Little Cottonwood Canyon ENVIRONMENTAL IMPACT STATEMENT
Wasatch Boulevard to Alta

APPENDIX 2G

Preferred Alternative Selection Memorandum

Little Cottonwood Canyon ENVIRONMENTAL IMPACT STATEMENT
S.R. 210 | Wasatch Blvd. to Alta

Preferred Alternative Technical Memorandum

Little Cottonwood Canyon Environmental Impact Statement Wasatch Boulevard to Alta

Lead agency:
Utah Department of Transportation

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Contents

Tables

Figures

1.0 Introduction

This technical memorandum documents the Utah Department of Transportation's (UDOT) process to identify the preferred alternative for the Draft Environmental Impact Statement (EIS) for the State Route (S.R.) 210 Project. UDOT's process included reviewing how the project alternatives would meet the purpose of and need for the project and how they would affect the human and natural environment, including Section 4(f) resources.

UDOT reviewed transportation and environmental information both at the regional scale (by the total alternative) and at the local level (by city or area). Local information was reviewed to ensure that UDOT considered how specific cities or neighborhoods would be affected by the alternatives.

What is Section 4(f)?

For a description of Section 4(f), see footnote **e** in Table 6.

Section 2.0, Preferred Alternative Evaluation, of this technical memorandum summarizes the transportation performance, costs, and impacts of the alternatives. Section 3.0, UDOT's Preferred Alternative, identifies the preferred alternative and the reasons for its identification.

The environmental review, consultation, and other actions required by applicable federal environmental laws for this action are being, or have been, carried out by UDOT pursuant to 23 United States Code (USC) Section 327 and a Memorandum of Understanding dated January 17, 2017, and executed by the Federal Highway Administration and UDOT.

2.0 Preferred Alternative Evaluation

2.1 Methodology

For the S.R. 210 Project, UDOT is evaluating five primary alternatives and nine sub-alternatives that support the primary alternatives. The primary alternatives provide the main transportation solution on S.R. 210 from Fort Union Boulevard to the town of Alta, and the sub-alternatives are supporting elements that help the primary alternatives achieve the project goals.

The five primary alternatives are as follows:

- Enhanced Bus Service Alternative
- Enhanced Bus Service in Peak-period Shoulder Lane Alternative
- Gondola Alternative A (Starting at Canyon Entrance)
- Gondola Alternative B (Starting at La Caille)
- Cog Rail Alternative (Starting at La Caille)

The nine sub-alternatives that help the primary alternatives achieve the project goals are:

- **S.R. 210 – Wasatch Boulevard Alternatives**
  - Imbalanced-lane Alternative
  - Five-lane Alternative
- **Mobility Hubs Alternative**
  - Gravel Pit
  - 9400 South and Highland Drive
- **Avalanche Mitigation Alternatives**
  - Snow Sheds with Berms Alternative
  - Snow Sheds with Realigned Road Alternative
- **Trailhead Parking Alternatives**
  - Trailhead Parking Improvements and No S.R. 210 Roadside Parking within ¼ Mile of Trailheads Alternative
  - Trailhead Parking Improvements and No Roadside Parking from S.R. 209/S.R. 210 Intersection to Snowbird Entry 1 Alternative
  - No Trailhead Parking Improvements and No Roadside Parking from S.R. 209/S.R. 210 Intersection to Snowbird Entry 1 Alternative
- **No Winter Parking Alternative**

What is a mobility hub?

A mobility hub is a location where users can transfer from their personal vehicle to a bus.

In identifying a preferred alternative, UDOT first evaluated and identified its preferred primary alternative, then decided which of the sub-alternatives would best support the objectives of the identified primary alternative. For the sub-alternatives, UDOT identified one of the S.R. 210 – Wasatch Boulevard, Avalanche Mitigation, and Trailhead Parking Alternatives) and decided whether to identify the Mobility Hubs Alternative and/or the No Winter Parking Alternative).

In its decision process, UDOT considered the following measures:

- **Purpose and Need Performance** – The degree to which an alternative would meet the project purpose to "substantially improve transportation-related safety, reliability, and mobility on S.R. 210 from Fort Union Boulevard through the town of Alta for all users on S.R. 210"
- **Resource Impacts** – The amount and type of impacts to the natural and human environment an alternative would have
- **Estimated Cost – How much an alternative would cost**

UDOT's decision process did not weigh any of the above measures as being more important than the others; UDOT considered all three when making its decision. The evaluation below explains UDOT's rationale for selecting the preferred alternative.

In reviewing the three measures, UDOT also looked at other factors as part of the evaluation. For example, with regard to purpose and need performance, some alternatives have a greater potential to cause travel delays on S.R. 210 on days when it snows. As another example, with regard to resource impacts, two alternatives could have similar impacts, but one would affect a resource of greater importance.

2.2 Primary Alternatives Evaluation

The five primary alternatives evaluated in the preferred alternative decision process are:

- Enhanced Bus Service Alternative
- Enhanced Bus Service in Peak-period Shoulder Lane Alternative
- Gondola Alternative A (Starting at Canyon Entrance)
- Gondola Alternative B (Starting at La Caille)
- Cog Rail Alternative (Starting at La Caille)

2.2.1 Purpose and Need Performance

Purpose and Need Screening Criteria Evaluation

UDOT analyzed the transportation performance of each alternative to determine how well the alternative would meet the purpose of and need for the project. The evaluation included the degree to which each alternative would meet the following objectives:

What is the 30th-busiest hour?

The 30th-busiest hour is the hour with the 30th-highest hourly traffic volumes during the year.

- Substantially improve peak-hour per-person (defined as the 30th-busiest hour) travel times in Little Cottonwood Canyon for uphill and downhill users in 2050 compared to travel times with the No-Action Alternative in 2050.
- Meet peak-hour average total person-demand on busy ski days in Little Cottonwood Canyon.
- Substantially reduce vehicle backups on S.R. 210 and S.R. 209 through residential areas on busy ski days (30th-busiest hour).

As shown in Table 1, all five primary alternatives would substantially reduce peak-hour per-person travel time, with the Enhanced Bus Service in Peak-Period Shoulder Lane Alternative providing the best overall travel time. All of the primary alternatives would provide nearly equal peak-hour capacity, but the Enhanced Bus Service Alternative would cause vehicles to back up for greater distances on S.R. 209 and S.R. 210 compared to the other primary alternatives (Figure 1).

Table 1. Purpose and Need Performance for the No-Action and Primary Action Alternatives

Alternative	30th-highest-hour Per-person Travel Time[a] (minutes)	Alternative Transit Capacity in the Peak Hour (persons)	Vehicle Backup Distance from S.R. 209/S.R. 210 Intersection (feet)	
			On S.R. 209	On S.R. 210
No-Action Alternative	80–85	336	6,700	13,000
Enhanced Bus Service Alternative	45–50	1,008	1,275	4,300
Enhanced Bus Service in Peak-period Shoulder Lane Alternative	35–40	1,008	350	3,050
Gondola Alternative A	45–50	1,050	350	3,050
Gondola Alternative B	45–50	1,050	350	3,050
Cog Rail Alternative	45–50	1,012	350	3,050

