

California High-Speed Rail Authority

Palmdale to Burbank *Project Section*

Draft Environmental Impact Report/
Environmental Impact Statement

Appendix 2.0-I Spoils Disposal Assumptions
used for Environmental Analysis

August 2022



The environmental review, consultation, and other actions required by applicable federal environmental laws for this project are being or have been carried out by the State of California pursuant to 23 U.S.C. 327 and a Memorandum of Understanding dated July 23, 2019, and executed by the Federal Railroad Administration and the State of California.

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Spoils Removal Location	Bulk Cubic Yards per Day	Duration (years)	No. of Outbound Truck Trips/Hour	Potential Off-hauling Scenario
Refined SR14 Build Alternative				
Refined SR14: Cuts/fills in Palmdale	1,519 BCY/d	4.6	11	Spoils would be off-hauled by truck.
Refined SR14: Portal 1 – California Aqueduct	2,300 BCY/d	1	16	Spoils would be off-hauled by truck.
Refined SR14: Portals 2 & 3	9,468 BCY/d (Portal 2 excavation)	1	66	Spoils would be off-hauled by truck.
	4,498 BCY/d (Excavation of Tunnel 1 through Portal 2)	2.5	31	
	4,070 BCY/d (Portal 3 excavation)	1	28	
Refined SR14: Portal 4	3,277 BCY/d (Portal 4 excavation)	1	23	Spoils would be off-hauled by truck.
	4,450 BCY/d (Tunnel 2 excavation)	1.1	31	
Refined SR14: Portal 5	2,843 BCY/d (Portal 5 excavation)	1	20	Spoils would be off-hauled by truck.
	1,698 BCY/d (Tunnel 3 excavation)	0.25	12	
Refined SR14: Portal 6	10,208 BCY/d (Portal 6 excavation)	1	0	Spoils would be transported by conveyor belt southward along the Refined SR14 alignment and through Tunnel 4 to fill pit at Vulcan mine after Tunnel 4 is excavated and the viaducts over the Santa Clara River are constructed.
	1,698 BCY/d (Tunnel 3 excavation)	0.25	0	

Spoils Removal Location	Bulk Cubic Yards per Day	Duration (years)	No. of Outbound Truck Trips/Hour	Potential Off-hauling Scenario
Refined SR14: Portal 7	3,349 BCY/d (Portal 7 excavation)	1	23	Spoils would be off-hauled by truck.
	2,247 BCY/d (Tunnel 4 excavation)	0.33	16	
Refined SR14: Portal 8	9,062 BCY/d (Portal 8 excavation)	1	0	Spoils would be transported by conveyor belt southward along Refined SR14 alignment to fill pit at Vulcan mine after Santa Clara River viaducts are constructed.
	2,247 BCY/d (Tunnel 4 excavation)	0.33	16	
Refined SR14: Open Cut/Fill between Portal 8 and Portal 9	1,650 BCY/d	3	11	Spoils would be off-hauled by truck.
Refined SR14: Portal 9 – Vulcan Mine	38,775 BCY/d (Portal 9 excavation)	1	49*	Nonhazardous spoils would be transported by conveyor belt directly to fill pit at Vulcan mine (0.3 mile).
	4,359 BCY/d (Tunnel 5 excavation)	1.33	0	50% of the excavated volume at SR14 Portal 9 is assumed to be hazardous material. This volume would require truck off-haul or railway transportation to a suitable treatment site.
	2,188 BCY/d (Tunnel/Fault chamber excavation)	1.5	0	The spoils coming from tunnel excavation are assumed to be free of substantial contamination and suitable for disposal at the mine. Spoils deposition in existing mine pit would require a project design, which would include geotechnical investigation of the site, identification of disposal technology, site preparation, spoils transportation to an off-site treatment facility if spoils are hazardous, fill and compaction procedures, slope stability, monitoring, water treatment, and surface and vegetation restoration among other elements. * Due to the volume of spoils to be off-hauled, truck trips calculated based on 2 work shifts (16 hours)/day, 7 days/week for this particular excavation.
Refined SR14: Adit near Pacoima reservoir (either Adit Option SR14-A2 or SR14-A3)	4,800 BCY/d (Excavation of adit and fault chamber, and tunnel)	2.6	34	Spoils would be off-hauled by truck.

Spoils Removal Location	Bulk Cubic Yards per Day	Duration (years)	No. of Outbound Truck Trips/Hour	Potential Off-hauling Scenario
Refined SR14: Intermediate window IW1	2,344 BCY/d (Fault chamber excavation)	1.7	17	Spoils would be off-hauled by truck. Spoils from the long tunnels that would be initially taken out from intermediate window at I-210 could be diverted through finished tunnels to Portal 10 to eliminate the truck hauling.
	4,638 BCY/d (Tunnel excavation)	1	32	
Refined SR14: Portal 10–Spreading Grounds	2,506 BCY/d (Tunnel excavation)	1.25	9	<p>Spoils would be transferred by conveyor belt directly to fill Boulevard mine pit, 0.9 mile from portal. The pit can also be used as temporary disposal site to reduce the required truck trips per hour without interfering with tunnel excavation operation (i.e., without hindering a possible fast TBM advance rate).</p> <p>50% of the spoils from this tunnel would be contaminated and require disposal at a facility licensed to accept potentially hazardous materials. Spoils disposal in existing mine pit would require a project design, which would include geotechnical investigation of the site, identification of disposal technology, site preparation, spoils transportation to an offsite treatment facility if spoils are hazardous, fill and compaction procedures, slope stability, monitoring, water treatment, and surface and vegetation restoration among other elements.</p> <p>Spoils from the long tunnels that would be initially taken out from intermediate window at I-210 could be diverted through finished tunnels to Portal 10 to eliminate the truck hauling.</p>
Refined SR14: Trench and cut-and-cover in Burbank Subsection	2,592 BCY/d (Trench excavation at Portal 10)	<1	18	Spoils would be off-hauled by truck. 100% of the spoils from the trench and cut-and-cover excavation would be contaminated and would need to be off-hauled to a suitable treatment site.
	1,728 BCY/d (Trench and cut-and-cover excavation at San Fernando Corridor)	0.7	10	
Refined SR14: Burbank Airport Station SEM Tunnel	589 BCY/d (SEM Tunnel excavation)	3	5	<p>Spoils would be off-hauled by truck.</p> <p>100% of the spoils from the tunnel excavation would be contaminated and would need to be off-hauled to a suitable treatment site.</p>

