

## ATTACHMENT B (i): Detailed Descriptions of Project Components for the Cullinan Ranch Restoration Project.

The following descriptions of the project components are from the US FWS permit application form to restore Cullinan Ranch submitted by Ducks Unlimited to the Water Board . Some changes have been made in the Order for this project. The Order should take precedence over any of the descriptions contained in this attachment.

The project would include implementation of the following components:

Component 1 – Block existing drainage ditches to promote redevelopment of the natural sloughs

Component 2 – Improve the Pond 1 levee and install water control structures

Component 3 - Protect Highway 37 from flooding and erosion

Component 4 – Construct public access areas

Component 5 – Pre-flood Cullinan Ranch site prior to breaching the levees

Component 6 – Lower levees for near-term habitat creation

Component 7 – Breach the levees along Dutchman and South Sloughs and Guadalcanal Village, and

Component 8 – Long-term monitoring and management

These project components are summarized in Findings 21 to 28 in the Order and provided in more detail below.

### **Component 1 – Block Drainage Ditches Created for Agricultural Purposes to Promote Redevelopment of the Natural Channel Network**

As part of the agricultural operations at the site, linear drainage channels were excavated in some areas. These channels could act as preferred drainages once tidal action is reintroduced to the site, and could prevent or slow the formation of natural, meandering channel systems. Some of these channels may be blocked by depositing soil and loosely compacting short portions of the channels (typically 10 feet top width or less). These ditch blocks would be constructed of on-site soils retrieved from the existing internal berms, or material from the excavation of the channel at CDFG Pond 1 if there is sufficient material available after the improvements to the Pond 1 levee are complete. The ditch blocks would be constructed to an elevation equal to the adjacent land surface, and would be constructed prior to breaching. Because these ditch blocks are not a required element of any other construction component, they can be constructed at any time prior to breaching when suitable excavated material is available.

## **Component 2 – Improve the Pond 1 Levee and Install Water Control Structures**

**(Note: This work will be addressed under the Napa Sonoma Marsh Restoration Project and its associated permits. A permit amendment request for this work was recently submitted by DFG and approved by the Water Board.)**

A channel would be constructed by CDFG in Pond 1 to improve circulation in Pond 1, and to create a hydrologic connection to Cullinan Ranch. Two water control structures would be installed in the Pond 1 levee to provide pre-breach (flood-up) water and circulation between Pond 1 and Cullinan Ranch. The existing CDFG Pond 1 levee would be reinforced and raised to elevation 8 feet NGVD 1929, where necessary. The borrow ditch adjacent to the Pond 1 levee on the Cullinan Ranch site would be filled with material from CDFG Pond 1, and the eastern slope of the Pond 1 levee would be flattened to approximately 7:1 (H:V). Excess material generated from the channel construction would be utilized on the Cullinan Ranch site. Material to raise the levee would likely have to be imported because the excavated material from Pond 1 would not have the proper geotechnical and engineering characteristics.

## **Component 3 – Protect Highway 37 from Flooding and Erosion<sup>1</sup>**

The Highway 37 embankment forms the southern levee of the Cullinan Ranch property. The embankment elevation at the edge of the pavement ranges from 4 to 11 feet (NGVD 1929). Hydrologic studies conducted by Moffat & Nichol Engineers (Moffat & Nichol Engineers and Hydroikos Associates, 2004) determined that if the Cullinan Ranch site were to be restored without adequately protecting the embankment, it is likely that the eastern portion of Highway 37 would be flooded during combined high tide and storm events. In addition to flooding, inadequate protection of the Highway 37 embankment from wind-induced waves from within the Cullinan Ranch site could result in significant erosion of the highway embankment. Tidal marsh restoration at the Cullinan Ranch Site cannot be accomplished without protecting the Highway 37 embankment.

The Highway 37 embankment will be protected by constructing a 3,500-foot-long buttress levee on the north side of Highway 37, at the eastern edge of the site. The existing drain at the toe of the embankment (toe drain) will be filled to match the adjacent field elevation as part of the buttress levee construction to provide a firm base for the armoring. The buttress levee will be constructed with a top elevation of 9.0 feet NGVD 1929, have a 5:1 horizontal to vertical slope from 9 feet to 8 feet, below which it will transition to a 10:1 slope. If practical, pickleweed will be collected from the toe drain along the Highway 37 embankment prior to construction, stockpiled, and planted on the finished slope. Planting plugs or hydroseeding with native species on the buttress levee may also be implemented to further enhance the embankment's habitat value and ability to resist erosion.