[a] Fort Union Boulevard to Alta ski resort

Figure 1. Vehicle Backup Distance from S.R. 209/S.R. 210 Intersection in 2050

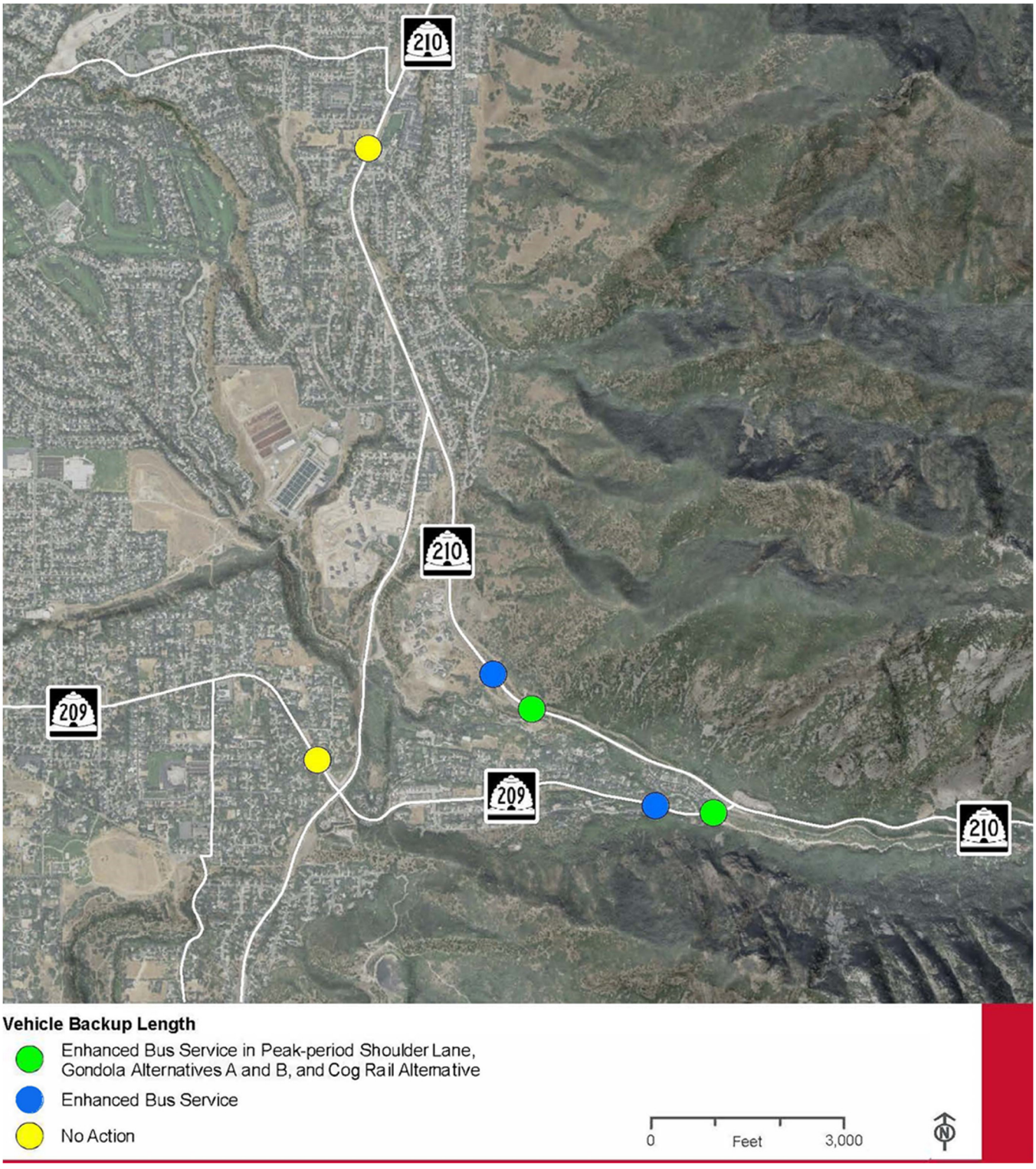

Table 2 shows the travel time for the primary alternatives for each mode of travel considered.

Table 2. Travel Time for the Primary Alternatives by Mode

In minutes

Alternative	Transit Mode Travel Time with Transfers[a]	Transit Mode Travel Time in Transit Vehicle[b]	Personal Vehicle Travel Time
Enhanced Bus Service Alternative	54	42	42
Enhanced Bus Service in Peak-period Shoulder Lane Alternative	36	24	38
Gondola Alternative A	63	34	38
Gondola Alternative B • From La Caille base station • From gravel pit mobility hub	 55 59	 37 47	 38 38
Cog Rail Alternative • From La Caille base station • From gravel pit mobility hub	 55 59	 37 47	 38 38

[a] Travel times are from Fort Union Boulevard to Alta ski resort and include transfers from parking to the transit mode.

[b] Travel times are times in the actual transit vehicle (bus, gondola, or cog rail) from the start location to Alta ski resort.

Table 3 evaluates the degree to which the primary alternatives would meet the project objectives.

Table 3. Degree to Which the Primary Alternatives Would Meet the Project Objectives

Alternative	Substantially Improve Peak-hour Per-person Travel Times	Meet Peak-hour Average Total Person-demand	Substantially Reduce Vehicle Backups on S.R. 210 and S.R. 209
Enhanced Bus Service Alternative	Travel times would be 45–50 minutes. The travel time would be similar to that with the gondola alternatives and Cog Rail Alternative.	Meets peak-hour demand.	This alternative would have the longest vehicle backups from the S.R. 209/ S.R. 210 intersection.
Enhanced Bus Service in Peak-period Shoulder Lane Alternative	This alternative would have the best overall per-person travel time.	Meets peak-hour demand.	This alternative, along with the gondola and cog rail alternatives, would have the shortest vehicle backups from the S.R. 209/S.R. 210 intersection.
Gondola Alternative A	Same as the Enhanced Bus Service Alternative.	Meets peak-hour demand.	Same as the Enhanced Bus Service Alternative in Peak-Period Shoulder Lane Alternative.
Gondola Alternative B	Same as the Enhanced Bus Service Alternative.	Meets peak-hour demand.	Same as the Enhanced Bus Service Alternative in Peak-Period Shoulder Lane Alternative.
Cog Rail Alternative	Same as the Enhanced Bus Service Alternative.	Meets peak-hour demand.	Same as the Enhanced Bus Service Alternative in Peak-Period Shoulder Lane Alternative.

Other Transportation Performance Considerations

In evaluating the primary alternatives, UDOT also considered other important factors such as how well each alternative would operate over the long term. The factors considered are as follows:

- **Scalable Service/Phased Implementation** – This measure was used to determine whether an alternative could be built in phases starting with improvements to address the initial transportation needs and build up to full build-out by 2050. For example, bus service could start with an initial smaller service and build on that service as demand increases. The advantage of scalable service is that it would allow UDOT to start with low initial upfront capital and operating costs and build the system over time while considering future changes in transportation demand and technology.
- **Travel Reliability** – This measure was used to determine how well an alternative would operate during snow events—for example, would vehicle slideoffs or accidents disrupt travel performance? A system that is less affected by snow would have an advantage.
- **Mechanical Complexity** – This measure was used to determine whether an alternative has a high degree of mechanical complexity compared to the other alternatives. Such complexity could result in more disruptions in service because of mechanical issues. A simple transportation system or redundant system would have an advantage.
- **Delay due to Snow-removal Operations** – This measure was used to determine whether personal vehicles and buses on S.R. 210 in Little Cottonwood Canyon would be delayed during snow-removal operations.
- **Avalanche Mitigation Risk** – This measure was used to determine whether an alternative could be delayed by avalanche mitigation operations.
- **Support of Active Transportation** – This measure was used to determine whether an alternative would provide greater benefits to active transportation (bicycle and pedestrian use).

Table 4 presents UDOT's evaluation of each consideration by alternative. As shown in the table, all alternatives have advantages and disadvantages depending on the considerations.

