

Attachment I1. Post-Construction Land Reclamation (Final Draft)

1. Introduction and Purpose

The Delta Conveyance Project (Project) would include intakes C-E-3 and C-E-5 along the Sacramento River between the confluences with American River and Sutter Slough, and a tunnel, along the Bethany Reservoir Alignment, from the intakes to the Bethany Reservoir Pumping Plant (BRPP) and associated facilities that pump water and discharge to the State Water Projects (SWP) existing Bethany Reservoir.

The Project would include construction of several permanent features along the length of the Bethany Reservoir Alignment, including:

- Intakes
- Tunnel launch, reception, and maintenance shafts
- A new pumping plant
- A main connection structure to the SWP

Some of these sites would require more than 5 acres of land to be used as temporary construction areas that would not have permanent features within them after construction is completed.

This technical memorandum (TM) describes the land reclamation treatments and equipment to be used to return temporary construction areas exceeding 5 acres to productive uses, where applicable. This TM would be used to support site planning and environmental analyses.

1.1 Organization

This TM is organized as follows:

- Introduction and Purpose
- Methodology
- Overview of Project Sites
- Preliminary Site Reclamation Plan
- References

2. Methodology

The following methodology was used to evaluate and determine the appropriate post-construction treatments for temporary construction areas:

- Review existing site conditions to determine what the land is currently used for (for example, agricultural use, crop type, or natural habitat) at each site.
- Review temporary construction areas at each site location to determine quantity and extent of temporary construction impacts to the land to inform what reclamation actions would be required.
- Determine desired end land-use at each site and recommend treatments and required equipment to reclaim sites to desired end-use.
- Calculate the equipment demand and on-road truck and commuter traffic and estimate the duration of the reclamation work for each site.

3. Overview of Project Sites

The Project would consist of four major site types. Note that smaller sites with temporary construction areas of less than 5 acres are not included in this TM. Examples of temporary construction areas that are smaller than 5 acres are the maintenance and reception shaft sites and the Bethany Reservoir Discharge Structure site. This section provides a general overview of the types of sites that would require post-construction reclamation. Section 4.2 describes the specific elements of each site in more detail.

The four major site types are as follows:

- 1) **Intakes:** Two intakes, C-E-3 and C-E-5, would be constructed at the northern end of the tunnel. These intakes would include intake and control structures, sedimentation basins, cylindrical tee screens, and vertical shafts to divert water from the Sacramento River into the tunnel.
- 2) **Launch Shaft Sites:** Two tunnel launch shafts that serve as locations to assemble and launch the TBMs: (1) Twin Cities Complex and (2) Lower Roberts Island. Both sites would include double-tunnel launch shafts for tunnel drives in both the north and south directions. Excavated material from the tunnel bore, RTM, would be brought to the surface through these shafts, processed, and stockpiled onsite. As a result, these sites require several hundred acres for temporary use for equipment, supplies, offices, parking, borrow, and RTM handling, filling, and storage. Permanent features would include elevated shaft pads, access roads, and RTM stockpiles.
- 3) **BRPP and Surge Basin:** The BRPP would be used to convey water to Bethany Reservoir via the Bethany Reservoir Aqueduct (Aqueduct). The Surge Basin would be required to contain flow from a hydraulic surge event in the main tunnel during operations. Surge tanks would be used to manage hydraulic surge within the Aqueduct pipelines. The BRPP and Surge Basin site area was developed at a larger scale than the minimum area required for the proposed facilities. The larger area was defined to provide flexibility for this site due to uncertainty with the interfaces between the adjacent Central Valley Project (CVP) C.W. "Bill" Jones (Jones) Pumping Plant and Western Area Power Administration substation.

The Surge Basin would include a tunnel reception shaft that would function as an overflow shaft during operations. This reception shaft area is completely encapsulated in the area required for the construction and operations of the BRPP and Surge Basin and does not have its own impact on the land reclamation requirements. Temporary construction areas would include access roads, parking areas, facilities and trailers for owners, contractors, and crew. Permanent features would include the surge basin, BRPP, material stockpiles, and buildings for operations.

- 4) **Bethany Reservoir Aqueduct:** The Aqueduct would convey water from the BRPP to Bethany Reservoir. The Aqueduct would consist of large-diameter pipelines, pressurized by the BRPP. The Aqueduct would use 180-inch-diameter welded steel pipe materials and would include multiple pipelines within the trench as a function of the design flow rate. The Aqueduct feeding Bethany Reservoir would include four pipelines for the 6,000-cfs Project design capacity. Temporary construction areas would include access roads, parking areas, excavated material stockpiles, and facilities and trailers for owners and contractors. Permanent features would include the Aqueduct pipelines, pipeline appurtenant structures, grading at tunnel portals, and access roads.

Below lists the specific Project sites, organized from north to south. Figure 3-1 is a Project overview map and identifies each of the Project sites where reclamation work is planned.

- Intake C-E-3
- Intake C-E-5

- Twin Cities Double-Launch Shaft Site
- Lower Roberts Island Double Launch Shaft Site
- BRPP and Surge Basin
- Bethany Reservoir Aqueduct

