Simultaneous Model Development and MTP Update

Kyeongsu Kim, Bobby Wertman, Jeff Frkonja
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Learning Objectives

- *Model development efforts often begin before all the planning questions have been asked.* Presentation will examine how practitioners can build flexibility into **simultaneous efforts** (metropolitan transportation plan + demand model development + strategic model development) and how development efforts need to **integrate planning concerns early** in the effort while maintaining **flexibility to be responsive to new questions** later in the process.

- *Travel demand models will not be able to answer all of the planning questions.* Presentation will examine how practitioners can combine traditional demand model development and **lightweight strategic models** in metropolitan planning processes to ensure toolkit is able to **be responsive to substantially more questions** in the planning process than before.

- *Alignment of multiple efforts is challenging but results in products and plans that are more data informed and responsive.* Presentation will demonstrate how **early alignment and planning resulted in better sensitivity** to compact development, how **a strategic model quickly narrowed hundreds of MTP alternative scenarios** for analysis in a demand model, and how the final analysis materialized in a metropolitan transportation plan.

Agenda

- **Topic 1: AMATS Model Update Process**

- **Topic 2: Plan and Model Update Overlap**

- **Topic 3: Travel Model Features Aligned to the Planning Goals**

- Topic 4: Regional Strategic Planning Model – RSPM
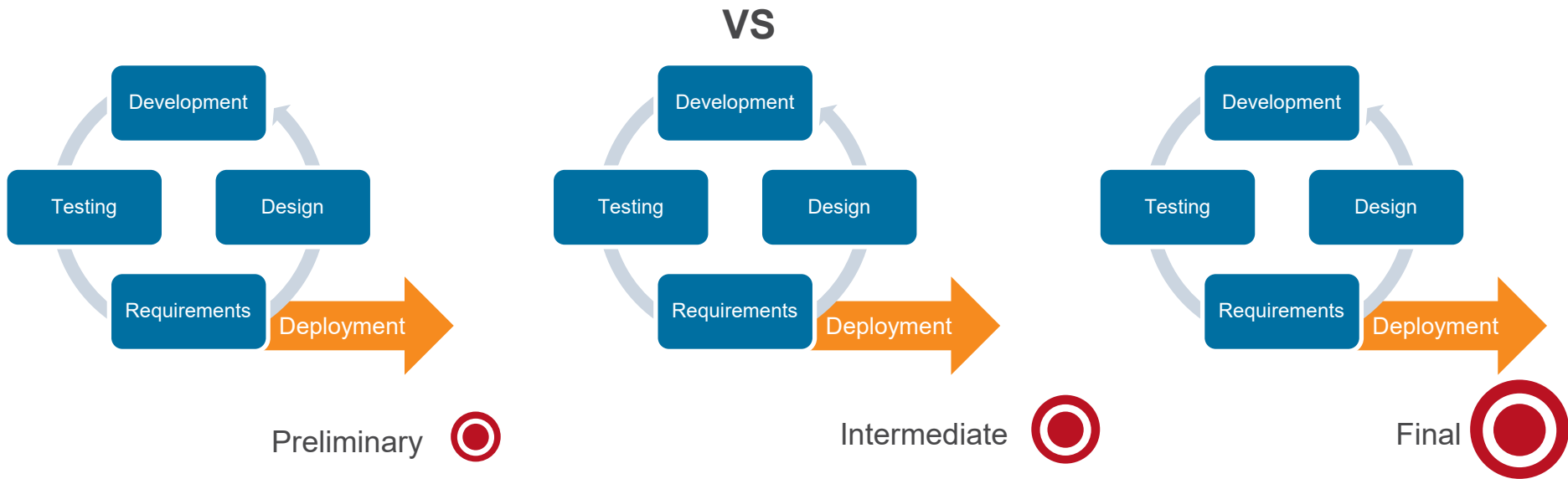
- Topic 5: Scenario Development