Table 4. Evaluation of Other Transportation Performance Considerations

Alternative	Scalable Service/ Phased Implementation	Travel Reliability	Mechanical Complexity	Delay due to Snow-removal Operations	Avalanche Mitigation Risk	Support of Active Transportation
Enhanced Bus Service Alternative	**Scalable service capability**. The alternative could initially start with a smaller bus fleet and fewer mobility hub parking spaces. This would allow UDOT to build on the service as demand grows and allow for future-year adjustments based on the operational characteristics of the bus service.	The buses would operate in the same travel lane as personal vehicles. Similar to existing conditions, vehicle slideoffs or accidents during snow events could block the travel lane and delay bus service.	Similar to the current bus system, which is easy to operate and maintain. Spare buses would be available if a bus breaks down during operation. Low likelihood of stranding users since one bus breaking down would not stop bus service.	Snow-removal operations could occur during operation of the bus service, similar to existing conditions.	With the addition of snow sheds, avalanche mitigation operations would have a low risk of delaying the bus service. Snow sheds improve roadway reliability and safety.	There would be no change to pedestrian and cyclist facilities on S.R. 210 in Little Cottonwood Canyon.
Enhanced Bus Service in Peak-period Shoulder Lane Alternative	**Scalable service capability**. Same as the Enhanced Bus Service Alternative except would require the capital investment for the peak-period shoulder lanes.	With the availability of a separate travel lane, buses could operate around vehicle slideoffs and accidents. However, snow and icy conditions would slow bus service.	Same as the Enhanced Bus Service Alternative.	Same as the Enhanced Bus Service Alternative.	Same as the Enhanced Bus Service Alternative.	The peak-period shoulder lanes would become pedestrian and cyclist lanes on S.R. 210 during the summer and when not in use during the winter.
Gondola Alternative A	**No scalable service capability**. UDOT would need to make the investment in the gondola infrastructure at project initiation. This would not allow UDOT to determine the operational success until after a major capital investment is made into the system.	The gondola system would not be affected by vehicle slideoffs or accidents. Vehicle users could decide to use the gondola system if travel lanes on S.R. 210 are closed or congested.	The system would have four stations, each necessary to operate the gondola system. If any part of the gondola system has a mechanical failure, the entire system would stop, stranding users at the base station or the ski resorts.	Same as the Enhanced Bus Service Alternative.	Current artillery use would require gondola cabins to be outside artillery fragmentation areas during avalanche mitigation operations. After use of artillery, the gondola cables would need to be inspected for damage before use. With snow sheds on S.R. 210, the use of artillery would be lower compared to current operations.	. Same as the Enhanced Bus Service Alternative.
Gondola Alternative B	**No scalable service capability**. Same as Gondola Alternative A.	Same as Gondola Alternative A.	Same as Gondola Alternative A but with an additional angle station (a station that adjusts the horizontal direction of the gondola cabin).	Same as the Enhanced Bus Service Alternative.	Same as Gondola Alternative A.	Same as the Enhanced Bus Service Alternative.
Cog Rail Alternative	**No scalable service capability**. UDOT would need to make the investment in the cog rail infrastructure at project initiation. This would not allow UDOT to determine the operational success until after a major capital investment is made into the system.	The cog rail system would not be affected by vehicle slideoffs or accidents. Vehicle users could decide to use the cog rail system if travel lanes on S.R. 210 are closed or congested.	The cog rail system would operate similar to other rail systems in the Salt Lake area except with cog wheels on the vehicles and a third, toothed rail. If a cog rail vehicle were to break down in a double-track segment of the alignment, other rail vehicles could still operate. However, a cog rail failure in the 2-mile single-track section would stop operation of the entire system. Low likelihood of stranding users.	Snow removed from the cog rail tracks would need to be blown onto S.R. 210, which would require UDOT to spend additional time for snow removal. In addition, when snow is blown off the tracks, this would temporarily close S.R. 210. The snow-blowing operation could occur during the early morning before peak travel periods.	Same as the Enhanced Bus Service Alternative.	A 6-to-8-foot-wide roadway shoulder would be built between the travel lane and the cog rail tracks. This shoulder could be used by pedestrians and cyclists.

2.2.2 Estimated Costs

Table 5 shows the estimated costs of the primary alternatives. The construction cost estimates include design, right-of-way, construction, utility relocations, and environmental mitigation. The construction cost estimates also include the sub-alternatives that would be necessary for the primary alternative to meet the project objectives. These construction cost estimates are based on unit prices for previously completed, similar projects that were escalated to 2020 dollars. The actual cost of construction would likely be higher because of inflation between 2020 and the year of construction, but the costs are expected to increase proportionally among the various alternatives.

The table also includes winter and summer operation and maintenance cost for each alternative. Only the gondola and cog rail alternatives would operate during the summer.

Table 5. Preliminary Cost Estimates for the Primary Alternatives
In millions of 2020 dollars

Alternative	Construction Cost Estimate[a,b]	Operation and Maintenance Cost Estimate[c]		
		Winter [d]	Summer	Total Annual Cost
Enhanced Bus Service Alternative	338–355	14.0	None	14.0
Enhanced Bus Service in Peak-period Shoulder Lane Alternative	493–510	11.0	None	11.0
Gondola Alternative A	554–561	9.5	5.0	14.5
Gondola Alternative B	575–592	7.6	3.0	10.6
Cog Rail Alternative	1,092–1,106	7.0	2.2	9.2

[a] The construction costs of the primary alternatives are presented as a range since each cost varies depending on the sub alternative(s) selected. The construction cost estimates also include tolling infrastructure.
[b] The construction costs for all alternatives include new buses, signal priority at intersections, fare-collection systems, communication equipment, and a bus maintenance and storage facility.
[c] The operation and maintenance costs include the total operations for the alternative, such as buses, personnel, and maintenance, plus snow removal for the Enhanced Bus Service in Peak-period Shoulder Lane Alternative and the Cog Rail Alternative.
[d] The operation and maintenance costs for the enhanced bus service alternatives include the cost of retaining drivers year-round to avoid laying off and rehiring and retraining drivers at the start of each winter season.

2.2.3 Summary Comparison of Resource Impacts by Alternative

Table 6 compares the resource impacts after mitigation of the five primary alternatives. This table provides a comparison among the alternatives for the resources evaluated in the Draft EIS. Although impacts are quantified, not all resources listed favored one alternative or another.

As shown in Table 6, some resources would experience a substantial difference in impacts from the alternatives, while other resources would experience no difference or a very small difference in impacts from the alternatives. Thus, some resource impacts were more helpful than others in distinguishing among the alternatives. Although Table 6 provides the quantitative information for each impact, it does not always provide the context and intensity of the impact. For some resources, the context and intensity of the impact provide relevant information for weighing alternatives. Impact context and intensity are included as appropriate in the following discussions of how UDOT's preferred primary alternative was identified.

Table 6. Environmental Impacts of the No-Action and Primary Action Alternatives including Supporting Elements

Impact Category	Unit	No-Action Alternative	Enhanced Bus Service Alternative	Enhanced Bus Service in Peak-period Shoulder Lane Alternative	Gondola Alternative A	Gondola Alternative B	Cog Rail Alternative
Potential residential relocations	Number	0	1	1	1	1	1
Potential business relocations	Number	0	0	0	0	0	0
Recreation areas affected	Number	0	2	4	3	3	5
Community facilities affected	Number	0	1	1	1	1	1
Environmental justice impacts	Yes/No	No	No	No	No	No	No
Economic impacts	Yes/No	No	No	No	No	No	No
Existing Forest Service trails affected	Number	0	0	1	1	1	1
Climbing resources (existing boulders and trails) affected	Number	0	0	5	1	1	21
Air quality impacts above regulations	Yes/No	No	No	No	No	No	No
Receptors with modeled noise levels above criteria	Number	173	213–230	216–233	213–230	213–230	214–231
Increase in impervious surface[a]	Acres	0	15.6–16.8	37.6–38.8	15.6–16.8	22–23.2	52.2–53.4
Water quality standards exceeded[b]	Yes/No	No	No	No	No	No	No
Wildlife habitat impacted	Acres	0	9–13	42–46	13–17	24–28	84–88
Threatened and endangered species	Yes/No	No	No	No	No	No	No
Impacts to waters of the United States[c]	Acres	0	0	0	0	0	0.01
Impacts to intermittent, perennial, and ephemeral streams	Acres	0	0.03–0.17	0.32–0.46	0.03–0.17	0.03–0.17	0.35–0.49
Impacts to Riparian Habitat Conservation Areas	Acres	0	0.14–0.83	1.58–2.18	0.14–0.83	0.14–0.83	0.75–1.44
Adverse impacts to cultural resources	Number	0	1	1	2	2	2
Hazardous waste sites affected	Number	0	1	2	1	2	2
Floodplain impacts	Acres	0	1.18–1.32	2.1–2.2	1.5–1.6	2.1–2.3	1.5–1.6

(*continued on next page*)

Table 6. Environmental Impacts of the No-Action and Primary Action Alternatives including Supporting Elements

Impact Category	Unit	No-Action Alternative	Enhanced Bus Service Alternative	Enhanced Bus Service in Peak-period Shoulder Lane Alternative	Gondola Alternative A	Gondola Alternative B	Cog Rail Alternative
Visual change[d] (Primary Alternative /Supporting Element)	Category	None	Negligible/High	Moderate/High	High/High	High/High	High/High
Section 4(f) uses (with greater–than–*de minimis* impact)[e]	Number	0	1	1	1	1	1

[a] The listed range captures the increase in impervious surface from the Wasatch Boulevard Imbalanced-lane Alternative or the Five-lane Alternative. The range does not include new impervious surface at the gravel pit or 9400 South and Highland mobility hubs; these locations were not included in the quantitative water quality analysis because they are outside the Little Cottonwood Creek watershed. The range includes the impervious surface at the gondola and cog rail base stations at La Caille.

[b] Based on water quality modeling, numeric water quality standards in Little Cottonwood Creek would not be exceeded with any alternative for modeled storm events.

[c] The impact would be to a seep from the upper-canyon snow sheds as part of the Cog Rail Alternative.

