

Construction Staging Workshop An Effective Value Methodology Application

 **SYMPOSIUM 2014**

**Solving Problems
Improving Value**



Toronto, Nov 17-18

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Introduction

Presentation Objectives

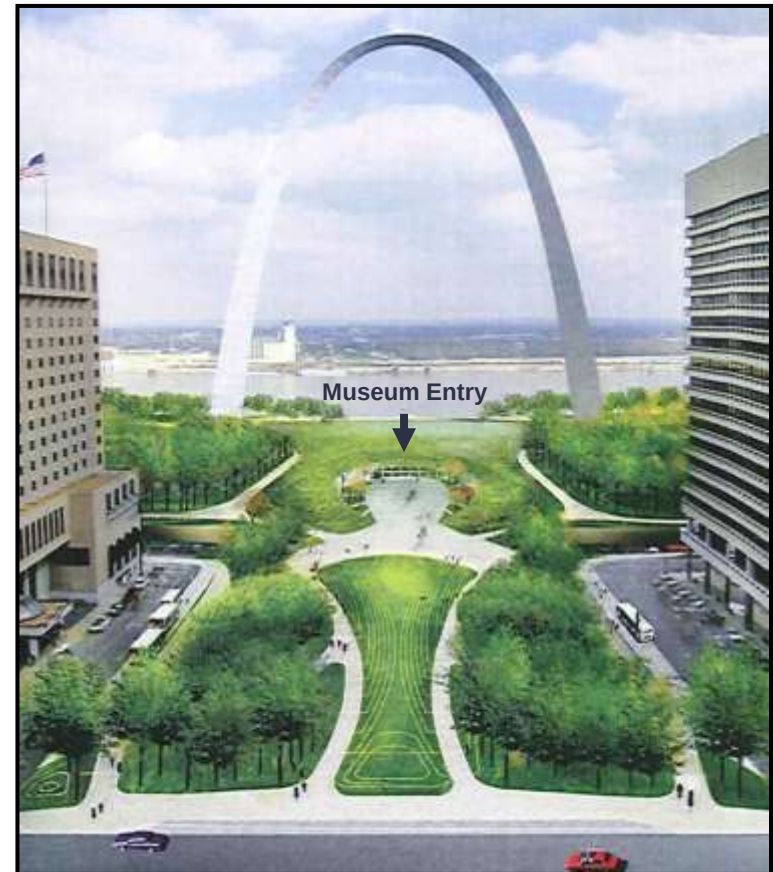
- 1. Explain how the value methodology (VM) was adapted into a *Construction Staging Workshop***
- 2. Describe workshop results**
- 3. Demonstrate VM flexibility**

Introduction - Outline

- **Introduction**
- **Project Overview**
- **Workshop Scope**
- **Workshop Process**
- **Workshop Results**
- **Summary & Conclusions**
- **Application**

Introduction

- **Project: “Park Over the Highway” (POH)**
 - **Client: Missouri Department of Transportation (MoDOT)**
 - **MoDOT request: Construction Staging Workshop at 50% plans**



Introduction

- **Purpose of Workshop**
 - **Confirm/refine staging plan**
 - **Shorten schedule**
 - **Reduce construction impacts**
 - **Unify involved agencies (7)**

Introduction

- **No MoDOT *Construction Staging Workshop* guidelines**
- **Value methodology employed for workshop:**
 - **Organization**
 - **Structure**
 - **Process**
 - **Common language**

Project Overview

POH part of larger Gateway Arch revitalization



*Jefferson National Expansion Memorial (JNEM) Gateway Arch –
downtown St. Louis*

Project Overview



Arch from Courthouse



I-70 at Arch grounds



Courthouse from Arch



Walnut St. Bridge

Project Overview

- **Arch Revitalization Project Partnership**
 - **National Park Service (NPS)**
 - **CityArchRiver 2015 Foundation (CAR2015)**
 - **Missouri Department of Transportation (MoDOT)**
- **50th anniversary celebration - 2015**