Models

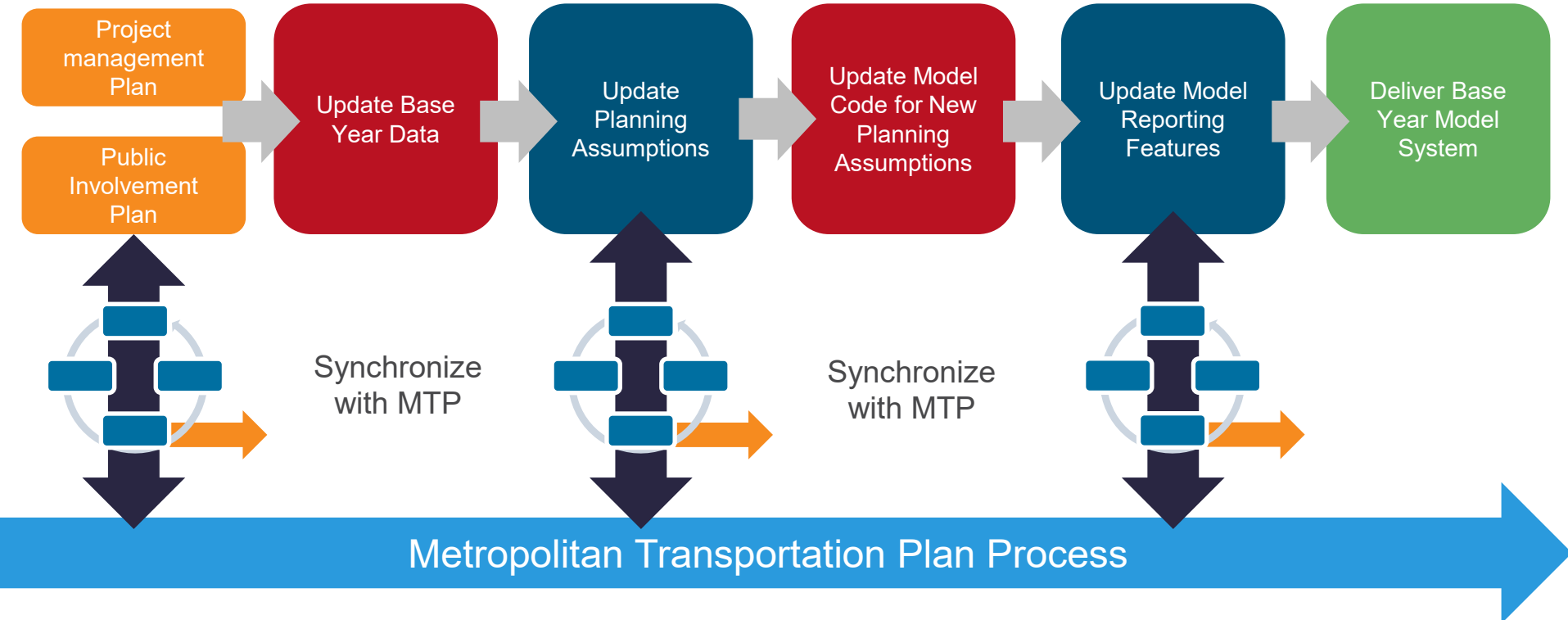.. are often managed in a linear process

| Requirements | → | Design | → | Development | → | Testing | → | Deployment |

One large final outcome at end ⦿

Agile project management allows flexibility
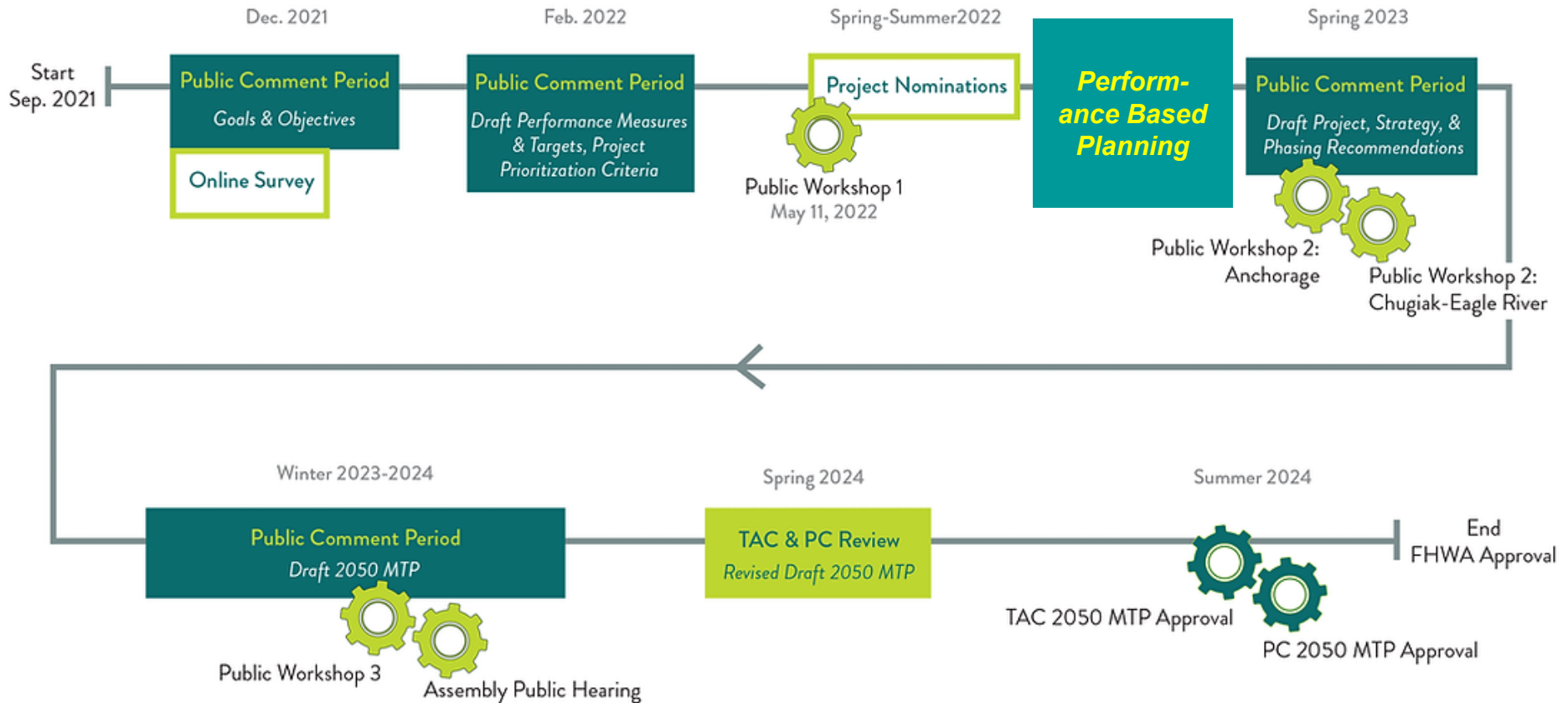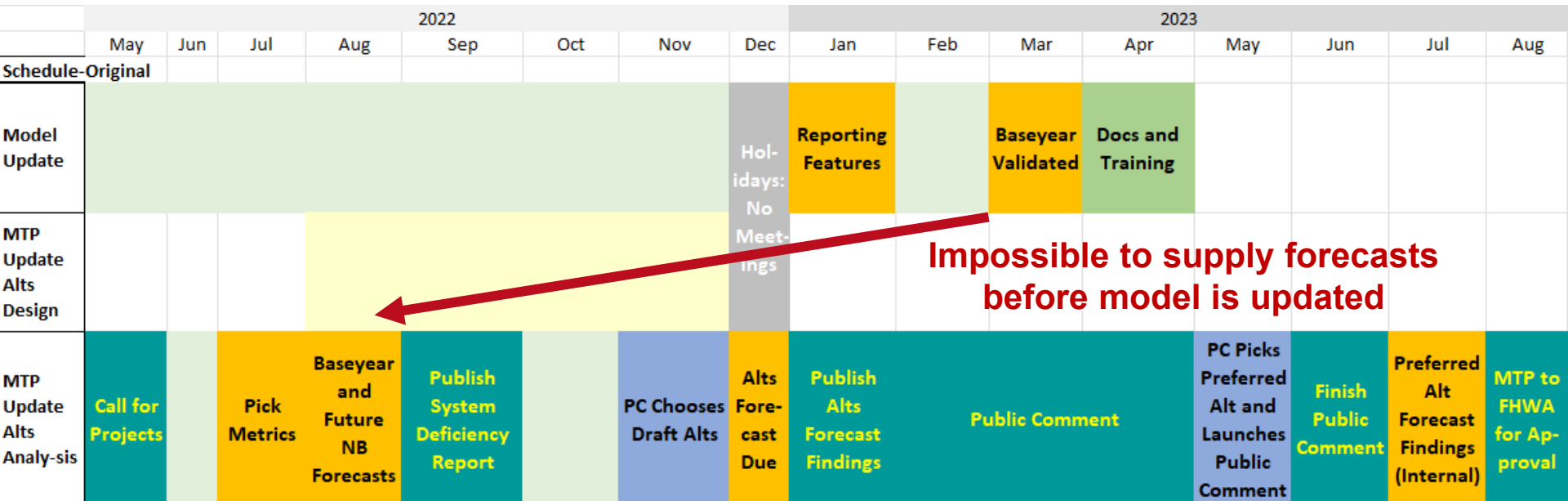
AMATS Model Update Process

Plan and Model Update Overlap

AMATS MTP Development process

.. required "performance-based planning" and extensive public involvement

Challenge 1: AMATS new travel model needed updating virtually simultaneously

		2022							2023							
	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Schedule-Original																
Model Update								Hol-idays: No Meet-ings	Reporting Features		Baseyear Validated	Docs and Training				
MTP Update Alts Design																
MTP Update Alts Analy-sis	Call for Projects		Pick Metrics	Baseyear and Future NB Forecasts	Publish System Deficiency Report		PC Chooses Draft Alts	Alts Fore-cast Due	Publish Alts Forecast Findings	Public Comment			PC Picks Preferred Alt and Launches Public Comment	Finish Public Comment	Preferred Alt Forecast Findings (Internal)	MTP to FHWA for Ap-proval