Spoils Removal Location	Bulk Cubic Yards per Day	Duration (years)	No. of Outbound Truck Trips/Hour	Potential Off-hauling Scenario
Refined SR14: Burbank Airport Station	1,728 BCY/d (Excess dirt - part of that volume from north half of cut-and-cover, part from south half of cut-and-cover. Assuming excavation at 2 locations simultaneously)	2.5	18 (Stockpiled over a period of 5.4 years) 12 (during 3.7 years)	Spoils can be stockpiled in an area adjacent to cut-and-cover (within station footprint), to separate the spoils volume into layers to be hauled to disposal site daily (about 20 acres available during construction within the station area footprint). 100% of the spoils from the station cut-and-cover excavation would be contaminated and would need to be off-hauled to a suitable treatment site.
SR14A Build Alternative				
SR14 A: Cuts/fills in Palmdale Subsection	1,519 BCY/d	4.6	11	Spoils would be off-hauled by truck.
SR14A: Cuts/fills in Central Subsection	3,922 BCY/d	6.4	27	At-grade alignment up to Portal 1A. Also added increase in earthworks (from Sta 0+265 up to Sta 355+00), roadways (up to Sta 400+00) and Metrolink (265+00 to 340+00)
SR14A: Portal 1A	4,893 BCY/d	6.4	12	Due to the volume of spoils, truck trips have been calculated considering 2 work shifts per day (16h/day), 7 days/week
SR14A: Portal IWA	1,491 BCY/d (Intermediate window)	1.34	10	Spoils would be off-hauled by truck.
	4,494 BCY/d (Tunnel 1A1 through IWA)	2.25	31	
SR14A: Portal 2A	6,501 BCY/d (Portal 2A excavation)	0.34	16	Spoils would be off-hauled by truck. Due to the volume of spoils, truck trips have been calculated considering 2 work shifts per day (16h/day), 7 days/week.
	4,494 BCY/d (Tunnel 1A2 through Portal 2A)	2.27	31	Spoils would be off-hauled by truck.
SR14A: Alignment	1,188 BCY/d	3	8	Spoils would be off-hauled by truck.
SR14A: Portal 3A	3,635 BCY/d	4.6	8	Due to the volume of spoils, truck trips have been calculated considering 2 work shifts per day (16h/day), 7 days/week. Spoils would be off-hauled by truck.

Spoils Removal Location	Bulk Cubic Yards per Day	Duration (years)	No. of Outbound Truck Trips/Hour	Potential Off-hauling Scenario
SR14A: Alignment	5,540 BCY/d	3	38	Spoils to be off-hauled by truck 3 miles through Soledad Canyon Road and Lang Station Road, to disposal in Vulkan mine.
SR14A: Portal 4A	7,653 BCY/d (Portal 4A excavation)	1	0	Conveyor belt southwards to Vulkan Mine after construction of viaduct over Santa Clara River.
	2,246 BCY/d (Tunnel 2A excavation)	0.76	0	
SR14A: Portal P9 – Vulkan Mine	38,775 BCY/d (Portal 9 excavation)	1	49 *	Conveyor belt directly to fill pit in Vulkan mine for nonhazardous material. Spoil deposition in existing mine pit requires a project design, including geotechnical investigation of the site, disposal technology, site preparation, spoils transportation to deposition site and treatment if they are hazardous, fill and compaction procedures, slope stability, monitoring, water treatment, surface and vegetation restoration, etc. The spoils coming from tunnel excavation are assumed suitable for deposition at the mine and free of significant contamination. 50% of the excavated volume at the tunnel portal is assumed to be hazardous material. This volume would require truck off-haul to a suitable treatment site. * Due to the volume of spoils to be off-hauled, truck trips calculated based on 2 work shifts (16 hours)/day, 7 days/week for this particular excavation.
	4,359 BCY/d (Tunnel 5 excavation)	1.33	0	
	2,188 BCY/d (Tunnel/fault chamber excavation)	1.5	0	
SR14A: Adit near Pacoima reservoir	4,800 BCY/d (Excavation of adit and fault chamber, and tunnel)	2.6	34	Spoils would be off-hauled by truck.
SR14A: Intermediate window at I-210	2,344 BCY/d (Fault chamber excavation)	1.7	17	Spoils would be off-hauled by truck. Spoils from the long tunnels that would be initially taken out from the intermediate window at I-210 could be diverted through finished tunnels to Portal 10 to eliminate the truck hauling.
	4,638 BCY/d (Tunnel excavation)	1	32	

