7.0 Alternatives Evaluation

The proposed alternatives for the Draper Transit Corridor were evaluated based on various factors, including transportation impacts, environmental impacts, potential for smart growth, cost-effectiveness, financial feasibility, and community and political support. Screening criteria were developed directly from the project goals, which flowed from the purpose of the project.

These evaluation factors are reflected in the goals and objectives developed for this AA. The proposed Draper Transit Corridor alternatives were evaluated to determine potential ridership and traffic impacts in the corridor. Environmental impacts were also addressed. The project team concentrated on the impact that the build alternatives would have on natural resources and the physical environment along the three alignments under study. Environmental impacts were considered qualitatively; more detailed technical analysis of the environmental impacts of the selected build alternative will be deferred to the Draft EIS and compared to the No-Action and TSM Alternatives.

The No-Action and TSM Alternatives were not subject to elimination using the screening criteria, but were retained to provide a baseline for comparison in the environmental study phase and when evaluating New Starts competitiveness. These two environmental and FTA New Starts baseline alternatives will be evaluated in the Draft EIS phase of project development.

The FTA New Starts Criteria were also considered in the evaluation of the build alternatives. As stated in FTA's New Starts program guidelines, FTA considers specific criteria in its deliberations to advance fixed-guideway transit projects through the project development process and to enter into a long-term financial commitment to implement the proposed transit investments. The New Starts program categorizes these criteria into two broad areas: project justification and local financial commitment. The project justification criteria, which are used to rank alternatives, are:

- Mobility improvements
- Cost-effectiveness
- Other factors (for example, transit-supportive land use and future patterns)

A comparison of how well each alternative meets the study goals and objectives (described in Section 5.1, Development of Goals and Objectives) and New Starts criteria is presented in this section of the AA Report. The purpose of the project consists of the following elements:

- Improve mobility and connectivity, including connectivity to UTA's other rail services.
- Provide faster, more reliable public transportation services in order to be a competitive alternative to travel by automobile.
- Increase transportation system capacity.
- Reduce traffic congestion or limit the growth of congestion.
- Enhance the opportunities for more travel choices.
- Improve transit service for non-commuter trips.
- Create opportunities for transit-oriented development.
- Reduce automobile emissions.

The screening criteria included community input, ridership, competitive travel times (versus automobile travel), ability to fund, potential for fatal flaws, and ability to integrate with TRAX. The screening criteria included comparing the following elements:

- Ridership (boardings and total transit trips)
- Roadway and intersection level of service and traffic impacts
- Estimate of probable capital cost
- O&M costs
- Cost-effectiveness (annualized cost per rider)

7.1 Mobility Improvements

This section summarizes the transportation impacts related to each alternative, including transit ridership impacts and local roadway and intersection impacts.

7.1.1 Ridership

Ridership is used as a proxy for measuring economic benefits. This study assumes that people who use a new transit service are receiving benefits and the higher the ridership, the greater the economic benefit.

The differences in ridership among the alignments under consideration are due in large measure to the proximity of residents and jobs to the logical station locations for each alignment. Table 7-1 provides an accounting of the year 2030 residents and employment within station areas, which are generally 0.25-mile and 0.5-mile radii from the center of the station platform. The year 2030 estimate is the number of households and employees projected to be in place if the community and general plan estimates are fully achieved.

Table 7-1. Population and Employment within Build Alternative Station Areas

Screening Criteria Performance Measures	Alternative A – West of I-15	Alternative B – State Street	Alternative C – UTA-Owned Right-of-Way
0.25-mile radius of potential stations			
Residents	6,600	9,900	17,800
Employees	12,000	13,400	4,400
0.5-mile radius of potential stations			
Residents	9,000	21,400	35,800
Employees	18,000	27,400	10,600

Source: WFRC 2006

The Draper Transit Corridor extension serves a more downtown-travel-oriented market, meaning that more residential population is likely to generate higher ridership. The employment base is largely commercial retail and is not well-suited to be served by rail transit. Alternative C has the highest residential population compared to Alternatives A and B.

