acres)	0.04
Area of repair above OHWL (acres)	0.04 (Entirely on waterside levee slope)

The reconstructed slope will conform to the pre-existing levee slope of the failure area. Within the repair footprint there is a downed tree that is submerged (snag) in the channel. This snag should be removed to decrease the amplification of erosion damage/process. In-water work required to place clean rock to buttress the slope fill.

The repair at Site 52 will include:

1. Enter the site from the levee patrol (crest) road. Access to site via County Road 144 (downstream) or via South River Road (upstream). Levee crest road is narrow and vegetated.
2. Remove brush and fallen trees/snags.

3. Excavate and remove soils disturbed by the erosion.
4. Place excavated material in the interim laydown area for review by Native American monitor.
5. Shape slope for stability.
6. Replace and compact lost levee material to design profile.
7. Excavate a key way for the placement of launch rock.
8. Place geotextile on cleaned, shaped and repaired surfaces in advance of placing rock.
9. Place launch rock in key and bring to 1 foot above waterline.
10. Place rockfill (erosion protection) and tie in to slope
11. Remove excavated soil from interim laydown area to contractor disposal area.

There are no overhead utilities in or near the site. Additionally, no signs of levee penetrations needing to be avoided or protected during construction were observed.

Estimated staging, species/habitat, and historical impacts:

- Potential staging areas, with good access and ample room for staging/laydown activities, have been identified nearby. The sites are adjacent to the levee along the landside toe slope. They are located approximately 300 feet, 1000 feet and 1500 feet in the upstream direction. The landside slopes are gentle at 4H:1V, thus access to/from these staging/laydown areas may not require the construction of a temporary road/ramp up the land side embankment.
- No jurisdictional wetland delineation is recommended.
- Elderberry shrub grows at this site.

See **Figures A-10a** and **A-10b** for site location map and representative photographs, respectively.



2017 Storm Damage DWR Rehabilitation Program / 130028.39

SOURCE: DWR 2017

Figure A-9a
Site 52, Elk Slough – Site Location Map



Aerial view looking at southern levee waterside slope erosion damage. Erosion scarp and tension cracking have working into the levee prism and are beginning to encroach on the levee crest.



Tension cracking, visible as shadows in the waterside levee slope vegetation.

SOURCE: DWR 2017

2017 Storm Damage DWR Rehabilitation Program / 130028.39

Figure A-9b
Site 52, Elk Slough – Representative Photographs

Site 53, Elk Slough

General Characteristics	
Waterbody	Elk Slough
Bank (view downstream)	Left (East)
County	Yolo
Local Maintaining Agency	RD150 – Merrit Island
Levee Problem Characteristics	
Levee Problem	Waterside erosion
Levee Miles (LM)	LM 8.35
Repair Characteristics	
Repair Type	Erosion
Work Limits (northing/easting)	NE 38.4082389643, -121.534219922 SE 38.4080458595, -121.534097794 SW 38.4079508047, -121.534377132 NW 38.4081415735, -121.534481986
Repair Length (linear feet)	60
Area of repair (acres)	0.04
Area of laydown (acres)	1.08
Estimated excavation (cubic yards)	42
Earthfill (cubic yards)	0
Aggregate base (tons)	34
Agricultural soil (tons)	0
Rockfill (tons)	0
Launch Rock (tons)	726
Bedding material (cubic yards)	0
Truck Loads	62
Final bank slope (H:V)	1.5H:1V
OHWL (estimated elevation in feet)	4
Area of repair below OHWL (acres)	0.02
Area of repair above OHWL (acres)	0.02 (Entirely on water side levee slope)

The repair footprint consists of one downed tree with its exposed rootball cavity and associated slumping of slope into the erosion damage. This tree will be removed to decrease the amplification of erosion damage/process.

The repair at Site 53 will include:

1. Enter the site from the levee patrol (crest) road. Access to site via County Road 144 (downstream) or via South River Road (upstream). The levee crest road is narrow and vegetated.
2. Remove brush and fallen trees/snags.

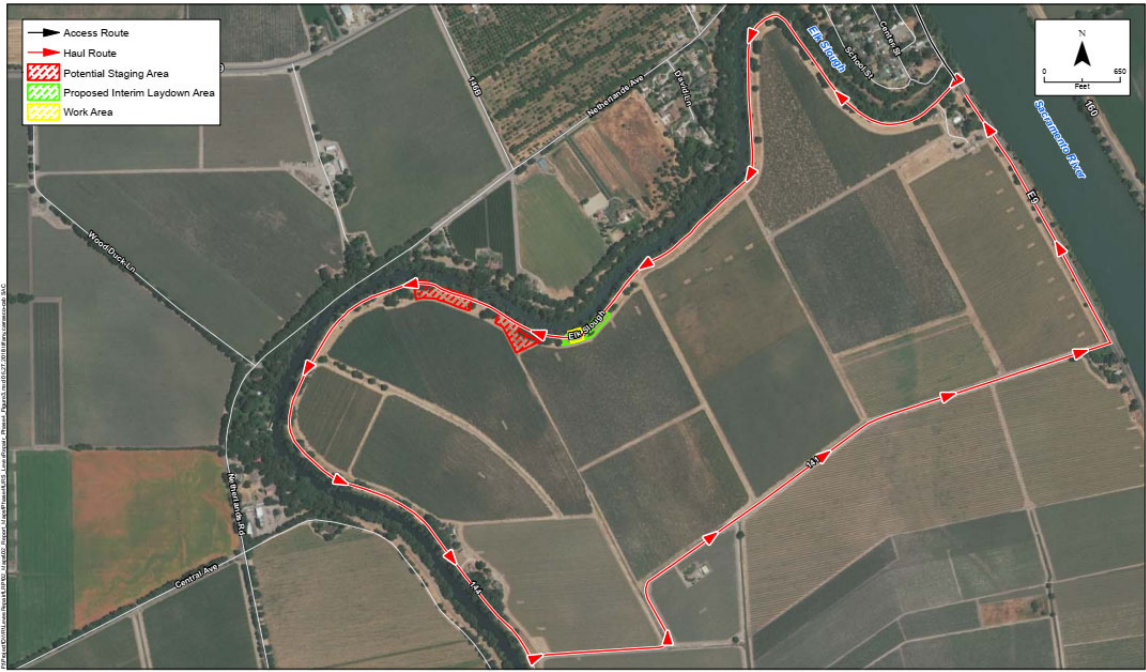
3. Identify utilities and protect in place.
4. Excavate and remove all soils disturbed by the erosion.
5. Shape slope for stability.
6. Place excavated material in interim lay down area for review by Native American monitors.
7. Replace and compact levee material to design profile.
8. Excavate a key way for the placement of launch rock.
9. Place geotextile on cleaned, shaped and repaired surfaces in advance of placing rock.
10. Place launch rock in key and bring to 1 foot above waterline.
11. Place rockfill (erosion protection) and tie in to slope.
12. Remove excavated soils from interim laydown area to contractor disposal area.

There are no overhead utilities at the site or signs of levee penetrations; however, approximately 50 feet in the upstream direction overhead utilities cross the levee to a water intake pump and pipe penetration. These facilities require protection during construction.

Estimated staging, species/habitat, and historical impacts:

- Potential staging areas, with good access and ample room for staging/laydown activities, have been identified nearby. The sites are located on the landside along the levee toe with the closest adjacent to the repair site and the other two are located approximately 450 feet and 1000 feet in the downstream direction. The landside slopes are gentle at 4H:1V, thus access to/from these staging/laydown areas likely may not require the construction of a temporary road/ramp up the land side embankment.
- No jurisdictional wetland delineation is recommended.

See **Figures A-11a** and **A-11b** for site location map and representative photographs, respectively.



SOURCE: DWR 2017

2017 Storm Damage DWR Rehabilitation Program / 130028.36

Figure A-10a
Site 53, Elk Slough – Site Location Map



Aerial view looking at southern levee slope erosion damage. Erosion damage has felled the tree and exposed the levee to more erosion around the root ball hole.



Aerial overview looking at erosion damage site and downed tree.

SOURCE: DWR 2017

2017 Storm Damage DWR Rehabilitation Program / 130028.39

Figure A-10b
Site 53, Elk Slough – Representative Photographs

Site 54, Yankee Slough

General Characteristics	
Waterbody	Yankee Slough
Bank (view downstream)	Right (North)
County	Sutter
Local Maintaining Agency	Reclamation District 1001
Levee Problem Characteristics	
Levee Problem	Waterside erosion
Levee Miles (LM)	LM 0.74
Repair Characteristics	
Repair Type	Erosion
Work Limits (northing/easting)	NE 38.9750747782, -121.480599089 SE 38.9748826709, -121.480600363 SW 38.9748796282, -121.481243362 NW 38.975044926, -121.481270149
Repair Length (linear feet)	1,700
Area of repair (acres)	0.08
Area of laydown (acres)	12.63
Estimated excavation (cubic yards)	410
Earthfill (cubic yards)	0
Aggregate base (tons)	74
Aggregate soil (tons)	335
Rockfill (tons)	853
Launch rock (tons)	0
Bedding material (cubic yards)	0
Truck Loads	297
Final bank slope (H:V)	6.5H:1V
OHWL (estimated elevation in feet)	60
Area of repair below OHWL (acres)	0
Area of repair above OHWL (acres)	0.08 (Entirely on waterside levee slope)

Repair of the site will consist of: restoring the levee to the design profile; protect against further erosion and the development of a secondary overflow channel with rockfill; and regrade the waterside ground surface from the levee toe to the outboard edge of the toe road to create a slope that will redirect overbank flows back into the main channel. Additionally, to increase flows through the slough and decrease overflow channel development due to backwater, the beaver dam, brush and debris will be removed from the main channel.

The repair at Site 54 will include:

1. Access and construction can be conducted from either the levee toe road or the levee crest road. The levee road is gated.