Spoils Removal Location	Bulk Cubic Yards per Day	Duration (years)	No. of Outbound Truck Trips/Hour	Potential Off-hauling Scenario
SR14A: Portal 10–Spreading Grounds	2,506 BCY/d (Tunnel excavation)	1.25	9	<p>Noncontaminated spoils would be transferred by conveyor belt directly to fill Boulevard mine pit, 0.9 miles from portal. See Table Notes about contaminated soil for Portal 9. The pit can also be used as temporary disposal site to reduce the truck trips per hour without interfering with tunnel excavation operation (i.e. without hindering a possible fast advance rate of the TBMs).</p> <p>50% of the spoils from the tunnel would be contaminated. Spoil disposal in existing mine pit requires a project design, including geotechnical investigation of the site, disposal technology, site preparation, spoils transport to disposal site and treatment if they are hazardous, fill and compaction procedures, slope stability, monitoring, water treatment, surface and vegetation restoration, etc.</p> <p>Spoils from the long tunnels that would be initially taken out from intermediate window at I-210 could be diverted through finished tunnels to Portal 10 to eliminate the truck hauling.</p>
SR14A: Burbank Subsection	2,592 BCY/d (Trench excavation at Portal 10)	<1	18	<p>Spoils would be off-hauled by truck.</p> <p>100% of the spoils from the trench and cut-and-cover excavation would be contaminated and would need to be off-hauled to a suitable treatment site.</p>
	1,728 BCY/d (Trench and cut-and-cover excavation at San Fernando Corridor)	0.7	10	
SR14A: Burbank Airport Station SEM Tunnel	589 BCY/d (SEM Tunnel excavation)	3	5	<p>Spoils would be off-hauled by truck.</p> <p>100% of the spoils from the tunnel excavation would be contaminated and would need to be off-hauled to a suitable treatment site.</p>

Spoils Removal Location	Bulk Cubic Yards per Day	Duration (years)	No. of Outbound Truck Trips/Hour	Potential Off-hauling Scenario
SR14A: Burbank Airport Station cut-and-cover	1,728 BCY/d	2.5	12 (during 3.7 years)	Spoils can be stockpiled in an area adjacent to cut-and-cover (within station footprint), to split the spoils volume into layers to be hauled to disposal site daily (about 20 acres available during construction within the station area footprint). 100% of the spoils from the station cut-and-cover excavation would be contaminated and would need to be off-hauled to a suitable treatment site.
E1 Build Alternative				
E1: Cuts/fills in Palmdale	1,519 BCY/d	4.6	11	Spoils would be off-hauled by truck.
E1: Cut in Acton Area	5,675 BCY/d (Excess dirt from open cuts/fills)	4.6	14	Excess dirt from cut slopes and cut-and-covers would be off-hauled by truck, using existing roadways, to potential disposal sites southeast of Palmdale. Due to volume of spoils to be off-hauled, truck trips calculated based on 2 work shifts (16 hours)/day, 7 days/week.
E1: Cut-and-cover Pearblossom	2,592 BCY/d –cut-and-cover excavation	2.8	6	Spoils would be off-hauled by truck. Due to volume of spoils to be off-hauled, truck trips calculated based on 2 work shifts (16 hours)/day, 7 days/week.
E1: Portal 1	19,212 BCY/d (Portal 1 excavation)	1	18 (Stockpiled over a period of 2.6 years)	Spoils would be transported by conveyor belt (about 2 miles) following the HSR tracks northward (within the Build Alternative footprint) to an area adjacent to the Metrolink Vincent Grade/Acton station (within the Build Alternative footprint). At this location, spoils would be stockpiled and taken out by truck at a lower frequency (trips/hour) than at locations requiring 16 hours/day, 7 day/week hauling. The maximum volume of spoils to be stockpiled would be about 3.2 million cubic yards in an area available between Pearblossom interchange and Mountain Springs road until Phase 4 Pearblossom interchange work begins. This off-haul solution requires that the HSR infrastructure between Portal 1 and Vincent Grade/Acton station be constructed before the excavation of the tunnel begins, including the 2 viaducts (N and S of Foreston Drive). Due to volume of spoils to be off-hauled, truck trips calculated based on 2 work shifts per day (16 hours/day), 7 days/week.
	2,035 BCY/d (Tunnel 1 excavation)	0.67	8	