Transit ridership is typically quantified in two ways. *Transit boardings* is the most common measure. A transit boarding occurs whenever a passenger boards a transit vehicle in the course of making a trip. *Linked trips* is the other common measure of ridership. A linked trip includes all segments that a passenger travels from a trip origin to a trip destination. For example, a linked trip could include a walk from home to a transit station, a bus ride with a transfer to a rail route, and a

walk to the final destination. A single linked trip could require more than one transit boarding, especially if transfers are required.

Table 7-2 shows the annual boardings for the North-South TRAX line and linked transit trips for the alternatives under consideration. The ridership results are obtained from the WFRC regional travel demand model (Version 6) and annualization factors used by UTA.

Table 7-2. Ridership Measures and Results

Screening Criteria Performance Measures	TSM Alternative	Alternative A – West of I-15	Alternative B – State Street	Alternative C – UTA-Owned Right-of-Way
Average system-wide daily transit trips[a]	257,100	259,300	259,800	262,200
Average North-South TRAX Line daily boardings[b]	30,770	36,000	35,800	39,100
Average weekday ridership[c]	3,900	4,600	4,400	7,700
Annual new ridership[d]	204,400	1,343,200	1,284,800	2,248,400

[a] Total trips in the UTA service area.

[b] Total new boardings from the proposed southern end of the line to downtown Salt Lake City.

[c] Annual new ridership on the TSM or LRT extension only.

[d] Annual new ridership is the annualized difference between No Action and the alternative.

Alternative C has the highest relative increase in ridership compared to Alternatives A and B. This higher ridership suggests that Alternative C would be the most cost-effective on an annualized basis, all other things being equal.

7.1.2 Traffic Impacts

For initial screening of traffic impacts, UTA examined the level of service (LOS) on roadway intersections and grade crossings. Traffic counts were taken at critical intersections on State Street and at other critical grade crossings of the UTA-owned right-of-way to determine whether grade separations were warranted. As a result of the traffic analysis, several intersections were noted as failing in 2030. All of these failing intersections could be mitigated by constructing a fly-over so that the LRT tracks would not interfere with traffic movements at the intersections. The cost of these fly-overs was added into the capital cost estimates for each build alternative (see Table 7-3).

Table 7-3. Traffic Impacts of Build Alternatives

Screening Criteria Performance Measures	Alternative A – West of I-15	Alternative B – State Street	Alternative C – UTA-Owned Right-of-Way
Number of failing intersections (LOS E or F)	4	3	0
Number of intersections with LOS E or F after mitigation	0	0	0

Source: AECOM 2008b

7.2 Estimates of Probable Capital Costs

The estimates of capital costs are used as part of the cost-effectiveness screening as well as a measure in its own right. Table 7-4 compares the costs of the three rail-build alternatives being examined.

Table 7-4. Capital Cost Measures

Screening Criteria Performance Measures	TSM Alternative	Alternative A – West of I-15	Alternative B – State Street	Alternative C – UTA-Owned Right-of-Way
Alignment distance (miles)	NA	7.8	6.7	8.6
Preliminary capital costs[a]	$23.9 million	$578.7 million	$481.7 million	$530.4 million
Cost per mile	NA	$74.2 million	$71.9 million	$61.7 million
Annualized capital costs	$1.9 million	$38.0 million	$33.7 million	$36.2 million

Source: AECOM 2008a

[a] Cost shown in YOE dollars

Although Alternative B has the lowest overall capital cost to implement, it is the shortest of the three alternatives. Alternative C has the lowest cost per mile compared to Alternatives A and B.

7.3 Estimates of O&M Costs

The estimates of O&M costs are used as part of the cost-effectiveness screening as well as a measure in its own right. Table 7-5 highlights the cost comparisons of the three rail-build alternatives being examined.