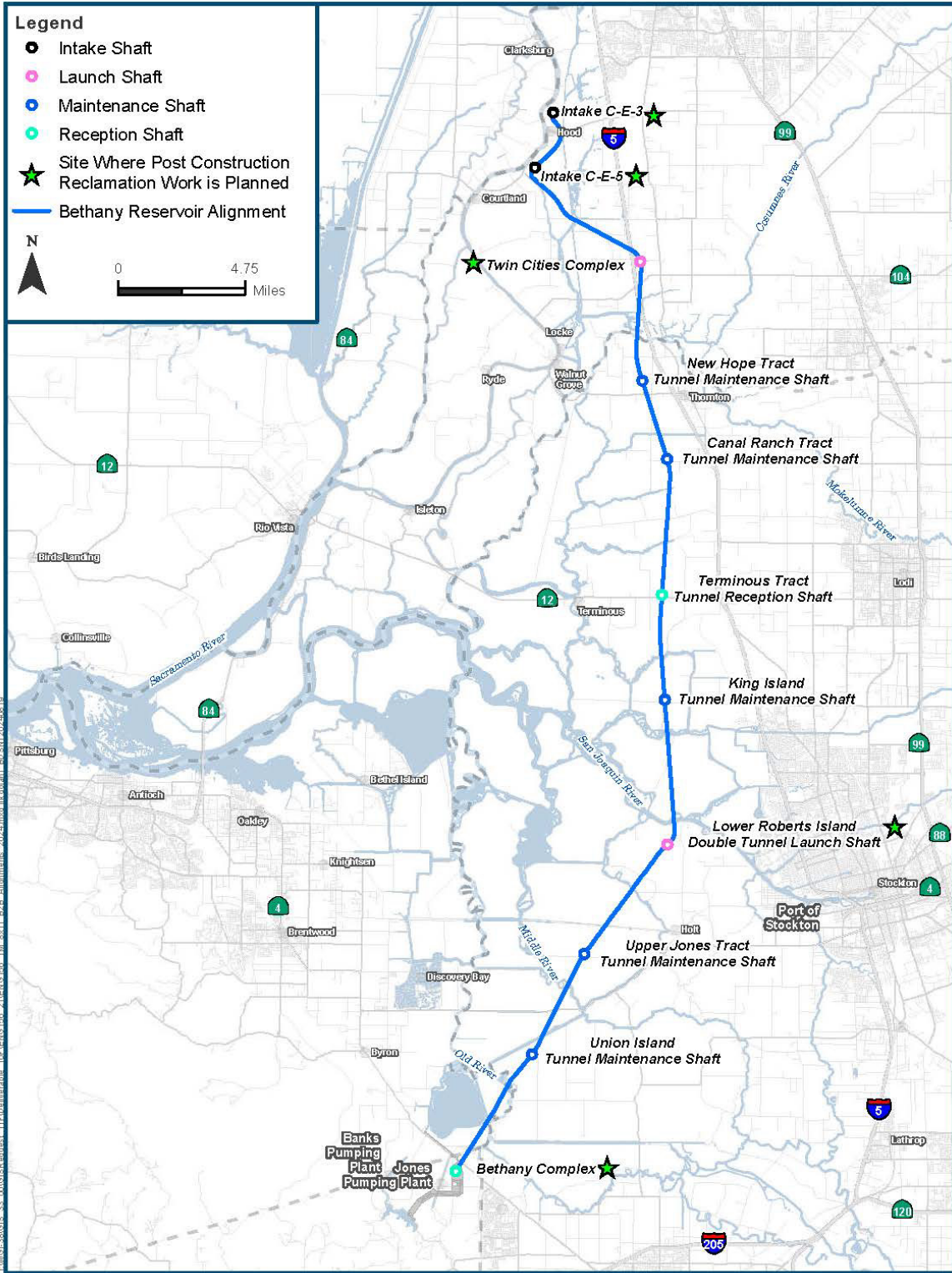


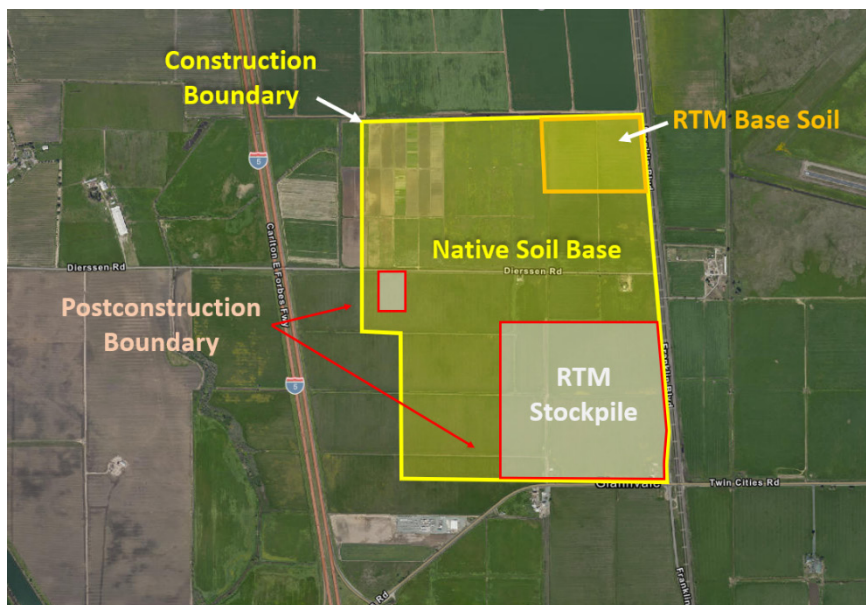
Figure 3-1. Project Overview

4. Preliminary Site Reclamation Plan

4.1 Proposed Treatments

The near-surface native soil within the temporary construction areas could be compacted from construction equipment, consolidated beneath material stockpiles, or have properties less suitable for agriculture or habitat restoration due to construction activities. The main goals of the land reclamation efforts would be to restore the soil quality and condition, to the extent practical, in these temporary construction areas.

The temporary construction areas at each of the sites were separated into three cases: native soil base, RTM base, and RTM stockpiles. Figure 4-1 shows a schematic example of a site with all types of temporary construction areas. As described in the following sections, the majority of the Project sites and associated acres of reclaimed land would likely consist of native soil base or RTM stockpile.