[d] Visual change includes landscape character change at key observation points. The visual change for the primary alternative and supporting elements such as snow sheds.

[e] The greater–than–*de minimis* Section 4(f) use would occur with the avalanche mitigation alternatives. Section 4(f) is an element of law and U.S. Department of Transportation regulation that requires a project to avoid the use of eligible or potentially eligible historic properties and significant publicly owned parks, recreation areas, and wildlife or waterfowl refuges unless there is no feasible and prudent alternative to such use or unless the use would have a *de minimis* impact. For historic properties, a *de minimis* impact means that UDOT has determined, in accordance with 36 Code of Federal Regulations Part 800, that the historic property in question would not be affected by the project or that the project would have "no adverse effect" on the historic property. For recreation areas, a *de minimis* impact is one that would not adversely affect the features, attributes, or activities that qualify the property for protection under Section 4(f). A temporary occupancy is an occupancy of land so minimal as to note constitute a use within the meaning of Section 4(f). For more information, see Chapter 26, Section 4(f) and Section 6(f) Evaluation.

2.2.4 Preferred Alternatives Selection

What are UDOT's preferred primary alternatives?

UDOT's preferred primary alternatives are the Enhanced Bus Service in Peak-period Shoulder Lane Alternative and Gondola Alternative B.

The section identifies and provides UDOT's basis for identifying its preferred primary alternatives in the Draft EIS. A single preferred primary alternative will be identified by UDOT before or in the Final EIS. The final selection of a primary alternative will be made by UDOT in the Record of Decision for the S.R. 210 Project. For the Draft EIS UDOT has narrowed down the five primary alternatives to two primary alternatives that are being considered as its preference. A purpose of identifying two primary preferred alternatives in the Draft EIS is to seek public input on the two alternatives that can be considered in identifying a single primary preferred alternative in the Final EIS and making a final selection of one of the alternatives in the Record of Decision.

UDOT identified the preferred primary alternatives based on their transportation performance, cost, and impacts to the natural and human environment. As part of identifying the preferred primary alternatives, UDOT considered public and agency input during the scoping process and the alternatives development, screening, and refinement process.

Note that there are strengths and weaknesses for each primary alternative. No primary alternative had the best transportation performance, the lowest cost, and the fewest impacts to all resources.

Based on the evaluation, UDOT identified the **Enhanced Bus Service in Peak-period Shoulder Lane Alternative** and **Gondola Alternative B** as its preferred primary alternatives. UDOT primarily based the decision on the Enhanced Bus Service in Peak-period Shoulder Lane Alternative providing the best overall **mobility** of the five primary action alternatives and Gondola Alternative B providing the best overall **reliability**. Other factors in making the decision are described below.

Enhanced Bus Service in Peak-period Shoulder Lane Alternative

- **Overall Per-person Peak-hour Travel Time.** The alternative would have the best overall travel time at 35 to 40 minutes in 2050, which is 10 minutes faster than the next-best alternative.
- **Transit Mode Travel Time.** The alternative would have the best transit travel time at 24 minutes and the best transit travel time with transfers at 36 minutes. These travel times are 10 minutes and 18 minutes faster, respectively, than the next-best alternatives.
- **Low Mechanical Complexity.** The alternative has a low mechanical complexity. If a bus is pulled from service, a spare bus can replace it without stopping the entire bus system
- **Scalable Service Capability.** The alternative could initially start with a smaller bus fleet and fewer mobility hub parking spaces. This would allow UDOT to build on the bus service as demand grows and adjust the service in the future based on its operational characteristics.
- **Travel Reliability.** Because a separate travel lane would be available, buses could operate around most vehicle slideoffs and accidents.
- **Support for Active Transportation.** The peak-period shoulder lanes would become pedestrian and cyclist lanes on S.R. 210 during the summer and when not in use during the winter.
- **Environment.** Of the five primary alternatives, the Enhanced Bus Service in Peak-period Shoulder Lane Alternative would have the second-highest impacts to wildlife habitat, but most of the area with impacts would be immediately adjacent to the existing road. In addition, the additional road cuts required for the shoulder lanes would cause a visual impact, but UDOT believes that these impacts would be less than with either the gondola alternatives or the Cog Rail Alternative.
- **Cost.** The alternative has the second-lowest construction cost.

Overall, UDOT believes that the Enhanced Bus Service in Peak-period Shoulder Lane Alternative best meets the project purpose of improving **mobility** by providing the best overall and transit travel times at the second-lowest cost. The separate bus lane would make the bus service attractive to people in personal vehicles because the buses would pass them during congested conditions. Combined with a toll for personal vehicles, the visibly faster bus service would likely provide an incentive for people to switch from personal vehicles to the bus service. Another mobility advantage with the Enhanced Bus Service in Peak-period Shoulder Lane Alternative is that it would reduce traffic on Wasatch Boulevard before this traffic enters the main residential portion of Cottonwood Heights, thereby improving mobility during busy ski periods for the residents. Bus users would use the mobility hub at the gravel pit north of the residential area, which would reduce traffic by about 250 vehicles during the peak morning hour.

The scalable service was also an important factor. UDOT could initially start with just the enhanced buses without the shoulder lanes and determine how the service operates, thereby delaying the cost of the peak-period shoulder lanes until they are needed. This delay would allow UDOT to adjust the bus service before making the large capital investment in the shoulder widening.

UDOT also considered the importance of the scenic value and watershed that Little Cottonwood Canyon provides. UDOT believes that the additional cuts into the canyon walls with the Enhanced Bus Service in Peak-period Shoulder Lane Alternative would cause less of a visual impact than the impacts from the

gondola towers or the cog rail alignment. In addition, UDOT could further reduce visual impacts by providing walls to reduce the size of the cuts.

UDOT acknowledges that the Enhanced Bus Service in Peak-period Shoulder Lane Alternative would add additional impervious roadway surface area, which would increase the amount of impervious surface in Little Cottonwood Canyon watershed, an important drinking water supply for Salt Lake Valley residents. However, to reduce impacts, UDOT would improve the current stormwater system, implement best management practices to improve the quality of stormwater runoff, and place additional guardrails at key locations along S.R. 210 to keep vehicles from entering Little Cottonwood Creek if they depart the road. Water quality modeling showed that this alternative would have *de minimis* impacts to the water quality of Little Cottonwood Creek.

The Enhanced Bus Service in Peak-period Shoulder Lane Alternative would also have the greatest impacts to Riparian Habitat Conservation Areas because Little Cottonwood Creek runs immediately adjacent to S.R. 210 in certain locations. UDOT would work with the U.S. Department of Agriculture (USDA) Forest Service to mitigate any impacts to the riparian resource. This alternative would also require removing two boulders used for climbing (Parking Lot West and Stick boulders) and require relocating three trails used to access climbing areas. UDOT would work with the USDA Forest Service on potentially relocating the boulders and would realign the trails to maintain connectivity. The Enhanced Bus Service in Peak-period Shoulder Lane Alternative would be consistent with the current USDA Forest Service *Revised Forest Plan: Wasatch-Cache National Forest* (USDA Forest Service 2003).

Gondola Alternative B

- **Travel Reliability.** The alternative would have a high travel reliability because it would be on a separate alignment from the road. Snow, vehicle slideoffs and accidents, and snow- and avalanche-removal operations would not affect the gondola service. If S.R. 210 were closed because of an avalanche or heavy snow, the gondola could still operate and be used as alternate to personal vehicle use. With the Cog Rail Alternative, the cog rail service could be delayed if an avalanche flow covers the rail alignment, similar to that of the road being covered by an avalanche flow.
- **Transit Mode Travel Time.** The alternative would have a better transit mode travel time with transfers than Gondola Alternative A (4 to 8 minutes) and the same travel time as the Cog Rail Alternative. The advantage of Gondola Alternative B over Gondola Alternative A is that the 1,500 parking spaces at the gondola base station at La Caille would reduce the need for an additional bus transfer and reduce the need for bus service to the base station and thus lower the operational and maintenance cost of this alternative by $2 million per year.
- **Delay Due to Snow Removal Operations.** The alternative would not delay or be delayed by UDOT's snow-removal operations. Both enhanced bus service alternatives could be delayed by snow-removal operations. For the Cog Rail Alternative, snow removed from the cog rail tracks would need to be blown onto S.R. 210, which would require UDOT to spend additional time for snow removal. In addition, when snow is blown off the tracks, this would temporarily close S.R. 210. The snow-blowing operation could occur during the early morning before peak travel periods. If an avalanche flow covers the rail tracks, cog rail operations would be delayed until the avalanche flow is cleared.
- **Environment.** Of the five primary alternatives, Gondola Alternative B would have lower impacts to wildlife habitat compared to the Enhanced Bus Service in Peak-period Shoulder Lane Alternative and the Cog Rail Alternative. The alternative would have the second-fewest impacts to climbing resources in Little Cottonwood Canyon and would have low impacts to the watershed because there would be no substantial increase in the amount of impervious surfaces in Little Cottonwood Canyon. The alternative would also have the lowest impact to riparian habitat conservation areas.
- **Cost.** The alternative has the second-highest construction cost but the second-lowest winter operational cost.