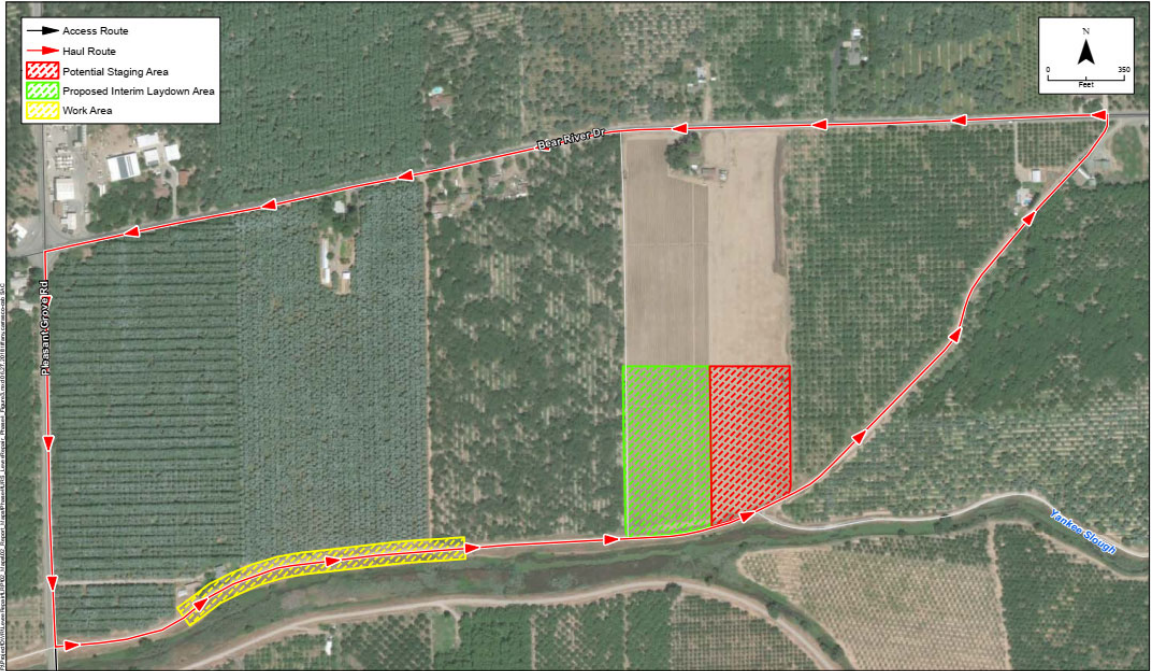
2. Identify power lines to be avoided.
3. Remove brush, fallen trees, stumps, snags, dead and dying trees from repair area levee slopes and toe road. Removal of live trees does not appear necessary, therefore; measures should be taken to protect them from the construction repair efforts.
4. Excavate and remove levee fill materials and toe road soils disturbed by the erosion.
5. Replace missing levee fill materials with select levee earthfill. Compact and shape slope to match design prism. For placement a rockfill protective cover on levee slope, match the levee fill surface to match the design prism minus the thickness of the rockfill cover such that the finished rockfill surface matches the design prism.
6. Regrade toe road to divert overbank flows away from levee toe.
7. Place excavated material in the interim lay down area for review by Native American monitor.
8. Place geotextile on cleaned and recompact repair surfaces in advance of placing rock.
9. Remove excavated soil from interim laydown area to contractor disposal area.
10. Place rockfill on toe road and along toe of levee to protect soils from erosion and divert flows away from the repair locations.
11. In addition to the erosion repair to the waterside levee slope and toe road, the beaver dam along with all brush and debris should be removed from the main channel. As necessary, the channel should be straightened to improve flows downstream and reduce the possibility of the flow from overtopping the main channel and eroding the levee slope.

Power line poles extend parallel to Pleasant Grove Road and along the landside toe of the right levee for approximately 950 feet east from Pleasant Grove Road. These overhead utilities need to be avoided for the first 950 feet (approximately) as well as the power lines and poles crossing the slough at the end of the 950 foot run.

Estimated staging, species/habitat, and historical impacts:

- Remnant treeless orchards adjacent to the levee are proposed as a staging area and an interim laydown area. A ramp will need to be constructed to effectively utilize this site. A single ramp constructed for both staging and interim laydown area can provide access to both locations. Equipment and material deliveries can be made to the site via Bear River Drive. Potential staging and interim laydown areas are on private property and will require permission from the land owner.
- Potential jurisdictional riparian wetlands running east/west along the southern side of the site.

See **Figures A-12a** and **A-12b** for site location map and representative photographs, respectively.



SOURCE: DWR 2017

2017 Storm Damage DWR Rehabilitation Program / 130028.39

Figure A-11a
Site 54, Yankee Slough – Site Location Map



Aerial view looking downstream at Yankee Slough. Erosion damage occurs along the waterside toe of the right levee.



Aerial view looking at erosion site and emergency repair rock placement. Beaver dam crossing the main channel is visible in the left side of the photo.

SOURCE: DWR 2017

2017 Storm Damage DWR Rehabilitation Program / 130028.39

Figure A-11b

Site 54, Yankee Slough – Representative Photographs

Site 55, San Joaquin River

General Characteristics	
Waterbody	San Joaquin River
Bank (view downstream)	Left (West)
County	San Joaquin
Local Maintaining Agency	RD2095 – Paradise Cut
Levee Problem Characteristics	
Levee Problem	Waterside erosion
Levee Miles (LM)	LM 1.75
Repair Characteristics	
Repair Type	Erosion
Work Limits (northing/easting)	NE 37.7402040225, -121.296880578 SE 37.7386074596, -121.297603159 SW 37.738656501, -121.298241692 NW 37.7404897405, -121.297412397
Repair Length (linear feet)	610
Area of repair (acres)	0.89
Area of laydown (acres)	2.48
Estimated excavation (cubic yards)	841
Earthfill (cubic yards)	0
Aggregate base (tons)	548
Agricultural soil (tons)	1,365
Rockfill (tons)	5,309
Launch Rock (tons)	11,527
Bedding material (cubic yards)	0
Truck Loads	1,418
Final bank slope (H:V)	Portions of 2H:1V and 1.5H:1V
OHWL (estimated elevation in feet)	7
Area of repair below OHWL (acres)	0.59
Area of repair above OHWL (acres)	0.3 (Entirely on waterside levee slope)

Repair of the site will incorporate rockfill to provide slope stability and erosion protection. The subject levee is under the maintenance responsibility of Reclamation District (RD) 2095. Access to the levee is impeded by a locked levee gate. To access this levee a key from the RD2095 will be required.

The repair at Site 55 will include:

1. Remove brush, fallen trees, stumps, snags, dead and dying trees.
2. Excavate and remove all loose and disturbed material/soils and any potential unstable zones.
3. Place excavated material in the interim laydown area for review by Native American monitor.

4. Place clean launch rock beneath the water up to 1 foot above water level, and soil rockfill 1 foot above the water level up the levee slope to the waterside hinge; including placement of geotextile between the launch rock and soil rockfill at the time of construction.
5. Place soil filled rockfill to within 6 inches of finish grade.
6. Blend soil filled rockfill and existing soil at transition to suit existing conditions.
7. Place geotextile on cleaned and shaped repair surface in advance of placing rock.
8. Place launch rock in key and bring to 1 foot above waterline.
9. Place rockfill and tie in to slope.
10. Remove excavated soil from interim laydown area to contractor disposal area.
11. Place hydroseed on disturbed areas.
12. Place and compact aggregate base to 6 inch thickness (minimum) to rebuild travel way.

The land side slope contains overhead utilities at the toe road.

Estimated staging, species/habitat, and historical impacts:

- Two proposed areas have been identified as potential staging and interim laydown areas. Both locations have good access and ample room for staging/laydown activities. Both sites are within levee easement along the landside toe and have ramp access to the levee. The proposed staging area is approximately 2000 feet x100 feet adjacent to the work area on the landside. The interim laydown area is approximately 1500 feet north of the work area and measures about 1800 feet x100 feet along the landside toe.
- No jurisdictional wetland delineation is recommended.

See **Figures A-13a** and **A-13b** for site location map and representative photographs, respectively.

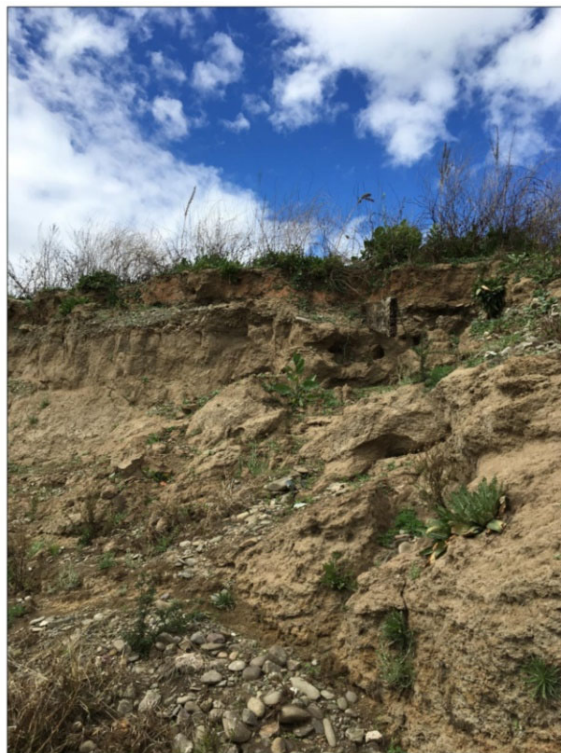


SOURCE: DWR 2017

Figure A-12a
Site 55, San Joaquin River LMA-296 – Site Location Map



View looking from upstream at waterside levee bank erosion.



View of eroded bank with tension cracks.

SOURCE: DWR 2017

2017 Storm Damage DWR Rehabilitation Program / 130028.39

Figure A-12b

Site 55, San Joaquin River LMA-296 – Representative Photographs

Phase 5 Sites

Site 58, Sacramento River

General Characteristics	
Waterbody	Sacramento River
Bank (view downstream)	Left (East)
County	Sacramento
Local Maintaining Agency	RD755 - Randall
Levee Problem Characteristics	
Levee Problem	Waterside erosion
Levee Miles (LM)	LM 1.73
Repair Characteristics	
Repair Type	Erosion
Work Limits (northing/easting)	NE 38.3380097209, -121.563674977 SE 38.3378815158, -121.56346629 SW 38.3369219704, -121.564401512 NW 38.337097015, -121.564691111
Repair Length (linear feet)	430
Area of repair (acres)	0.38
Area of laydown (acres)	1.22
Estimated excavation (cubic yards)	2,897
Earthfill (cubic yards)	0
Aggregate base (tons)	0
Agricultural soil (tons)	0
Rockfill (tons)	6,761
Launch Rock (tons)	0
Bedding material (cubic yards)	0
Truck Loads	1,993
Final bank slope (H:V)	1.7H:1V
OHWL (estimated elevation in feet)	9
Area of repair below OHWM (acres)	0.06
Area of repair above OHWM (acres)	0.32 (Entirely on waterside levee slope)

The reconstructed slope will conform to the pre-existing levee slope of the failure area. In-water work required to place clean rock to buttress the slope fill.

The repair at Site 58 will include:

1. Enter the site from the levee road (Randall Island Road) or use barge services along the Sacramento River. Bathymetric surveys indicate the repair can be done by barge,
2. Identify trees and protect in place.