Source: DCA

Figure 4-1. Example Land Reclamation Treatment Areas

The recommended treatments for reclamation of each of the temporary construction areas would vary slightly depending on the base soil type. Based on the current and previous land uses at each of the sites, the reclamation treatments were tailored to return the land to conditions suitable for agricultural use or to be natural habitat areas planted with a mixture of native materials. RTM stockpiles would be seeded with grasses for erosion control and prepared in such a way that they could be accessible for future stockpile use as borrow material.

The treatments for each of the base soil types are described in more detail in the following subsections.

4.1.1 Native Soil Base

Approximately 60 percent of the temporary construction areas to be reclaimed would consist of native soil base with a variety of construction-phase impacts. These impacts would range from minimal, where

little work occurred on an area, to highly compacted or otherwise disturbed soils. The initial reclamation tasks would include:

- Demolition of concrete slabs from temporary material storage areas
- Removal of temporary stockpiles and embankments
- Removal of other construction materials or structures
- Removal of project-related temporary haul routes
- Grading and leveling of the site

Initial soil treatments would depend on the actual disturbance, but for soils with more than minimal impact, the work would be expected to include ripping the soil and incorporating amendments (for example, gypsum) to address compaction. This would be followed by spreading topsoil, cross discing, and grading and leveling to prepare the soil surface for future use. At this point, if an end-user (for example, agricultural or conservation entities) is ready to take over activities at the site to transition it to long-term use, the Project reclamation steps would be complete. However, if an end-user is not ready, then the areas would be drill-seeded to provide erosion and dust control with a grass seed mix appropriate for the desired end-use. Areas to be restored to natural habitat would be seeded with a native grass mix, whereas areas to be restored to agricultural use would be seeded with an erosion control seed mix.

Table 4-1 summarizes the recommended steps for reclamation of temporary construction areas with a native soil base, and the equipment and estimated production rates for each step.

Table 4-1. Recommended Post-construction Treatments for Reclamation of Native Soil Base

Step	Task	Equipment	Daily Rate	Unit
1	Slab demolition	CAT 330 excavator with hydraulic hammer	250	cy
2	Ring levee removal (Twin Cities only)	CAT 12G grader	5,000	cy
		CAT D8 bulldozer		
		CAT 623 scraper		
		CAT CS68B compactor		
		Water truck		
3	Grade and level site	CAT 12G grader	20	acres
4	Rip to 3-foot depth	CAT D8 bulldozer	5	acres
5	Spread amendments to address compaction	CAT 930K loader to load trailers	200	tons
		Case Magnum 280 farm tractor with spreader trailer	100	tons
6	Incorporate amendments and cross rip	Case Magnum 280 farm tractor with disc	5	acres

Step	Task	Equipment	Daily Rate	Unit
7	Spread topsoil	CAT 623 scraper	5,000	cy
		CAT D6 dozer		
8	Cross disc	Case Magnum 280 farm tractor with disc	20	acres
9	Final grade and level	Case Magnum 280 farm tractor with land plane	25	acres
10	Drill seeding	Case Magnum 280 farm tractor with drill-seeder	60	acres

Notes:
 cy = cubic yard(s)

4.1.2 Reusable Tunnel Material Base

The RTM soil base condition would exist in areas where the native soil was excavated to create borrow pits that would later be backfilled with RTM to bring the area back to existing grade. RTM soil base would likely only exist at portions of the Twin Cities Complex, on Glanville Tract. In some cases, other temporary excavation could be refilled with excavated material other than RTM, though it would still receive the same treatment. Treatments for reclamation of RTM base soil would be similar to those recommended for native soils, as described in Section 4.1.1; however, additional treatments could be required to address soil conditions (for example, high or low pH).

Lime and soil sulfur were assumed to be appropriate amendments for addressing soil pH; however, the actual amendments used would be based on soil tests performed at each of the sites post-construction. Amendments to address nutrient deficiencies would be handled by the end-user because the choice and quantity of amendments could be dependent on the crop type or specific habitat plan. Topsoil would be re-spread to a depth of 1 foot over the RTM base soil. For crops, the top 1 foot is most important to the farmer and where they typically focus fertilizer application to address the specific needs of the crop.

Table 4-2 summarizes the recommended steps for reclamation of temporary construction areas with an RTM base and the equipment and estimated production rates for each step.

Table 4-2. Recommended Post-construction Treatments for Reclamation of Reusable Tunnel Material Soil Base

Step	Task	Equipment	Daily Rate	Unit
1	Grade and level site	CAT 12G grader	20	acres
2	Rip to 3-foot depth	CAT D8 bulldozer	5	acres
3	Spread amendments to address compaction	CAT 930K loader to load trailers	200	tons
		Case Magnum 280 farm tractor with spreader trailer	100	tons
4	Incorporate amendments and cross rip	Case Magnum 280 farm tractor with disc	5	acres
5	Spread topsoil	CAT 623 scraper	5,000	cy
		CAT D6 dozer		

Step	Task	Equipment	Daily Rate	Unit
6	Spread amendments to address RTM soil suitability	CAT 930K loader to load trailers	2,880	cy
		Case Magnum 280 farm tractor with spreader trailer	360	cy
7	Cross disc	Case Magnum 280 farm tractor with disc	20	acres
8	Final grade and level	Case Magnum 280 farm tractor with land plane	25	acres
9	Drill seeding	Case Magnum 280 farm tractor with drill-seeder	60	acres

4.1.3 Reusable Tunnel Material Stockpile

Permanent RTM stockpiles would be expected at some of the tunnel launch sites. These stockpiles would be elevated above the surrounding grades and would be planted with native grasses primarily for erosion control, but also to create a natural habitat area while the stockpile is not in use. Recommended treatments for permanent RTM stockpiles include spreading topsoil, cross discing, and planting native grasses. An access road would also be constructed from the existing paved road nearest to the stockpile to facilitate future use of the stockpile.