Overall, UDOT believes that the Gondola Alternative B best meets the project purpose of improving **reliability** because it can operate independently of S.R. 210 and avoid delays related to snow removal, avalanche removal, and traffic. In addition, UDOT believes that having a 1,500-space parking structure at the gondola base station would make Gondola Alternative B an attractive option to using personal vehicles. During congested traffic times related to snow and avalanche removal, the visibly faster gondola service would likely provide an incentive for people to switch from personal vehicles to the gondola service. UDOT also recognized the concerns of the residents in Cottonwood Heights that the proposed 1,500-car parking structure at the gondola base station would reduce mobility on busy ski days on Wasatch Boulevard. However, based on the proposed improvements both to Wasatch Boulevard and North Little Cottonwood Road and results of traffic modeling, UDOT determined that traffic going to the Gondola Alternative B base station would not cause congestion or traffic backups on Wasatch Boulevard.

UDOT also considered the importance of the scenic value and watershed that Little Cottonwood Canyon provides. UDOT believes that Gondola Alternative B would have the highest visual impacts of the primary action alternatives; however, the alternative would have the second-lowest impacts to the watershed (after

the Enhanced Bus Service Alternative) because there would be no substantial increase in the amount of impervious services in the watershed, thus reducing the potential for increasing stormwater runoff.

UDOT also believes that Gondola Alternative B would not provide an additional barrier to wildlife movement since no additional travel lanes or rail alignment would be added to S.R. 210. The alternative would not affect climbing boulders in Little Cottonwood Canyon.

2.3 Sub-alternatives Evaluation

The nine sub-alternatives that help the primary alternatives achieve the project goals are:

- **S.R. 210 – Wasatch Boulevard Alternatives**
  - Imbalanced-lane Alternative
  - Five-lane Alternative
- **Mobility Hubs Alternative**
  - Gravel Pit
  - 9400 South and Highland Drive
- **Avalanche Mitigation Alternatives**
  - Snow Sheds with Berms Alternative
  - Snow Sheds with Realigned Road Alternative
- **Trailhead Parking Alternatives**
  - Trailhead Parking Improvements and No S.R. 210 Roadside Parking within ¼ Mile of Trailheads Alternative
  - Trailhead Parking Improvements and No Roadside Parking from S.R. 209/S.R. 210 Intersection to Snowbird Entry 1 Alternative
  - No Trailhead Parking Improvements and No Roadside Parking from S.R. 209/S.R. 210 Intersection to Snowbird Entry 1 Alternative
- **No Winter Parking Alternative**

2.3.1 S.R. 210 – Wasatch Boulevard Alternatives

Purpose and Need Performance

UDOT analyzed the transportation performance of each Wasatch Boulevard sub-alternative to determine how well the alternative would meet the purpose of and need for the project. The evaluation included the degree to which each alternative would meet the following objective:

- By 2050, meet UDOT's goal of level of service (LOS) D in the weekday AM and PM peak periods on Wasatch Boulevard.

What is level of service?

Level of service is a measure of the operating conditions on a road or at an intersection. Level of service is represented by a letter "grade" ranging from A (free-flowing traffic and little delay) to F (extremely congested, stop-and-go traffic and excessive delay).

As shown in Table 7 and Table 8, the two Wasatch Boulevard sub-alternatives would meet UDOT's goal of level of service (LOS) D in the weekday AM and PM peak periods on both the segments and intersections on Wasatch Boulevard. Overall, with the additional travel lane, the Five-lane Alternative would meet the LOS D objective to a greater degree; two roadway segments and five intersections would operate at a higher level of service than with the Imbalanced-lane Alternative. Additionally, the Five-lane Alternative would meet a higher demand of traffic in the future if traffic growth is greater than predicted.

Table 7. Wasatch Boulevard – Level of Service by Segment for the No-Action Alternative and Wasatch Boulevard Sub-alternatives (2050)

Alternative	Travel Time from Fort Union Blvd. to North Little Cottonwood Road (minutes)		Level of Service by Segment (Passing Criteria Are LOS A–D)			
	Northbound in AM/PM Peak Hour	Southbound in AM/PM Peak Hour	Fort Union Blvd. to Bengal Blvd.	Bengal Blvd. to 3500 East	3500 East to Kings Hill Drive	Kings Hill Drive to North Little Cottonwood Road
No-Action Alternative	4:22 / 4:40	3:53 / 10:15	F	E	E	D
Imbalanced-lane Alternative	4:05 / 4:37	3:32 / 4:21	C	C	C	C
Five-lane Alternative	3:51 / 4:00	3:32 / 4:12	C	B	B	C

Source: Fehr & Peers 2019

Red shading = Does not meet level of service goal of LOS D.

Table 8. Wasatch Boulevard – Level of Service by Intersection for the No-Action Alternative and Wasatch Boulevard Sub-alternatives (2050)

Alternative	Level of Service by Intersection									
	Fort Union Blvd./Wasatch Blvd.		Bengal Blvd./ Wasatch Blvd.		3500 East/ Wasatch Blvd.		Kings Hill Drive/ Wasatch Blvd.		North Little Cottonwood Road/ Wasatch Blvd.	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
No-Action Alternative	B	F	C	F	B	E	B	F	D	C
Imbalanced-lane Alternative	C	D	C	C	A	B	C	D	C	D
Five-lane Alternative	C	C	B	B	A	B	B	C	C	D

Source: Fehr & Peers 2019

Red shading = Does not meet level of service goal of LOS D.

Estimated Costs

Table 9 shows the estimated construction costs of the Wasatch Boulevard sub-alternatives. The construction cost estimates include design, right-of-way, construction, utility relocations, and environmental mitigation. These construction cost estimates are based on unit prices for previously completed, similar projects that were escalated to 2020 dollars. The actual cost of construction would likely be higher because of inflation between 2020 and the year of construction, but the costs are expected to increase proportionally between the two alternatives.

Table 9. Preliminary Construction Cost Estimates for the Wasatch Boulevard Sub-alternatives

In millions of 2020 dollars

Alternative	Construction Cost Estimate
Imbalanced-lane Alternative	59
Five-lane Alternative	62

Summary Comparison of Resource Impacts by Alternative

Table 10 compares the resource impacts of the Wasatch Boulevard sub-alternatives. This table provides a quantitative comparison among the alternatives for the resources evaluated in the Draft EIS. Although impacts are quantified for all of the impact categories below, not all resources listed favored one alternative or another.

As shown in Table 10, some resources would experience a substantial difference in impacts from the alternatives, while other resources would experience no difference or a very small difference in impacts from the alternatives. Thus, some resource impacts were more helpful than others in distinguishing among the alternatives.

Although Table 10 provides the quantitative information for each impact, it does not always provide the context and intensity of the impact. For some resources, the context and intensity of the impact provide relevant information for weighing alternatives. Impact context and intensity are included as appropriate in the following discussions of how UDOT's preferred Wasatch Boulevard alternative was identified.