Impossible to supply forecasts before model is updated

Challenge 2: How to design meaningful *draft* alternatives

	2022							2023							
	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Schedule-Original																
Model Update								Hol-idays: No Meet-ings	Reporting Features		Baseyear Validated	Docs and Training				
MTP Update Alts Design				**?**												
MTP Update Alts Analy-sis	Call for Projects		Pick Metrics	Baseyear and Future NB Forecasts	Publish System Deficiency Report		PC Chooses Draft Alts	Alts Fore-cast Due	Publish Alts Forecast Findings	Public Comment			PC Picks Preferred Alt and Launches Public Comment	Finish Public Comment	Preferred Alt Forecast Findings (Internal)	MTP to FHWA for Ap-proval

Solutions: Sliding Non-Essential Modeling Tasks *after* Strategic Modeling and MTP Forecasts; Using Strategic Modeling to Quickly Apply Quantitative Performance Measures
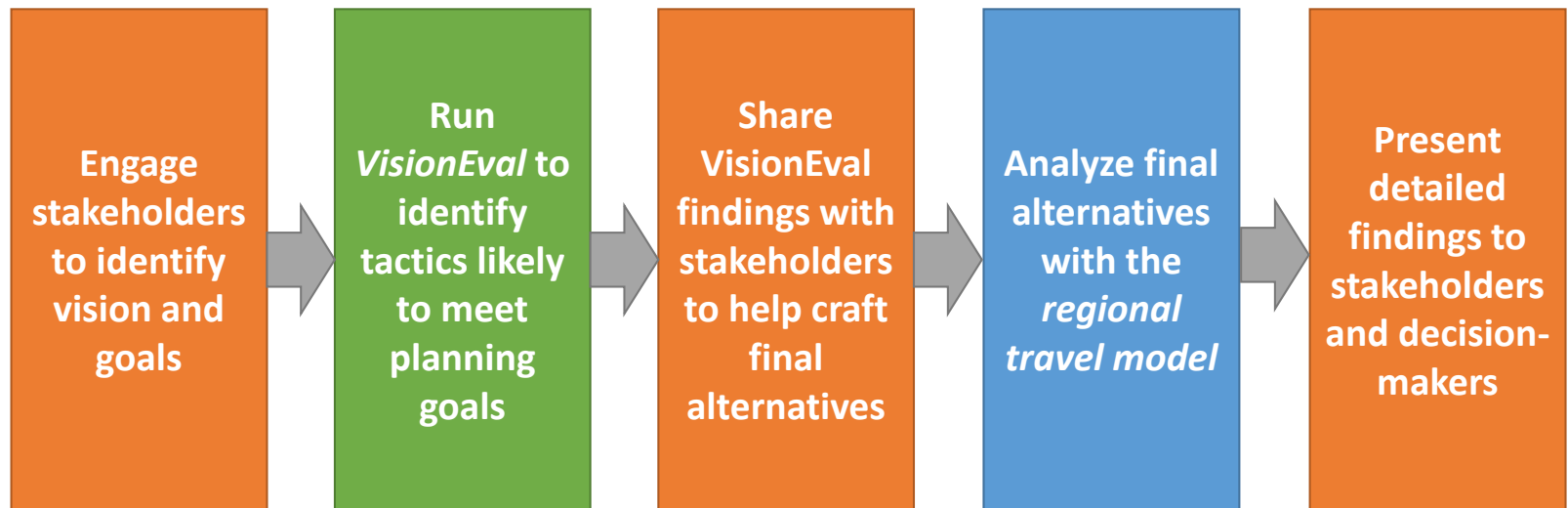
	2022							2023							
	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Schedule-Coordinated																
Model Update					Baseyear Validated								Docs and Training			
MTP Update Alts Design				Introduce Strategic Planning	Strategic Model Initial Findings to TAC and PC	TAC and PC Interim Guidance to Staff on Draft Alts	Final Strategic Model Findings to TAC and PC	Hol-idays: No Meet-ings		Parallel Public Comment						
MTP Update Alts Analy-sis	Call for Projects		Pick Metrics		Baseyear and Future NB Forecasts	Publish System Deficiency Report			PC Chooses Draft Alts	Alts Coded in Model	Alts Forecast Findings Due (Internal)	Publish Alts Forecast Findings	PC Picks Preferred Alt and Launches Public Comment	Final Public Comment	Preferred Alt Forecast Findings (Internal)	MTP to FHWA for Ap-proval

VisionEval Strategic Model "Short Cuts" the Alternatives "Design" Process and Does the Preliminary Screening Using Aggregate Performance Measures
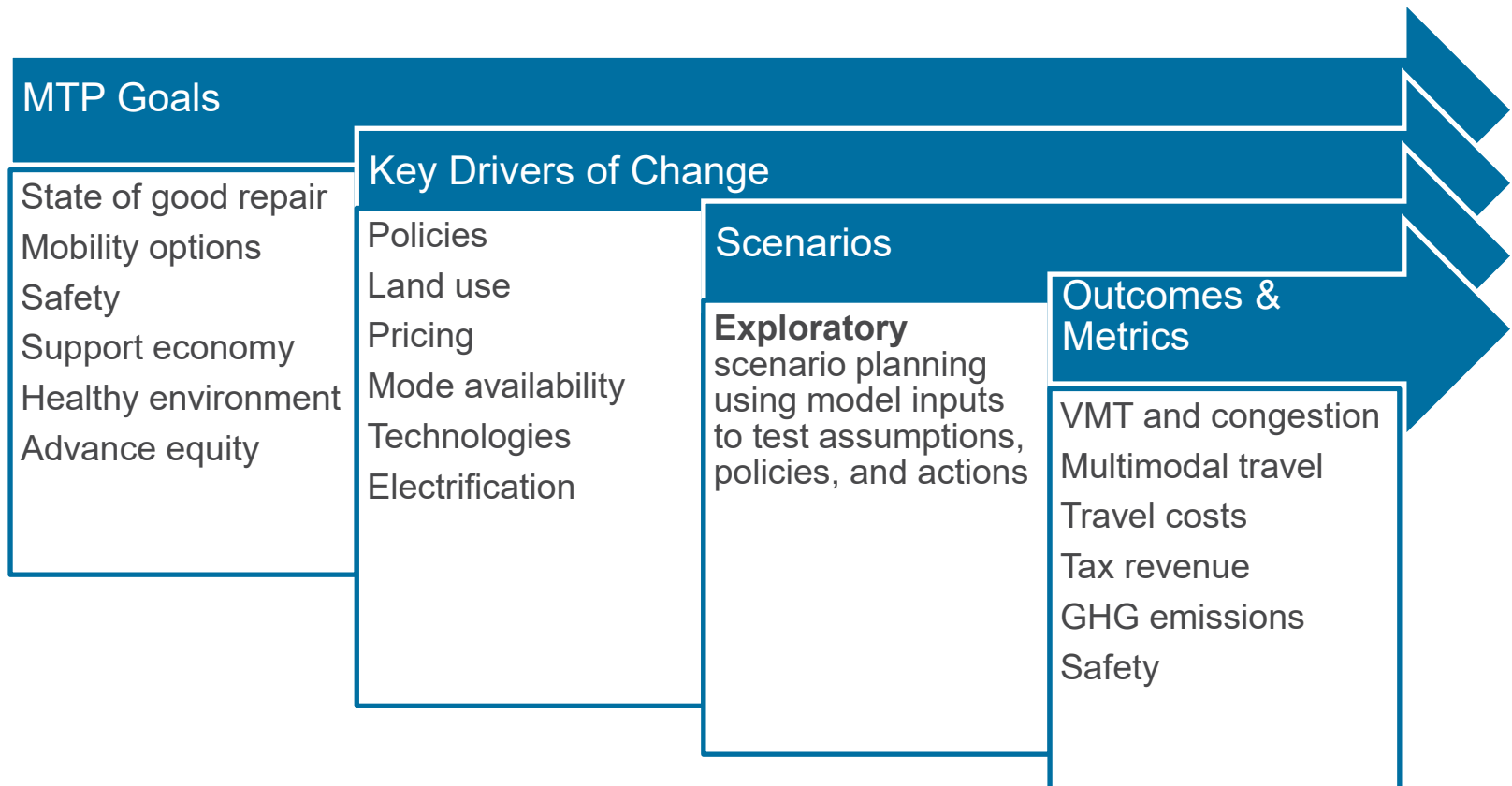
Travel Forecasting for MTP Prioritized over Model Documentation and Training