Ground improvement would be required to support concrete slabs at the Lower Roberts Island Double Launch Shaft Sites. These ground improvement elements would likely permanently impact the quality of the near-surface soil; therefore, reclamation of these areas for agricultural use would be more challenging. Areas that contain temporary slabs supported by ground improvement elements would be prepared with the same treatments described for the RTM stockpile implemented after the slabs are removed.

Table 4-3 summarizes the recommended steps for stabilization of permanent RTM stockpiles and the equipment and estimated production rates for each step.

Table 4-3. Recommended Post-construction Treatments for Permanent Reusable Tunnel Material Stockpiles

Step	Task	Equipment	Daily Rate	Unit
1	Spread topsoil	CAT 623 scraper	5,000	cy
		CAT D6 dozer		
2	Cross disc	Case Magnum 280 farm tractor with disc	20	acres
3	Hydroseed native grasses, apply straw mulch, apply tackifier	Diesel truck (separate truck for each step)	20	acres
4	Establish access road to stockpile	CAT 12G grader	7,500	sf
		CAT 623 scraper		
		CAT CS68B compactor		
		Water truck		

Notes:

cy = cubic yards

sf = square foot (feet)

4.2 Project Site Treatments

This section includes descriptions of each Project site where post-construction reclamation is planned, and provides summaries of the sequence, equipment required, and total expected duration of the reclamation work. It was assumed that reclamation work would need to be completed in one construction season or less, with a maximum duration of approximately 147 working days (April 15 to November 15 = 7 months x 21 working days per month = 147 working days). The quantity of equipment to be used for each task was adjusted until the total duration was less than approximately 147 working days. Note that this duration and the estimated quantity of equipment required are only approximations. Contractor-specific production rates, final acreages of temporary construction areas, equipment mobilization times, soil testing, and other factors would likely all affect these estimates and would be required to produce more refined estimates as part of future design phases.

The expected on-road truck and commuter traffic for post-construction reclamation at each Project site was also estimated and is summarized in the following sections. The following assumptions were used to determine the on-road truck and commuter traffic distances:

- Concrete slab disposal locations:
 - Port of West Sacramento: Intakes, Twin Cities Complex
 - Port of Stockton: Lower Roberts Island Double Launch Shaft
- Ring levee material disposal (for Twin Cities Complex): Onsite
- Soil amendment source location: Lathrop, California
- Average round-trip commute distance: 50 miles

4.2.1 Intake C-E-3

4.2.1.1 Site Description

Intake C-E-3 is the middle intake and would be located on the eastern bank of the Sacramento River north of Hood. The existing site is used for growing multiple tree crops, including grapes, pears, apples, cherries, and citrus (DWR, 2019).

Permanent features would include the following:

- Concrete intake structure
- Outlet shaft
- Sedimentation basins
- Sedimentation drying lagoons
- Control structures
- Realigned State Route 160 along the Sacramento River

Temporary construction areas to be restored to agricultural usage would include the following activities:

- Material and equipment laydown and staging
- Material stockpiles
- Slurry batch plant
- Retention ponds
- Parking areas
- Bus drop-off and pick-up

- Access roads
- Facilities and trailers for owners, contractors, and crew

Table 4-4 summarizes the acreage at the site delineated by base soil type and proposed post-construction use.

Table 4-4. Summary of Land Reclamation Areas at Intake C-E-3

Base Soil	Proposed Post-Construction Use	Acres
Native Soil	Agriculture	119

4.2.1.2 Construction Methods and Equipment

Reclamation work would consist of reclaiming approximately 122 acres of temporary construction areas with native soil base to agriculture use following the methods described in Section 4.1. Tables 4-5 and 4-6 summarize the equipment, durations, and expected on-road truck and commuter traffic that would be required to complete the reclamation work, assuming all 122 acres would be impacted.

Table 4-5. Summary of Required Equipment for Reclamation Work at Intake C-E-3

Step	Tasks	Equipment ^[a]	Equipment-Days	Pieces of Equipment	Duration (days)	Acres
1	Grade and level site	Grader small	6	1	6	119 ^[b]
2	Rip to 3-foot depth	Dozer large	24	2	12	119 ^[b]
3	Spread amendments to address compaction	Rubber-tire loader medium	2	1	2	119 ^[b]
		Farm tractor large	3	2		
4	Incorporate amendments to address compaction and cross rip	Farm tractor large	24	2	12	119 ^[b]
5	Spread topsoil	Scraper	41	2	21	119 ^[b]
		Dozer medium	41	2		
6	Cross disc	Farm tractor large	6	1	6	119 ^[b]
7	Final grade and level	Farm tractor large	5	1	5	119 ^[b]
8	Drill-seed grasses	Farm tractor large	2	1	2	119
Total Duration					66 days	

^[a] Refer to tables in Section 4.1 for specific make, model, and size of equipment.

^[b] Indicates the number of acres of soil that would be disturbed for the given task.

Table 4-6. Summary of On-Road Truck and Commuter Traffic for Reclamation Work at Intake C-E-3

Step	Tasks	On-road Vehicle Truck Traffic	On-road Truck Trips per Day	On-road Truck Miles per Round Trip	Commuter Traffic Personnel per Day	Commuter Traffic Miles per Round-trip Commute, per Person
1	Grade and level site		0	0	3	50
2	Rip to 3-foot depth		0	0	4	50
3	Spread amendments to address compaction	Semi-truck	3	92	5	50
4	Incorporate amendments to address compaction and cross rip		0	0	4	50
5	Spread topsoil		0	0	6	50
6	Cross disc		0	0	3	50
7	Final grade and level		0	0	3	50
8	Drill-seed grasses		0	0	3	50

4.2.2 Intake C-E-5

4.2.2.1 Site Description

Intake C-E-5 is the southernmost intake and would be located on the eastern bank of the Sacramento River south of Hood. Land at the existing site area is used for growing multiple row and tree crops, including tomatoes, safflower, grapes, pears, and cherries (DWR, 2019).