The remaining approximately 12,100 feet of highway embankment will be armored to prevent wind-wave erosion. Revetment above elevation 7 feet NGVD 1929 will be

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<sup>1</sup> The levee on the Cullinan Ranch side of Highway 37 is within BCDC Shoreline Band jurisdiction.

backfilled and covered with clean soil and planted with salt-tolerant native grasses or salvaged pickleweed to reduce habitat for non-native predators and reduce the establishment of non-native plant species. The intent of the grass cover is to minimize infestation by non-native or invasive plant species, as depicted in the typical cross section shown in Figure 5.

The buttress levee will be higher in elevation than the eastern section of Highway 37 that it is protecting. The buttress levee design will include a grassy swale below the highway shoulder to convey rainwater away from the embankment. A Stormwater Pollution Prevention Plan (SWPPP) would be developed prior to construction and would include BMPs to control construction-related runoff and prevent any discharges to surrounding water. The water will drain eastward into a detention basin constructed out of an abandoned ditch segment between Guadalcanal Village and Highway 37, where it will be held until it can drain into the Cullinan Ranch Site at low tide through tide gates. Discharge of both construction and post-construction stormwater runoff would comply with California Department of Transportation (CalTrans)'s existing NPDES permit. Alternatively, the stormwater could potentially be diverted into the existing drainage canals located near Guadalcanal Village and the Mare Island Bridge.

*The buttress levee, riprap armoring, deceleration lanes (discussed below with public access) are all located within CalTrans' Right-of-Way. As a matter of public safety, the design for these components will be closely coordinated with CalTrans. Construction-related vehicular routing would also be coordinated with CalTrans and other agencies as necessary. Design details, plans and other technical information will be submitted to CalTrans at appropriate design levels for their review and comment.*

#### **Component 4 – Construct Public Access Features**

The Cullinan Ranch Site is currently closed to the public except for docent-led bird tours. The project would significantly improve and add public access (Figure 6). The CDFG Pond 1 levee serves as the public access point to Cullinan Ranch Site. During construction, access to the Cullinan Ranch Site via the Pond 1 levee would be restricted until augmentation of the Pond 1 levee is completed and access from Highway 37 is improved. Although many of the public access improvements are located on CDFG property, the improvements will be constructed as part of this project. The project would add the following public access improvements:

- Acceleration and deceleration lanes from Highway 37 to provide safer vehicular access,
- Construction of a kayak launch site previously permitted under CDFG Permit Order R2-2004-0063 and amendment,
- Installation of a viewing platform with interpretive signs and benches,
- Construction of a 100-foot long fishing pier,
- Construction of graded intertidal benches with pickleweed and other native tidal marsh plant species near the parking lot to provide interpretation opportunities, and
- Resurfacing 7,000 feet of the Pond 1 levee to improve the informal trail access previously permitted under CDFG Order R2-2004-0063 and amendment (paid for by USFWS).

Some of the planned public access that is part of and funded by this USFWS restoration project will occur on or adjacent to the CDFG Pond 1 levee. Due to the landownership, CDFG has requested a permit amendment for some of the work under the existing Napa Sonoma Marsh Restoration Project permit (RWQCB Order R2-2004-0063 and amendment) (Table 3). The public access improvements located on USFWS property are included in this permit application.

**Table 3. Location of Public Access Features**

<b>Public Access Feature</b>	<b>Located on USFWS Property (part of this permit application)</b>	<b>Located on CDFG Property (part of a request to amend Order R2-2004-0063 )</b>
Parking lot		Entire lot (existing)
Acceleration Lane		Entire lane (750 feet)
Deceleration Lane	660 feet	90 feet
Kayak Launch Site <sup>2</sup>		Entire launch site
Fishing Pier		Entire pier
Viewing Platform		Entire platform
Graded intertidal Benches	Approximately 2/3 (included in deceleration lane footprint)	Approximately 1/3 (overlaps with viewing platform footprint)
Resurfacing Pond 1 Levee <sup>3</sup>		Entire levee

A deepwater channel would be excavated prior to flood up of the Cullinan site to connect the kayak launch site to natural slough channels. The material would be side-cast and graded into the adjacent area and reused on-site to raise the marsh plain elevation or levees. The fishing pier would be constructed of on-site or imported material on CDFG property and extend out from the Pond 1 levee to a pile supported substructure.