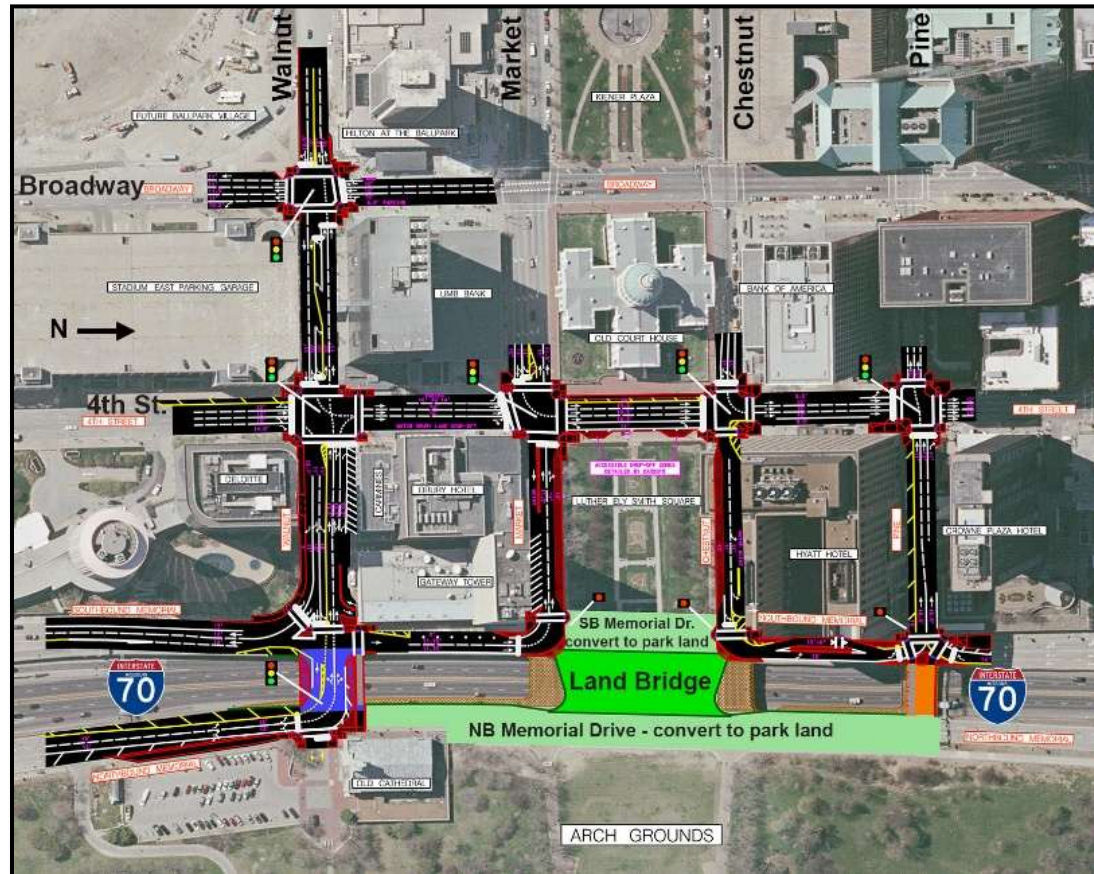
Project Overview

JNEM/CAR2015 Revitalization Project



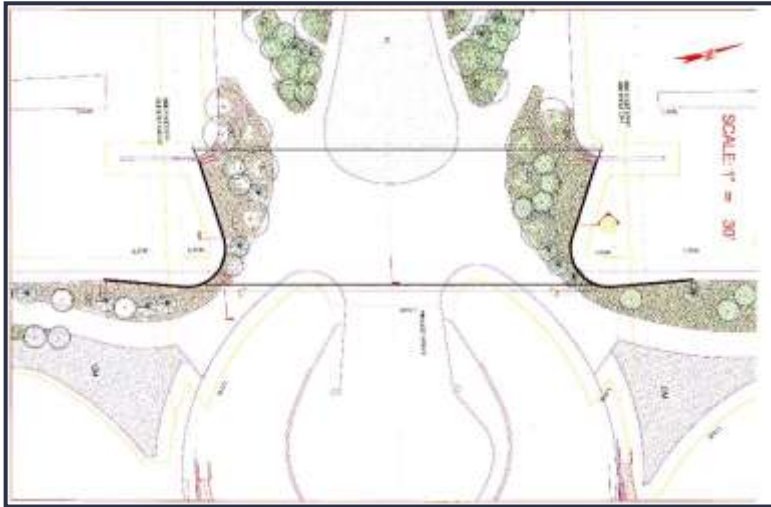
Project Overview

POH Project Scope

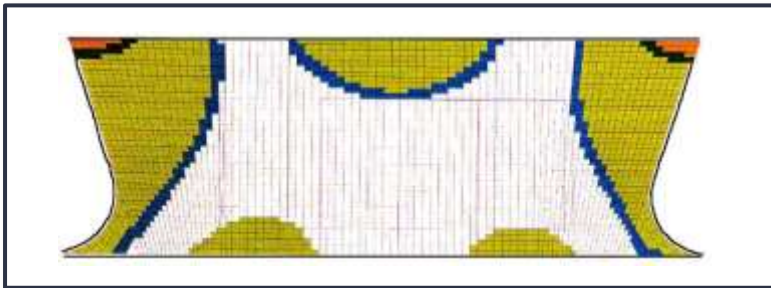


Note: I-70 from the Poplar St. Bridge 0.5 miles south of the POH to the new Stan Musial/Veterans Memorial Bridge 1.50 miles north of the POH was remarked I-44 in February 2014.

