

## Technical Memorandum

To: Wasatch Front Central Corridor Study Management Team

From: Wasatch Front Central Corridor Study (WFCCS) Technical Team

Date: January 10, 2017

Subject: FINAL Task 5 Deliverable – Hybrid Scenario Development Process Memorandum

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### Purpose of this Memorandum

This memorandum describes the development of a WFCCS “hybrid scenario” for future integration into the 2019-2050 Regional Transportation Plans (RTPs) for MAG and WFRC. The hybrid scenario represents the capital, policy, and program elements that best meet the WFCCS goals, shown below:

 <b>IMPROVE SAFETY</b>	 <b>INCREASE PERSON THROUGHPUT</b>	 <b>IMPROVE TRAVEL TIME RELIABILITY</b>	 <b>INCREASE ACCESSIBILITY TO JOBS &amp; EDUCATION</b>
 <b>IMPROVE AIR QUALITY</b>	 <b>IMPROVE ECONOMIC OUTCOMES</b>	 <b>REDUCE HOUSEHOLD TRANSPORTATION COSTS</b>	 <b>IMPROVE MODE BALANCE</b>

## Hybrid Scenario Development Process

The process of selecting the hybrid scenario involved:

- Reviewing WFCCS scenario performance related to the study’s goals and associated metrics;
- Identifying which WFCCS key elements best met those goals and should be included in a hybrid scenario; and
- Identifying which WFCCS key elements will not be included in the hybrid scenario but may be looked at in the future.

Final selection of key WFCCS elements to be included occurred during a facilitated meeting on November 28<sup>th</sup>, 2016. Technical and Communications Team members facilitated the discussion and provided background data.

Hybrid scenario elements fall into two categories: those that can be implemented with a moderate amount of further study, and those that will require a more considerable level of study and greater understanding of anticipated disruptive trends before implementation is possible. The photo at right shows the WFCCS projects selected during the November 28<sup>th</sup> meeting for integration into the 2019-2050 Regional Transportation Plans.

### Scenario Performance Comparison

The WFCCS scenarios received scores based on how well they performed on several high-priority metrics. A score of 1 indicates low performance, 2 indicates medium performance, and 3 indicates high performance. Table 1 summarizes the scenario performance.

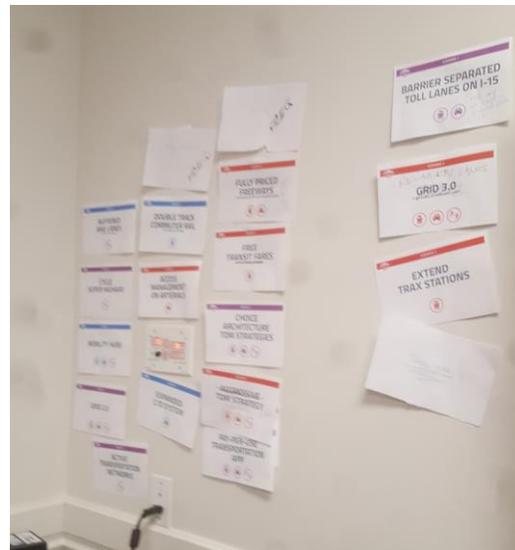


Table 1: Scenario Score Comparison			
Goals and Metrics	Scenario 1	Scenario 2	Scenario 3
<b>Improve Safety</b>			
Injuries and fatalities	3	1	2
<b>Increase Person Throughput</b>			
Total person throughput	1	2	3
Transit seat utilization	3	2	1
Freeway seat utilization	2	3	1
<b>Improve Travel Time</b>			
Travel time	1	3	2
Buffer index	1	3	2
<b>Increase Regional Accessibility</b>			
Access to employment	1	3	2
<b>Improve Air Quality</b>			
Air pollutant emissions	2	3	1
<b>Improve Economic Outcomes</b>			
Benefit/cost ratio	3	2	1
<b>Improve Mode Balance</b>			
Walk/bike access to transit	2	2	3
Transit access mode split	3	1	2
Peak period mode split	2	3	1
<b>Total Scenario Score</b>	<b>24</b>	<b>28</b>	<b>21</b>

As indicated in Table 1, Scenario 2 best met the metrics presented for discussion, followed by Scenarios 1 and 3. Further sensitivity testing helped the project team members better understand how individual key elements influenced overall scenario performance, as discussed in the next section. Additional metrics related to economic impacts are presented in a separate technical memorandum.