Table 7-5. O&M Cost Measures

Screening Criteria Performance Measures	TSM Alternative	Alternative A – West of I-15	Alternative B – State Street	Alternative C – UTA-Owned Right-of-Way
Alignment distance (miles)	NA	7.8	6.7	8.6
Annual O&M costs	$6.0 million	$8.2 million	$8.0 million	$7.1 million

Source: UTA 2008

7.4 Estimates of Cost Effectiveness

FTA has developed a new measure of project benefits that is aimed at quantifying travel time savings for all users of the proposed project (both existing riders and new riders); the measure is referred to as *user benefits*. According to this definition, a *benefit* is generated if a build alternative provides reduced travel time or travel cost compared to a baseline alternative. User benefits include savings in travel time (that is, a build alternative that provides faster station-to-station times, reduced wait times, and/or reduced transfer times compared to the baseline); better access to transit (that is, provides a transit alternative to areas not served by the baseline); and avoidance of out-of-pocket costs (such as cost of parking in downtown Salt Lake City or the cost of driving farther to a park-and-ride lot). All of these benefits are totaled and translated to equivalent hours of travel time. Calculations are made using SUMMIT, special software that was developed by FTA and is required for use in applications for federal funds. The cost-effectiveness criterion for New Starts reporting purposes is cost per transportation system user benefit (TSUB).

However, for the purpose of evaluating the three potential build alternatives in the AA, a simpler technique was used to determine cost-effectiveness. The cost per new rider criterion was used to determine whether the proposed investment was cost-effective. Cost per new rider is calculated by determining the annualized capital cost of the alternative and adding the annual operating cost to obtain the sum of annualized costs. This annualized cost is divided by the annualized number of new riders attracted to the system for each alternative under consideration as compared to the TSM Alternative.

Table 7-6 shows the results of these calculations and presents the cost per new rider for each alternative.

Table 7-6. Cost per New Rider

Screening Criteria Performance Measures	TSM Alternative	Alternative A – West of I-15	Alternative B – State Street	Alternative C – UTA-Owned Right-of-Way
Alignment distance (miles)	NA	7.8	6.7	8.6
Annualized capital costs	$1.9 million	$38.0 million	$33.7 million	$36.2 million
Annual O&M costs	$6.0 million	$8.2 million	$8.0 million	$7.1 million
Total annualized costs	$7.9 million	$46.2 million	$41.7 million	$43.3 million
Annualized new riders[a]	204,400	1,343,200	1,284,800	2,248,400
Cost per new rider	$38.64	$34.40	$32.46	$19.26

Source: AECOM 2008a

[a] Annual ridership on the extension only

Alternative C has the lowest cost per new rider, which reflects the higher ridership generated by its alignment through more residential neighborhoods. This alignment provides greater market penetration through improved access to residents in the corridor.

The calculation of the FTA New Starts cost-effectiveness criterion will be completed when comparing the preferred build alternative to the No-Action and TSM baseline alternatives during the preparation of the Draft EIS and related New Starts Report.

7.5 Comparison of Alternatives for Land-Use Compatibility

As described in Section 4.0, Purpose and Need, land-use projections in the high-growth areas of the Draper Transit Corridor have exceeded growth projections and are expected to nearly achieve their build-out numbers well before 2030. In order to assess the implications for selecting an appropriate transit alternative that will meet that expected demand, an examination of land-use patterns and potential for transit oriented development should be undertaken.

Based on recent experience with U.S. transit systems, rail transit improvements and LRT improvements in particular show significantly higher residential and employment densities and increases in ridership. Many studies have demonstrated that transit ridership is enhanced by carefully planned density within walking distance of stations. A recent technical paper by the Transportation Research Board summarizes research showing that neighborhood transit-oriented development (TOD) will increase daily linked trips by a significant percentage (Thompson and Audirac 2000).

Considerable developable land is available in the Draper Transit Corridor, and the cities of Draper and Sandy are working diligently to increase population and employment density within the 0.25-mile and 0.5-mile walk access shed of each station with the intent of fostering TOD.

The development of the North-South TRAX line and new transit stations between the Sandy Civic Center Station at 10000 South and Draper Town Center and beyond to 14600 South will create major opportunities for smart growth. Several of the proposed stations on the preferred build alternative will be an incentive for higher-density, mixed-use development that meets the smart growth goal. These stations are 11800 South, Draper Town Center, Highland Drive, and 14600 South. In particular, developers can take advantage of special zoning provisions to build higher-density projects near stations.