An existing wide section of the Pond 1 levee located close to Highway 37 includes a paved 10-vehicle parking area for recreational users. Access to or from the Highway 37 can be hazardous due to the lack of acceleration and deceleration lanes (a sharp right, 90° turn is required to enter and exit the parking lot). Paved acceleration and deceleration lanes would be installed on the north side of Highway 37 as part of this project along the westbound lane, before and after the Pond 1 levee to facilitate safe highway deceleration and merging. The acceleration lane and a portion of the deceleration lane along the CDFG Pond 1 site will be permitted under an existing CDFG permit. The portion of the deceleration lane located on the USFWS Cullinan Ranch site property is included in this

<sup>2</sup> Permitted under CDFG RWQCB Order R2-2004-0063 and amendments

<sup>3</sup> Permitted under CDFG RWQCB Order R2-2004-0063 and amendments

permit. Construction of the deceleration lane would necessitate the widening of the Highway 37 embankment along its path and the filling of approximately 0.30 acres of open water ditch adjacent to Highway 37.

### **Component 5 – Pre-flood Cullinan Ranch Site Prior to Breaching the Levees**

The Site has lain fallow for over a decade, allowing ruderal upland vegetation and wetland habitats, primarily seasonal wetlands, to form. Mammals that have populated the Site would be displaced when tidal flow is restored. To allow slow emigration of animals from the Site, the flooding of the site would be phased. In the first phase the Site would be slowly flooded in midwinter (when water naturally ponds in the site) using the water control structures installed by USFWS in CDFG's Pond 1 levee for this project. Once the Site is flooded to a depth of one foot and animals have had an opportunity to emigrate, the levee between the site and South and Dutchman Sloughs would be breached as described in Component 7. The Guadalcanal Breach opening may also be opened at this time. This breach was engineered but not opened as part of the CalTrans Guadalcanal mitigation project.

Anaerobic conditions may form during the pre-flood period depending on the length of time water is held in Cullinan Ranch prior to breaching the outboard levees. Water quality monitoring (for dissolved oxygen, temperature, salinity, pH, and turbidity, or as required under this proposed permit) within the Site and in the sloughs adjacent to the Site would be instituted before and after the Site is flooded to assess pre- and post-breach water quality. Breaches will be phased, if necessary, to protect receiving water quality. In addition, the levee will be breached on an incoming tide, to drive higher quality water into the site prior to the initial discharge. The volume of water within the site is small compared to winter flows and daily tidal exchange in this part of the Napa River Estuary. Any discharge into the sloughs from Cullinan Ranch Site during breaching would be quickly diluted.

### **Component 6 – Lower Levees for Near-term Habitat Creation**

To ensure availability of habitat for salt marsh harvest mice in the near term, a minimum of 30 acres suitable for the immediate colonization by mid-to-high marsh vegetation would be created through levee lowering and grading activities along sections of the Dutchman and South Slough levees. Portions of the northern levee would be lowered to around mean higher high water, and material from levee lowering would be placed on some of the interior levee slopes to create additional acreage at the proper elevation for vegetation colonization. If sufficient clean material becomes available, including beneficial reuse of dredged sediments, and funding allows, up to 50 additional acres of habitat suitable for marsh colonization would be created adjacent to Guadalcanal Village. All imported soils or sediment will have to meet "wetland surface material" screening criteria as described in the USFWS Biological Opinion.

To expedite the establishment of tidal marsh, the northern levee will be lowered, interior levee slopes will be flattened and select areas within the Site raised with imported and/or on-site soil. These actions are intended to improve marsh plain continuity, increase tidal

circulation, reduce predator access, reduce the opportunities for invasive species to colonize the site, and increase the area suitable for near-term establishment of tidal marsh vegetation. All soils will be placed prior to breaching the site.

The site has subsided significantly and is bounded by utilitarian levees with typical side slopes of 3:1 (H:V). Steep levee slopes such as these preclude the development of a gradual upland to wetland transition that is more representative of natural conditions in tidal marshes and provides important habitat for a variety of wildlife and plant species that can only occur in such habitats. The gradual upland-wetland transition zone that occurs in natural settings will be restored along a portion of the northern levee, as well as along the buttress levee adjacent to Guadalcanal Village and the Pond 1 levee. As noted earlier, the buttress levee will have a 10:1 (H:V) slope and the Pond 1 levee will be flattened to a 7:1 (H:V) slope. All of these areas will provide additional acreage suitable for near term establishment of tidal marsh vegetation.

Approximately 26,000 linear feet of the northern levee along Dutchman and South Sloughs will be lowered to MHHW, elevation 3.5 ft NGVD 1929 (approximately +6.2 feet MLLW). The material generated from levee lowering activities and breach construction will be placed on the southern (interior) side of the northern levee and used to flatten the levee slope. This will create a minimum 30-acre area along Dutchman and South Sloughs and Guadalcanal Village that will support near term establishment of mid-to-high marsh vegetation. As noted earlier, the buttress levee will have a 10:1 (H:V) slope and the Pond 1 levee will be flattened to a 7:1 (H:V) slope. All of these areas will provide additional acreage suitable for near term establishment of tidal marsh vegetation.