Spoils Removal Location	Bulk Cubic Yards per Day	Duration (years)	No. of Outbound Truck Trips/Hour	Potential Off-hauling Scenario
E1: Portals 2 & 3 (Aliso Canyon)	4,588 BCY/d (Portal 2 excavation)	1 (Portal 2)	32 (Portal 2)	<p>Spoils originating from the excavation of Portal 2 and Tunnel 1 would be off-hauled by truck along Aliso Canyon road to disposal.</p> <p>After Tunnel 1 is completed, excavation of Portal 3 and Tunnel 2 would start, so spoils could be taken out by conveyor belt along the HSR tracks (northwards) to an area in the vicinity of Vincent Grade/Acton station, within the Build Alternative footprint. From there, spoils would be off-hauled by truck to disposal site. There would be no area available within the footprint, near Vincent Grade/Acton station or Pearblossom interchange, to stockpile those spoils (809,000 CY total or 3,065 bulk CY/day from Portal 3 [1 year] and 697,951 Bulk CY total or 2.086 BCY/d from tunnel 2 [1 year]).</p> <p>The option of starting construction of Portal 3 and Tunnel 2 after Tunnel 1 is excavated would be feasible because Tunnels 1 and 2 would be short tunnels and not in the critical path and building one tunnel after the other would not affect the overall construction time.</p> <p>* Truck trips needed to off-haul spoils from the Vincent Grade/Acton station area calculated based on 2 work shifts (16 hours)/day, 7 days/week.</p>
	Then	Then	Then	
	2,035 BCY/d (Tunnel 1 excavation)	0.67 (Tunnel 1)	14 (Tunnel 1)	
	3,065 BCY/d (Portal 3 excavation)	1 (Portal 3)	8* (Portal 3)	
	Then	Then	Then	
2,086 BCY/d (Tunnel 2 excavation)	0.92 (Tunnel 2)	8* (Tunnel 2)		
E1: Intermediate window at Arrastre Canyon	276 BCY/d Shaft excavation	1	2	<p>Spoils from the excavation of the shaft and the tunnel would be off-hauled by truck down Arrastre Canyon Road to disposal.</p> <p>Spoils from the tunnel excavation could also be transported by conveyor belt from IW1 northwards through the HSR tracks (if Tunnels 1 and 2 are completed when the TBMs begin their operation).</p>
	2,086 BCY/d Tunnel excavation (Tunnel 2, from IW1 northward)	0.92	14	
	5,579 BCY/d Tunnel excavation (Tunnel 3, from IW1 southward)	1.75	39	
E1: San Gabriel adit (either Adit Option E1-A1 or E1-A2)	4,647 BCY/d (Excavation of adit and fault chamber)	2.5	32	Spoils would be off-hauled by truck.
	5,600 BCY/d (Tunnel excavation)	1.75	39	

Spoils Removal Location	Bulk Cubic Yards per Day	Duration (years)	No. of Outbound Truck Trips/Hour	Potential Off-hauling Scenario
E1: Intermediate window at I-210	3,836 BCY/d (Tunnel excavation)	4.4	27	Spoils would be off-hauled by truck. Spoils from the long tunnels that would be initially taken out from intermediate window at I-280 could be diverted through finished tunnels to Portal 4 to eliminate the truck hauling.
E1: Portal 4– Spreading grounds	2,506 BCY/d (Tunnel excavation)	1.25	9	Spoils would be transported by conveyor belt directly to fill Boulevard mine, 0.9 mile from portal. The pit can also be used as temporary disposal site to reduce the truck trips per hour without interfering with tunnel excavation operation (i.e., without hindering a possible fast TBM advance rate). 50% of the spoils from this tunnel would be contaminated and require disposal at a facility licensed to accept potentially hazardous materials. Spoils disposal in existing mine pit would require a project design, which would include geotechnical investigation of the site, identification of disposal technology, site preparation, spoils transportation to an offsite treatment facility if spoils are hazardous, fill and compaction procedures, slope stability, monitoring, water treatment, and surface and vegetation restoration among other elements. Spoils from the long tunnels that would be initially taken out from intermediate window at I-280 could be diverted through finished tunnels to Portal 4 to eliminate the truck hauling.
E1: Trench and cut-and-cover in Burbank Subsection	2,592 BCY/d (Trench excavation at Portal 4)	<1	18	Spoils would be off-hauled by truck. 100% of the spoils from the trench and cut-and-cover excavation would be contaminated and would need to be off-hauled to a suitable treatment site.
	1,728 BCY/d (Trench and cut-and-cover excavation at San Fernando Corridor)	0.7	10	
E1: Burbank Airport Station SEM Tunnel	589 BCY/d (SEM Tunnel excavation)	3	5	Spoils would be off-hauled by truck. 100% of the spoils from the tunnel excavation would be contaminated and would need to be off-hauled to a suitable treatment site.

Spoils Removal Location	Bulk Cubic Yards per Day	Duration (years)	No. of Outbound Truck Trips/Hour	Potential Off-hauling Scenario
E1: Burbank Airport Station cut-and-cover	1,728 BCY/d (Excess dirt - part of that volume from north half of cut-and-cover, part from south half of cut-and-cover. Assuming excavation at 2 locations simultaneously)	2.5	18 (Stockpiled over a period of 5.4 years) 12 (during 3.7 years)	Spoils can be stockpiled in an area adjacent to cut-and-cover (within station footprint), to separate the spoils volume into layers to be hauled to disposal site daily (about 20 acres available during construction within the station area footprint). 100% of the spoils from the station cut-and-cover excavation would be contaminated and would need to be off-hauled to a suitable treatment site.
E1A Build Alternative				
E1A: Cuts/fills in Palmdale Subsection	1,519 BCY/d	4.6	11	Spoils would be off-hauled by truck.
E1A: Cuts Central Subsection	1,705 BCY/d (Excess dirt from open cuts/fills)	6.4	12	Excess dirt from cut slopes would be off-hauled by truck through existing roadways to potential disposal sites southeast of Palmdale.
E1A: Portal 1A	5,153 BCY/d (Portal 1A excavation)	3.5	13	Spoils would be off-hauled by truck. Due to the volume of spoils to be off-hauled, truck trips calculated based on 2 work shifts per day (16h/day), 7 days/week
E1A: Portal 2A and 3A	3,352 BCY/d (Portal 2A, Portal 3A, and cut and cover excavation)	1	8	Spoils would be off-hauled by truck. Due to the volume of spoils to be off-hauled, truck trips calculated based on 2 work shifts per day (16h/day), 7 days/week
	1,769 BCY/d (Tunnel 1A excavation)	1.56	5	
E1A Alignment	1,887 BCY/d	0.75	4	Spoils would be off-hauled by truck. Due to the volume of spoils to be off-hauled, truck trips calculated based on 2 work shifts per day (16h/day), 7 days/week