Permanent features would include the following:

- Concrete intake structure
- Outlet shaft
- Sedimentation basins
- Sedimentation drying lagoons
- Control structures
- Realigned State Route 160 along the Sacramento River

Temporary construction areas would include areas for the following activities:

- Material and equipment laydown and staging
- Material stockpiles
- Slurry batch plant

- Retention ponds
- Parking areas
- Bus drop-off and pick-up
- Access roads
- Facilities and trailers for owners, contractors, and crew

Table 4-7 summarizes the acreage at the site delineated by base soil type and proposed post-construction use.

Table 4-7. Summary of Land Reclamation Areas at Intake C-E-5

Base Soil	Proposed Post-construction Use	Acres
Native Soil	Agriculture	130

4.2.2.2 Construction Methods and Equipment

Tables 4-8 through 4-9 summarize the equipment, durations, and expected on-road truck and commuter traffic that would be required to complete the reclamation work for summarized in Table 4-7.

Table 4-8. Summary of Required Equipment for Reclamation Work at Intake C-E-5

Step	Tasks	Equipment ^[a]	Equipment-Days	Pieces of Equipment	Duration (days)	Acres
1	Grade and level site	Grader small	7	1	7	130 ^[b]
2	Rip to 3-foot depth	Dozer large	27	2	14	130 ^[b]
3	Spread amendments to address compaction	Rubber-tire loader medium	2	1	2	130 ^[b]
		Farm tractor large	3	2		
4	Incorporate amendments to address compaction and cross rip	Farm tractor large	27	2	14	130 ^[b]
5	Spread topsoil	Scraper	37	2	19	130 ^[b]
		Dozer medium	37	2		
6	Cross disc	Farm tractor large	7	1	7	130
7	Final grade and level	Farm tractor large	6	1	6	130 ^[b]
8	Drill-seed grasses	Farm tractor large	3	1	3	130
Total Duration					72 days	

^[a] Refer to tables in Section 4.1 for specific make, model, and size of equipment.

^[b] Indicates the number of acres of soil that would be disturbed for the given task.

Table 4-9. Summary of On-Road Truck and Commuter Traffic for Reclamation Work at Intake C-E-5

Step	Tasks	On-road Vehicle Truck Traffic	On-road Truck Trips per Day	On-road Truck Traffic Miles per Round Trip	Commuter Traffic Personnel per Day	Commuter Traffic Miles per Round-trip Commute, per Person
1	Grade and level site		0	0	3	50
2	Rip to 3-foot depth		0	0	4	50
3	Spread amendments to address compaction	Semi-truck	4	92	5	50
4	Incorporate amendments to address compaction and cross rip		0	0	4	50
5	Spread topsoil		0	0	6	50
6	Cross disc		0	0	3	50
7	Final grade and level		0	0	3	50
8	Drill-seed grasses		0	0	3	50

4.2.3 Twin Cities Complex (Glanville Tract)

4.2.3.1 Site Description

The Twin Cities Complex, located on Glanville Tract, would serve as a double launch shaft for the Bethany Reservoir Alignment tunnel. Land at the existing site area is used for pasture and for growing multiple types of row crops (DWR, 2019).

Permanent features would include the elevated pad for the tunnel shaft, permanent RTM stockpile, and access roads leading to the pad and RTM stockpile. Temporary construction areas would include areas for the following activities:

- Temporary RTM storage
- RTM mechanical drying
- Topsoil storage
- Tunnel segment storage
- Retention ponds
- Ring levee
- Railroad spurs
- Parking areas
- Access roads
- Facilities and trailers for owners, contractors, and crew

A portion of this site would also be excavated as a borrow pit and then backfilled with RTM to bring the area back to existing grade.

Table 4-10 summarizes the acreage at the site delineated by base soil type and proposed post-construction use.

Table 4-10. Summary of Land Reclamation Areas at the Twin Cities Complex (Glanville Tract)

Base Soil	Proposed Post-Construction Use	Acres
Native Soil	Agriculture	324
RTM Base	Agriculture	40
RTM Stockpile	Stockpile	214

Notes:

ft = foot (feet)

4.2.3.2 Construction Methods and Equipment

Tables 4-11 through 4-12 summarize the equipment, durations, and expected on-road truck and commuter traffic that would be required to complete the reclamation work for all alignment and diameter scenarios summarized in Table 4-10.

Table 4-11. Summary of Required Equipment for Reclamation Work at the Twin Cities Complex (Glanville Tract)

Step	Tasks	Equipment ^[a]	Equipment-Days	Pieces of Equipment	Duration (days)	Acres
1	Slab demolition	Excavators medium	264	7	38	41
2	Ring levee removal (Twin Cities only)	Scrapers	53	5	11	29
		Dozer large	53	5		
		Graders	53	5		
		Compactor	53	5		
		Water truck	53	5		
3	Grade and level site	Grader small	19	5	4	364 ^[b]
4	Rip to 3-ft depth	Dozer large	74	6	13	364 ^[b]
5	Spread amendments to address compaction	Rubber-tire loader medium	5	2	3	364 ^[b]
		Farm tractor large	8	4		

Step	Tasks	Equipment ^[a]	Equipment-Days	Pieces of Equipment	Duration (days)	Acres
6	Incorporate amendments to address compaction and cross rip	Farm tractor large	75	6	13	364 ^[b]
7	Spread topsoil	Scraper	184	6	31	578 ^[b]
		Dozer medium	184	6		
8	Spread Amendments to address fertility (RTM Base only)	Rubber-tire loader medium	2	1	2	40 ^[b]
		Farm Tractor Large	2	1		
9	Cross disc	Farm tractor large	30	4	8	578 ^[b]
10	Final grade and level	Farm tractor large	15	4	4	364 ^[b]
11	Drill-seed grasses	Farm tractor large	7	1	7	364
12	Hydroseed (RTM stockpile only)	Diesel truck	11	1	11	214
Total Duration					145 days	

^[a] Refer to tables in section 4.1 for specific make, model, and size of equipment.