### Sensitivity Tests

Sensitivity tests assessed the selected travel effects of individual key elements of the WFCCS scenarios. The sensitivity tests, conducted by members of the WFCCS Technical Team as well as travel demand modeling staff at the WFCCS partner agencies, are shown in Table 2. These analyses are not a comprehensive evaluation of all aspects of a particular strategy; rather, the analysis results provide a high-level assessment of several regional metrics. The geographic extent varies depending on the metrics tested: transit ridership and employment accessibility metric results represent the WFRC/MAG model region; VMT is reported only for the study area; and person throughput is an average of multiple screenlines across I-15 (1300 South, 3300 South, 7800 South, 12300 South, and SR-92). The variation in geographic analysis was necessary since the metrics are measured and reported in different geographic and temporal dimensions. Readers should also note that the sensitivity tests evaluate scenario performance by removing one major key element at a time from scenario models, and then comparing the results back to the original scenario. The test variable could potentially perform differently with different background conditions.

**Table 2: Sensitivity Test Results**

<b>Key Element Tested</b>	<b>Regional Metric</b>	<b>Effect</b>
Double Track/Electrify FrontRunner	Transit ridership	+ 6%
No-Fares Transit	Transit ridership	+ 16 to 17%
Increased Transit Frequency	Transit ridership	+ 31%
No-Fares Transit with Increased Transit Frequency	Transit ridership	+ 43%
Grid 2.0	Employment Accessibility	No meaningful change
	Transit ridership	No meaningful change
	Vehicle Throughput*	No meaningful change
	VMT (study area)	No meaningful change
Grid 3.0	Employment Accessibility	No meaningful change
	Vehicle Throughput*	+ 49,000
	Transit ridership	+ 1.2%
	VMT (study area)	+ 4.2%
Expanded I-15 CD System	Transit ridership	No meaningful change
	Vehicle Throughput*	+ 2,000
	VMT (study area)	+ 3.6%
Elevated Lanes	Transit ridership	No meaningful change
	Vehicle Throughput*	+ 23,500
	VMT (study area)	+ 1.8%
Tolled GP Lanes	Transit ridership	No meaningful change
	Vehicle Throughput*	- 57,000
	VMT (study area)	- 6%

\*Average for I-15 screenlines at SR-92, 12300 S, 7800 S, 3300 S, 1300 S

The pattern in this table suggests that travel behavior (or the model) is much more sensitive when the change being tested directly involves the mode being evaluated. In other words, transit changes in the model have the biggest effect on transit performance while ‘equivalent’ changes on the highway side have much less measurable effects. However, other research indicates that tolling would likely have a larger effect on transit ridership than is indicated here; therefore, model limitations are something to keep in mind when considering this information.

### Elements Forwarded into RTP or Other Future Study

The WFCCS Management Team selected the key elements below for inclusion in the 2019-2050 RTPs to be prepared by WFRC and MAG, and for future study and refinement. Elements are organized into those that require a moderate degree of additional study, compared to those that will need a considerable degree of additional study and possibly greater certainty about future travel conditions. More information regarding the scenarios’ performance on specific metrics can be found in the Evaluation of Investment Scenarios Technical Memorandum. For each selected key element, this memorandum identifies the relevant goals served by that element and potential next steps if applicable.

## WFCCS Hybrid Scenario Elements Requiring Moderate Additional Study

### *Vision Zero*

*Relevant Goal: Improve Safety*

The WFCCS Vision Zero strategies included:

- Reduction of posted speeds on State Street and Redwood Road by five miles per hour;
- Improvement of lighting at intersections and crosswalks at high-collision locations in the study area;
- Installation of enhanced pedestrian crossings (Pedestrian Hybrid Beacon control or Rapid Rectangular Flashing Beacon warning) at multiple locations:
  - State Street and Lagoon Drive in Farmington
  - 500 West and 1880 South in Bountiful
  - Redwood Road and Earnshaw Lane (~1760 North) in Salt Lake City
  - 400 South at the entrance to Sherwood Park (~1450 West) in Salt Lake City
  - Glendale Street and California Avenue in Salt Lake City
  - 700 East and 3900 South in Millcreek
  - State Street and approximately 5700 South in Murray
  - Center Street and Jefferson Street in Midvale
- Installation of raised medians on Redwood Road and State Street

A broader Vision Zero strategy may be undertaken, evaluating collision patterns at a regional scale to identify hot-spot locations where additional countermeasures beyond these may be beneficial.

### *Pay-Per-Use Transportation App*

*Relevant Goals: Improve Air Quality, Reduce Household Transportation Costs, Improve Mode Balance*

This type of mobile app, sometimes referred to as “Mobility as a Service”, is gaining traction as bike share, car share, casual carpooling, and companies like Uber and Lyft become more familiar as transportation options. Individuals could subscribe to a monthly package of transportation services that provides them with a set number of bike share, car share, electric bike rentals, Uber or Lyft rides, transit trips, and grocery deliveries to their home every month for a set fee. These apps are sometimes generated by the private sector, but the WFCCS partner agencies may proactively seek out potential app providers and shape options that develop in this region.