Spoils Removal Location	Bulk Cubic Yards per Day	Duration (years)	No. of Outbound Truck Trips/Hour	Potential Off-hauling Scenario
E1A: Portal 1	19,212 BCY/d (Portal 1 excavation)	1	18 (during 2.6 years)	Conveyor belt transportation (about 2 miles) following the proposed alignment northwards within the project footprint, to an area adjacent to the Metrolink Vincent Grade/Acton station (within the project footprint). At this location, spoils would be stockpiled and taken out by truck at a lower frequency (trips/hour). The maximum volume of spoils to be stockpiled would be about 3.2 MCY - area available between Pearblossom interchange and Mountain Springs road, until works for Phase 4 in the Pearblossom interchange start. This off-haul solution requires that the HSR infrastructure between Portal 1 and Vincent Grade/Acton station is constructed before the excavation of the tunnel begins, including the 2 viaducts (north and south of Foreston Drive). Due to the volume of spoils to be off-hauled, truck trips calculated based on 2 work shifts per day (16h/day), 7 days/week
	2,035 BCY/d (Tunnel 1 excavation)	0.67	8	
E1A: Portals 2 & 3 (Aliso Canyon)	4,588 BCY/d (Portal 2 excavation)	1	32 (Portal 2)	Spoils originating from the excavation of Portal 2 and Tunnel 1 would be off-hauled by truck along Aliso Canyon road to disposal. After Tunnel 1 is completed, excavation of Portal 3 and Tunnel 2 would start, so spoils could be taken out by conveyor belt along the HSR tracks (northwards) to an area in the vicinity of Vincent Grade/Acton station, within the Build Alternative footprint. From there, spoils would be off-hauled by truck to disposal site. There would be no area available within the footprint, near Vincent Grade/Acton station or Pearblossom interchange, to stockpile those spoils (809,000 CY total or 3,065 bulk CY/day from Portal 3 [1year] and 697,951 Bulk CY total or 2.086 BCY/d from tunnel 2 [1 year]). The option of starting construction of Portal 3 and Tunnel 2 after Tunnel 1 is excavated would be feasible because Tunnels 1 and 2 would be short tunnels and not in the critical path and building one tunnel after the other would not affect the overall construction time. *Truck trips needed to off-haul spoils from the Vincent Grade/Acton station area calculated based on 2 work shifts (16 hours)/day, 7 days/week.
	3,065 BCY/d (Portal 3 excavation)		8* (Portal 3)	
	2,035 BCY/d (Tunnel 1 excavation)	0.67 (Tunnel 1)	14 (Tunnel 1)	
	2.086 BCY/d (Tunnel 2 excavation)	0.92 (Tunnel 2)	8* (Tunnel 2)	

Spoils Removal Location	Bulk Cubic Yards per Day	Duration (years)	No. of Outbound Truck Trips/Hour	Potential Off-hauling Scenario
E1A: Intermediate window at Arrastre Canyon	276 BCY/d Shaft excavation	1	2	Spoils from the excavation of the shaft and the tunnel would be off-hauled by truck down Arrastre Canyon Road to disposal. Spoils from the tunnel excavation could also be transported by conveyor belt from IW1 northwards through the HSR tracks (if Tunnels 1 and 2 are completed when the TBMs begin their operation).
	2,086 BCY/d Tunnel excavation (Tunnel 2, from IW1 northward)	0.92	14	
	5,579 BCY/d Tunnel excavation (Tunnel 3, from IW1 southward)	1.75	39	
E1A: San Gabriel adit	4,647 BCY/d (Excavation of adit and fault chamber)	2.5	32	Spoils would be off-hauled by truck.
	5,600 BCY/d (Tunnel excavation)	1.75	39	
E1A: Intermediate window at I-210	3,836 BCY/d (Tunnel excavation)	4.4	27	Spoils would be off-hauled by truck. Spoils from the long tunnels that would be initially taken out from intermediate window at I-280 could be diverted through finished tunnels to Portal 4 to eliminate the truck hauling.
E1A: Portal 4– Spreading grounds	2,506 BCY/d (Tunnel excavation)	1.25	9	Spoils would be transported by conveyor belt directly to fill Boulevard mine, 0.9 miles from portal. The pit can also be used as temporary disposal site to reduce the truck trips per hour without interfering with tunnel excavation operation (i.e., without hindering a possible fast TBM advance rate). 50% of the spoils from this tunnel would be contaminated and require disposal at a facility licensed to accept potentially hazardous materials. Spoils disposal in existing mine pit would require a project design, which would include geotechnical investigation of the site, identification of disposal technology, site preparation, spoils transportation to an offsite treatment facility if spoils are hazardous, fill and compaction procedures, slope stability, monitoring, water treatment, and surface and vegetation restoration among other elements. Spoils from the long tunnels that would be initially taken out from intermediate window at I-280 could be diverted through finished tunnels to Portal 4 to eliminate the truck hauling.