3. Remove brush and fallen trees.
4. Excavate and remove soils disturbed by the erosion and fallen rock including unstable zones and loose material. In addition, excavate soils, loose materials and unstable cobbles in the transition zones adjacent to or within the failure.
5. Place excavated material in interim lay down area for review by Native American Monitors.
6. Shape back slope of levee for stability.
7. Place geotextile on cleaned and shaped repair surface of levee in advance of placing rock.
8. Excavate a key way for the placement of launch rock at the toe of the failure extending into the waterway.
9. Place clean launch rock beneath the water up to just 1 foot above water level, place geotextile and then soil filled rock fill above the water level at the time of construction.
10. Blend launch and soil filled rock fill protection at transition ends into the existing slopes of adjacent soils and/or rip rap and finish to grade
11. Remove excavated soils from interim laydown area to contractor disposal area. There are no power poles that cross the levee or other utilities at the waterside levee slope and hinge, although private and business properties with dwellings are located east of and adjacent to the landside levee slope.

There are no power poles that cross the levee or other utilities at the waterside levee slope and hinge, although private and business properties with dwellings are located east of and adjacent to the landside levee slope.

Estimated staging, species/habitat, and historical impacts:

- Only one potential staging area along the landside of the levee south of the site appeared to have adequate space to be potential staging area and interim laydown area. Access to the space is at the intersection of Route 160 and Randall Island Road in a semigravel area. There are 5 large oak trees that will require protection in staging area.
- The water side of the narrow base of the levee exhibits characteristics of potential emergent and riparian jurisdictional wetlands (presence of hydrophytic vegetation, wetland hydrology, and hydric soils.

See **Figures A-14a** and **A-14b** for site location map and representative photographs, respectively.



SOURCE: DWR 2017

2017 Storm Damage DWR Rehabilitation Program / 130028.39

Figure A-13a
Site 58, Sacramento River – Site Location Map



View of erosion along waterside levee which has fallen to the levee toe.



View of waterside levee slope where erosion damage exists.

SOURCE: DWR 2017

2017 Storm Damage DWR Rehabilitation Program / 130028.39

Figure A-13b
Site 58, Sacramento River – Representative Photographs

Site 59, Sacramento River

General Characteristics	
Waterbody	Sacramento River
Bank (view downstream)	Left (East)
County	Sacramento
Local Maintaining Agency	RD551 - Pearson
Levee Problem Characteristics	
Levee Problem	Waterside erosion
Levee Miles (LM)	LM 5.2
Repair Characteristics	
Repair Type	Erosion
Work Limits (northing/easting)	NE 38.2737849864, -121.537531981 SE 38.2736249704, -121.537720296 SW 38.2747054168, -121.539204926 NW 38.2748661178, -121.539015604
Repair Length (linear feet)	430
Area of repair (acres)	0.32
Area of laydown (acres)	2.69
Estimated excavation (cubic yards)	1,451
Earthfill (cubic yards)	0
Aggregate base (tons)	0
Agricultural soil (tons)	443
Rockfill (tons)	2,365
Launch Rock (tons)	0
Bedding material (cubic yards)	0
Truck Loads	970
Final bank slope (H:V)	Portions of 1.75H:1V and 2H:1V
OHWL (estimated elevation in feet)	9
Area of repair below OHWL (acres)	0
Area of repair above OHWL (acres)	0.32 (Entirely on waterside levee slope)

There is an intake pipe with associated cement structure and pumping system approximately at the mid-way point of the levee in which the pipe runs from the river to two-thirds the height of the levee. Beneath the concrete structure which houses the piping and pumping unit erosion (undermining and loss of material) has occurred. The pumping unit and piping will be protected during construction activities. The reconstructed slope will conform to the pre-existing levee slope of the failure area. In-water work required to place clean rock to buttress the slope fill.

The repair at Site 59 will include:

1. Enter the site from the levee road (River Road) or use barge services along the Sacramento River. Bathymetric surveys indicate the repair can be done by barge.

2. Identify utilities and protect in place. No utilities identified during the site visit except the pumping structure.
3. Remove brush and fallen trees.
4. Protect existing intake pipe.
5. Excavate and remove soils disturbed by the erosion and fallen rock including unstable zones and loose material. In addition, excavate soils, loose materials and unstable rip rap in the transition zones adjacent to or within the failure.
6. Evaluate existing key way; if necessary and only where required, excavate a key way for the placement of launch rock at the toe of the failure extending into the waterway.
7. Shape back slope of levee for slope stability.
8. Place excavated material in interim lay down area for review by Native American Monitors.
9. Place geotextile on cleaned and shaped repair surface of levee in advance of placing rock.
10. Place clean launch rock beneath the water up to just 1 foot above water level, place geotextile and then soil filled rock fill above the water level at the time of construction.
11. Blend launch and soil filled rock fill protection at transition ends into the existing slopes of adjacent soils and/or rip rap and finish to grade.
12. Remove excavated soils from interim laydown area to contractor disposal area.

There are no power poles with associated power lines that cross the levee or other utilities that exists at the waterside levee hinge although private and business properties with dwellings are located east of and adjacent to the landside levee.

Estimated staging, species/habitat, and historical impacts:

- Two potential areas east of the landside of the levee appeared to have the space capable of being potential staging and interim laydown area. Access to the first space is south from the site on River Road to Twin Cities Road where at the intersection is an open farm field. Access to the second space is north from the site on River Road to Vorden Road, to an open farm field approximately 0.7 miles east of the intersection of River and Vorden roads; however, access to the each of the lands would require permission from the individual land owners.
- The water side of the narrow base of the levee exhibits characteristics of potential emergent and riparian jurisdictional wetlands (presence of hydrophytic vegetation, wetland hydrology, and hydric soils).

See **Figures A-15a** and **A-15b** for site location map and representative photographs, respectively.



SOURCE: DWR 2017

2017 Storm Damage DWR Rehabilitation Program / 130028.39

Figure A-14a
Site 59, Sacramento River– Site Location Map



View of waterside levee toe erosion above emergency rock repair.



View of levee slope depression beneath pipe structure and emergency rock repair along levee waterside toe.

SOURCE: DWR 2017

2017 Storm Damage DWR Rehabilitation Program / 130028.39

Figure A-14b
Site 59, Sacramento River – Representative Photographs

Site 60, Sacramento River

General Characteristics	
Waterbody	Sacramento River
Bank (view downstream)	Left (East)
County	Sacramento
Local Maintaining Agency	RD551 - Pearson
Levee Problem Characteristics	
Levee Problem	Waterside erosion
Levee Miles (LM)	LM 6.22
Repair Characteristics	
Repair Type	Erosion
Work Limits (northing/easting)	NE 38.2642980714, -121.52500669 SE 38.2641510034, -121.525201034 SW 38.2644668557, -121.525599968 NW 38.2646112504, -121.525393489
Repair Length (linear feet)	120
Area of repair (acres)	0.09
Area of laydown (acres)	2.69
Estimated excavation (cubic yards)	537
Earthfill (cubic yards)	0
Aggregate base (tons)	0
Agricultural soil (tons)	238
Rockfill (tons)	927
Launch Rock (tons)	0
Bedding material (cubic yards)	0
Truck Loads	365
Final bank slope (H:V)	2H:1V
OHWL (estimated elevation in feet)	6
Area of repair below OHWL (acres)	0.01
Area of repair above OHWL (acres)	0.09 (Entirely on waterside levee slope)

The reconstructed slope will conform to the pre-existing levee slope of the failure area. In-water work required to place clean rock to buttress the slope fill.

The repair at Site 60 will include:

1. Enter the site from the levee road (County Road E13 [River Road]) or use barge services along the Sacramento River. Bathymetric surveys indicate the repair can be done by barge.
2. Identify utilities and protect in place. No utilities identified during the site visit.
3. Remove brush and fallen trees.

4. Excavate and remove soils disturbed by the erosion and fallen rock including unstable zones and loose material. In addition, excavate soils, loose materials and unstable rip rap in the transition zones adjacent to or within the failure.
5. Evaluate existing key way; if necessary and only where required, excavate a key way for the placement of launch rock at the toe of the failure extending into the waterway.
6. Shape back slope of levee slope for stability.
7. Place excavated material in interim lay down area for review by Native American Monitors.
8. Place geotextile on cleaned and shaped repair surface of levee in advance of placing rock.
9. Place clean launch rock beneath the water up to just 1 foot above water level, place geotextile and then soil filled rock fill above the water level at the time of construction.
10. Blend launch and soil filled rock fill protection at transition ends into the existing slopes of adjacent soils and/or rip rap and finish to grade
11. Remove excavated soils from interim laydown area to contractor disposal area.

There are no power poles with associated powerlines that cross the levee or other utilities that exists at the waterside levee hinge. Private and business properties with dwellings are located east of and adjacent to the landside levee. There is a small, private boat dock south of the site along the Sacramento River.

Estimated staging, species/habitat, and historical impacts:

- Two potential areas east of the landside of the levee appeared to have adequate space to be potential staging and interim laydown area. Access to the first space is south from the site on County Road E13 to Twin Cities Road where at the intersection is an open farm field. Access to the second space is north from the site on County Road E13 to Vorden Road, to an open farm field approximately 0.7 miles east of the intersection of River and Vorden Roads; however, access to the each of the lands would require permission from the individual land owners.
- The water side of the narrow base of the levee exhibits characteristics of potential emergent and riparian jurisdictional wetlands (presence of hydrophytic vegetation, wetland hydrology, and hydric soils).

See **Figures A-16a** and **A-16b** for site location map and representative photographs, respectively.



SOURCE: DWR 2017

2017 Storm Damage DWR Rehabilitation Program / 130028.39

Figure A-15a
Site 60, Sacramento River – Site Location Map



View of waterside levee erosion rock placement repair.



View of diversion structure at boat dock at southern end of erosion damage site.

SOURCE: DWR 2017

2017 Storm Damage DWR Rehabilitation Program / 130028.39

Figure A-15b
Site 60, Sacramento River – Representative Photographs

Site 61, Sacramento River

General Characteristics	
Waterbody	Sacramento River
Bank (view downstream)	Right (West)
County	Yolo
Local Maintaining Agency	RD999 - Netherlands
Levee Problem Characteristics	
Levee Problem	Waterside erosion
Levee Miles (LM)	LM 0.1
Repair Characteristics	
Repair Type	Erosion
Work Limits (northing/easting)	NE 38.4180712697, -121.525169492 SE 38.4151982473, -121.523273052 SW 38.4150295029, -121.523792136 NW 38.4178761766, -121.52566413
Repair Length (linear feet)	1,000
Area of repair (acres)	1.15
Area of laydown (acres)	1.89
Estimated excavation (cubic yards)	6,319
Earthfill (cubic yards)	0
Aggregate base (tons)	0
Agricultural soil (tons)	3,569
Rockfill (tons)	13,880
Launch Rock (tons)	5,886
Bedding material (cubic yards)	0
Truck Loads	4,778
Final bank slope (H:V)	Portions of 1.5H:1V and 2H:1V
OHWL (estimated elevation in feet)	9
Area of repair below OHWM (acres)	0.33
Area of repair above OHWM (acres)	0.83 (Entirely on waterside levee slope)

The reconstructed slope will conform to the pre-existing levee slope of the failure area. In-water work required to place clean rock to buttress the slope fill.