### ***Increased Transit Frequency***

*Relevant Goals: Increase Person Throughput, Increase Accessibility, Improve Air Quality, Improve Mode Balance*

This key element represents doubling bus frequency in UTA’s service area and also doubling FrontRunner frequency. Next steps for this element would be to refine which routes would benefit the system most by the doubled frequency. UTA’s upcoming analysis of Core Routes may help address this question. The Future of FrontRunner study is currently analyzing the feasibility of double-tracking and electrifying the FrontRunner system, which would be necessary to double its frequency.

### ***No-Fare Transit***

*Relevant Goals: Improve Air Quality, Reduce Household Transportation Costs, Improve Mode Balance*

This key element was modeled to represent the ability of individuals to ride the transit system without paying a fare. Next steps for this element would entail more detailed analysis of fare structure (already being analyzed by UTA) and compensation for lost farebox revenues. Transit system capacity on some routes or lines may also be necessary to accommodate potential demand increases.

### ***Access Management on Arterials***

*Relevant Goal: Improve Safety*

This key element closes and consolidates driveways on Redwood Road and State Street, thereby reducing the potential number of conflict points for collisions. This strategy builds on current UDOT practice and can be completed in the near term. Public involvement campaigns will likely need to address concerns about economic impacts to businesses.

### ***Choice Architecture Transportation Demand Management Strategies***

*Relevant Goals: Improve Air Quality, Reduce Household Transportation Costs, Improve Mode Balance*

This key element focuses on persuading people to make different choices in how they travel: for example, it might encourage them to take transit, drive on a less congested road, carpool, or make their trips at a less congested time of day. Choice architecture is a strategy based in behavioral economics. It requires a detailed understanding of how Utahans make their travel decisions, and how those decisions can be reframed to incentivize individual choices that benefit the transportation system as a whole. As such, the next steps for this key element may be consultation with behavioral scientists (such as ideas42.org) to identify opportunities to apply this strategy effectively.

### ***Comprehensive Transportation Demand Management Strategy***

*Relevant Goals: Improve Air Quality, Reduce Household Transportation Costs, Improve Mode Balance*

This key element was modeled as implementation of Traffic Management Associations (TMA) in downtown Salt Lake City and in the Thanksgiving Point area of Lehi. The analysis assumed the following transportation demand program elements would be implemented by the TMA's:

- Support for affordable housing near employment centers
- Traffic calming measures
- Carshare and bikeshare programs and complimentary memberships
- End-of-trip facilities such as short- and long-term bicycle parking, bicycle repair and maintenance areas, showers, and lockers
- Unbundling of parking and property costs
- Market pricing of on-street parking
- Carpool and vanpool parking
- Commute Trip Reduction programs for each TMA, with marketing for the programs
- Workplace parking pricing
- Alternative work schedules and telecommute programs
- Employer-sponsored vanpools or shuttles
- Ridesharing programs
- On-site child care programs

#### ***Double-Track and Electrify FrontRunner, with New FrontRunner Stations***

*Relevant Goals: Increase Person Throughput, Improve Reliability, Improve Air Quality, Increase Accessibility, Improve Mode Balance*

This key element includes double track and electrification of the FrontRunner system, which would decrease delays associated with siding locations and allow for faster travel using electric power. The WFCCS assumes new FrontRunner stations at Business Depot Ogden, Sunset, Centerville, and Bluffdale. The Future of FrontRunner study, currently under way, is analyzing this key element in more detail.

#### ***Mobility Hubs***

*Relevant Goals: Improve Air Quality, Increase Accessibility, Improve Mode Balance*

This key element represents high-density and high-intensity station development (similar to a Denver Union Station or other types of facilities with high levels of housing and employment and multiple integrated modes of transportation). In the WFCCS study area, mobility hubs are proposed at Salt Lake Central Intermodal, Murray Central, and Bluffdale FrontRunner stations.

#### ***Cycle Super Highways***

*Relevant Goals: Improve Safety, Improve Air Quality, Improve Mode Balance*

This key element is proposed along the Jordan River Parkway and on State Street. Cycle super highway cross sections could be analyzed in the ongoing Life on State Study (in Salt Lake City and South Salt Lake City). Further discussion with the Jordan River Commission will be needed to refine cycle super highway options in that corridor.

### **Buffered Bike Lanes on Arterials**

*Relevant Goals: Improve Safety, Improve Air Quality, Improve Mode Balance*

This key element involves installation of buffered bike lanes on multiple routes throughout the study area. This complements the cycle super highway routes and connects cyclists to major transit nodes. Buffered bike lane locations include 500 South in Bountiful, Beck Street, 3500 South, 4700 South, 7800 South, 11400 South, 12300 South, 14600 South, 900 West, and 1300 West.