Spoils Removal Location	Bulk Cubic Yards per Day	Duration (years)	No. of Outbound Truck Trips/Hour	Potential Off-hauling Scenario
E1A: Trench and cut-and-cover in Burbank Subsection	2,592 BCY/d (Trench excavation at Portal 4)	<1	18	Spoils would be off-hauled by truck. 100% of the spoils from the trench and cut-and-cover excavation would be contaminated and would need to be off-hauled to a suitable treatment site.
	1,728 BCY/d (Trench and cut-and-cover excavation at San Fernando Corridor)	0.7	10	
E1A Burbank Airport Station SEM Tunnel	589 BCY/d (SEM Tunnel excavation)	3	5	Spoils would be off-hauled by truck. 100% of the spoils from the tunnel excavation would be contaminated and would need to be off-hauled to a suitable treatment site.
E1A: Burbank Airport Station cut-and-cover	1,728 BCY/d Total –excess dirt from the station cut-and-cover	2.5 (Assuming excavation at 2 locations simultaneously)	18 (Stockpiled over a period of 5.4 years) 12 (during 3.7 years)	Spoils can be stockpiled in an area adjacent to cut-and-cover (within station footprint), to separate the spoils volume into layers to be hauled to disposal site daily (about 20 acres available during construction within the station area footprint). 100% of the spoils from the station cut-and-cover excavation would be contaminated and would need to be off-hauled to a suitable treatment site.
E2 Build Alternative				
E2: Cuts/fills in Palmdale	1,519 BCY/d	4.6	11	Spoils would be off-hauled by truck.
E2: Cut in Acton Area	5,675 BCY/d (Excess dirt from open cuts/fills)	4.6	14	Excess dirt from cut slopes and cut-and-covers would be off-hauled by truck, along existing roadways, to potential disposal sites southeast of Palmdale. Due to volume of spoils to be off-hauled from the cuts, truck trips calculated based on 2 work shifts (16 hours)/ day, 7 days/week.
E2: Cut-and-cover Pearblossom	2,592 BCY/d –cut-and-cover excavation	2.8	6	Spoils would be off-hauled by truck. Due to volume of spoils to be off-hauled, truck trips calculated based on 2 work shifts (16 hours)/ day, 7 days/week.

Spoils Removal Location	Bulk Cubic Yards per Day	Duration (years)	No. of Outbound Truck Trips/Hour	Potential Off-hauling Scenario
E2: Portal 1	19,212 BCY/d (Portal 1 excavation)	1	18 (Stockpiled over a period of 2.6 years)	Spoils would be transported by conveyor belt (about 2 miles) following the HSR tracks northward within the Build Alternative footprint, to an area adjacent to the Metrolink Vincent Grade/Acton station (within the Build Alternative footprint).
	2,035 BCY/d (Tunnel 1 excavation)	0.67	8	At this location, spoils would be stockpiled and taken out by truck at a lower frequency (trips/hour) than at locations requiring hauling 16 hours/day, 7 days/week. The maximum volume of spoils to be stockpiled would be about 3.2 million CY, in an area available between Pearblossom interchange and Mountain Springs road, until work starts on for Phase 4 in the Pearblossom interchange. This off-haul solution requires that the HSR infrastructure between Portal 1 and Vincent Grade/Acton station be constructed before the excavation of the tunnel begins, including the 2 viaducts (N and S of Foreston Drive). Due to volume of spoils to be off-hauled, truck trips calculated based on 2 work shifts (16 hours) per day, 7 days/week.
E2: Portals 2 and 3 (Aliso Canyon)	4,588 BCY/d (Portal 2 excavation)	1	32 (Portal 2)	Spoils originating from the excavation of Portal 2 and Tunnel 1 would be off-hauled by truck along Aliso Canyon Road to disposal. After Tunnel 1 is completed, excavation of Portal 3 and Tunnel 2 would start, so spoils could be taken out by conveyor belt along the HSR tracks (northward) to an area in the vicinity of Vincent Grade/Acton station, within the Build Alternative footprint. From there, spoils would be off-hauled by truck to disposal site. There would be no area available within the footprint, near Vincent Grade/Acton station or Pearblossom interchange, to stockpile those spoils (809,000 CY total or 3,065 bulk CY/day from Portal 3 [1year] and 697,951 Bulk CY total or 2.086 BCY/d from tunnel 2 [1 year]). The option of starting construction of Portal 3 and Tunnel 2 after Tunnel 1 is excavated would be feasible because Tunnels 1 and 2 are short and not in the critical path and building one tunnel after the other would not affect the overall construction time. * Truck trips needed to off-haul spoils from the Vincent Grade/Acton station area calculated based on 2 work shifts (16 hours) /day, 7 days/week.
	3,065 BCY/d (Portal 3 excavation)		8* (Portal 3)	
	2,035 BCY/d (Tunnel 1 excavation)	0.67 (Tunnel 1)	14 (Tunnel 1)	
	2,086 BCY/d (Tunnel 2 excavation)	0.92 (Tunnel 2)	8* (Tunnel 2)	

Spoils Removal Location	Bulk Cubic Yards per Day	Duration (years)	No. of Outbound Truck Trips/Hour	Potential Off-hauling Scenario
E2: Intermediate window at Arrastre Canyon	276 BCY/d (Shaft excavation)	1	2	Spoils from the excavation of the shaft and the tunnel would be off-hauled by truck along Arrastre Canyon Road to disposal. Spoils from the tunnel excavation could also be transported by conveyor belt from IW1, northward through the alignment, if Tunnels 1 and 2 are completed when the TBMs begin operating.
	2,086 BCY/d (Tunnel excavation from IW1 northwards)	0.92	14	
	3,575 BCY/d (Tunnel excavation from IW1 southwards)	3.4	25	
E2: San Gabriel adit	1,124 BCY/d (Excavation of adit and fault chamber)	4.9	8	Spoils would be off-hauled by truck.
E2: Portal 4	8,888 BCY/d (Portal 4 excavation)	1	62	Spoils would be off-hauled by truck (from the tunnel portal down the footprint area and onto the I-210 freeway).
	3,935 BCY/d (Tunnel excavation)	5.1	27	
E2: Portal 5	3,500 BCY/d (Portal 5 excavation)	1	24	Spoils would be off-hauled by truck. 10% of the spoils from the tunnel excavation would be contaminated and would need to be off-hauled to a suitable treatment site.
	612 BCY/d (Tunnel excavation)	1.25	4	