Final Step-by-Step MTP development Process

| Engage stakeholders to identify vision and goals | → | Run *VisionEval* to identify tactics likely to meet planning goals | → | Share VisionEval findings with stakeholders to help craft final alternatives | → | Analyze final alternatives with the *regional travel model* | → | Present detailed findings to stakeholders and decision-makers |

VisionEval strategic model in "exploratory" mode tests hundreds of scenarios and filters *only* the successful ones based on user-defined measures

MTP Goals

State of good repair
Mobility options
Safety
Support economy
Healthy environment
Advance equity

Key Drivers of Change

Policies
Land use
Pricing
Mode availability
Technologies
Electrification

Scenarios

Exploratory
scenario planning
using model inputs
to test assumptions,
policies, and actions

Outcomes & Metrics

VMT and congestion
Multimodal travel
Travel costs
Tax revenue
GHG emissions
Safety

Travel Model Features Aligned to the Planning Goals

The AMATS geography encompasses Anchorage and Chugiak-Eagle River SE of the Knik Arm fjord…

…but the practical travel shed includes the Matanuska-Susitna Borough (MatSu) to the NW of the Knik Arm

MatSu

Chugiak-Eagle River

Anchorage

Esri, HERE, Garmin, USGS, NGA, EPA, USDA, NPS
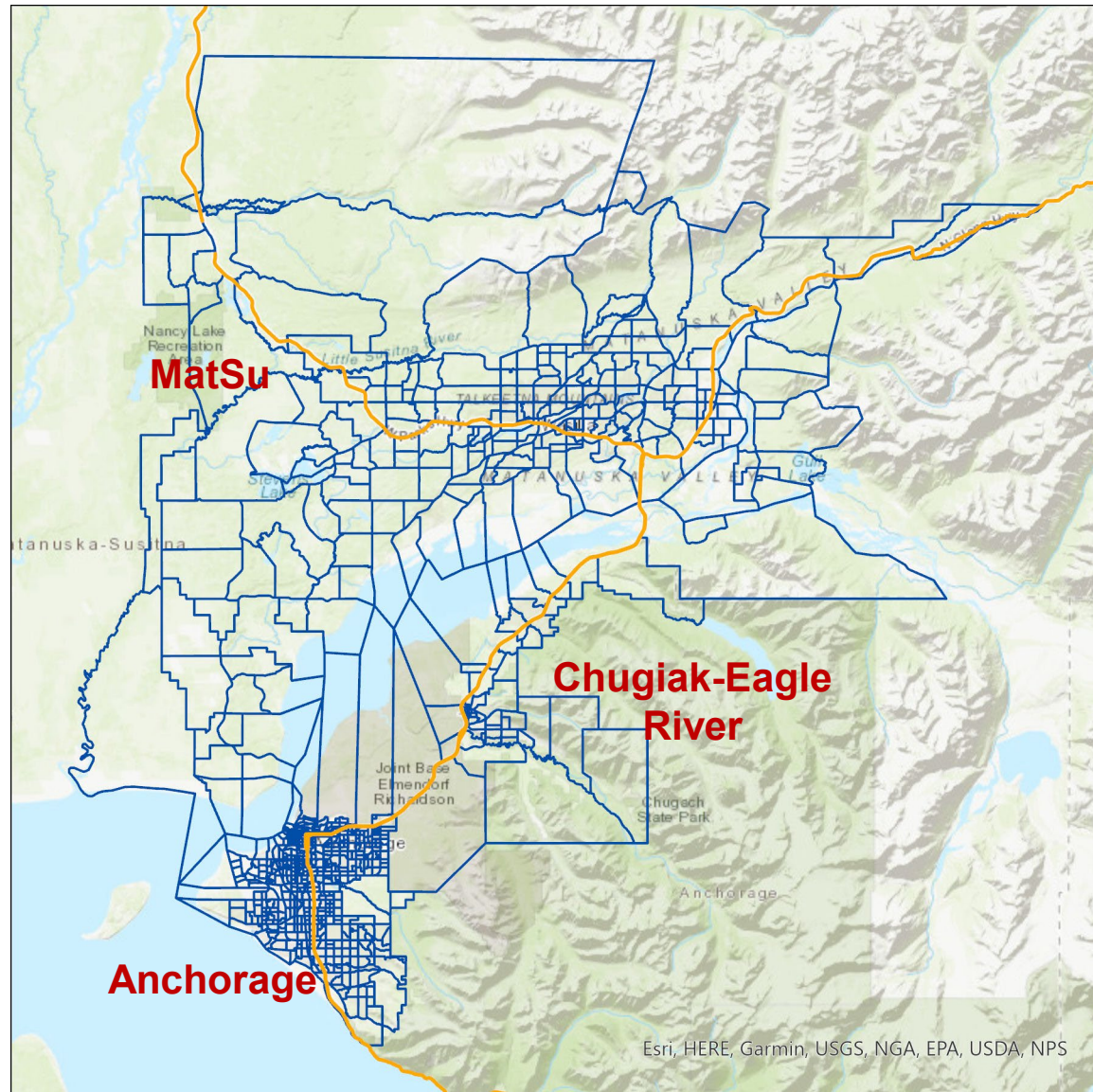
Anchorage region growth expectations evolved radically in the past decade
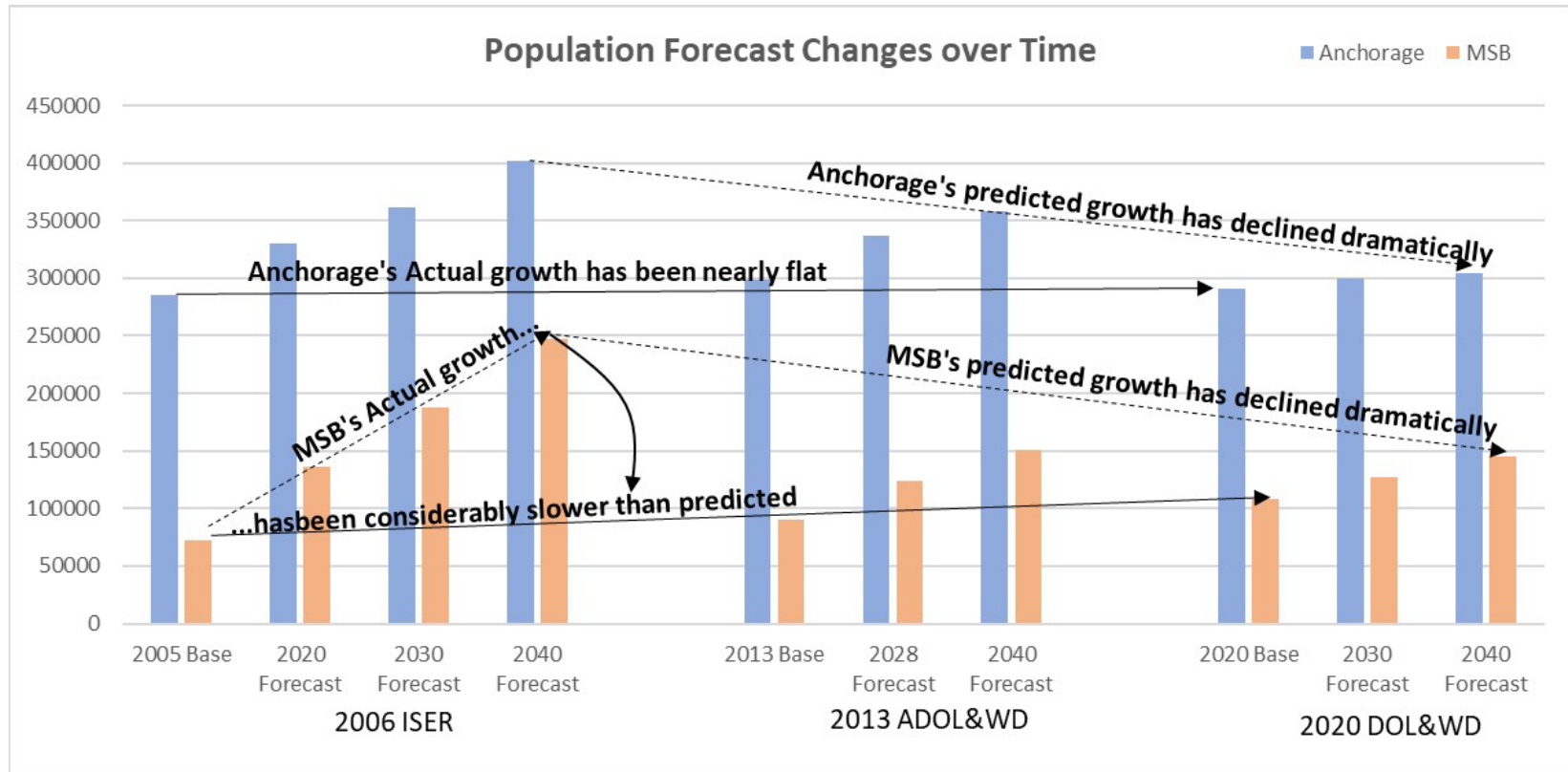
Radically-changed growth expectations contributed to new planning goals and stakeholder priorities