^[b] Indicates the number of acres of soil that would be disturbed for the given task.

Table 4-12. Summary of On-road Truck and Commuter Traffic for Reclamation Work at the Twin Cities Complex (Glanville Tract)

Step	Tasks	On-road Vehicle Truck Traffic	On-road Truck Trips per Day	On-road Truck Miles per Round Trip	Commuter Traffic Personnel per Day	Commuter Traffic Miles per Round-trip Commute, per Person
1	Slab demolition	Tri-axle Dump Truck	173	50	9	50
2	Ring levee removal (Twin Cities only)	Not Applicable	0	0	27	50
3	Grade and level site	Not Applicable	0	0	7	50
4	Rip to 3-ft depth	Not Applicable	0	0	8	50
5	Spread amendments to address compaction	Semi-truck	7	76	8	50

Step	Tasks	On-road Vehicle Truck Traffic	On-road Truck Trips per Day	On-road Truck Miles per Round Trip	Commuter Traffic Personnel per Day	Commuter Traffic Miles per Round-trip Commute, per Person
6	Incorporate amendments to address compaction and cross rip	Not Applicable	0	0	8	50
7	Spread topsoil	Not Applicable	0	0	14	50
8	Spread Amendments to address fertility (RTM Base only)	Semi-truck	3	76	4	50
9	Cross disc	not applicable	0	0	6	50
10	Final grade and level	Not Applicable	0	0	6	50
11	Drill-seed grasses	Semi-truck	2	50	3	50
12	Hydroseed (RTM stockpile only)	Semi-truck	2	50	3	50

4.2.4 Lower Roberts Island Double Launch Shaft

4.2.4.1 Site Description

The Lower Roberts Island Launch Shaft would serve as a double launch site for then Bethany Reservoir Alignment tunnel. Land at the existing site area is used for growing corn (DWR, 2019).

Permanent features would include the following:

- Elevated pad for the tunnel shaft
- Access road leading to the pad
- Railroad spurs
- Permanent RTM stockpile

Repairs would be required to existing levees around the perimeter of the island. Temporary construction areas to be restored to agricultural usage would include areas for the following activities:

- Temporary RTM storage
- RTM mechanical drying
- Topsoil storage
- Tunnel segment storage
- Retention ponds
- Parking areas
- Access roads
- Facilities and trailers for owners, contractors, and crew

Ground improvement would be installed beneath the shaft pad, segment storage slab, and RTM temporary wet storage area.

Table 4-13 summarizes the acreage at the site delineated by base soil type and proposed post-construction use for all tunnel diameter options.

Table 4-13. Summary of Land Reclamation Areas at the Lower Roberts Island Launch Shaft

Base Soil	Proposed Post-Construction Use	Acres
Native Soil	Agriculture	243
RTM Base	Agriculture	26
RTM Stockpile	Stockpile	230

4.2.4.2 Construction Methods and Equipment

Tables 4-14 and 4-15 summarize the equipment, durations, and expected on-road truck and commuter traffic that would be required to complete the reclamation work for all alignment and diameter scenarios summarized in Table 4-13.

Table 4-14. Summary of Required Equipment for Reclamation Work at the Lower Roberts Island Launch Shaft

Step	Tasks	Equipment ^[a]	Equipment -Days	Pieces of Equipment	Duration (days)	Acres
1	Slab demolition	Excavators medium	264	5	53	41
2	Grade and level site	Grader small	14	3	5	269
3	Rip to 3-ft depth	Dozer large	55	5	11	269 ^[b]
4	Spread amendments to address compaction	Rubber-tire loader medium	4	2	2	269 ^[b]
		Farm tractor large	6	3		
5	Incorporate amendments to address compaction and cross rip	Farm tractor large	56	5	12	269 ^[b]
6	Spread topsoil	Scraper	109	4	28	499 ^[b]
		Dozer medium	109	4		
7	Spread Amendments to address fertility (RTM Base only)	Rubber-tire loader medium	1	1	2	26 ^[b]
		Farm tractor large	2	1		
8	Cross disc	Farm tractor large	27	2	14	499 ^[b]
9	Final grade and level	Farm tractor large	12	4	3	269 ^[b]

Step	Tasks	Equipment ^[a]	Equipment -Days	Pieces of Equipment	Duration (days)	Acres
10	Drill-seed grasses	Farm tractor large	6	2	3	269 ^[b]
11	Hydroseed (RTM stockpile only)	Diesel truck	12	1	12	230
12	Establish access road to RTM stockpile	Grader small	1	1	2	0.2
		Scraper	1	1		
		Compactor	1	1		
		Water truck	1	1		
Total Duration						147 days

^[a] Refer to tables in section 4.1 for specific make, model, and size of equipment.

^[b] Indicates the number of acres of soil that would be disturbed for the given task.