The repair at Site 61 will include:

1. Enter the site from the levee road (South River Road) or use barge services along the Sacramento River. Bathymetric surveys indicate the repair can be done by barge.
2. Identify trees, utilities, and wooden dock and protect in place.
3. Identify and remove erosion control poles.

4. Remove brush, fallen trees, and metal staircase on slope.
5. Excavate and remove all soils disturbed by the erosion and fallen rock including unstable zones and loose material. In addition, excavate soils, loose materials and unstable rip rap rock in the transition zones adjacent to or within the failure.
6. Excavate a key way for the placement of launch rock at the toe of the failure extending into the waterway.
7. Shape backslope of levee slope for stability.
8. Place excavated material in interim lay down area for review by Native American Monitors.
9. Place geotextile on cleaned and shaped repair surface of levee in advance of placing rock.
10. Place clean launch rock beneath the water up to just 1 foot above water level, place geotextile and then soil filled rock fill above the water level at the time of construction.
11. Blend launch and soil filled rock fill protection at transition ends into the existing slopes of adjacent soils and/or rip rap and finish to grade.
12. Remove excavated soils from interim laydown area to contractor disposal.

There are two power poles with associated powerlines that exists within the limit of work. Coordination with local utilities for relocation and protection will need to be considered during the remediation design and construction. There is also a wooden deck with a ramp that is to be protected in place.

Estimated staging, species/habitat, and historical impacts:

- One potential area along the landside of the levee north of the site appeared to have adequate space to be potential staging and laydown area. Access to the space is by an earth ramp; however, access to the land would require permission from the land owner. Another potential staging area is next to the Old Sugar Mill. The area is an open, flat, gravel lot with access via Willow Avenue.
- The water side of the narrow base of the levee exhibits characteristics of potential emergent and riparian jurisdictional wetlands (presence of hydrophytic vegetation, wetland hydrology, and hydric soils).

See **Figures A-17a** and **A-17b** for site location map and representative photographs, respectively.



SOURCE: DWR 2017

2017 Storm Damage DWR Rehabilitation Program / 130028.39

Figure A-16a
Site 61, Sacramento River – Site Location Map



View of boat dock with erosion occurring behind boat dock.



View of erosion along bank. Erosion control poles and boat dock visible in background.

SOURCE: DWR 2017

2017 Storm Damage DWR Rehabilitation Program / 130028.39

Figure A-16b

Site 61, Sacramento River – Representative Photographs

Site 62, San Joaquin River

General Characteristics	
Waterbody	San Joaquin River
Bank (view downstream)	Left (West)
County	San Joaquin
Local Maintaining Agency	RD524 – Middle Robert's Island
Levee Problem Characteristics	
Levee Problem	Waterside erosion
Levee Miles (LM)	LM 4.53
Repair Characteristics	
Repair Type	Erosion
Work Limits (northing/easting)	NE 37.892578109, -121.327980072 SE 37.8918124146, -121.328035327 SW 37.8919067294, -121.328326405 NW 37.892475613, -121.328287413
Repair Length (linear feet)	125
Area of repair (acres)	0.19
Area of laydown (acres)	0.84
Estimated excavation (cubic yards)	2,021
Earthfill (cubic yards)	0
Aggregate base (tons)	146
Agricultural soil (tons)	601
Rockfill (tons)	2,336
Launch Rock (tons)	889
Bedding material (cubic yards)	31
Truck loads	1,388
Final bank slope (H:V)	1.7H:1V
OHWL (estimated elevation in feet)	6
Area of repair below OHWL (acres)	0.03
Area of repair above OHWL (acres)	0.16 (Entirely on waterside levee slope)

The reconstructed slope will conform to the pre-existing levee slope of the failure area. In-water work required to place clean rock to buttress the slope fill. The repair at Site 62 will include:

1. Enter the site from the levee road. The levee road is gated.
2. Identify utilities and protect in place. No utilities were identified during site visit.
3. Remove dead tree and construction debris.
4. Excavate and remove all soils disturbed by the erosion including unstable zones and loose material. In addition, excavate soils, loose materials and unstable rip rap in the transition zones adjacent to or within the failure.

5. Evaluate existing key way; if necessary and only where required, excavate a key way for the placement of launch rock at the toe of the failure extending into the waterway.
6. Shape backslope of levee for stability.
7. Place excavated material in interim lay down area for review by Native American Monitors.
8. Place geotextile on cleaned and shaped repair surface of levee in advance of placing rock.
9. Place clean launch rock beneath the water up to just 1 foot above water level, place geotextile and then place rip rap rock above the water level at the time of construction.
10. Place soil filled rock fill from 1 foot above water to top of repair. There are no power poles with associated powerlines that cross the levee or other utilities that exists at the waterside levee hinge.
11. Blend launch and rock fill protection at transition ends into the existing slopes of adjacent soils and/or rip rap and finish to grade.
12. Remove excavated soils from interim laydown area to contractor disposal area.
13. Hydroseed soil filled rock fill and disturbed laydown and staging areas.

There are no power poles with associated powerlines that cross the levee or other utilities that exists at the waterside levee hinge.

Estimated staging, species/habitat, and historical impacts:

- One potential area south and adjacent to the landside of the levee appeared to have adequate space to be potential staging and laydown area. Access to the space is off the levee road from the site to an open farm field to the southwest; however, access to the land would require permission from the individual land owner.

See **Figures A-18a** and **A-18b** for site location map and representative photographs, respectively.



SOURCE: DWR 2017

2017 Storm Damage DWR Rehabilitation Program / 130028.39

Figure A-17a
Site 62, San Joaquin River– Site Location Map



View looking south of eroded bank with construction debris along waterside levee slope.



View of bank loss and construction debris

SOURCE: DWR 2017

2017 Storm Damage DWR Rehabilitation Program / 130028.39

Figure A-17b

Site 62, San Joaquin River – Representative Photographs

Site 63, Sacramento River

General Characteristics	
Waterbody	Sacramento River
Bank (view downstream)	Right (West)
County	Yolo
Local Maintaining Agency	RD307 - Lisbon
Levee Problem Characteristics	
Levee Problem	Waterside erosion
Levee Miles (LM)	NA
Repair Characteristics	
Repair Type	Erosion
Work Limits (northing/easting)	NE 38.4320717757, -121.532960796 SE 38.4311286749, -121.533064056 SW 38.431147861, -121.533494996 NW 38.4321281436, -121.533357818
Repair Length (linear feet)	210
Area of repair (acres)	0.42
Area of laydown (acres)	2.12
Estimated excavation (cubic yards)	2,746
Earthfill (cubic yards)	0
Aggregate base (tons)	0
Agricultural soil (tons)	360
Rockfill (tons)	3,761
Launch Rock (tons)	2,573
Bedding material (cubic yards)	0
Truck Loads	1,934
Final bank slope (H:V)	2H:1V
OHWL (estimated elevation in feet)	9
Area of repair below OHWM (acres)	0.15
Area of repair above OHWM (acres)	0.27 (Entirely on waterside levee slope)

The reconstructed slope will conform to the pre-existing levee slope of the failure area. In-water work required to place clean rock to buttress the slope fill.

The repair at Site 63 will include:

1. Enter the site from the levee road (County Road E9) or use barge services along the Sacramento River. Bathymetric surveys indicate the repair can be done by barge.
2. Identify trees and utilities and protect in place.
3. Remove brush and fallen trees.

4. Excavate and remove soils disturbed by the erosion and fallen rock including unstable zones and loose material. In addition, excavate soils and loose rip rap in the transition zones adjacent to failure.
5. Excavate a key way for the placement of launch rock at the toe of the failure extending into the waterway.
6. Shape backslope of levee for stability.
7. Place excavated material in interim lay down area for review by Native American Monitors.
8. Place geotextile on cleaned and shaped repair surface of levee in advance of placing rock.
9. Place clean launch rock beneath the water up to just 1 foot above water level, place geotextile and then soil filled rock fill above the water level at the time of construction.
10. Blend launch and soil filled rock fill protection at transition ends into the existing slopes of adjacent soils and/or rip rap and finish to grade.

Remove excavated soils from interim laydown area to contractor disposal area.

There is a pump station with a 4-inch and 6-inch steel conduit to be protected in place. There are no overhead powerline that crosses the levee; however, traffic guard rails exist at the landside levee hinge and private properties with dwellings are located west of and adjacent to the landside levee.

Estimated staging, species/habitat, and historical impacts:

- One potential area along the landside of the levee north of the site appeared to have adequate space to be potential staging and laydown area. Access to the space is by an earth ramp with some gravel into a farming storage yard; however, access to the land would require permission from the land owner. Another potential staging area is next to the Old Sugar Mill. The area is an open, flat, gravel lot with access via Willow Ave.
- The water side of the narrow base of the levee exhibits characteristics of potential emergent and riparian jurisdictional wetlands (presence of hydrophytic vegetation, wetland hydrology, and hydric soils).

See **Figures A-19a** and **A-19b** for site location map and representative photographs, respectively.



SOURCE: DWR 2017

2017 Storm Damage DWR Rehabilitation Program / 130028.39

Figure A-18a
Site 63, Sacramento River – Site Location Map



View of erosion and rock placement from emergency erosion repairs visible along waterside toe.



View at east extent of repair site showing erosion along waterside levee toe.

SOURCE: DWR 2017

2017 Storm Damage DWR Rehabilitation Program / 130028.39

Figure A-18b

Site 63, Sacramento River – Representative Photographs

Site 65, Sacramento River, (included with Site 63 Design Plan)

General Characteristics	
Waterbody	Sacramento River
Bank (view downstream)	Right (West)
County	Yolo
Local Maintaining Agency	RD307 - Lisbon
Levee Problem Characteristics	
Levee Problem	Waterside erosion
Levee Miles (LM)	LM 6.48
Repair Characteristics	
Repair Type	Erosion
Work Limits (northing/easting)	NE 38.4311286749, -121.533064056 SE 38.4306577888, -121.533012329 SW 38.4305928174, -121.533453962 NW 38.431147861, -121.533494996
Repair Length (linear feet)	150
Area of repair (acres)	0.27
Area of laydown (acres)	2.12
Estimated excavation (cubic yards)	577
Earthfill (cubic yards)	0
Aggregate base (tons)	0
Agricultural soil (tons)	0
Rockfill (tons)	0
Launch Rock (tons)	1,677
Bedding material (cubic yards)	0
Truck Loads	414
Final bank slope (H:V)	2H:1V
OHWL (estimated elevation in feet)	9
Area of repair below OHWL (acres)	0.10
Area of repair above OHWL (acres)	0.17 (Entirely on waterside levee slope)

The reconstructed slope will conform to the pre-existing levee slope of the failure area. In-water work required to place clean rock to buttress the slope fill.