### **Component 7 – Breach Levees along Dutchman and South Sloughs, and Guadalcanal Village**

To restore the tidal prism to the site up to four breaches would be constructed between Cullinan Ranch and Dutchman and South Sloughs and one between Cullinan Ranch and the Guadalcanal Village marsh restoration site (Figure 4). Breach construction would be initiated at the west end of the site. Breach locations will be as close to historic channel mouths/alignments as practicable. South Slough and the lower portion of Dutchman Slough would serve as the primary channels for the property. Breaching would occur in the winter, but before January 30 when juvenile salmonids are expected to migrate in the general vicinity, or as specified in the National Marine Fisheries Service biological opinion and essential fish habitat consultation.

Where practical, there would be some levee recontouring near the breach locations. The hydrodynamic modeling investigation performed by Moffatt & Nichol (2004) was used to design breach size and depth of excavation. The sizes of the breaches are based on the breach locations, the amount of the tidal prism that would pass through the breach at each tide cycle, and the acreage and the elevation of the restoration area that each breach would be supporting. The elevation determined in the final hydraulic design would be carried through the levee footprint, then transition to the existing grade within Cullinan Ranch Site. Material from the breach construction would be placed on the interior levee slopes of Dutchman and South Slough and Guadalcanal Village levees to provide

additional wetland habitat. Breaches would be unarmored and allowed to widen naturally to an equilibrium size.

The placement of the breaches would increase the capacity of South Slough over time. This would result in South Slough conveying a larger percentage of the tidal prism into the Cullinan Ranch Site and would reduce physical effects to Dutchman Slough and Pritchett Marsh (located near the mouth of Dutchman Slough). The size of the breaches would initially result in a muted tidal prism within the Site. This would result in lower tidal velocities, which in turn would reduce the adverse impacts to the adjacent slough system. Over time the breaches and sloughs would erode as the system comes into equilibrium.

Another levee, located along the eastern border of the Site, separates Cullinan Ranch from the recently restored Guadalcanal Village marsh. This levee was designed to resist tidal action. An armored spillway was installed in the levee and then backfilled during the Guadalcanal Village restoration. This armored breach may be opened to allow tidal flow between Cullinan Ranch Site and Guadalcanal Village marsh.

Breach size and quantities associated with breach excavation are described in Table 4.

**Table 4. Dimensions of Levee Breaches and Tidal Channel Excavation**

<b>Breach (West to East)</b>	<b>Bottom Width of Breach (Feet)</b>	<b>Channel Excavation<sup>a,b</sup> (Linear feet/cubic yards)</b>	<b>Associated Drainage Area (Acres)</b>
Dutchman/South slough Breach #1	100	160/3,800	~20-25% of site
Dutchman/South slough Breach #2	100	240/6,300	~20-25% of site
Dutchman/South slough Breach #3	100	80/1,250	~20-25% of site
Dutchman/South slough Breach #4	100	165/3,240	~20-25% of site
Guadalcanal Village Breach	Unknown	100/5,000cy	~20-25% of site

<sup>a</sup> Breach widths and channel excavation are based on preliminary calculations and modeling, and are estimates of the maximum that would be required for restoring tidal circulation.

<sup>b</sup> Volumes represent breach excavation in Waters of the U.S.

Construction of the breaches would require excavation in uplands and pilot channel construction through outboard marsh as needed. Placement of temporary cofferdams or excavation from barges may also be necessary for breach construction. The majority of material excavated from the breaches would be used on-site for improvement of existing levees or to raise habitat elevations. Material excavated from breaches that is not suitable for on-site reuse (e.g., rebar and concrete debris) would be recycled or disposed of off-site. As discussed earlier, the levee would be breached on an incoming tide allowing water from the slough to first enter the Site and dilute the water present within the site. The total quantity of water that will be present within the site at the time of breaching is

small compared to both the total capacity of the site and the total tidal prism in the adjacent sloughs.

### **Component 8 – Long-Term Monitoring**

Monitoring activities would be conducted to document changes in tidal hydraulics, geomorphology, plant and wildlife species, water quality, and habitat types and functions as restoration progresses. The Cullinan Ranch Project would use the Napa Sonoma Marsh Restoration Project monitoring plan as a basis for its monitoring plan. Initiation of long-term monitoring of the Site would occur immediately following breaching of the north levee. Prior to initiating project construction, a detailed long-term monitoring plan outlining the duration of monitoring and tasks to be completed over the duration of the monitoring period would be completed.