Table 10. Environmental Impacts of the No-Action Alternative and Wasatch Boulevard Sub-alternatives

Impact Category	Unit	No-Action Alternative	Imbalanced-lane Alternative	Five-lane Alternative
Land converted to transportation use	Acres	0	49	50
Residential relocations	Number	0	1	1
Business relocations	Number	0	0	0
Recreation areas affected	Number	0	2	2
Community facilities affected	Number	0	1	1
Environmental justice impacts	Yes/No	No	No	No
Economic impacts	Yes/No	Yes	No	No
Existing trails affected	Number	0	0	0
Air quality impacts above regulations	Yes/No	No	No	No
Receptors with modeled noise levels above criteria	Number	99	135	152
Wildlife habitat impacted	Acres	0	1	1
Threatened and endangered species	Yes/No	No	No	No
Increase in impervious surface	Acres	0	13.2	14.4
Water quality standards exceed	Yes/No	No	No	No
Impacts to waters of the United States	Acres	0	0	0
Impacts to intermittent, perennial, and ephemeral streams	Acres	0	0.02	0.02
Adverse impacts to cultural resources	Number	0	0	0
Hazardous waste sites affected	Number	0	0	0
Floodplain impacts	Acres	0	1.17	1.17
Visual change	Category	None	Low	Low
Section 4(f) uses (with greater than *de minimis* impact)[a]	Number	0	0	0

[a] All uses of Section 4(f) properties would have *de minimis* impacts. Section 4(f) is an element of law and U.S. Department of Transportation regulation that requires a project to avoid the use of eligible or potentially eligible historic properties and significant publicly owned parks, recreation areas, and wildlife or waterfowl refuges unless there is no feasible and prudent alternative to such use or unless the use would have a *de minimis* impact. For historic properties, a *de minimis* impact means that UDOT has determined, in accordance with 36 Code of Federal Regulations Part 800, that the historic property in question would not be affected by the project or that the project would have "no adverse effect" on the historic property. For recreation areas, a *de minimis* impact is one that would not adversely affect the features, attributes, or activities that qualify the property for protection under Section 4(f). A temporary occupancy is an occupancy of land so minimal as to note constitute a use within the meaning of Section 4(f). For more information, see Chapter 26, Section 4(f) and Section 6(f) Evaluation.

Preferred Alternative Selection

What is UDOT's preferred Wasatch Boulevard alternative?

UDOT's preferred Wasatch Boulevard alternative is the Five-lane Alternative.

The section identifies and provides UDOT's basis for identifying its preferred Wasatch Boulevard alternative. The final selection of a Wasatch Boulevard alternative will be made by UDOT in the Record of Decision for the S.R. 210 Project. UDOT identified the preferred Wasatch Boulevard alternative based on its transportation performance, cost, and impacts to the natural and human environment. As part of identifying the preferred Wasatch Boulevard alternative, UDOT considered public and agency input during the scoping process and the alternatives development, screening, and refinement process. Note that there are strengths and weaknesses for each Wasatch Boulevard alternative. Neither of the Wasatch Boulevard alternatives had the best transportation performance, the lowest cost, and the fewest impacts to all resources.

Based on the evaluation, UDOT has identified the **Five-lane Alternative** as its preferred Wasatch Boulevard alternative for the Draft EIS. The Five-lane Alternative would provide better transportation performance, with all segments of Wasatch Boulevard operating at LOS B or better compared to the Imbalanced-lane Alternative providing LOS C or better. In addition, the Five-lane Alternative would have only one intersection operating at LOS D, whereas the Imbalanced-lane Alternative would have three. In addition, the travel times for the Five-lane Alternative in the northbound direction in the morning peak-period would be 13% shorter with the Five-lane Alternative. Therefore, the Five-lane Alternative would have a higher degree of meeting the project purpose of improving mobility on Wasatch Boulevard.

Although the cost would be slightly greater with the Five-lane Alternative compared to the Imbalanced-lane Alternative ($62 million versus $59 million), UDOT believes that the better transportation performance outweighs the higher cost. The environmental impacts of the alternatives would be similar, with the main difference being that about 17 more residential receptors would have noise impacts from the Five-lane Alternative compared to the Imbalanced-lane Alternative.

Some residents of Cottonwood Heights wanted UDOT to minimize the footprint of any Wasatch Boulevard alternative being considered. Residents felt that a wider road would harm the rural nature of the community, cause greater safety concerns with pedestrians wanting to cross the road, and further increase vehicle speeds. In making its decision, UDOT considered the concerns of the residents and therefore would implement a phased approach for the Five-lane Alternative.

With the phased approach, UDOT would first construct the Imbalanced-lane Alternative but would purchase the right-of-way to accommodate the Five-lane Alternative in the future. The extra right-of-way would be maintained as open space on the east side of the road between the travel lane and multi-use trail until the additional northbound lane is needed. UDOT would base the need for the additional northbound lane on when the level of service on the roadway and/or intersections reaches LOS E or greater. According to the current traffic analysis, this might not occur until after 2050.

2.3.2 Mobility Hubs Alternative

UDOT identified two mobility hubs that would be built with all of the primary alternatives: a mobility hub at the gravel pit and a mobility hub at 9400 South and Highland Drive. No other locations were identified that would meet the project objectives. All of the primary alternatives require building both the gravel pit and 9400 South and Highland Drive mobility hubs in order to meet the project objectives. Therefore, both mobility hubs will be included as part of the preferred alternative.

What is the gravel pit?

The gravel pit is an existing aggregate (gravel) mine located on the east side of Wasatch Boulevard between 6200 South and Fort Union Boulevard.

2.3.3 Avalanche Mitigation Alternatives

Purpose and Need Performance

UDOT analyzed the transportation performance of each avalanche mitigation sub-alternative to determine how well the alternative would meet the purpose of and need for the project. The evaluation included the degree to which each alternative would meet the following objectives:

- Substantially reduce the number of hours and/or days during which avalanches delay users.
- Substantially reduce the avalanche hazard for roadway users.

As shown in Table 11, the two avalanche mitigation alternatives would equally meet UDOT's objectives. However, the Snow Sheds with Realigned Road Alternative would straighten out the S.R. 210 roadway in the immediate area of the snow sheds (the Snow Sheds with Berms Alternative would leave the road in its current configuration), thereby improving vehicle safety by providing better driver sight distance in the sheds.

Table 11. S.R. 210 – Average Days and Hours of Road Closures with the No-Action Alternative and Avalanche Mitigation Sub-alternatives (2050)

Alternative	Average Days of Closures[a]	Average Hours of Closures[a]	Avalanche Hazard Index[a]
No-Action	10.5 to 21	56 to 108+	96
Snow Sheds with Berms	4 to 6	2 to 11	59
Snow Sheds with Realigned Road	4 to 6	2 to 11	59

[a] Avalanche hazard index. <1 = very low; 1 to 10 = low; 10 to 40 = moderate; 40 to 150 = high; >150 = very high.

Estimated Costs

Table 12 shows the estimated construction costs of the avalanche mitigation sub-alternatives. The cost estimates include design, right-of-way, construction, utility relocations, and environmental mitigation. These cost estimates are based on unit prices for previously completed, similar projects that were escalated to 2020 dollars. The actual cost of construction would likely be higher because of inflation between 2020 and the year of construction, but the costs are expected to increase proportionally between the two alternatives.

Table 12. Preliminary Construction Cost Estimates for the Avalanche Mitigation Sub-alternatives

In millions of 2020 dollars

Alternative	Construction Cost Estimate
Snow Sheds with Berms	72
Snow Sheds with Realigned Road	86

Summary Comparison of Resource Impacts by Alternative

Table 13 compares the resource impacts of the avalanche mitigation sub-alternatives. This table provides a quantitative comparison among the alternatives for the resources evaluated in the Draft EIS. Although impacts are quantified for all of the impact categories below, not all resources listed favored one alternative or another.

As shown in Table 13, some resources would experience a difference in impacts from the alternatives, while other resources would experience no difference or a very small difference in impacts from the alternatives. Thus, some resource impacts were more helpful than others in distinguishing among the alternatives.

Although Table 13 provides the quantitative information for each impact, it does not always provide the context and intensity of the impact. For some resources, the context and intensity of the impact provide relevant information for weighing alternatives. Impact context and intensity are included as appropriate in the following discussions of how UDOT's preferred avalanche mitigation alternative was identified.