The repair at Site 65 will include:

1. Enter the site from the levee road (County Road E9) or use barge services along the Sacramento River. Bathymetric surveys indicate the repair can be conducted by barge.
2. Identify trees and protect in place.
3. Remove brush and fallen trees.

4. Excavate and remove all soils disturbed by the erosion and fallen rock including unstable zones and loose material. In addition, excavate soils and loose rip rap in the transition zones adjacent to failure.
5. Excavate a key way for the placement of launch rock at the toe of the failure extending into the waterway.
6. Shape back slope of levee slope for stability.
7. Place excavated material in interim lay down area for review by Native American Monitors.
8. Place geotextile on cleaned and shaped repair surface of levee in advance of placing rock.
9. Place clean launch rock beneath the water up to just 1 foot above water level, place geotextile and then soil filled rock fill above the water level at the time of construction.
10. Blend launch and soil filled rock fill protection at transition ends into the existing slopes of adjacent soils and/or rip rap and finish to grade.
11. Remove excavated soils from interim laydown area to contractor disposal area.

There are no overhead powerline that crosses the levee; however, a traffic guard rail exists at the landside levee hinge and private properties with dwellings are located west of and adjacent to the landside levee. No signs of underground utilities or levee penetrations were observed.

Estimated staging, species/habitat, and historical impacts:

- One potential area along the landside of the levee north of the site appeared to have adequate space to be potential staging and laydown area. Access to the space is by a earth ramp with some gravel into a farming storage yard; however, access to the land would require permission from the land owner. Another potential staging area is next to the Old Sugar Mill. The area is an open, flat, gravel lot with access via Willow Ave.
- The water side of the narrow base of the levee exhibits characteristics of potential emergent and riparian jurisdictional wetlands (presence of hydrophytic vegetation, wetland hydrology, and

See **Figures A-20a** and **A-20b** for site location map and representative photographs, respectively.



SOURCE: DWR 2017

2017 Storm Damage DWR Rehabilitation Program / 130028.39

Figure A-19a
Site 65, Sacramento River – Site Location Map



View of erosion repair site where bank erosion occurred along waterside levee toe.



View of northeast extent of repair site where emergency rock was placed.

SOURCE: DWR 2017

2017 Storm Damage DWR Rehabilitation Program / 130028.39

Figure A-19b
Site 65, Sacramento River – Representative Photographs

Site 67, Sacramento River (included with Site 63 Design Plan)

General Characteristics	
Waterbody	Sacramento River
Bank (view downstream)	Right (West)
County	Yolo
Local Maintaining Agency	RD307 - Lisbon
Levee Problem Characteristics	
Levee Problem	Waterside erosion
Levee Miles (LM)	LM 6.51
Repair Characteristics	
Repair Type	Erosion
Work Limits (northing/easting)	NE 38.4306577888, -121.533012329 SE 38.4300739165, -121.532872141 SW 38.4300089473, -121.533323164 NW 38.4305928174, -121.533453962
Repair Length (linear feet)	180
Area of repair (acres)	0.24
Area of laydown (acres)	2.12
Estimated excavation (cubic yards)	294
Earthfill (cubic yards)	0
Aggregate base (tons)	0
Agricultural soil (tons)	0
Rockfill (tons)	0
Launch Rock (tons)	1,139
Bedding material (cubic yards)	0
Truck Loads	225
Final bank slope (H:V)	2H:1V
OHWL (estimated elevation in feet)	9
Area of repair below OHWM (acres)	0.09
Area of repair above OHWM (acres)	0.15 (Entirely on waterside levee slope)

The reconstructed slope will conform to the pre-existing levee slope of the failure area. In-water work required to place clean rock to buttress the slope fill.

The repair at Site 67 will include:

1. Enter the site from the levee road (County Road E9) or use barge services along the Sacramento River. Bathymetric surveys indicate the repair can be done by barge.
2. Remove brush and fallen trees.
3. Identify existing trees and infrastructure and protected in place.

4. Excavate and remove all soils disturbed by the erosion and fallen rock including unstable zones and loose material. In addition, excavate soils and loose rip rap in the transition zones adjacent to failure.
5. Excavate a key way for the placement of launch rock at the toe of the failure extending into the waterway.
6. Shape back slope of levee for stability.
7. Place excavated material in interim laydown area for review by Native American Monitors.
8. Place geotextile on cleaned and shaped repair surface of levee in advance of placing rock.
9. Place clean launch rock beneath the water up to just 1 foot above water level, place geotextile and then soil filled rock fill above the water level at the time of construction.
10. Blend launch and soil filled rock fill protection at transition ends into the existing slopes of adjacent soils and/or rip rap and finish to grade.
11. Remove excavated soils from interim laydown area to contractor disposal.

Three existing 12 inch steel conduits are to be protected in place. There are no overhead powerline that crosses the levee; however, a traffic guard rail exists at the landside levee hinge and private properties with dwellings are located west of and adjacent to the landside levee. No signs of underground utilities or levee penetrations were observed.

Estimated staging, species/habitat, and historical impacts:

- One potential area along the landside of the levee north of the site appeared to have adequate space to be potential staging and laydown area. Access to the space is by an earth ramp with some gravel into a farming storage yard; however, access to the land would require permission from the land owner. Another potential staging area is next to the Old Sugar Mill. The area is an open, flat, gravel lot with access via Willow Avenue.
- The water side of the narrow base of the levee exhibits characteristics of potential emergent and riparian jurisdictional wetlands (presence of hydrophytic vegetation, wetland hydrology, and hydric soils).

See **Figures A-21a** and **A-21b** for site location map and representative photographs, respectively.



SOURCE: DWR 2017

2017 Storm Damage DWR Rehabilitation Program / 130028.39

Figure A-20a
Site 67, Sacramento River – Site Location Map



View of northeast extent of repair site. Live trees will be protected during construction.



View of waterside levee erosion along waterside toe.

SOURCE: DWR 2017

2017 Storm Damage DWR Rehabilitation Program / 130028.39

Figure A-20b
Site 67, Sacramento River – Representative Photographs

Site 69, San Joaquin River

General Characteristics	
Waterbody	San Joaquin River
Bank (view downstream)	Left (West)
County	San Joaquin
Local Maintaining Agency	RD524 – Middle Robert's Island
Levee Problem Characteristics	
Levee Problem	Waterside erosion
Levee Miles (LM)	LM 1.3
Repair Characteristics	
Repair Type	Erosion
Work Limits (northing/easting)	NE 37.9326696872, -121.328514759 SE 37.9318998771, -121.32815759 SW 37.931829746, -121.328363581 NW 37.932618082, -121.328725609
Repair Length (linear feet)	350
Area of repair (acres)	0.23
Area of laydown (acres)	1.61
Estimated excavation (cubic yards)	1,741
Earthfill (cubic yards)	0
Aggregate base (tons)	197
Agricultural soil (tons)	570
Rockfill (tons)	2,217
Launch Rock (tons)	826
Bedding material (cubic yards)	223
Truck Loads	1,313
Final bank slope (H:V)	1.5H:1V
OHWL (estimated elevation in feet)	6
Area of repair below OHWL (acres)	0.04
Area of repair above OHWL (acres)	0.19 (Entirely on waterside levee slope)

The reconstructed slope will conform to the pre-existing levee slope of the failure area. In-water work required to place clean rock to buttress the slope fill.

The levee road is gated. For access, check in with Stockton Wastewater Treatment Plant (WWTP).

The repair at Site 69 will include:

1. Identify trees and utilities and protect in place.
2. Remove brush.

3. Excavate and remove all soils disturbed by the erosion including unstable zones and loose material. In addition, excavate soils, loose materials and unstable rip rap in the transition zones adjacent to or within the failure.
4. Evaluate existing key way; if necessary and only where required, excavate a key way for the placement of launch rock at the toe of the failure extending into the waterway.
5. Shape backslope of levee for stability.
6. Place excavated material in interim lay down area for review by Native American Monitors.
7. Place geotextile and then place rip rap rock from the bottom of key way to 1 foot above water during the time of construction.
8. Place 6 inches of bedding material (no geotextile) from one foot above the water to the top of repair.
9. Place soil filled rock fill from 1 foot above water to top of repair.
10. Blend launch and rock fill protection at transition ends into the existing slopes of adjacent soils and/or rip rap and finish to grade.
11. Remove excavated soils from interim laydown area to contractor disposal area.
12. Hydroseed soil filled rock fill and disturbed laydown and staging areas.

There are utilities that exist within and adjacent to the repair site. There are 2 pipes (one below the crown and one 17 feet below crown to protect in place). Near the southern end of the site there is a pipe that penetrates through the levee bank and down the waterside slope. To the south, adjacent to the site, is a former repair site having rip rap repair. To the west, power poles and power lines run along the landside levee toe.

Estimated staging, species/habitat, and historical impacts:

- Only one potential area west and approximately 4,000 feet from the site northwest of the levee appeared to have adequate space to be potential staging and interim laydown area. Access to the space is off and on to the waste treatment plant road adjacent to the levee running in a circular pattern around the waste water treatment plant ponds west of the repair site; however, access to the facility would require permission from the City of Stockton WWTP.
- The water side of the narrow base of the levee exhibits characteristics of potential emergent and riparian jurisdictional wetlands (presence of hydrophytic vegetation, wetland hydrology, and hydric soils).
- Elderberry shrubs occur within the site.

See **Figures A-22a** and **A-22b** for site location map and representative photographs, respectively.



SOURCE: DWR 2017

Figure A-21a
Site 69, San Joaquin River – Site Location Map



View looking south showing waterside levee erosion.



View of waterside erosion, continues throughout the entire repair site.

SOURCE: DWR 2017

2017 Storm Damage DWR Rehabilitation Program / 130028.39

Figure A-21b
Site 69, San Joaquin River – Representative Photographs

Site 70, San Joaquin River

General Characteristics	
Waterbody	San Joaquin River
Bank (view downstream)	Left (West)
County	San Joaquin
Local Maintaining Agency	RD524 – Middle Robert's Island
Levee Problem Characteristics	
Levee Problem	Waterside erosion
Levee Miles (LM)	LM 0.91
Repair Characteristics	
Repair Type	Erosion
Work Limits (northing/easting)	NE 37.9354310651, -121.333140126 SE 37.9352753762, -121.333168743 SW 37.9352998232, -121.333317549 NW 37.9354511759, -121.33328671
Repair Length (linear feet)	60
Area of repair (acres)	0.03
Area of laydown (acres)	1.60
Estimated excavation (cubic yards)	95
Earthfill (cubic yards)	0
Aggregate base (tons)	15
Agricultural soil (tons)	46
Rockfill (tons)	178
Launch Rock (tons)	107
Bedding material (cubic yards)	19
Truck Loads	82
Final bank slope (H:V)	2H:1V
OHWL (estimated elevation in feet)	6
Area of repair below OHWL (acres)	0.01
Area of repair above OHWL (acres)	0.02 (Entirely on waterside levee slope)

The reconstructed slope will conform to the pre-existing levee slope of the failure area. In-water work required to place clean rock to buttress the slope fill.