Sandy and Draper cities are working with UTA and developers to prepare station area plans that facilitate mixed-use transit-oriented development. The cities are also working to complete the hiking and biking trails adjacent to the proposed TRAX extension to promote nonmotorized access to the transit stations.

7.6 Comparison of Alternatives

All the rail-build alternatives satisfied the purpose of the project, which is why they were advanced from the Tier One screening. In this second-tier screening, the alternatives were evaluated based on quantitative measures of effectiveness that allowed the TRP, CIC, and UTA staff to compare the alternatives and determine the most appropriate build alternative to be advanced to environmental screening in the Draft EIS.

Table 7-7 shows the results of the second tier of screening. Average daily transit trips and average daily boardings report values for the entire transit system. Ridership estimates are based on the approved model used for the Mid-Jordan Line extension. All other values are specific to the alternative in the Draper Transit Corridor. In almost every category, the rail alternative within the UTA-owned right-of-way ranks highest in the evaluation criteria.

The screening criteria and performance measures were derived by examining preliminary estimates of probable costs and ridership. These measures show that Alternative C would cost the least to operate and maintain and would have more average daily boardings, total transit trips, and annual boardings than either Alternative A or Alternative B. Alternative C also would have the lowest cost per annual boarding, which was used as a measure of cost-effectiveness. The result of the second-tier screening was to eliminate Alternatives A and B from further consideration.

From the two tiers of screening, Alternative C (UTA-owned right-of-way) emerged as the preferred build alternative and was selected as the LPA. This alternative will be carried forward for more detailed technical and environmental analysis during the preparation of the Draft EIS and will be compared to the No-Action and TSM baseline alternatives. The preferred alternative is described in Section 9.0, Selection of the Locally Preferred Alternative.

The results of this screening step were shared with the public through the CIC at a meeting in July 2008 (CIC Meeting #3); at the WFRC meetings in August 2008 (the WFRC Technical Committee Meeting, the WFRC Regional Growth Committee Meeting, and the WFRC Board Meeting); at the Draper City Council meeting in September 2008; at the September 12, 2008, CIC meeting (CIC meeting #4); and at the October 15, 2008, public informational meeting.

Table 7-7. Comparative Evaluation of Measures of Effectiveness

Screening Criteria Performance Measures	TSM Alternative	Alternative A – West of I-15	Alternative B – State Street	Alternative C – UTA-Owned Right-of-Way
Alignment distance	NA	7.8	6.7	8.6
Failing intersections[a]	0	0	0	0
Average system-wide daily transit trips[b]	257,100	259,300	259,800	262,200
Average North-South TRAX Line daily boardings[c]	30,770	36,000	35,800	39,100
Average weekday ridership[d]	3,900	4,600	4,400	7,700
Annual new ridership[e]	204,400	1,343,200	1,284,800	2,248,400
Preliminary capital costs[f]	$23.9 million	$578.7 million	$481.7 million	$530.4 million
Cost per mile	NA	$74.2 million	$71.9 million	$61.7 million
Annualized capital costs	$1.9 million	$38.0 million	$33.7 million	$36.2 million
Annual O&M costs	$6.0 million	$8.2 million	$8.0 million	$7.1 million
Total annualized costs	$7.9 million	$46.2 million	$41.7 million	$43.3 million
Cost per annual rider	$38.64	$34.40	$32.46	$19.26

[a] With at-grade light rail through intersections, the level of service was failing at two intersections for Alternatives A and B. Grade separation of the LRT was added to prevent these severe traffic impacts.

[b] Total transit trips in the UTA service area.

[c] Total boardings for the entire North-South TRAX line between Draper and Salt Lake City.

[d] Average daily ridership on the proposed new service.

[e] Annual new ridership is the annualized difference between No Action and the alternative.

[f] Preliminary cost estimates were used for screening purposes. Cost shown in year-of-expenditure (YOE) dollars.