Table 13. Environmental Impacts of the No-Action Alternative and Avalanche Mitigation Sub-alternatives

Impact Category	Unit	No-Action Alternative	Snow Sheds with Berms	Snow Sheds with Realigned Road
Land converted to transportation use	Acres	0	15	19
Residential relocations	Number	0	0	0
Business relocations	Number	0	0	0
Recreation areas affected	Number	0	0	0
Community facilities affected	Number	0	0	0
Environmental justice impacts	Yes/No	No	No	No
Economic impacts	Yes/No	Yes	No	No
Existing trails affected	Number	0	0	0
Climber boulders and trails affected	Number	0	0	0
Air quality impacts above regulations	Yes/No	No	No	No
Receptors with modeled noise levels above criteria[a]	Number	0	0	0
Wildlife habitat impacted	Acres	0	6	10
Threatened and endangered species	Yes/No	No	No	No
Increase in impervious surface	Number	0	0	0
Water quality standards exceeded	Yes/No	No	No	No
Impacts to waters of the United States[b]	Acres	0	0	0
Impacts to intermittent, perennial, and ephemeral streams	Acres	0	0.01	0.01
Impact to Riparian Habitat Conservation Areas	Acres	0	0.23	0.14
Adverse impacts to cultural resources	Number	0	1	1
Hazardous waste sites affected	Number	0	0	0
Floodplain impacts	Acres	0	0.01	O.14
Visual change	Category	None	High	High
Section 4(f) uses (with greater than *de minimis* impact)[a]	Number	0	1	1

[a] Section 4(f) is an element of law and U.S. Department of Transportation regulation that requires a project to avoid the use of eligible or potentially eligible historic properties and significant publicly owned parks, recreation areas, and wildlife or waterfowl refuges unless there is no feasible and prudent alternative to such use or unless the use would have a *de minimis* impact. For historic properties, a *de minimis* impact means that UDOT has determined, in accordance with 36 Code of Federal Regulations Part 800, that the historic property in question would not be affected by the project or that the project would have "no adverse effect" on the historic property. For recreation areas, a *de minimis* impact is one that would not adversely affect the features, attributes, or activities that qualify the property for protection under Section 4(f). A temporary occupancy is an occupancy of land so minimal as to note constitute a use within the meaning of Section 4(f). For more information, see Chapter 26, Section 4(f) and Section 6(f) Evaluation.

Preferred Alternative Selection

The section identifies and provides UDOT's basis for identifying its preferred avalanche mitigation alternative. The final selection of an avalanche mitigation alternative will be made by UDOT in the Record of Decision for the S.R. 210 Project. UDOT identified the preferred avalanche mitigation alternative based on its transportation performance, cost, and impacts to the natural and human environment. As part of identifying the preferred avalanche mitigation alternative, UDOT considered public and agency input during the scoping process and the alternatives development, screening, and refinement process. Note that there are strengths and weaknesses for each avalanche mitigation alternative.

What is UDOT's preferred avalanche mitigation alternative?

UDOT's preferred avalanche mitigation alternative is the Snow Sheds with Realigned Road Alternative.

Based on the evaluation, UDOT has identified the **Snow Sheds with Realigned Road Alternative** as its preferred avalanche mitigation alternative. The decision was based primarily on visual impacts. Both avalanche mitigation alternatives would equally meet the project purpose of improving safety and reliability by substantially decreasing the amount of time when S.R. 210 is closed for avalanche mitigation and by reducing the avalanche risk to roadway users. The environmental impacts of the two avalanche mitigation alternatives would be similar, with the main difference being that the Snow Sheds with Berms Alternative would have a greater visual impact because the berms that would extend 300 feet up the mountainside at a height of up to 20 feet. In addition, the impacts to Riparian Habitat Conservation Areas would be 0.14 acre with the Snow Sheds with Realigned Road Alternative compared to 0.23 acre with the Snow Sheds with Berms Alternative.

Both alternatives would have the same greater–than–*de minimis* impact to a Section 4(f) resource (archaeological site 42SL419). However, as part of the least overall harm analysis, it was determined that the Snow Sheds with Realigned Road Alternative would have the least harm because the alternative would have less visual impact and impacts to Riparian Habitat Conservation Areas.

In its evaluation, UDOT did consider that the Snow Sheds with Realigned Road Alternative would cost about $14 million more than the Snow Sheds with Berms Alternative ($86 million versus $72 million); however, UDOT believes that the lesser visual impacts outweigh the greater cost.

2.3.4 Trailhead Parking Alternatives

Purpose and Need Performance

UDOT analyzed the transportation performance of each trailhead parking sub-alternative to determine how well the alternative would meet the purpose of and need for the project. The evaluation included the degree to which each alternative would meet the following objectives:

- Improve roadway safety at existing trailhead locations.
- Reduce or eliminate traffic conflicts between motorized and nonmotorized transportation modes at key trailhead locations.
- Reduce or eliminate roadside parking to improve the safety and operational characteristics of S.R. 210.

Table 14 shows the number of parking spaces that would be associated with each trailhead parking sub-alternative. Table 15 provides a summary evaluation of how well each alternative would meet the project objectives.

Table 14. Total Parking Spaces from S.R. 209/S.R. 210 Intersection to Snowbird Entry 1 by Trailhead Parking Sub-alternative

Parking Area	Number of Parking Spaces[a]			
	Existing Parking/ No-Action Alternative	Trailhead Improvement Alternatives		No Trailhead Improvement Alternative
		No Roadside Parking ¼ Mile from Trailhead	No Roadside Parking to Snowbird Entry 1	No Roadside Parking to Snowbird Entry 1
Roadside parking	429	290	0	0
Gate Buttress Trailhead	30 (in formal dirt lot)	21	21	30 (in formal dirt lot)
Bridge Trailhead	Not applicable (roadside parking only)	15	15	0
Lisa Falls Trailhead	17 (north and south dirt pullouts)	41	41	17 (north and south dirt pullouts)
White Pine Trailhead	52	144	144	52
Total parking spaces[a]	**528**	**511**	**221**	**99**

[a] The total number of parking spaces does not capture all of the smaller available pullouts along S.R. 210, so the total number of existing parking spaces would be higher.

Table 15. Degree to Which the Trailhead Parking Sub-alternatives Would Meet the Project Objectives

Alternative	Improve Roadway Safety at Trailheads	Reduce or Eliminate Traffic Conflicts	Improve Safety and Operations
Trailhead Improvements and No Roadside Parking within ¼ Mile	Existing and new trailheads would be designed to meet UDOT safety standards for vehicle ingress and egress.	Roadside parking would be eliminated only within ¼ mile of the trailheads. Outside this area, some roadside parking could be allowed, which might cause conflicts with pedestrians and cyclists.	Some roadside parking would still be allowed, which could reduce the safety and operation of all transportation modes.
Trailhead Improvements and No Roadside Parking in Little Cottonwood Canyon	Same as Trailhead Improvements and No Roadside Parking within ¼ Mile Alternative.	Eliminating roadside parking on S.R. 210 in Little Cottonwood Canyon would eliminate roadside parked vehicles and pedestrian/ cyclist conflicts.	Eliminating roadside parking on S.R. 210 in Little Cottonwood Canyon would improve safety and operations for all transportation modes.
No Trailhead Improvements and No Roadside Parking	Gate Buttress, Lisa Falls, and White Pine Trailheads would continue to have substandard vehicle sight distances at entrances and no left or right turn lanes from S.R. 210.	Same as Trailhead Improvements and No Roadside Parking in Little Cottonwood Canyon Alternative.	Same as Trailhead Improve-ments and No Roadside Parking in Little Cottonwood Canyon Alternative.

Estimated Costs

Table 16 shows the estimated costs of the trailhead parking sub-alternatives. The cost estimates include design, right-of-way, construction, utility relocations, and environmental mitigation. These cost estimates are based on unit prices for previously completed, similar projects that were escalated to 2020 dollars. The actual cost of construction would likely be higher because of inflation between 2020 and the year of construction, but the costs are expected to increase proportionally between the three alternatives.

Table 16. Preliminary Construction Cost Estimates for the Trailhead Parking Sub-alternatives

In millions of 2020 dollars

Alternative	Construction Cost Estimate
Trailhead Improvements and No Roadside Parking within ¼ Mile	5.8
Trailhead Improvements and No Roadside Parking in Little Cottonwood Canyon	5.8
No Trailhead Improvements and No Roadside Parking	0.0

Summary Comparison of Resource Impacts by Alternative

Table 17 compares the resource impacts of the trailhead parking sub-alternatives. This table provides a quantitative comparison among the alternatives for the resources evaluated in the Draft EIS. Although impacts are quantified for all of the impact categories below, not all resources listed favored one alternative or another.

As shown in Table 17, some resources would experience a substantial difference in impacts from the alternatives, while other resources would experience no difference or a very small difference in impacts from the alternatives. Thus, some resource impacts were more helpful than others in distinguishing among the alternatives.

Although Table 17 provides the quantitative information for each impact, it does not always provide the context and intensity of the impact. For some resources, the context and intensity of the impact provide relevant information for weighing alternatives. Impact context and intensity are included as appropriate in the following discussions of how UDOT's preferred trailhead parking alternative was identified.