- "Complete Streets" roadway focus rather than general purpose capacity
- Elevating transit and active transport solutions
- Elevating environmental goals (emissions, livability)
- Safety

Note the three call-for-projects categories

Project #	Project Nominations	Bart	Chelsea	Daniel		Average	rank	Notes
CPS020	36th Avenue - Spenard Road to Lake Otis Parkway	81	93	8?	70	82	1	
CPS018	36th Ave - Spenard Road to Old Seward Highway	79	89		70	79	2	
CPS026	5th & 6th Ave Complete Streets	82	94	?	49	79	2	
CPS142	Muldoon Road - Tudor Road to Glenn Highway	82	92	59	74	77	4	
CPS006	15th Ave - L Street to Gamble Street	81		79	60	76	5	
CPS008	15th Avenue Complete Street & North-South crossing	78	?0	86	47	75	6	
CPS014	32nd & 33rd Avenue Upgrade	65	80	87	68	75	7	
CPS037	A and C Complete Streets Project	?	94	68	54	74	8	
CPS045	Arctic Blvd Complete Street - Dimond Blvd to 17th Ave	77	93	78	46	74	9	
CPS023	42nd Ave Upgrade - Lake Otis Pkwy to Florina St (18- 06)	67	83	72	71	73	10	
CPS046	Arctic Boulevard Traffic Calming or Road Diet - Fireweed to 16th Avenue	77	93	78	42	73	11	
CPS072	Denali Street Complete Street - Fireweed to Tudor Road	66	93	81	50	73	11	
CPS131	Lake Otis Parkway Rehabilitation - 15th Ave to Old Seward Highway	80	98	76	30	71	13	
CPS146	North Lane Street - Ames Ave to McPhee Ave	69	86	75	49	70	14	
CPS118	Ingra Street - 3rd Ave to 15th Ave	73	81	66	55	69	15	
CPS009	15th Avenue Rehabiltiation - E St to I St	75	62	82	53	68	16	
CPS158	Old Seward Highway Rehabilitation - 36th Ave to Seward Highway	71	89	62	50	68	16	
CPS115	I St & L Street Reconstruction-Complete Streets	69	83	67	51	68	18	
CPS148	Northway Drive - Debarr Road to Penland Parkway	67	83	60	57	67	19	

Complete Streets | Non-motorized | Transit | +

What can the travel model measure relevant to this new focus? Solutions included…

- Increased sensitivity to TSMO investments by incorporating more-detailed intersection delay treatment, responsive to signal coordination and other operational strategies
- Mode choice sensitivity to the "D" variables…
  - Density (population and employment)
  - Design (street grid and intersection density)
  - Destinations (proximity of amenities)
  - etc.