The levee road is gated. For access, check in with City of Stockton WWTP.

The repair at Site 70 will include:

1. Identify trees and protect in place.
2. Remove brush.

3. Excavate and remove all soils disturbed by the erosion including unstable zones and loose material. In addition, excavate soils, loose materials and unstable rip rap in the transition zones adjacent to or within the failure.
4. Evaluate existing key way; if necessary and only where required, excavate a key way for the placement of launch rock at the toe of the failure extending into the waterway.
5. Shape backslope of levee for stability.
6. Place excavated material in interim lay down area for review by Native American Monitors.
7. Place geotextile and then place rip rap rock from the bottom of key way to 1 foot above water during the time of construction.
8. Place 6 inches of bedding material (no geotextile) from one foot above the water to the top of repair.
9. Place soil filled rock fill from 1 foot above water to top of repair.
10. Blend launch and rock fill protection at transition ends into the existing slopes of adjacent soils and/or rip rap and finish to grade.
11. Remove excavated soils from interim laydown area to contractor disposal area.
12. Hydroseed soil filled rock fill and disturbed laydown and staging areas.

There are no power poles with associated powerlines that cross the levee; however, there are other utilities that exist at the waterside levee hinge. To the south of the site is a piping structure associated with the waste water treatment facility traveling through the levee bank, as well as, a small pipe that protrudes from the levee waterside bank.

Estimated staging, species/habitat, and historical impacts:

- Only one potential area west and approximately 1,800 feet from the site west of the levee appeared to have adequate space to be potential staging and laydown area. Access to the space is off and on to the waste treatment plant road adjacent to the levee running in a circular pattern around the waste water treatment plant ponds west of the repair site; however, access to the facility requires permission from the City of Stockton WWTP.
- The water side of the narrow base of the levee exhibits characteristics of potential emergent and riparian jurisdictional wetlands (presence of hydrophytic vegetation, wetland hydrology, and hydric soils).
- Elderberry shrubs occur adjacent to the laydown area.

See **Figures A-23a** and **A-23b** for site location map and representative photographs, respectively.



SOURCE: DWR 2017

Figure A-22a
Site 70, San Joaquin River – Site Location Map



Close up view of erosion on waterside levee bank and loss of waterside toe.



View of piping, rip rap, construction debris, and storm water erosion adjacent to repair

SOURCE: DWR 2017

2017 Storm Damage DWR Rehabilitation Program / 130028.39

Figure A-22b

Site 70, San Joaquin River – Representative Photographs

Site 71, Old River

General Characteristics	
Waterbody	Old River
Bank (view downstream)	Right (North)
County	San Joaquin
Local Maintaining Agency	RD544 – Upper Robert's Island
Levee Problem Characteristics	
Levee Problem	Waterside erosion
Levee Miles (LM)	LM 2.18
Repair Characteristics	
Repair Type	Erosion
Work Limits (northing/easting)	NE 37.8205768442, -121.345912535 SE 37.8202920837, -121.345623884 SW 37.8201448018, -121.345826348 NW 37.8204013877, -121.346177484
Repair Length (linear feet)	130
Area of repair (acres)	0.07
Area of laydown (acres)	0.61
Estimated excavation (cubic yards)	372
Earthfill (cubic yards)	0
Aggregate base (tons)	47
Agricultural soil (tons)	0
Rockfill (tons)	405
Launch Rock (tons)	412
Bedding material (cubic yards)	0
Truck Loads	256
Final bank slope (H:V)	1.5H:1V
OHWL (estimated elevation in feet)	6
Area of repair below OHWL (acres)	0.03
Area of repair above OHWL (acres)	0.04 (Entirely on waterside levee slope)

The reconstructed slope will conform to the pre-existing levee slope of the failure area. In-water work required to place clean rock to buttress the slope fill.

The repair at Site 71 will include:

1. Enter the site from the levee road.
2. Identify trees and utilities and protect in place.
3. Remove brush and fallen trees. Excavate and remove all soils disturbed by the erosion including unstable zones and loose material. In addition, excavate soils, loose materials and unstable rip rap in the transition zones adjacent to or within the failure.

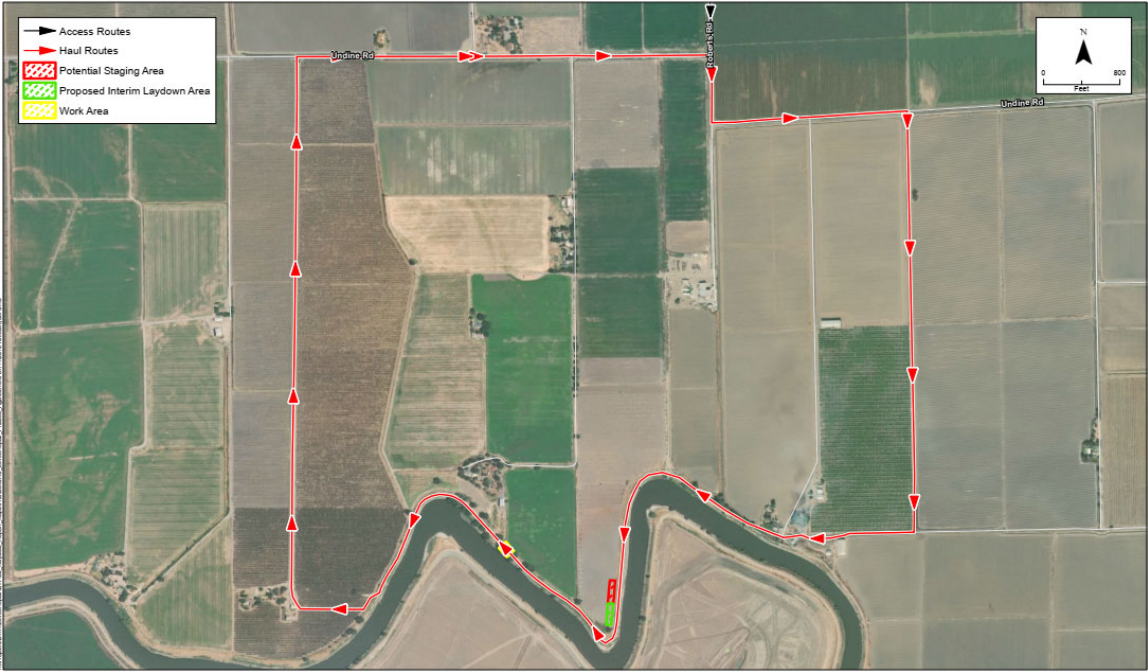
4. Evaluate existing key way; if necessary and only where required, excavate a key way for the placement of launch rock at the toe of the failure extending into the waterway.
5. Shape back slope of levee for slope stability.
6. Place excavated material in interim lay down area for review by Native American Monitors.
7. Place geotextile on cleaned and shaped repair surface of levee in advance of placing rock.
8. Place clean launch rock beneath the water up to just 1 foot above water level, place geotextile and then place rip rap rock above the water level at the time of construction.
9. Place soil filled rock fill from 1 foot above water to top of repair.
10. Blend launch and rock fill protection at transition ends into the existing slopes of adjacent soils and/or rip rap and finish to grade.
11. Remove excavated soils from interim laydown area to contractor disposal area.
12. Hydroseed soil filled rock fill and disturbed laydown and staging areas.

There are no power poles with associated powerlines that cross the levee or other utilities that exists at the waterside levee hinge. To the northwest of the site an intake structure with associated piping traveling up and through the levee bank exists.

Estimated staging, species/habitat, and historical impacts:

- Only one potential area southeast and approximately 1,475 feet from the site north of the levee appeared to have adequate space to be potential staging and laydown area. Access to the space is off and on to the levee road adjacent to the levee running north and south; however, access to the land would require permission from the individual land owner.
- The water side of the narrow base of the levee exhibits characteristics of potential emergent and riparian jurisdictional wetlands (presence of hydrophytic vegetation, wetland hydrology, and hydric soils).
- Elderberry shrub is present at this site.

See **Figures A-24a** and **A-24b** for site location map and representative photographs, respectively.



SOURCE: DWR 2017

2017 Storm Damage DWR Rehabilitation Program / 130028.39

Figure A-23a
Site 71, Old River – Site Location Map



Aerial view of erosion and emergency rock placement repair under tree.



View of pipe through levee west of erosion repair site.

SOURCE: DWR 2017

2017 Storm Damage DWR Rehabilitation Program / 130028.39

Figure A-23b
Site 71, Old River – Representative Photographs

Site 72, Old River

General Characteristics	
Waterbody	Old River
Bank (view downstream)	Right (West)
County	San Joaquin
Local Maintaining Agency	RD544 – Upper Robert's Island
Levee Problem Characteristics	
Levee Problem	Waterside erosion
Levee Miles (LM)	LM 5.36
Repair Characteristics	
Repair Type	Erosion
Work Limits (northing/easting)	NE 37.8139504355, -121.31945511 SE 37.8134674389, -121.318952409 SW 37.8132873057, -121.319227786 NW 37.8137454064, -121.319767749
Repair Length (linear feet)	220
Area of repair (acres)	0.13
Area of laydown (acres)	0.50
Estimated excavation (cubic yards)	677
Earthfill (cubic yards)	0
Aggregate base (tons)	104
Agricultural soil (tons)	281
Rockfill (tons)	1,094
Launch Rock (tons)	703
Bedding material (cubic yards)	0
Truck Loads	496
Final bank slope (H:V)	2H:1V
OHWL (estimated elevation in feet)	6
Area of repair below OHWL (acres)	0.03
Area of repair above OHWL (acres)	0.10 (Entirely on waterside levee slope)

The reconstructed slope will conform to the pre-existing levee slope of the failure area. In-water work required to place clean rock to buttress the slope fill.

The repair at Site 72 will include:

1. Enter the site from the levee road.
2. Identify trees and protect in place.
3. Remove brush and fallen trees, protect existing trees. Excavate and remove all soils disturbed by the erosion including unstable zones and loose material. In addition, excavate soils, loose materials and unstable rip rap in the transition zones adjacent to or within the failure.