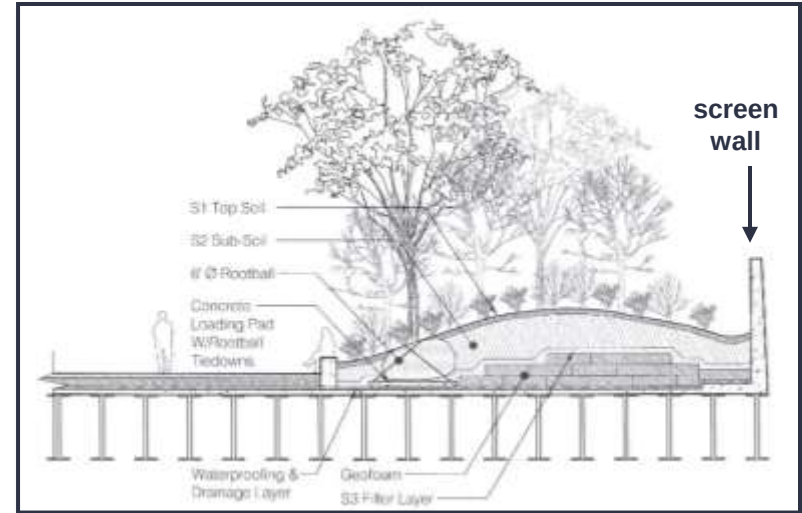
Project Overview



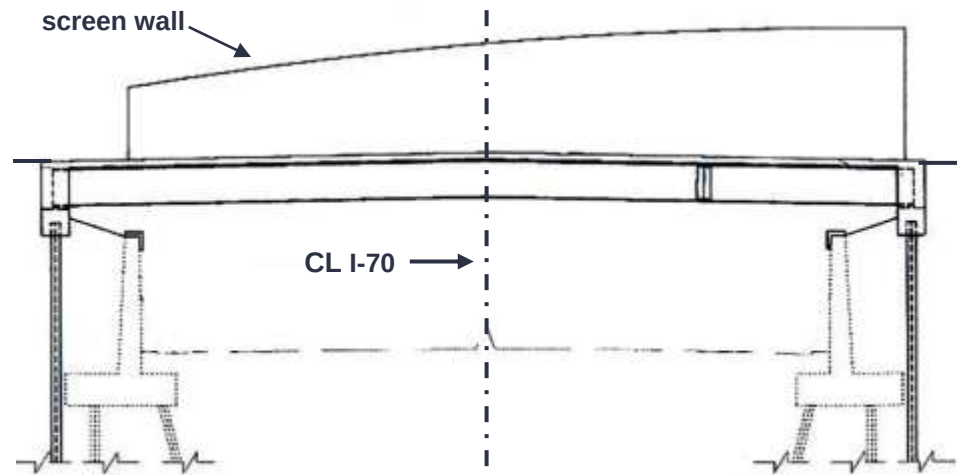
Plan view – landscaping/bridge deck



Loading stress map



Landscape deadload materials



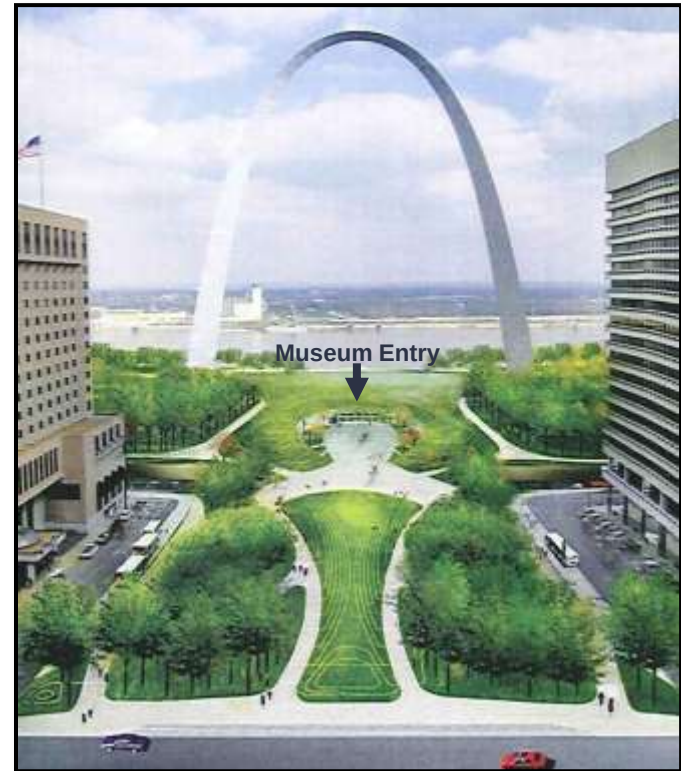
Land bridge - elevation

Project Overview

Arch grounds/Luther Ely Square - Uninterrupted Pedestrian Mall



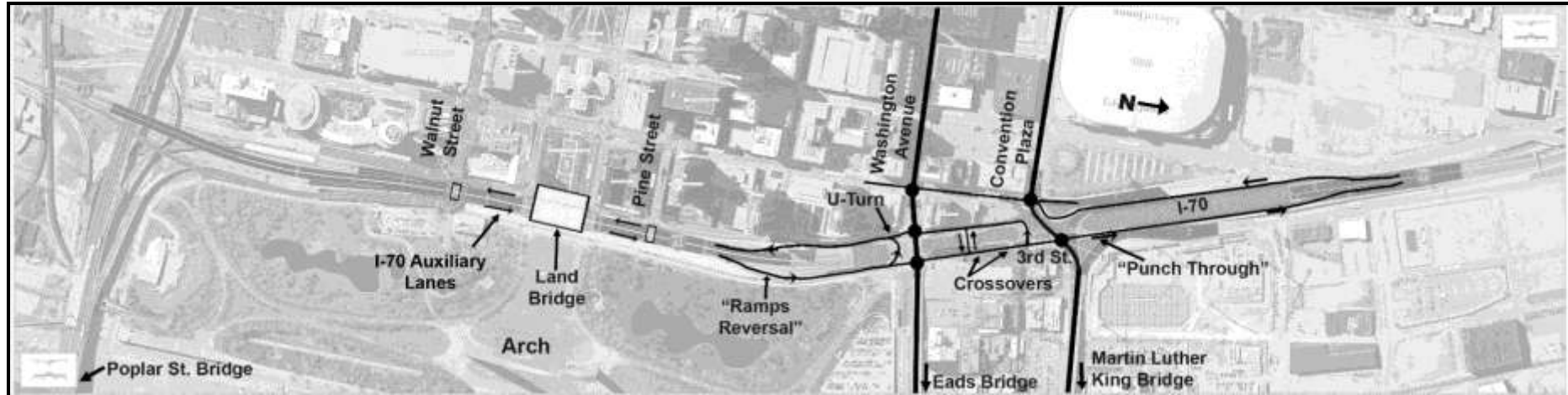
Before



After

Project Overview

“Ramps” Project Scope



Project Overview

Involved Agencies

- **National Park Service**
 - Headquarters
 - Local project management
 - Gateway Arch operations
- **CAR2015**
 - Foundation
 - Consultant architects
- **MoDOT**
 - Local project management
 - Consultant engineers
- **Federal Highway Administration (FHWA)**
- **City of St. Louis Streets Department**
- **St. Louis Metro Transit**
- **Illinois Department of Transportation (IDOT)**

Project Overview

Viewpoint Diversity

- Aesthetics/function/cost
- Motorist/pedestrian priority
- Efficient construction/business, motorist, Arch disruption
- Construction impacts/long-term O&M impacts
- Architectural/Engineering perspectives
- Esteem value/utility value priority

Project Overview

- **Separate POH and Ramps contracts**
- **Completion date: October 2015**
- **Estimated construction cost: \$21.9 million**

Project Concerns

Critical Project Concerns

- 1. Meet Arch 50th anniversary schedule**
- 2. Prevent perception: downtown St. Louis “closed for business”**
- 3. Cost secondary**

Workshop Scope - Focus

- **Construction staging plan**
- **Constructability**
- **Schedule**
- **Stakeholder/user impacts**



Preliminary Construction Staging Plan

Workshop Scope - Timing

- **50% plans stage**
 - **Best agency feedback opportunity**
 - **Sufficient detail**
 - **Assess constructability, staging & impacts**

Workshop Scope - Team

MoDOT (4)

FHWA (1)

NPS (5)

City (2)

CAR2015 (2)

POH designer (3)

Ramps designer (3)

Construction specialist (1)

Utility liaison (1)

IDOT (2)

Workshop facilitator (1)

TOTAL - 25

Workshop Scope - Challenges

- **Large team**
- **One day**
- **Diverse viewpoints**

Workshop Process

How was value methodology job plan modified?