The updated model handles the D variables…

- By borrowing estimated mode choice coefficients from observed data and final statistical models from San Diego
- *Density*: computing population and employment densities by TAZ at runtime
- *Destinations:* Mode choice submodel treatment of accessibility to (logsums)
- *Design:* Pre-processing an all-streets network for intersection density
  - Note: inputs allow users to override calculated values to better incorporate compact/smart growth scenarios (e.g. complete streets treatments such as setbacks, ped-friendly road surfaces, plantings, and other amenities)

Mode Choice Enhancements

- Methodology and parameters were transferred from previous SANDAG (San Diego MPO) effort

  - Parameters were scaled to match in-vehicle time

- Model makes use of 3 additional variables:

  - Intersection density
  - Dwelling unit density
  - Employment density

- Dwelling unit and employment density automatically calculated by model

- Intersection density is based off the open street map all streets network

- Model utilizes various interactions of these terms together that focus on non-motorized and transit measures by purpose

- 20 additional variables added to mode choice model

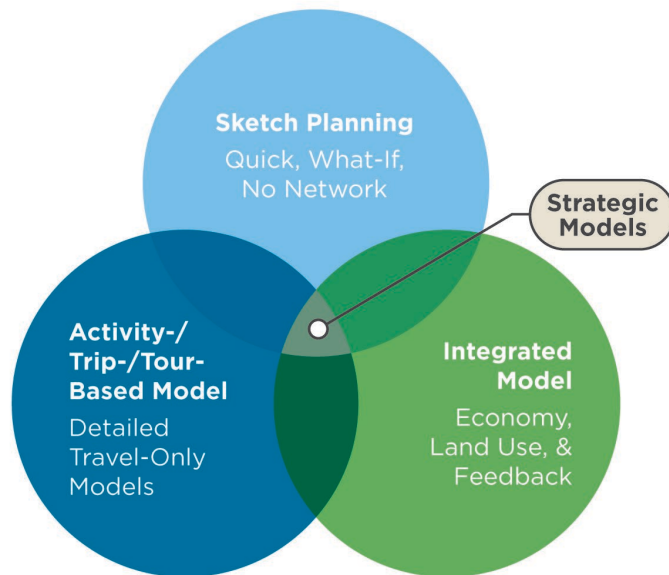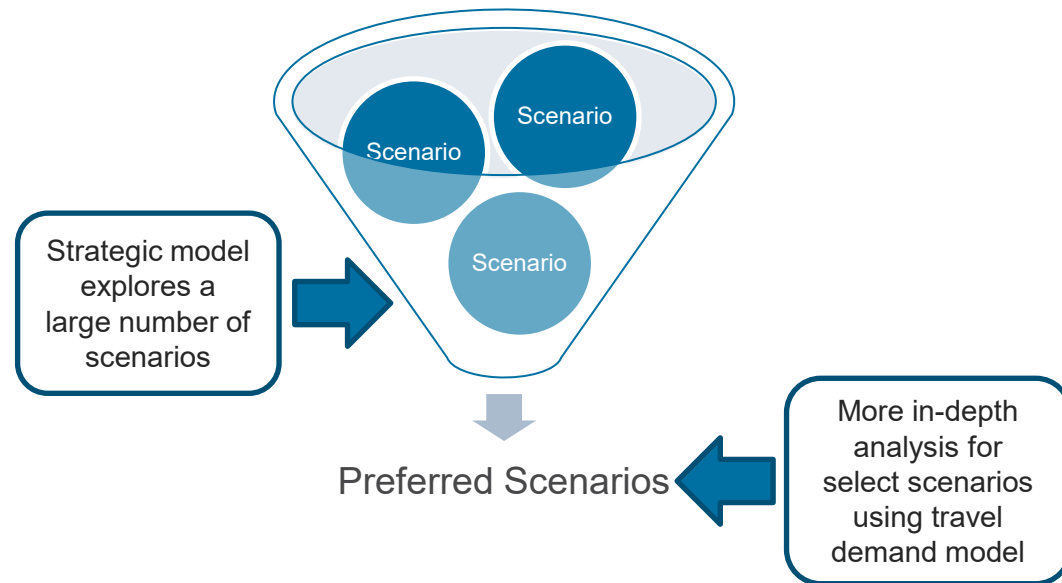| Variable name	HBW	HBO	NHB	Description
4D_HDI_NM	1.08	1.56		High Density Intersection - Non-motorized
4D_HDE_NM		-0.88		High Density Employment - Non-motorized
4D_MDE_T	1.11	0.57	0.34	Med Density Employment – Transit
4D_HDE_T	0.86	0.65	0.79	High Density Employment – Transit
4D_MDU_T	0.58	0.61		Med Density Dwelling Unit Density – Transit
4D_HDU_T	0.87	1.13		High Density Dwelling Unit Density – Transit
4D_MDI_T	0.48	0.55	0.4	Med Density Intersection – Transit
4D_HDI_T	0.67	0.33	0.82	High Density Intersection – Transit
4D_MDUxMDE_T	-0.73		-0.03	Med Density Dwelling Unit, Med Density Employment – Transit
4D_MDUxHDE_T	-0.25		-0.48	Med Density Dwelling Unit, High Density Employment – Transit
4D_HDUxMDE_T	-0.17		-0.04	High Density Dwelling Unit, Med Density Employment – Transit
4D_HDUxHDE_T	-1.3		-0.31	High Density Dwelling Unit, High Density Employment – Transit
4D_MDUxMDIxMDE_T	-0.59	-0.64		Med Density Dwelling Unit, Med Den Intersection, Med Density Employment - Transit
4D_MDUxMDIxHDE_T	-0.69	-0.77		Med Density Dwelling Unit, Med Den Intersection, High Density Employment - Transit
4D_MDUxHDIxMDE_T	-0.58	-0.47		Med Density Dwelling Unit, High Den Intersection, Med Density Employment - Transit
4D_MDUxHDIxHDE_T	-0.74	-0.28		Med Density Dwelling Unit, High Den Intersection, High Density Employment - Transit
4D_HDUxMDIxMDE_T	0.46			High Density Dwelling Unit, Med Den Intersection, Med Density Employment - Transit
4D_HDUxMDIxHDE_T	-1.58	-0.22		High Density Dwelling Unit, Med Den Intersection, High Density Employment - Transit
4D_HDUxHDIxMDE_T	0.81	-0.49		High Density Dwelling Unit, High Den Intersection, Med Density Employment - Transit
4D_HDUxHDIxHDE_T	-0.5	-0.43		High Density Dwelling Unit, High Den Intersection, High Density Employment - Transit

Why apply a strategic model?

Strategic models are designed to quantitatively explore a large number scenarios to answer *what can happen*? A strategic model can be used in "search" mode to identify scenarios for more detailed evaluation.

Strategic Model Niche

Sketch Planning
Quick, What-If, No Network

Strategic Models

Activity-/Trip-/Tour-Based Model
Detailed Travel-Only Models

Integrated Model
Economy, Land Use, & Feedback

Strategic Model Search Mode

Strategic model explores a large number of scenarios

Scenario
Scenario
Scenario

Preferred Scenarios

More in-depth analysis for select scenarios using travel demand model

Key characteristics of strategic models and the VisionEval framework

RSPM is part of the most common strategic model framework – **VisionEval**.