Table 17. Environmental Impacts of the No-Action Alternative and Trailhead Parking Sub-alternatives

Impact Category	Unit	No-Action Alternative	Trailhead Improvements and No Roadside Parking within ¼ Mile	Trailhead Improvements and No Roadside Parking	No Trailhead Improvements and No Roadside Parking
Land converted to transportation use	Acres	0	7	7	0
Residential relocations	Number	0	0	0	0
Business relocations	Number	0	0	0	0
Recreation areas affected	Number	0	0	0	0
Community facilities affected	Number	0	0	0	0
Environmental justice impacts	Yes/No	No	No	No	No
Economic impacts	Yes/No	Yes	No	No	No
Existing trails affected	Number	0	0	0	0
Climber boulders and trails affected	Number	0	0	0	0
Air quality impacts above regulations	Yes/No	No	No	No	No
Receptors with modeled noise levels above criteria	Number	0	0	0	0
Wildlife habitat impacted	Acres	0	7	7	0
Threatened and endangered species	Yes/No	No	No	No	No
Increase in impervious surface	Acres	0	2.4	2.4	0
Water quality standards exceeded	Yes/No	No	No	No	No
Impacts to intermittent, perennial, and ephemeral streams	Acres	0	0.14	0.14	0
Impact to Riparian Habitat Conservation Areas	Acres	0	0.6	0.6	0
Impacts to waters of the United States	Acres	0	0	0	0
Adverse impacts to cultural resources	Number	0	0	0	0
Hazardous waste sites affected	Number	0	0	0	0
Floodplain impacts	Acres	0	0.01	0.01	0
Visual change	Category	None	Moderate	Moderate	None
Section 4(f) uses (with greater than *de minimis* impact)[a]	Number	0	0	0	0

(*continued on next page*)

Table 17. Environmental Impacts of the No-Action Alternative and Trailhead Parking Sub-alternatives

Impact Category	Unit	No-Action Alternative	Trailhead Improvements and No Roadside Parking within ¼ Mile	Trailhead Improvements and No Roadside Parking	No Trailhead Improvements and No Roadside Parking

[a] All uses of Section 4(f) properties would have *de minimis* impacts. Section 4(f) is an element of law and U.S. Department of Transportation regulation that requires a project to avoid the use of eligible or potentially eligible historic properties and significant publicly owned parks, recreation areas, and wildlife or waterfowl refuges unless there is no feasible and prudent alternative to such use or unless the use would have a *de minimis* impact. For historic properties, a *de minimis* impact means that UDOT has determined, in accordance with 36 Code of Federal Regulations Part 800, that the historic property in question would not be affected by the project or that the project would have "no adverse effect" on the historic property. For recreation areas, a *de minimis* impact is one that would not adversely affect the features, attributes, or activities that qualify the property for protection under Section 4(f). A temporary occupancy is an occupancy of land so minimal as to note constitute a use within the meaning of Section 4(f). For more information, see Chapter 26, Section 4(f) and Section 6(f) Evaluation.

Preferred Alternative Selection

The section identifies and provides UDOT's basis for identifying its preferred trailhead parking alternative. The final selection of a trailhead parking alternative will be made by UDOT in the Record of Decision for the S.R. 210 Project. UDOT identified the preferred trailhead parking alternative based on its transportation performance, cost, and impacts to the natural and human environment. As part of identifying the preferred trailhead parking alternative, UDOT considered public and agency input during the scoping process and the alternatives development, screening, and refinement process. Note that there are strengths and weaknesses for each trailhead parking alternative.

What is UDOT's preferred trailhead parking alternative?

UDOT's preferred trailhead parking alternative is the Trailhead Improvements and No Roadside Parking within ¼ Mile Alternative.

Based on the evaluation, UDOT has identified the **Trailhead Improvements and No Roadside Parking within ¼ Mile Alternative** as its preferred trailhead parking alternative. UDOT made this decision primarily because UDOT did not want to substantially reduce recreation access in areas that are currently used by recreationists and do not have designated parking areas. With the trailhead improvements, UDOT would add parking at the Bridge, Lisa Falls, and White Pine Trailheads equivalent to the number of spaces eliminated in the proposed no-parking areas ¼ mile on either side of the trailheads and would maintain the existing roadside parking outside the ¼ mile. Overall, this alternative would reduce parking in Little Cottonwood Canyon by 17 spaces, from 528 to 511.

All three trailhead alternatives would address the project need to reduce or eliminate traffic conflicts among roadside parked vehicles, cyclists and pedestrians, and vehicles moving in the S.R. 210 travel lanes. The Trailhead Improvements and No Roadside Parking in Little Cottonwood Canyon Alternative and the No Trailhead Improvements and No Roadside Parking Alternative would reduce these conflicts to a greater degree, but they would also eliminate roadside recreational access except at designated trailheads from the intersection of S.R. 209/S.R. 210 to Snowbird Entry 1. UDOT decided that maintaining some roadside recreation access outside the main trailheads was important to many recreational users in Little Cottonwood Canyon. UDOT also decided that was important to improve the access to the existing trailheads at the Lisa

Falls and White Pine Trailheads since they do not meet safety standards for sight distance. The No Trailhead Improvements and No Roadside Parking Alternative would not improve these safety deficiencies.

Of the three trailhead parking alternatives evaluated, the No Trailhead Improvements and No Roadside Parking Alternative would not cause any additional environmental impacts since there would be no improvements to trailhead parking. The Trailhead Improvements and No Roadside Parking within ¼ Mile Alternative would result in 7 acres of impacts to wildlife habitat; 0.14 acre of impacts to intermittent, perennial, or ephemeral streams; and 0.6 acre of impact to Riparian Habitat Conservation Areas. However, in discussions with the USDA Forest Service, UDOT decided that reducing roadside vehicle parking conflicts within ¼ mile of either side of the trailheads, improving safety for vehicles accessing the trailheads, and providing trailheads that would allow the USDA Forest Service to better manage access (appropriate restrooms, reduction in "spider web" trailheads, and water treatment measures) at the existing trailheads outweighed the environmental impacts.

Cost was not a factor in UDOT's decision process regarding improving trailheads.

2.3.5 No Winter Parking Alternative

The No Winter Parking Alternative would eliminate some winter roadside parking (about 230 spaces) adjacent to the ski resorts. The objective of this alternative is to reduce or eliminate roadside parking to improve the safety and operational characteristics of S.R. 210. No construction is required to implement this alternative, so it would have no construction-related environmental impacts or cost.

What is UDOT's decision regarding the No Winter Parking Alternative?

UDOT decided to select the No Winter Parking Alternative as part of its preferred alternative.

Based on the evaluation, UDOT has identified the **No Winter Parking Alternative** as part of the preferred alternative. UDOT based its decision on the fact that removing winter roadside parking would reduce friction between parked vehicles and vehicles in the travel lanes and therefore improve overall mobility. In addition, removing roadside parked vehicles would allow UDOT to improve winter snow removal operations since snow plows would not need to navigate around parked vehicles and would provide more areas for storing snow.

3.0 UDOT's Preferred Alternatives

For the Draft EIS UDOT has narrowed down the five primary alternatives to the two primary alternatives that it considers preferable at this time. A purpose of identifying these two primary preferred alternatives is to seek public input that can be considered in making a final selection of one of the primary alternative in the Record of Decision.

Based on the analysis presented in this technical memorandum, UDOT has identified the **Enhanced Bus Service in Peak-period Shoulder Lane Alternative** as the primary preferred alternative in the Draft EIS for providing the best overall mobility and **Gondola Alternative B** as the primary preferred alternative in the Draft EIS for providing the best overall reliability. UDOT has identified the following sub-alternatives as the supporting elements of the primary preferred alternatives in the Draft EIS:

- **Five-lane Alternative** (Wasatch Boulevard alternative)
- **Snow Sheds with Realigned Road Alternative** (avalanche mitigation alternative)
- **Trailhead Improvements and No Roadside Parking within ¼ Mile Alternative** (trailhead parking alternative)
- **No Winter Parking Alternative**

4.0 References

[USDA Forest Service] U.S. Department of Agriculture Forest Service

2003 Revised Forest Plan: Wasatch-Cache National Forest. South Jordan, Utah: U.S. Department of Agriculture, Forest Service, Intermountain Region, Uinta-Wasatch-Cache National Forest. https://www.fs.usda.gov/detailfull/uwcnf/landmanagement/planning/?cid=stelprdb5076923&width=full.