Workshop Process

VM Job Plan Modifications – Overview

Information:	project cost/ <i>time</i> model
Function Analysis:	functionality <i>review</i> “means & methods” functions customer FAST – during const.
Creative:	3 sub-teams
Evaluation:	workshop output – idea list
Development:	design team/post workshop
Presentation:	design team/post workshop

Information Phase

- Information package 1 week prior
- Project presentation
- Site visit via PPT slides



MoDOT



CAR2015



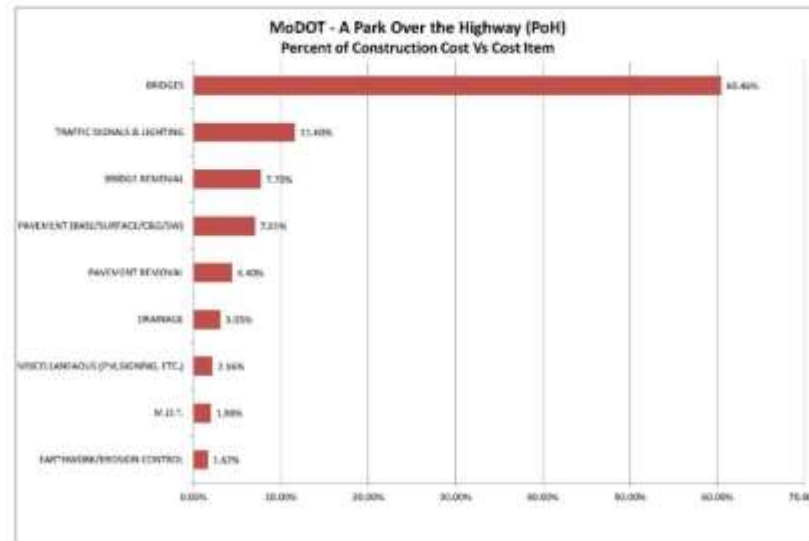
POH Design Consultant



National Park Service

Information Stage

Project Cost/**Time** Model



Bridges
←

MoDOT J612413 - PRACTICAL DESIGN WORKSHOP A Park Over the Highway (PoH) BASELINE COST ESTIMATE AUGUST 2012				
ITEM NO.	COST ITEM DESCRIPTION	CONSTRUCTION \$	CONSTRUCTION %	CUMULATIVE %
1	BRIDGES	\$8,896,000	60.40%	60.40%
2	TRAFFIC SIGNALS & LIGHTING	\$1,315,850	11.60%	72.07%
3	BRIDGE REMOVAL	\$673,000	7.70%	79.77%
4	PAVEMENT (BASE/SURFACE/C&G/SIDEWALK)	\$794,750	7.01%	86.78%
5	PAVEMENT REMOVAL	\$499,000	4.40%	91.18%
6	DRAINAGE	\$346,000	3.05%	94.23%
7	MISCELLANEOUS (PM, SIGNING, ETC.)	\$245,200	2.16%	96.39%
8	M.O.T.	\$225,000	1.98%	98.38%
9	EARTHWORK/EROSION CONTROL	\$164,000	1.62%	100.00%



Function Analysis Phase

■ Project Functionality *Review*

- Common understanding of project purpose, need and key design elements
- Aid identification of alternative creative ideas
- Focus team on constructability, construction staging and user impacts

Project Functionality Review

■ **Functionality 101**

- **Functions answer the question:**
- **“What does it do?” – active verb/measurable noun**
- **Higher order; basic; secondary**
- **Examples (arch, bridge, wall)**