- Estimated with readily available data
- Runs quickly (run hundreds of scenarios in a short timeframe)
- Results can be viewed in an interactive visualizer and are available in output files (CSVs)
- VisionEval is open source and is supported by a federally funded Pooled Fund effort with several DOT and MPO members across the country
- See http://visioneval.org

Setting up the strategic model for the AMATS region using the regional travel demand model

- First step is to develop the "base" model that reflects current conditions and the latest forecasts

- Base model inputs are developed for two years: 2019 and 2050

- Key data from the regional travel demand model is being used to develop the RSPM base model

  - Zonal structure and land use

  - Population and housing

  - Employment

- Regional travel demand model will also be used to calibrate RSPM

Model Zone Structure

Municipality of Anchorage, Matanuska-Susitna Borough GIS, Esri, HERE, Garmin, USGS, NGA, EPA, USDA, NPS
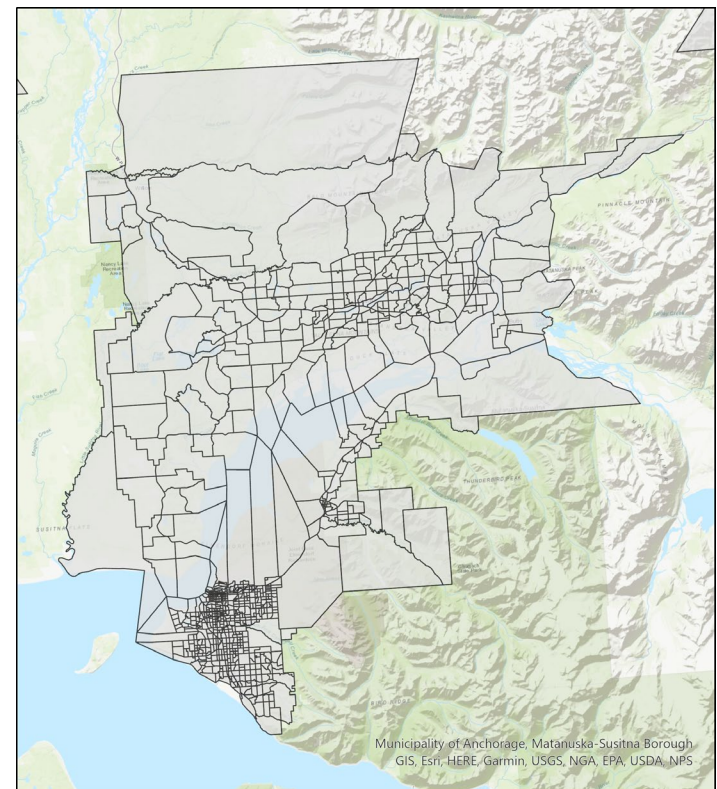
Scenario Development

Scenarios are alternative futures, any model input can be used to develop scenarios

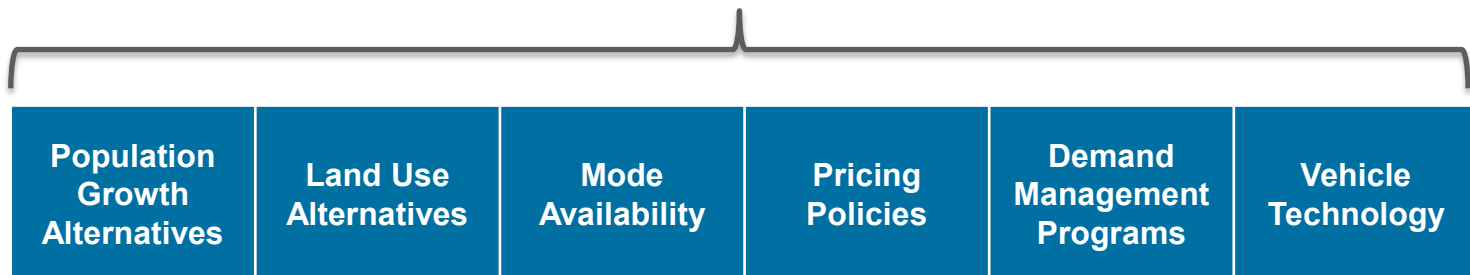| CHANGES IN DEMOGRAPHICS AND LAND USE	LOCAL POLICY ACTIONS AND PRICING	CHANGES IN TRANSPORTATION SUPPLY
• Changes in population & demographics • Changes in average income per capita • Changes in employment • Changes in the proportion of houses located in mixed-use and unprotected areas available for development • Residential & workplace PEV charging infrastructure	• Parking pricing programs • Demand management policies • Suitability for active transportation • Diversion of SOV trips by bikes, e-scooters, or other personal modes • Road cost recovery • Congestion fees • Pay-as-you-go insurance & other road fees • VMT fee	• Changes in freeway & arterial lane miles • Powertrain proportions for light-duty, transit, & heavy-duty vehicles (by ICE, HEV, & PEV) • Ride-hailing & carsharing availability, substitutability, & access time • Amount of regional transit service • ITS strategies for freeways & arterials

Developing scenarios involves deciding on policies to test and the level of change

First step is to decide on which inputs (policies, investments, and actions) to include in testing, usually grouped into categories. For each category of inputs, several *levels* of change from the base model assumptions are defined.


Scenario Input Categories

Population Growth Alternatives	Land Use Alternatives	Mode Availability	Pricing Policies	Demand Management Programs	Vehicle Technology

Level of change

1. Base Model (calibrated to existing conditions, no change)
2.
3.
4.

- The strategic model runs all the combinations of scenario input levels
- Total number of scenarios is a function of the number of categories and the number of levels in each category
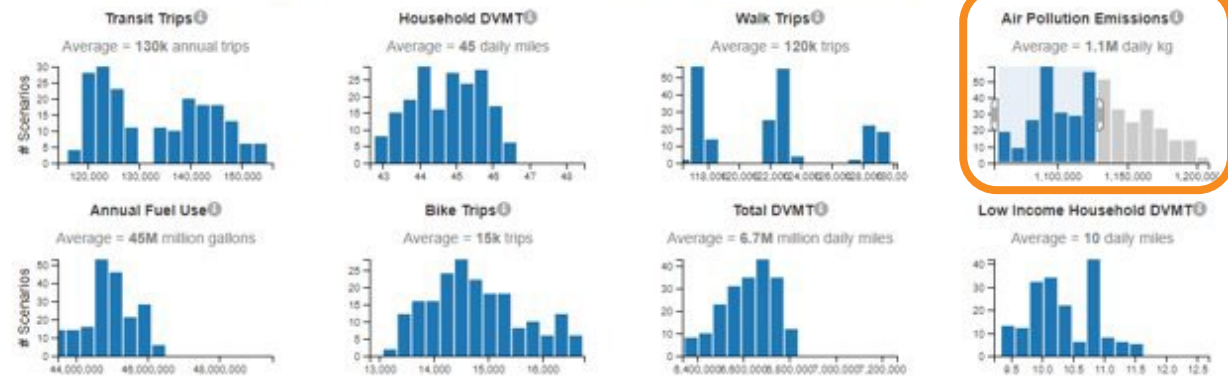
Example of the scenario viewer to explore results and goal-seek solutions