Spoils Removal Location	Bulk Cubic Yards per Day	Duration (years)	No. of Outbound Truck Trips/Hour	Potential Off-hauling Scenario
E2: Intermediate window at Calmat Mine	1,792 BCY/d (SEM twin and single tunnels excavation)	1.75 and 3.7	6	<p>Noncontaminated spoils to be taken away by conveyor belt directly to CalMat Mine.</p> <p>Spoils disposal in existing mine pit would require a project design, which would include geotechnical investigation of the site, identification of disposal technology, site preparation, spoils transportation to an off-site treatment facility if spoils are hazardous, fill and compaction procedures, slope stability, monitoring, water treatment, and surface and vegetation restoration among other elements.</p> <p>10% of the spoils from the SEM twin tunnel north of the intermediate window would be contaminated and that 100% of the spoils from the SEM tunnel (twin and single) south of the intermediate window would be contaminated. Contaminated spoils would be off-hauled by truck to a suitable treatment site.</p>
E2: SEM tunnel excavated from Burbank Airport Station	576 BCY/d (SEM tunnel excavation and cavern)	2.75	4	<p>Spoils would be off-hauled by truck.</p> <p>100% of the spoils from the tunnel excavation would be contaminated and would need to be off-hauled to a suitable treatment site.</p>
E2: Cut-and-cover Burbank Airport Station	1,728 BCY/d	3.2	12 (during 6.3 years)	<p>Spoils can be stockpiled in an area adjacent to cut-and-cover (within station footprint), to separate the spoils volume into layers to be hauled to disposal site daily (about 20 acres available during construction within the station area footprint).</p> <p>100% of the spoils from the station cut-and-cover excavation would be contaminated and would need to be off-hauled to a suitable treatment site.</p>
E2A Build Alternative				
E2A: Cuts/fills in Palmdale Subsection	1,519 BCY/d	4.6	11	Spoils would be off-hauled by truck.
E2A: Cuts in Central Subsection	1,705 BCY/d (Excess dirt from open cuts/fills)	6.4	12	Excess dirt from cut slopes would be off-hauled by truck through existing roadways to potential disposal sites southeast of Palmdale.

Spoils Removal Location	Bulk Cubic Yards per Day	Duration (years)	No. of Outbound Truck Trips/Hour	Potential Off-hauling Scenario
E2A: Portal 1A	5,153 BCY/d (Portal 1A excavation)	3.5	13	Spoils would be off-hauled by truck. Due to the volume of spoils to be off-hauled, truck trips calculated based on 2 work shifts per day (16h/day), 7 days/week
E2A: Portal 2A and 3A	3,352 BCY/d (Portal 2A, Portal 3A, and cut and cover excavation)	1	8	Spoils would be off-hauled by truck. Due to the volume of spoils to be off-hauled, truck trips calculated based on 2 work shifts per day (16h/day), 7 days/week
	1,769 BCY/d (Tunnel 1A excavation)	1.56	5	
E2A Alignment	1,887 BCY/d	0.75	4	Spoils would be off-hauled by truck. Due to the volume of spoils to be off-hauled, truck trips calculated based on 2 work shifts per day (16h/day), 7 days/week
E2A: Portal 1	19,212 BCY/d (Portal 1 excavation)	1	18 (during 2.6 years)	Conveyor belt transportation (about 2 miles) following the HSR tracks northwards within the project footprint, to an area adjacent to the Metrolink Vincent Grade/Acton station (within the project footprint). At this location, spoils would be stockpiled and taken out by truck at a lower frequency (trips/hour). The maximum volume of spoils to be stockpiled would be about 3.2 MCY - area available between Pearblossom interchange and Mountain Springs road, until works for Phase 4 in the Pearblossom interchange start - . This off-haul solution requires that the HSR infrastructure between Portal 1 and Vincent Grade/Acton station is constructed before the excavation of the tunnel begins, including the 2 viaducts (north and south of Foreston Drive). Due to the volume of spoils to be off-hauled, truck trips calculated based on 2 work shifts per day (16h/day), 7 days/week
	2,035 BCY/d (Tunnel 1 excavation)	0.67	8	