Project Functionality Review

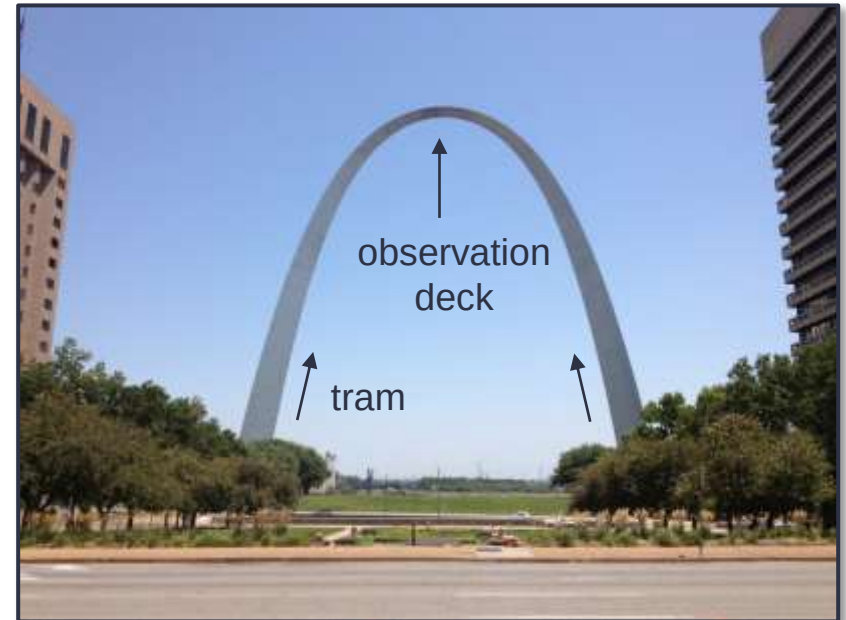
Value/Function Illustration

■ Esteem Value

- Illustrate history
- Symbolize gateway
- Memorialize pioneers
- Inspire spectators
- Display ingenuity
- Signify St. Louis
- Attract visitors

■ Utility Value

- Elevate visitors
- Afford (bird's eye) view



Project Functionality Review

■ CAR2015 Goals are Project Functions

- Create place
- Catalyze vitality
- Honor character
- **Create (city/Arch) connection**
- Embrace river/east bank
- Reinvigorate story
- Create attractors
- **Mitigate (transportation) impacts**
- Develop (sustainable) future
- Enhance experience

Project Functionality Review

- Functions can also be thought of in this way:

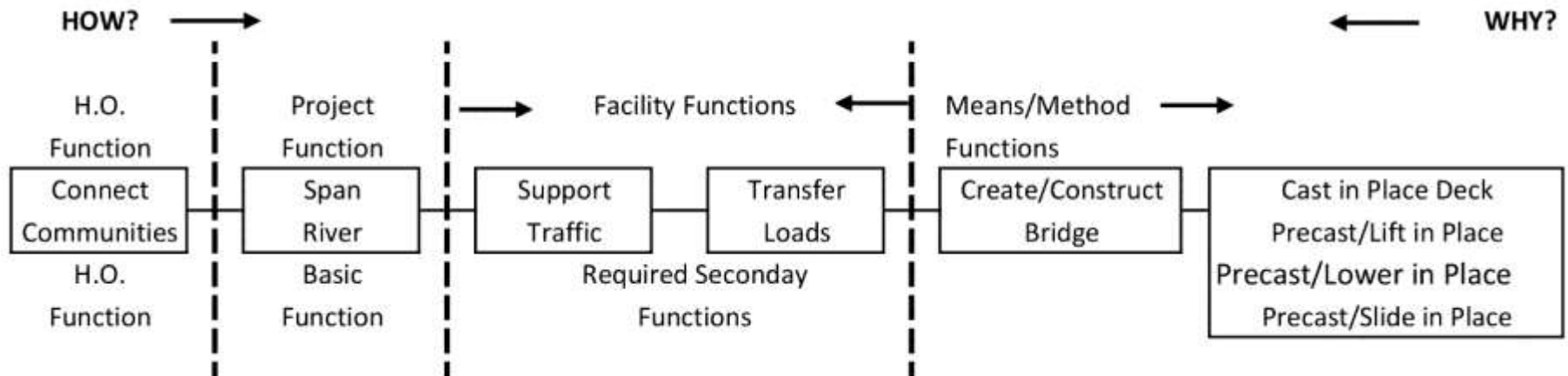
Type	Definition	Implementing Action
Higher Order	Need of the project	Planning
Project	How project function meets need	Concept Engineering
Facility	How a project facility/component accomplishes the project function	Design Engineering
Means/Methods	How a project facility/component is constructed	Construction