Table 4-15. Summary of On-road Truck and Commuter Traffic for Reclamation Work at the Lower Roberts Island Launch Shaft

Step	Tasks	On-road Vehicle Truck Traffic	On-road Truck Trips per Day	On-road Truck Miles per Round Trip	Commuter Traffic Personnel per Day	Commuter Traffic Miles per Round-trip Commute, per Person
1	Slab demolition	Tri-axle Dump Truck	124	18	7	50
2	Grade and level site	Not Applicable	0	0	5	50
3	Rip to 3-ft depth	Not Applicable	0	0	7	50
4	Spread amendments to address compaction	Semi-truck	8	38	7	50
5	Incorporate amendments to address compaction and cross rip	Not Applicable	0	0	7	50
6	Spread topsoil	Not Applicable	0	0	10	50
7	Spread Amendments to address fertility (RTM Base only)	Semi-truck	2	38	4	50
8	Cross disc	Not Applicable	0	0	4	50
9	Final grade and level	Not Applicable	0	0	6	50

Step	Tasks	On-road Vehicle Truck Traffic	On-road Truck Trips per Day	On-road Truck Miles per Round Trip	Commuter Traffic Personnel per Day	Commuter Traffic Miles per Round-trip Commute, per Person
10	Drill-seed grasses	Semi-truck	2	50	4	50
11	Hydroseed (RTM stockpile only)	Semi-truck	2	50	3	50
12	Establish access road to RTM stockpile	Not Applicable	0	0	6	50

4.2.5 Bethany Reservoir Pumping Plant and Surge Basin

4.2.5.1 Site Description

The BRPP would function to convey water to the Bethany Reservoir via the Aqueduct. An associated Surge Basin would be required to contain flow in the main tunnel resulting from a hydraulic surge event during operations, such as a power failure. The site area associated with the BRPP and Surge Basin also includes Aqueduct surge tanks. Land at the existing BRPP and Surge Basin site area is used for growing grain, hay, and alfalfa and land at the existing Jones Pumping Plant approach channel site area currently has native grass (DWR 2019).

Temporary construction areas would be required as follows:

- Concrete batch plants
- Access roads
- Facilities and trailers for owners, contractors, and crew

Permanent features would include the following:

- Belowground Surge Basin
- Belowground BRPP
- Aqueduct surge tanks
- Electrical substation
- Equipment storage, electrical, and generator buildings
- Stockpiles for surplus excavated material for potential future use
- Access roads and parking areas
- Concrete outlet and control structures (40-ft tunnel diameter option only)

Table 4-16 summarizes the acreage at the site delineated by base soil type and proposed post-construction use for all Project design capacity scenarios.

Table 4-16. Summary of Land Reclamation Areas at the Bethany Reservoir Pumping Plant and Surge Basin

Base Soil	Proposed Post-Construction Use	Acres
Native Soil	Agriculture	29
Excavated Material Stockpile	Stockpile	70

4.2.5.2 Construction Methods and Equipment

Tables 4-17 through 4-18 summarize the equipment, durations, and expected on-road truck and commuter traffic that would be required to complete the reclamation work for all Project design capacity scenarios summarized in Table 4-16.

Table 4-17. Summary of Required Equipment for Reclamation Work at the BRPP and Surge Basin – 36-foot-diameter Tunnel (6,000-cfs Project Design Capacity)

Step	Tasks	Equipment ^[a]	Equipment-Days	Pieces of Equipment	Duration (days)	Acres
1	Grade and level site	Grader small	3	1	3	53 ^[b]
2	Rip to 3-ft depth	Dozer large	11	3	4	53 ^[b]
3	Spread amendments to address compaction	Rubber-tire loader medium	1	1	1	53 ^[b]
		Farm tractor large	2	2		
4	Incorporate amendments to address compaction and cross rip	Farm tractor large	11	3	4	53 ^[b]
5	Spread topsoil	Scraper	47	3	16	113 ^[b]
		Dozer medium	47	3		
6	Cross disc	Farm tractor large	6	2	3	113 ^[b]
7	Final grade and level	Farm tractor large	3	1	3	53 ^[b]
8	Drill-seed grasses	Farm tractor large	1	1	1	53
9	Hydroseed (Excavated Material Stockpile only)	Diesel Truck	3	1	3	59
Total Duration					38 days	

^[a] Refer to tables in section 4.1 for specific make, model, and size of equipment.

^[b] Indicates the number of acres of soil that would be disturbed for the given task.

Table 4-18. Summary of On-road Truck and Commuter Traffic for Reclamation Work at the BRPP and Surge Basin – 36-foot-diameter Tunnel (6,000-cfs Project Design Capacity)

Step	Tasks	On-road Vehicle Truck Traffic	On-road Truck Trips per Day	On-road Truck Miles per Round Trip	Commuter Traffic Personnel per Day	Commuter Traffic Miles per Round-trip Commute, per Person
1	Grade and level site	Not Applicable	0	0	3	50
2	Rip to 3-ft depth	Not Applicable	0	0	5	50
3	Spread amendments to address compaction	Semi-truck	3	50	5	50
4	Incorporate amendments to address compaction and cross rip	Not Applicable	0	0	5	50
5	Spread topsoil	Not Applicable	0	0	8	50
6	Cross disc	Not Applicable	0	0	4	50
7	Final grade and level	Not Applicable	0	0	3	50
8	Drill-seed grasses	Semi-truck	2	50	3	50
9	Hydroseed (Excavated Material Stockpile only)	Semi-truck	2	50	3	50

4.2.6 Bethany Reservoir Aqueduct

4.2.6.1 Site Description

The Aqueduct would convey water from the BRPP to Bethany Reservoir via four large-diameter pipelines, pressurized by the BRPP.

Land at the existing site area is used for growing almonds, alfalfa, and native grass (DWR 2019).

Temporary construction areas would include areas for the following uses:

- Equipment storage
- Excavated material stockpile
- Water treatment
- Controlled low-strength material processing
- Access roads
- Load limiting crossings
- Parking areas
- Facilities and trailers for owners and contractors, shipping and receiving offices, and crew

Permanent features would include the Aqueduct pipelines, appurtenant pipeline structures, grading at tunnel portals, and access roads.

Table 4-19 summarizes the acreage at the site delineated by base soil type and proposed post-construction use for the Project design capacity.