4. Evaluate existing key way; if necessary and only where required, excavate a key way for the placement of launch rock at the toe of the failure extending into the waterway.
5. Shape back slope of levee slope for stability.
6. Place excavated material in interim lay down area for review by Native American Monitors.
7. Place geotextile on cleaned and shaped repair surface of levee in advance of placing rock.
8. Place clean launch rock beneath the water up to just 1 foot above water level, place geotextile and then place rip rap rock above the water level at the time of construction.
9. Place soil filled rock fill from 1 foot above water to top of repair.
10. Blend launch and rock fill protection at transition ends into the existing slopes of adjacent soils and/or rip rap and finish to grade.
11. Remove excavated soils from interim laydown area to contractor disposal area.
12. Hydroseed soil filled rock fill and disturbed laydown and staging areas.

There are no power poles with associated powerlines that cross the levee or other utilities that exists at the waterside levee hinge.

Estimated staging, species/habitat, and historical impacts:

- Only one potential area northwest and approximately 2,900 feet from the site west of the levee appeared to have adequate space to be potential staging and laydown area. Access to the space is off the levee road from the site to an open farm field to the northwest; however, access to the land would require permission from the individual land owner.
- The water side of the narrow base of the levee exhibits characteristics of potential emergent and riparian jurisdictional wetlands (presence of hydrophytic vegetation, wetland hydrology, and hydric soils).

See **Figures A-25a** and **A-25b** for site location map and representative photographs, respectively.



2017 Storm Damage DWR Rehabilitation Program / 130028.39

SOURCE: DWR 2017

Figure A-24a
Site 72, Old River – Site Location Map



Aerial view of erosion along waterside levee slope. Emergency rock repairs visible beneath existing tree.



View of waterside levee slope. Downed tree visible in the repair site.

SOURCE: DWR 2017

2017 Storm Damage DWR Rehabilitation Program / 130028.39

Figure A-24b

Site 72, Old River – Representative Photographs

Site 73, Old River

General Characteristics	
Waterbody	Old River
Bank (view downstream)	Right (West)
County	San Joaquin
Local Maintaining Agency	RD544 – Upper Robert's Island
Levee Problem Characteristics	
Levee Problem	Waterside erosion
Levee Miles (LM)	LM 4.99
Repair Characteristics	
Repair Type	Erosion
Work Limits (northing/easting)	NE 37.8185148183, -121.318687589 SE 37.8183382347, -121.318771659 SW 37.8186233536, -121.319373608 NW 37.8187881999, -121.319216819
Repair Length (linear feet)	175
Area of repair (acres)	0.12
Area of laydown (acres)	0.50
Estimated excavation (cubic yards)	889
Earthfill (cubic yards)	0
Aggregate base (tons)	121
Agricultural soil (tons)	250
Rockfill (tons)	974
Launch Rock (tons)	1,246
Bedding material (cubic yards)	0
Truck Loads	638
Final bank slope (H:V)	2H:1V
OHWL (estimated elevation in feet)	6
Area of repair below OHWL (acres)	0.06
Area of repair above OHWL (acres)	0.06 (Entirely on waterside levee slope)

The reconstructed slope will conform to the pre-existing levee slope of the failure area. In-water work required to place clean rock to buttress the slope fill. The repair at Site 73 will include:

1. Enter the site from the levee road. The levee road is gated.
2. Identify trees and protect in place. No utilities were identified during the site visit.
3. Remove brush and fallen trees. Excavate and remove all soils disturbed by the erosion including unstable zones and loose material. In addition, excavate soils, loose materials and unstable rip rap in the transition zones adjacent to or within the failure.

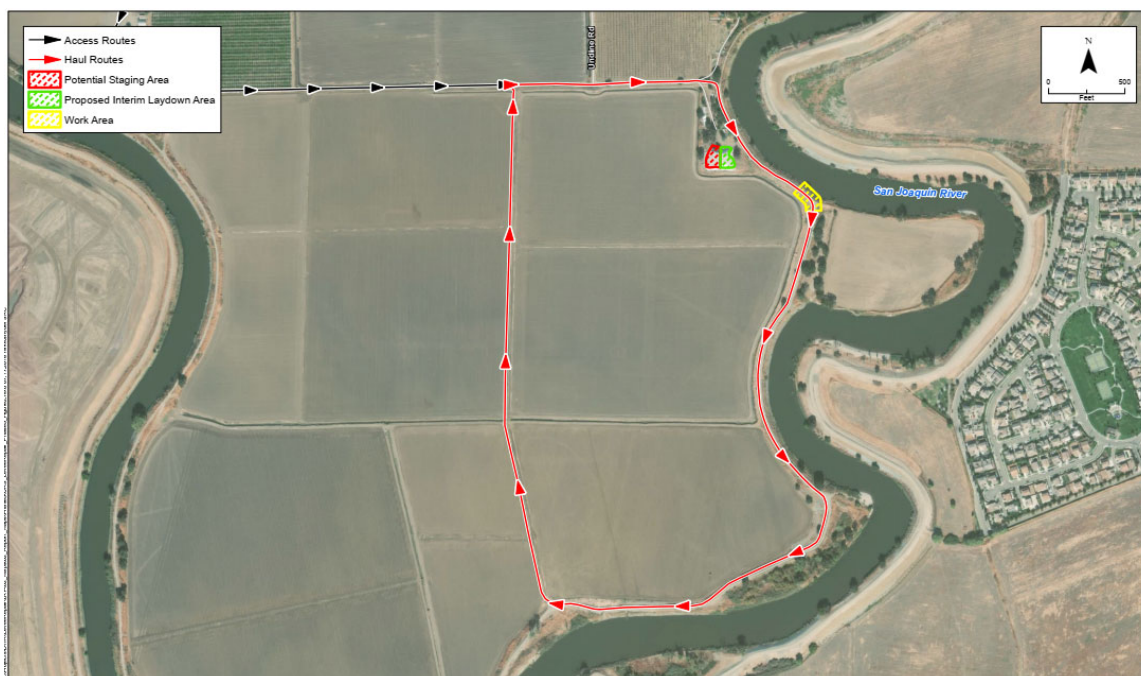
4. Evaluate existing key way; if necessary and only where required, excavate a key way for the placement of launch rock at the toe of the failure extending into the waterway.
5. Shape slope for stability.
6. Place excavated material in interim lay down area for review by Native American Monitors.
7. Place geotextile on cleaned and shaped repair surface of levee in advance of placing rock.
8. Place clean launch rock beneath the water up to just 1 foot above water level, place geotextile and then place rip rap rock above the water level at the time of construction.
9. Place soil filled rock fill from 1 foot above water to top of repair.
10. Blend launch and rock fill protection at transition ends into the existing slopes of adjacent soils and/or rip rap and finish to grade.
11. Remove excavated soils from interim laydown area to contractor disposal area.
12. Hydroseed soil filled rock fill and disturbed laydown and staging areas.

There are no power poles with associated powerlines that cross the levee or other utilities that exists at the waterside levee hinge.

Estimated staging, species/habitat, and historical impacts:

- Only one potential area northwest and approximately 670 feet from the site west of the levee appeared to have adequate space to be potential staging and laydown area. Access to the space is off the levee road from the site to an open farm field to the northwest; however, access to the land would require permission from the individual land owner.
- The water side of the narrow base of the levee exhibits characteristics of potential emergent and riparian jurisdictional wetlands (presence of hydrophytic vegetation, wetland hydrology, and hydric soils).

See **Figures A-26a** and **A-26b** for site location map and representative photographs, respectively.



SOURCE: DWR 2017

2017 Storm Damage DWR Rehabilitation Program / 130028.39

Figure A-25a
Site 73, Old River – Site Location Map



Aerial view of erosion with rock repair armoring longitudinally along repair site.



View of southern end of erosion along waterside levee slope.

SOURCE: DWR 2017

2017 Storm Damage DWR Rehabilitation Program / 130028.39

Figure A-25b
Site 73, Old River – Representative Photographs

Site 74, Old River

General Characteristics	
Waterbody	Old River
Bank (view downstream)	Right (West)
County	San Joaquin
Local Maintaining Agency	RD544 – Upper Robert's Island
Levee Problem Characteristics	
Levee Problem	Waterside erosion, riprap displacement
Levee Miles (LM)	LM 3.82
Repair Characteristics	
Repair Type	Erosion
Work Limits (northing/easting)	NE 37.829935437, -121.311876106 SE 37.8293323685, -121.311666388 SW 37.8292916541, -121.311962998 NW 37.8298585633, -121.312149948
Repair Length (linear feet)	250
Area of repair (acres)	0.23
Area of laydown (acres)	0.59
Estimated excavation (cubic yards)	1,312
Earthfill (cubic yards)	0
Aggregate base (tons)	94
Agricultural soil (tons)	648
Rockfill (tons)	2,522
Launch Rock (tons)	1,357
Bedding material (cubic yards)	0
Truck Loads	981
Final bank slope (H:V)	1.5H:1V
OHWL (estimated elevation in feet)	6
Area of repair below OHWL (acres)	0.08
Area of repair above OHWL (acres)	0.15 (Entirely on waterside levee slope)

The reconstructed slope will conform to the pre-existing levee slope of the failure area. In-water work required to place clean rock to buttress the slope fill.

The repair at site 74 will include:

1. Enter the site from the levee road. The levee road is gated.
2. Identify trees and protect in place.
3. Remove brush and fallen trees. Protect in place all elderberry shrubs. Protect in place to maximum extent practicable all native riparian trees, County Ordinance protected oaks and heritage trees.

4. Excavate and remove all soils disturbed by the erosion including unstable zones and loose material. In addition, excavate soils, loose materials and unstable rip rap in the transition zones adjacent to or within the failure.
5. Evaluate existing key way; if necessary and only where required, excavate a key way for the placement of launch rock at the toe of the failure extending into the waterway.
6. Shape backslope of levee for stability.
7. Place excavated material in interim lay down area for review by Native American Monitors.
8. Place geotextile on cleaned and shaped repair surface of levee in advance of placing rock.
9. Place clean launch rock beneath the water up to just 1 foot above water level, place geotextile and then place rip rap rock above the water level at the time of construction.
10. Place soil filled rock fill from 1 foot above water to top of repair.
11. Blend launch and rock fill protection at transition ends into the existing slopes of adjacent soils and/or rip rap and finish to grade.
12. Remove excavated soils from interim laydown area to contractor disposal area.
13. Hydroseed soil filled rock fill and disturbed laydown and staging areas.

There are no power poles with associated powerlines that cross the levee or other utilities that exists at the waterside levee hinge.

Estimated staging, species/habitat, and historical impacts:

- Only one potential area southwest and approximately 0.15 miles from the site west of the levee appeared to have adequate space to be potential staging and laydown area. Access to the space is off the levee road from the site to an open farm field to the southwest; however, access to the land would require permission from the individual land owner.
- The water side of the narrow base of the levee exhibits characteristics of potential emergent and riparian jurisdictional wetlands (presence of hydrophytic vegetation, wetland hydrology, and hydric soils).
- Several elderberry shrubs grow in the repair area.