Spoils Removal Location	Bulk Cubic Yards per Day	Duration (years)	No. of Outbound Truck Trips/Hour	Potential Off-hauling Scenario
E2A: Portals 2 & 3 (Aliso Canyon)	4,588 BCY/d (Portal 2 excavation)	1	32 (Portal 2)	<p>Spoils originating from the excavation of Portal 2 and Tunnel 1 would be off-hauled by truck along Aliso Canyon road to disposal.</p> <p>After Tunnel 1 is completed, excavation of Portal 3 and Tunnel 2 would start, so spoils could be taken out by conveyor belt along the HSR tracks (northwards) to an area in the vicinity of Vincent Grade/Acton station, within the Build Alternative footprint. From there, spoils would be off-hauled by truck to disposal site. There would be no area available within the footprint, near Vincent Grade/Acton station or Pearblossom interchange, to stockpile those spoils (809,000 CY total or 3,065 bulk CY/day from Portal 3 [1 year] and 697,951 Bulk CY total or 2.086 BCY/d from tunnel 2 [1 year]).</p> <p>The option of starting construction of Portal 3 and Tunnel 2 after Tunnel 1 is excavated would be feasible because Tunnels 1 and 2 would be short tunnels and not in the critical path and building one tunnel after the other would not affect the overall construction time.</p> <p>*Truck trips needed to off-haul spoils from the Vincent Grade/Acton station area calculated based on 2 work shifts (16 hours)/day, 7 days/week.</p>
	3,065 BCY/d (Portal 3 excavation)		8* (Portal 3)	
	2,035 BCY/d (Tunnel 1 excavation)	0.67 (Tunnel 1)	14 (Tunnel 1)	
	2,086 BCY/d (Tunnel 2 excavation)	0.92 (Tunnel 2)	8* (Tunnel 2)	
E2A: Intermediate window at Arrastre Canyon	276 BCY/d (Shaft excavation)	1	2	<p>Spoils from the excavation of the shaft and the tunnel would be off-hauled by truck along Arrastre Canyon Road to disposal.</p> <p>Spoils from the tunnel excavation could also be transported by conveyor belt from IW1, northward through the alignment, if Tunnels 1 and 2 are completed when the TBMs begin operating.</p>
	2,086 BCY/d (Tunnel excavation from IW1 northwards)	0.92	14	
	3,575 BCY/d (Tunnel excavation from IW1 southwards)	3.4	25	
E2A: San Gabriel adit	1,124 BCY/d (Excavation of adit and fault chamber)	4.9	8	Spoils would be off-hauled by truck.

Spoils Removal Location	Bulk Cubic Yards per Day	Duration (years)	No. of Outbound Truck Trips/Hour	Potential Off-hauling Scenario
E2A: Portal 4	8,888 BCY/d (Portal 4 excavation)	1	62	Spoils would be off-hauled by truck (from the tunnel portal down the footprint area and onto the I-210 freeway).
	3,935 BCY/d (Tunnel excavation)	5.1	27	
E2A: Portal 5	3,500 BCY/d (Portal 5 excavation)	1	24	Spoils would be off-hauled by truck. 10% of the spoils from the tunnel excavation would be contaminated and would need to be off-hauled to a suitable treatment site.
	612 BCY/d (Tunnel excavation)	1.25	4	
E2A: Intermediate window at Calmat Mine	1,792 BCY/d (SEM twin and single tunnels excavation)	1.75 and 3.7	6	<p>Noncontaminated spoils to be taken away by conveyor belt directly to CalMat Mine.</p> <p>Spoils disposal in existing mine pit would require a project design, which would include geotechnical investigation of the site, identification of disposal technology, site preparation, spoils transportation to an off-site treatment facility if spoils are hazardous, fill and compaction procedures, slope stability, monitoring, water treatment, and surface and vegetation restoration among other elements.</p> <p>10% of the spoils from the SEM twin tunnel north of the intermediate window would be contaminated and that 100% of the spoils from the SEM tunnel (twin and single) south of the intermediate window would be contaminated. Contaminated spoils would be off-hauled by truck to a suitable treatment site.</p>
E2A: SEM tunnel excavated from Burbank Airport Station	576 BCY/d (SEM tunnel excavation and cavern)	2.75	4	<p>Spoils would be off-hauled by truck.</p> <p>100% of the spoils from the tunnel excavation would be contaminated and would need to be off-hauled to a suitable treatment site.</p>

Spoils Removal Location	Bulk Cubic Yards per Day	Duration (years)	No. of Outbound Truck Trips/Hour	Potential Off-hauling Scenario
E2A: Cut-and-cover Burbank Airport Station	1,728 BCY/d	3.2	12 (during 6.3 years)	<p>Spoils can be stockpiled in an area adjacent to cut-and-cover (within station footprint), to separate the spoils volume into layers to be hauled to disposal site daily (about 20 acres available during construction within the station area footprint).</p> <p>100% of the spoils from the station cut-and-cover excavation would be contaminated and would need to be off-hauled to a suitable treatment site.</p>

Assumptions:

1. The number of truck trips per hour to disposal site listed in the table has been calculated assuming 1 work shift of 8 hours/day and of 5 work days/week for the hauling of spoils from the portals, and 1 shift of 8 hours/day and 7 working days/week for the hauling of spoils from the tunnels (except where noted otherwise).
2. The number of trucks presented refers only to trucks per hour going from the construction sites to a disposal site (outbound), loaded with spoils. It does not include inbound trucks coming to the construction site to be loaded.
3. Bodies of embankments are built with spoils from cut slopes (Topsoil is re-used entirely for landscape restoration). Spoils volumes used to estimate the number of trucks for off-haul are calculated deducting fill volumes from cut volumes.
4. Hazardous materials would be trucked/shipped to a classified/permited disposal site.
5. Duration of tunnel activities based on a tunnel construction strategy that includes an Intermediate adit for shortening construction time (for E1 this implies an extra pair of TBMs launched from the adit).
6. Construction durations shown would occur simultaneously in some locations, so durations in this table are not additive to a total construction timeline.

BCY/d = bulk cubic yards per day; CY = cubic yard; h = hours; IW1 = Intermediate Window 1; SEM = sequential excavation method, TBM = tunnel boring machine