Project Functionality Review

■ FAST Diagrams 101

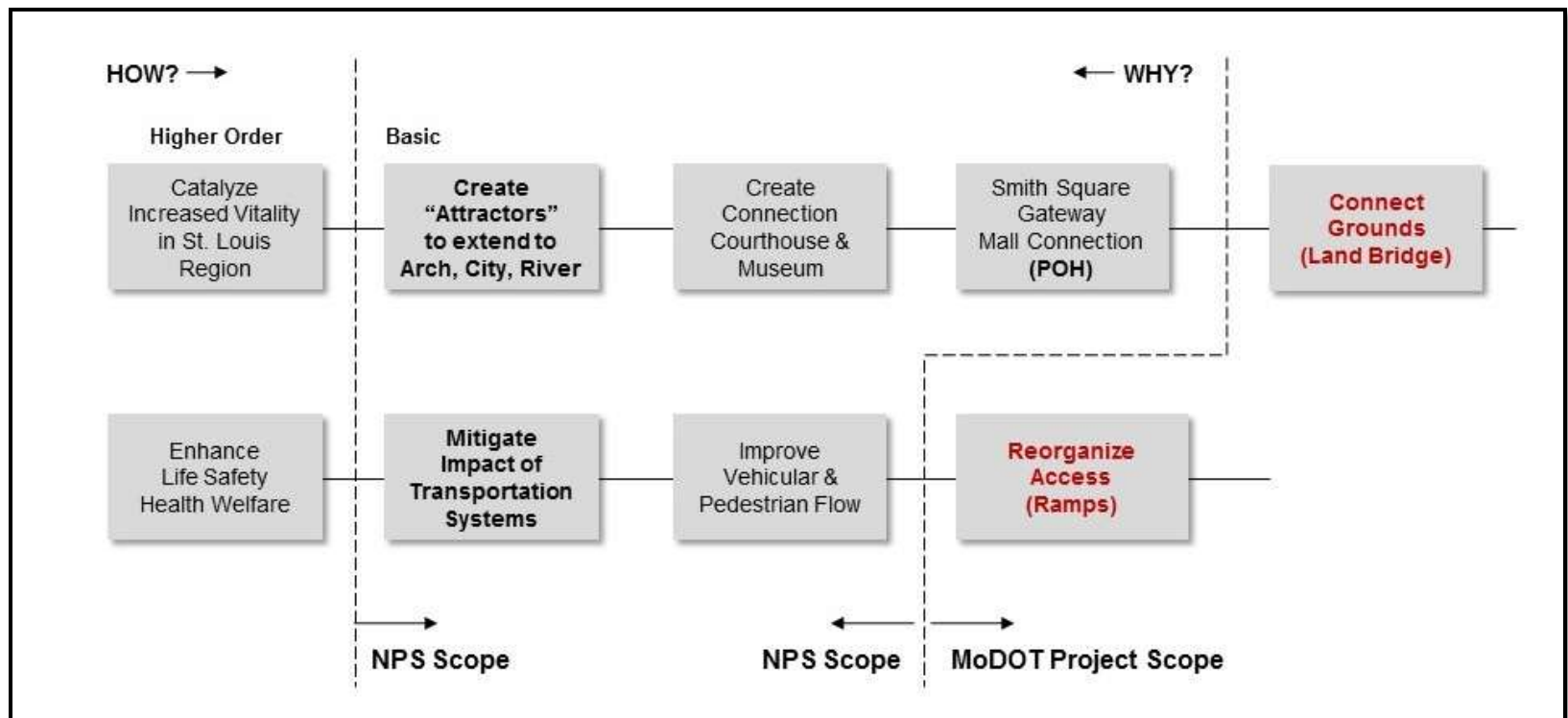
- Technical FAST
- Customer FAST

■ Example bridge FAST diagram



Project Functionality Review

National Park Service Value Analysis Study #3 JNEM FAST Diagram



Project Functionality Review

■ Workshop Target Function Categories

- Facility design (**designer** viewpoint)
- Constructability/construction staging (**contractor** viewpoint)
- User operations and safety (**stakeholders/users** viewpoint)

Project Functionality Review

■ Facility Design Functions

- Key cost items from cost/time model
- Pre-prepared 2-word-function list for each cost item
- Others added by workshop team

Project Functionality Review

- **Facility Design Functions – bridge examples:**
 - **Connect grounds**
 - **Span I-70 & walls**
 - **Support (live) load**
 - **Transfer loads**
 - **Drain runoff**