See **Figures A-27a** and **A-27b** for site location map and representative photographs, respectively.



2017 Storm Damage DWR Rehabilitation Program / 130028.39

Figure A-26a
Site 74, Old River – Site Location Map



Aerial view of erosion with rock placement along waterside levee toe.



View of rip rap repair above erosion along waterside levee slope.

SOURCE: DWR 2017

2017 Storm Damage DWR Rehabilitation Program / 130028.39

Figure A-26b
Site 74, Old River – Representative Photographs

Site 76, Elder Creek

General Characteristics	
Waterbody	Elder Creek
Bank (view downstream)	Right (North)
County	Tehama
Local Maintaining Agency	Tehama County Flood Control and Water Conservation District – NA19
Levee Problem Characteristics	
Levee Problem	Waterside erosion
Levee Miles (LM)	LM 1.43
Repair Characteristics	
Repair Type	Erosion
Work Limits (northing/easting)	NE 40.0521546959, -122.163102488 SE 40.0518761455, -122.162935461 SW 40.0514734147, -122.164070591 NW 40.0517515855, -122.164237563
Repair Length (linear feet)	370
Area of repair (acres)	0.27
Area of laydown (acres)	2.09
Estimated excavation (cubic yards)	1,747
Earthfill (cubic yards)	0
Aggregate base (tons)	164
Agricultural soil (tons)	957
Rockfill (tons)	3,721
Launch Rock (tons)	0
Bedding material (cubic yards)	0
Truck Loads	1,240
Final bank slope (H:V)	2.25H:1V
OHWM (estimated elevation in feet)	244
Area of repair below OHWM (acres)	0.12
Area of repair above OHWM (acres)	0.16 (Entirely on waterside levee slope)

Levee performance is affected by erosion along a 370-foot section of the waterside levee slope. The reconstructed slope will conform to the pre-existing levee slope of the failure area. The subject levee is under the maintenance responsibility of the local maintaining agency Tehama County. Access to the levee is impeded by a locked levee gate. To access this levee, a key from the local maintaining agency is required.

The repairs at Site 76 will include:

1. Enter the site from the levee road.
2. Remove brush, fallen trees, stumps, snags, dead and dying trees.

3. Excavate and remove all loose and disturbed material/soils and any potential unstable zones.
4. Shape backslope of levee for stability.
5. Place excavated material in interim lay down area for review by Native American Monitors.
6. Place geotextile on cleaned and shaped repair surface of levee in advance of placing rock.
7. Place clean launch rock beneath the water up to just 1 foot above water level, place geotextile and then place rip rap rock above the water level at the time of construction.
8. Place soil filled rock fill from 1 foot above water to top of repair.
9. Blend launch and rock fill protection at transition ends into the existing slopes of adjacent soils and/or rip rap and finish to grade.
10. Remove excavated soils from interim laydown area to contractor disposal area.
12. Hydroseed soil filled rock fill and disturbed laydown and staging areas. The land side slope contains overhead utilities at the toe road.

There are no power poles with associated powerlines that cross the levee or other utilities that exists at the waterside levee hinge.

Estimated staging, species/habitat, and historical impacts:

- Two proposed areas have been identified as potential staging and interim laydown areas. Both locations have good access and ample room for staging/laydown activities. Staging areas are on private property and will require permission from the land owner.
- The water side of the narrow base of the levee downstream of the past rock slope protection repair area exhibits characteristics of potential emergent and riparian jurisdictional wetlands (presence of hydrophytic vegetation, wetland hydrology, and hydric soils).

See **Figures A-28a** and **A-28b** for site location map and representative photographs, respectively.



– 2017 Storm Damage DWR Rehabilitation Program / 130028.39

SOURCE: DWR 2017

Figure A-27a
Site 76, Elder Creek – Site Location Map



Aerial imagery of erosion and emergency rock repair at the damaged site.



Bank erosion and emergency rock repair at the waterside toe of damaged site.

SOURCE: DWR 2017

2017 Storm Damage DWR Rehabilitation Program / 130028.39

Figure A-27b

Site 76, Elder Creek – Representative Photographs

Site 77, Georgiana Slough

General Characteristics	
Waterbody	Georgiana Slough
Bank (view downstream)	Left (East)
County	Sacramento
Local Maintaining Agency	RD563 – Tyler Island
Levee Problem Characteristics	
Levee Problem	Waterside erosion, riprap failing
Levee Miles (LM)	LM 9.73
Repair Characteristics	
Repair Type	Erosion
Work Limits (northing/easting)	NE 38.1508540483, -121.59391461 SE 38.1507219401, -121.594022966 SW 38.1508505572, -121.594324642 NW 38.1509989299, -121.594241375
Repair Length (linear feet)	120
Area of repair (acres)	0.04
Area of laydown (acres)	1.28
Estimated excavation (cubic yards)	240
Earthfill (cubic yards)	0
Aggregate base (tons)	47
Agricultural soil (tons)	65
Rockfill (tons)	253
Launch Rock (tons)	190
Bedding material (cubic yards)	0
Truck Loads	165
Final bank slope (H:V)	3H:1V
OHWL (estimated elevation in feet)	6
Area of repair below OHWL (acres)	0.01
Area of repair above OHWL (acres)	0.03 (Entirely on waterside levee slope)

The reconstructed slope will conform to the pre-existing levee slope of the failure area. In-water work required to place clean rock to buttress the slope fill.

The repair at Site 77 will include:

1. Enter the site from the levee road (off Tyler Island Road). The levee road is gated.
2. Identify utilities and protect in place. No utilities were identified during the site visit.
3. Remove vegetation.

4. Excavate and remove all soils disturbed by the erosion including unstable zones and loose material. In addition, excavate soils, loose materials and unstable rip rap in the transition zones adjacent to or within the failure.
5. Evaluate existing key way; if necessary and only where required, excavate a key way for the placement of launch rock at the toe of the failure extending into the waterway.
6. Shape back slope of levee for slope stability.
7. Place excavated material in interim lay down area for review by Native American Monitors.
8. Place geotextile on cleaned and shaped repair surface of levee in advance of placing rock.
9. Place clean launch rock beneath the water up to just 1 foot above water level, place geotextile and then soil filled rock fill above the water level at the time of construction.
10. Place soil filled rock fill from 1 foot above water to top of repair.
11. Blend launch and soil filled rock fill protection at transition ends into the existing slopes of adjacent soils and/or rip rap and finish to grade.
12. Remove excavated soils from interim laydown area to contractor disposal area.
13. Hydroseed soil filled rock fill and disturbed laydown and staging areas.

There are no power poles with associated powerlines that cross the levee or other utilities that exists at the waterside levee hinge. The site is across from the Ox-bow Marina.

Estimated staging, species/habitat, and historical impacts:

- One potential area south and adjacent to the landside of the levee appears to have adequate space to be potential staging and laydown area. Access to the space is off the levee road from the site to an open farm field; however, access to the land would require permission from the individual land owner.
- The water side of the narrow base of the levee exhibits characteristics of potential emergent and riparian jurisdictional wetlands (presence of hydrophytic vegetation, wetland hydrology, and hydric soils).

See **Figures A-29a** and **A-29b** for site location map and representative photographs, respectively.



SOURCE: DWR 2017

2017 Storm Damage DWR Rehabilitation Program / 130028.39

Figure A-28a
Site 77, Georgiana Slough – Site Location Map



View of erosion along waterside levee slope.



View of erosion and animal burrows along levee slope.

SOURCE: DWR 2017

2017 Storm Damage DWR Rehabilitation Program / 130028.39

Figure A-28b
Site 77, Georgiana Slough – Representative Photographs

Site 79, Butte Creek

General Characteristics	
Waterbody	Butte Creek
Bank (view downstream)	Left (East)
County	Butte
Local Maintaining Agency	State Maintained Area 5 – Sutter Maintenance Yard
Levee Problem Characteristics	
Levee Problem	Waterside erosion
Levee Miles (LM)	LM 1.6
Repair Characteristics	
Repair Type	Erosion
Work Limits (northing/easting)	Start Lat/Long: 39.676298, -121.778272 End Lat/Long: 39.675818, -121.77863
Repair Length (linear feet)	400
Area of repair (acres)	0.2
Area of laydown (acres)	0.50
Estimated excavation (cubic yards)	2,444
Earthfill (cubic yards)	0
Aggregate base (tons)	309
Agricultural soil (tons)	114
Rockfill (tons)	4,355
Launch Rock (tons)	4,355
Bedding material (cubic yards)	0
Truck Loads	1,635
Final bank slope (H:V)	1.7H:1V
OHWL (estimated elevation in feet)	185
Area of repair below OHWM (acres)	0.07
Area of repair above OHWM (acres)	0.13 (Entirely on waterside levee slope)

The reconstruction of the levee slope will conform to the pre-existing levee slope of the failure area. In-water work required to place clean rock and buttress the slope fill.

The repair at Butte Creek Site 79 will include:

1. Enter the site from the levee road. The subject levee is impeded by a locked levee gate.
2. Identify trees and protect in place.
3. Remove brush, fallen trees, stumps, snags, dead and dying trees.
4. Excavate and remove all loose and disturbed material/soils and any potential unstable zones.

5. Excavate and remove all soils disturbed by the erosion including unstable zones and loose material. In addition, excavate soils, loose materials and unstable rip rap in the transition zones adjacent to or within the failure.
6. Shape backslope of levee for stability.
7. Place excavated material in interim lay down area for review by Native American Monitors.
8. Place geotextile on cleaned and shaped repair surface of levee in advance of placing rock.
9. Place clean launch rock beneath the water up to just 1 foot above water level, place geotextile and then place rip rap rock above the water level at the time of construction.
10. Place soil filled rock fill from 1 foot above water to top of repair.
11. Blend launch and rock fill protection at transition ends into the existing slopes of adjacent soils and/or rip rap and finish to grade.

There are power poles that may have associated powerlines that cross the levee on the downstream edge of the repair segment. No utilities were identified at the waterside levee hinge although private properties are located on the landside of the levee segment.

Estimated staging, species/habitat, and historical impacts:

- Proposed areas have been identified as potential staging and interim laydown areas. The locations have good access and ample room for staging/laydown activities.
- The water side of the narrow base of the levee exhibits characteristics of potential emergent and riparian jurisdictional wetlands (presence of hydrophytic vegetation, wetland hydrology, and hydric soils).

See **Figures A-30a** and **A-30b** for site location map and representative photographs, respectively.



SOURCE: DWR 2017

Figure A-29a
Site 79, Butte Creek – Site Location Map



Bank erosion at damaged site.



View looking upstream of erosion along southern levee slope.

SOURCE: DWR 2017

2017 Storm Damage DWR Rehabilitation Program / 130028.39

Figure A-29b

Site 79, Butte Creek – Representative Photographs