### **Extensive Active Transportation Networks**

*Relevant Goals: Improve Safety, Improve Air Quality, Improve Mode Balance*

This key element assumes implementation of the preferred alignments from the Salt Lake County East-West Trails Plan, the first/last mile improvements proposed by UTA, and the WFRC Regional Bicycle Priority Routes in the unfunded portion of the 2040 Regional Transportation Plan.

### **Fully-Priced Freeways with Barrier-Separated “Reliability” Lanes**

*Relevant Goals: Improve Reliability, Increase Accessibility*

This key element was modeled with the following tolling assumptions:

- Barrier separated lanes: in the peak period and direction, tolled users pay 48 cents/mile and transit or HOV 2+ are free; in the off-peak period and direction, tolled users pay 5 cents/mile and transit or HOV 2+ are free
- General purpose lanes: in the peak period and direction, everyone pays 24 cents/mile but in the off-peak period and direction these lanes would be free

Future steps for this key element should help refine tolling assumptions and identify travel markets best served by the limited access points to the barrier-separated lanes. It may also be necessary to identify potential subsidies for low-income groups to offset the tolling costs for these populations.

### **Expanded Collector-Distributor System**

*Relevant Goals: Increase Person Throughput, Increase Accessibility*

UDOT completed conceptual engineering design of this key element while WFCCS was ongoing. The collector-distributor system will likely be implemented in the near term.

### **Grid 2.0**

*Relevant Goal: Increase Accessibility*

This key element includes nine new overpasses:

- 1250 North (Centerville)
- 7500 South

- 8400 South
- 9400 South
- 11000 South
- 11800 South
- 13200 South
- 14200 South
- 2200 West (at Interstate 215)

### WFCCS Hybrid Scenario Elements Requiring Considerable Additional Study

#### *Reliability Lanes (formerly referred to as Grid 3.0)*

*Relevant Goals: Increase Person Throughput, Improve Reliability, Improve Air Quality, Improve Mode Balance*

This key element is a network of managed lanes, establishing exclusive transit/HOT lanes on several arterials through the use of reversible lanes in some locations.

#### *Increase TRAX Frequency*

*Relevant Goals: Increase Person Throughput, Improve Air Quality, Increase Accessibility, Improve Mode Balance*

This key element changes TRAX peak period frequency from every 15 minutes to every 10 minutes. This key element will require detailed analysis of intersection conditions in downtown Salt Lake City, since the current TRAX operations are already affecting certain intersections at the maximum level identified as acceptable by Salt Lake City. If TRAX frequency is increased, this issue will need to be addressed – either by allowing vehicle level of service to decrease further at specific intersections, or to identify potential TRAX alignment alternatives that would avoid those intersections. Impacts to east-west cross-streets in the corridor (especially north of 6400 South) should also be analyzed and addressed.

#### *Extension of TRAX Stations*

*Relevant Goal: Increase Person Throughput, Improve Air Quality, Improve Mode Balance*

This key element increases TRAX capacity with longer train consists (i.e, more than four TRAX vehicles in a consist). Current TRAX platform configurations can only accommodate a four-train consist. Next steps for this key element involve evaluation of necessity; if TRAX frequencies are increased in the peak period to every ten minutes, longer consists may not be necessary. Longer station platforms may not be possible in downtown Salt Lake City given current block lengths.

### Elements Not Forwarded for Further Consideration

The WFCCS Management Team also identified WFCCS key elements that were not forwarded for further consideration at this point, although this does not prevent them from being studied by the agencies in the future. These elements are described below.

### Double-Decked I-15

This key element represents two general-purpose elevated freeway lanes over the existing interstate between I-80 Eastbound and Bangerter Highway. The high capital costs of this project contributed to a below-break-even benefit/cost ratio for Scenario 3, and model results indicated that there was minimal travel time savings associated with the additional freeway capacity due to induced travel demand. In addition, stakeholder support for double-decked I-15 was low.

### Reversible Lanes on I-15

This key element, which represents two reversible lanes on I-15 between the Legacy Parkway interchange in Farmington and the I-80 Westbound interchange in Salt Lake City, was not forwarded for further consideration due to high cost and constructability concerns.

### Exclusive Transit/HOT Lanes with Grade-Separated Intersections

This key element was modeled in Scenario 3 as exclusive transit/HOT lanes on Redwood Road and State Street with grade-separated intersections at 4500 South, 5400 South, 7000 South, 9000 South, and 10600 South. The exclusive lanes would have required additional pavement widening and right-of-way expansion. The WFCCS Management Team decided to select the “Grid 3.0” concept instead, which accommodates exclusive transit/HOT lanes on a broad network of roadways using reversible lanes. The Management Team also determined that the grade-separated interchanges would be impactful to local communities, bicyclists, and pedestrians.

### Prioritize Transportation Projects in Transit Oriented Development Nodes

The WFCCS Management Team believed it was not necessary to include this key element for further consideration because this is already institutionalized in agency practice.