Table 4-19. Summary of Land Reclamation Areas at the Aqueduct

Base Soil	Proposed Post-Construction Use	Acres
Native Soil	Agriculture	60

4.2.6.2 Construction Methods and Equipment

Table 4-20 and 4-21 summarize the equipment, durations, and expected on-road truck and commuter traffic that would be required to complete the reclamation work for all Project design capacity scenarios summarized in Table 4-19.

Table 4-20. Summary of Required Equipment for Reclamation Work at the Aqueduct – 36-foot-diameter Tunnel (6,000-cfs)

Step	Tasks	Equipment ^[a]	Equipment -Days	Pieces of Equipment	Duration (days)	Acres
1	Grade and level site	Grader small	4	1	4	75 ^[b]
2	Rip to 3-ft depth	Dozer large	16	3	6	75 ^[b]
3	Spread amendments to address compaction	Rubber-tire loader medium	1	1	1	75 ^[b]
		Farm tractor large	2	2		
4	Incorporate amendments to address compaction and cross rip	Farm tractor large	16	2	8	75 ^[b]
5	Spread topsoil	Scraper	29	3	10	75 ^[b]
		Dozer medium	29	3		
6	Cross disc	Farm tractor large	4	1	4	75 ^[b]
7	Final grade and level	Farm tractor large	3	1	3	75
8	Drill-seed grasses	Farm tractor large	2	1	2	75
Total Duration					38 days	

^[a] Refer to tables in section 4.1 for specific make, model, and size of equipment.

^[b] Indicates the number of acres of soil that would be disturbed for the given task.

Table 4-21. Summary of On-road Truck and Commuter Traffic for Reclamation Work at the Aqueduct – 36-foot-diameter Tunnel (6,000- cfs)

Step	Tasks	On-road Vehicle Truck Traffic	On-road Truck Trips per Day	On-road Truck Miles per Round Trip	Commuter Traffic Personnel per Day	Commuter Traffic Miles per Round-trip Commute, per Person
1	Grade and level site		0	0	3	50
2	Rip to 3-ft depth		0	0	5	50
3	Spread amendments to address compaction	Semi-truck	4	54	5	50
4	Incorporate amendments to address compaction and cross rip		0	0	4	50
5	Spread topsoil		0	0	8	50
6	Cross disc		0	0	3	50
7	Final grade and level		0	0	3	50
8	Drill-seed grasses	Semi-truck	2	50	3	50

4.3 Equipment Summary

Table 4-22 provides a summary of the estimated quantity of the equipment and duration required to complete reclamation of the temporary construction areas at each of the Project sites.

Table 22. Summary of Required Equipment for Reclamation Work for the Project

Task	Equipment	Intake C-E-3		Intake C-E-5		Twin Cities Complex		Lower Roberts Island		BRPP		Aqueduct (4 pipelines)	
		Equipment (Qty)	Duration (days)	Equipment (Qty)	Duration (days)	Equipment (Qty)	Duration (days)	Equipment (Qty)	Duration (days)	Equipment (Qty)	Duration (days)	Equipment (Qty)	Duration (days)
Slab Demolition	CAT 330 excavator	1	Not Required	1	Not Required	7	38	5	53	1	Not Required	1	Not Required
Ring Levee removal (Twin Cities only)	CAT 623 scraper	1	Not Required	1	Not Required	5	11	1	Not Required	1	Not Required	1	Not Required
	CAT D8 dozer	1		1		5		1		1			
	CAT 12G grader	1		1		5		1		1			
	CAT CS68B compactor	1		1		5		1		1			
	Water truck	1	1	5	1	1	1	1					
Grade and Level Site	CAT 12G grader	1	7	1	7	5	4	3	5	1	3	1	4
Rip to 3-foot depth	CAT D8 dozer	2	13	2	14	6	13	5	11	3	4	3	6
Spread amendments to address compaction	CAT 930K loader	1	2	1	2	2	3	2	2	1	1	1	1
	Case Magnum 280 farm tractor	2		2		4		3		2		2	
Incorporate amendments to address compaction and cross rip	Case Magnum 280 farm tractor	2	13	2	14	6	13	5	12	3	4	2	8
Spread topsoil	CAT 623 scraper	2	21	2	19	6	31	4	28	3	16	3	10
	CAT D6 dozer	2		2		6		4		3		3	
Spread amendments to address fertility (RTM base only)	CAT 930K loader	1	Not Required	1	Not Required	1	2	1	2	1	Not Required	1	Not Required
	Case Magnum 280 farm tractor	1		1		1		1	2	1		1	
Cross disc	Case Magnum 280 farm tractor	1	7	1	7	4	8	2	14	2	3	1	4
Final grade and level	Case Magnum 280 farm tractor	1	5	1	6	4	4	4	3	1	3	1	3
Drill-seed grasses	Case Magnum 280 farm tractor	1	3	1	3	1	7	2	3	1	1	1	2
Hydroseed (RTM stockpile only)	Diesel truck	1	Not Required	1	Not Required	1	11	1	12	1	3	1	Not Required
Establish access road to RTM stockpile	CAT 12G grader	1	Not Required	1	Not Required	1	Not Required	1	2	1	Not Required	1	Not Required
	CAT 623 scraper	1		1		1		1		1		1	
	CAT CS68B compactor	1		1		1		1		1		1	
	Water truck	1		1		1		1		1		1	
TOTALS		Total (days)	71	Total (days)	72	Total (days)	145	Total (days)	147	Total (days)	38	Total (days)	38

Notes:
ID = inner diameter, Qty = quantity

5. References

California Department of Water Resources (DWR). 2019. *CADWR Land Use Viewer*.
<https://gis.water.ca.gov/app/CADWRLandUseViewer>.

California Department of Water Resources (DWR). 2020. 2020 State Water Resilience Portfolio Draft. January.