the set of policies…
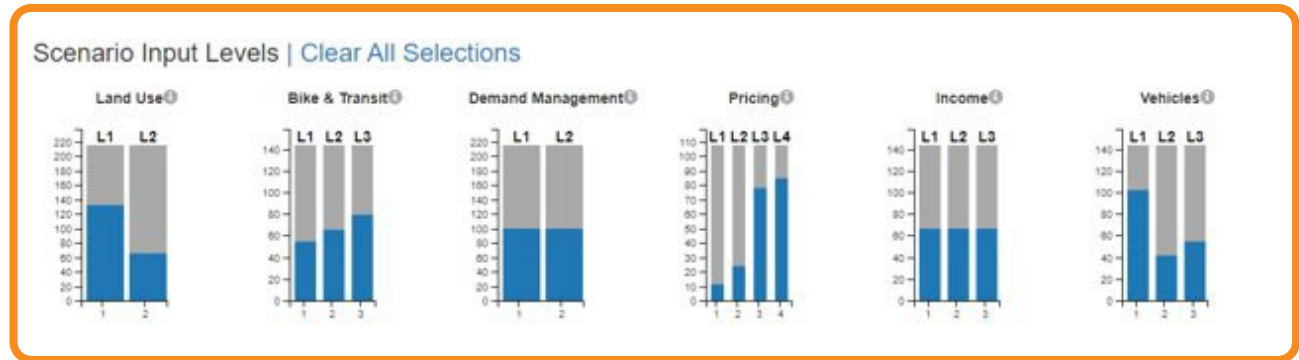
a desired set of results

Selecting the scenarios with the lowest air pollution emissions shows the corresponding scenario input levels (top row)

We tested numerous scenarios using the VERSPM …

1. We devised a variety of high-level 'ingredients' (investments, policies, programs) that could meet your goals, in consultation with AMATS staff.

2. We selected certain VERSPM output metrics that seem best suited to help AMATS judge how well future outcomes meet your goals

3. We made *preliminary* forecasts of 2050 transport system performance for the hundreds of combinations of the 'ingredients'.

…then filtered the **432** scenarios into groups that produced outcomes aligned with MTP goals
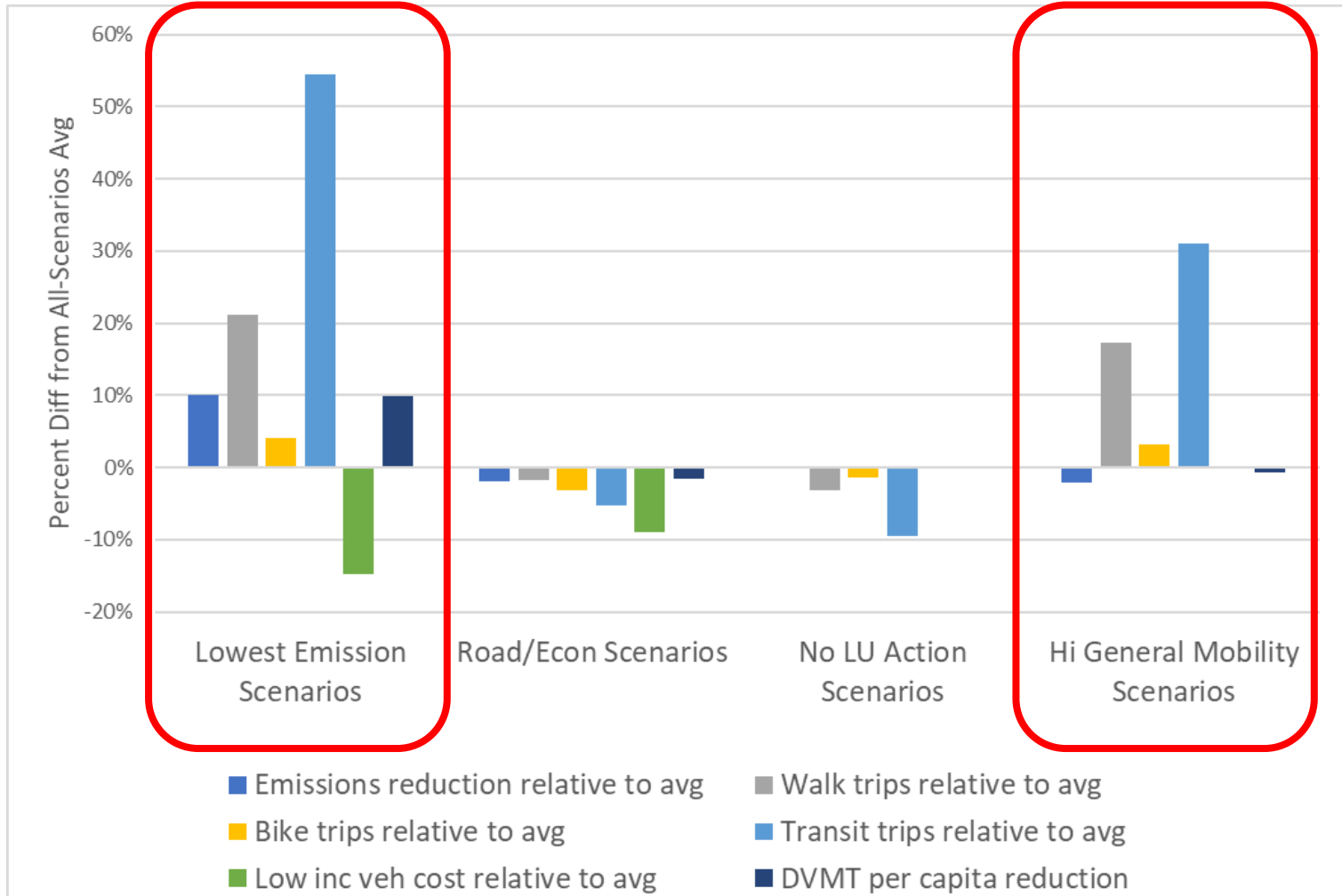
The strategic model groupings led naturally to the design of four* *2050 Draft Alternatives* for deeper analysis in the regional travel model

Conceptual Description of the Action	"Minimize GHG and other emissions"	"Minimize GHG and other emissions" WITH land use	"Something for All Goals"	"Something for All Goals" WITH land use
Make investments that increase active transport trips by about 20%	X	X	X	X
Increase transit revenue miles by at least 50%	X	X	Modified	Modified
Add new transit service at the neighborhood level to reflect added routes	X	X	Modified	Modified
Increase fuel tax by 10 cents	X	X	X	X
Add a VMT mileage-based fee of around 3 cents/mile	X	X	O	O
Increase price by 50% and extent of priced parking	X	X	X	X
Invest in travel demand management programs to shift 10% more trips out of SOV	X	X	X	X
Invest to increase road operations efficiency effects by 10%	X	X	X	X
Increase road lane-miles by roughly 10%, focused on freight mobility	O	O	X	X
Increase public sector fleets to be 50% alternative fuels by 2050 Promote electric vehicle adoption, e.g. with policies to provide electric vehicle charging in most multi-family buildings Incentivize commercial and service vehicle move to alternative fuels (90%)	X	X	X	X
Concentrate future residents and jobs into areas designated in the Anchorage Land Use Plan, the Eagle River Town Center area, and the Wasilla-Palmer area	O	X	O	X

in addition to the future 'no build' alternative

The new travel model sensitivities already described helped the alternatives analysis reach a preferred alternative

Thank you!