Project Functionality Review

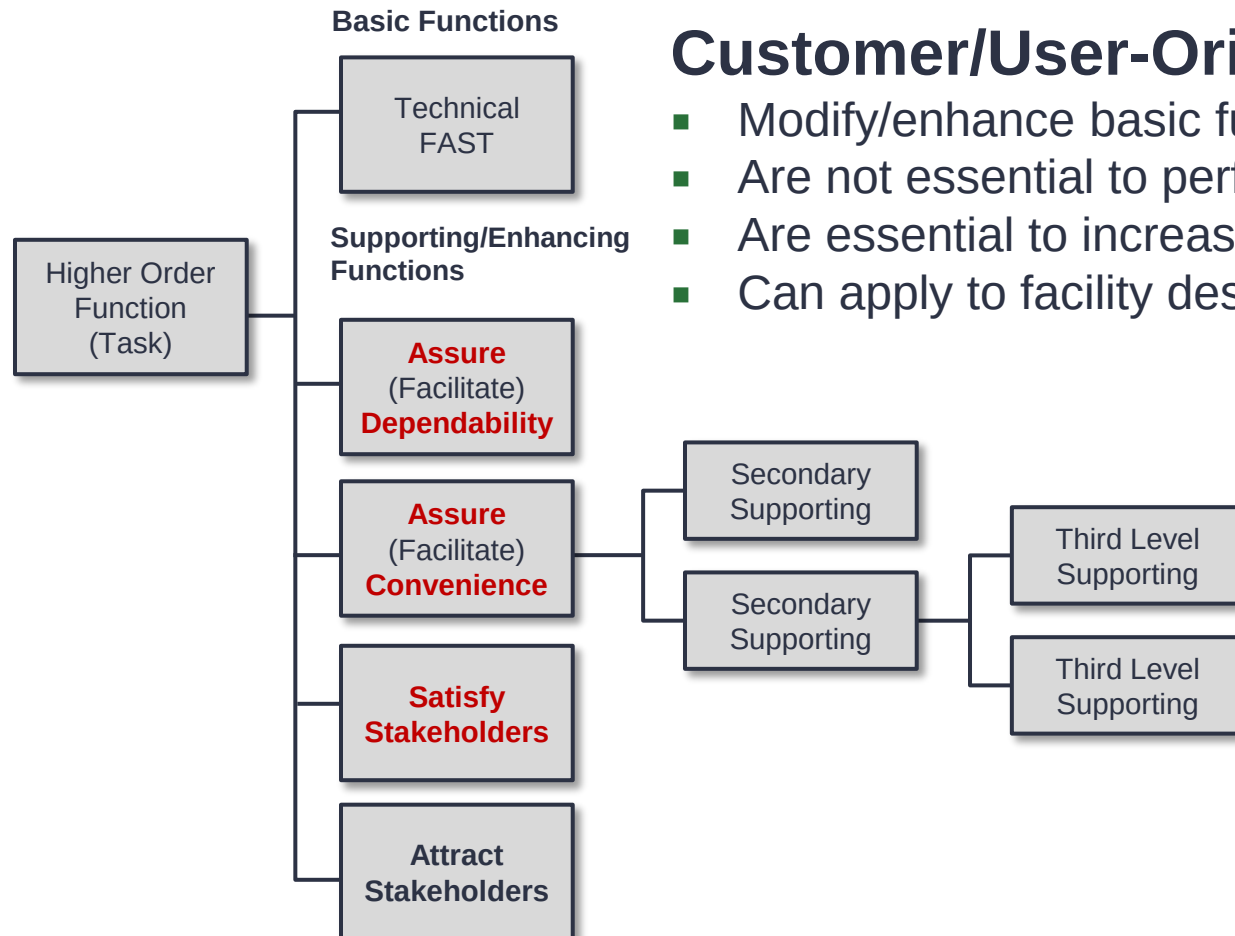
- **Construction “Means & Methods” functions examples:**
 - **Cast (in place) concrete**
 - **Maintain access**
 - **Safeguard workers**
 - **Store materials/equipment**
 - **Stage construction**

Project Functionality Review

How develop customer/user-oriented functions (during construction)?

Project Functionality Review

Use Customer/User-Oriented FAST



Customer/User-Oriented Functions:

- Modify/enhance basic functions or project elements
- Are not essential to performance of the task
- Are essential to increase customer/user acceptance
- Can apply to facility design or its construction

Project Functionality Review

Customer/User-Oriented Functions (during construction)

Assure Dependability – function has at least one of these attributes:

- Makes project element stronger, more reliable, more effective
- **Makes it safer to use**
- Lengthens life or minimizes maintenance
- Protects environment

Assure Convenience – function has at least one of these attributes:

- **Makes it more convenient to use**
- Facilitates maintenance/repairs
- **Furnishes instructions and directions**
- Enhances spatial arrangements

Satisfy Stakeholders – function has at least one of these attributes:

- Makes user's life more pleasant (i.e. reduces noise)
- **Satisfies individual desires**
- Makes element appear to be better in user's opinion

Attract Stakeholder – function has at least one of these attributes:

- Emphasizes visual/aesthetic aspects
- Projects favorable image

Project Functionality Review

Customer/User-Oriented Functions (during construction)

Assure dependability

- Focus on construction safety

Assure convenience

- Focus on motorist/pedestrian delay & wayfinding

Satisfy stakeholders

- Focus on business owner/customer desires

Attract stakeholders

- (CAR2015 scope)

Project Functionality Review

- **User-Operations functions**
 - **Assure dependability examples**
 - **Safeguard motorists**
 - **Safeguard pedestrians**
 - **Protect environment**

Project Functionality Review

- **User-Operations Functions**
 - **Assure convenience examples**
 - Inform motorists
 - Reduce delays
 - Reduce closure time

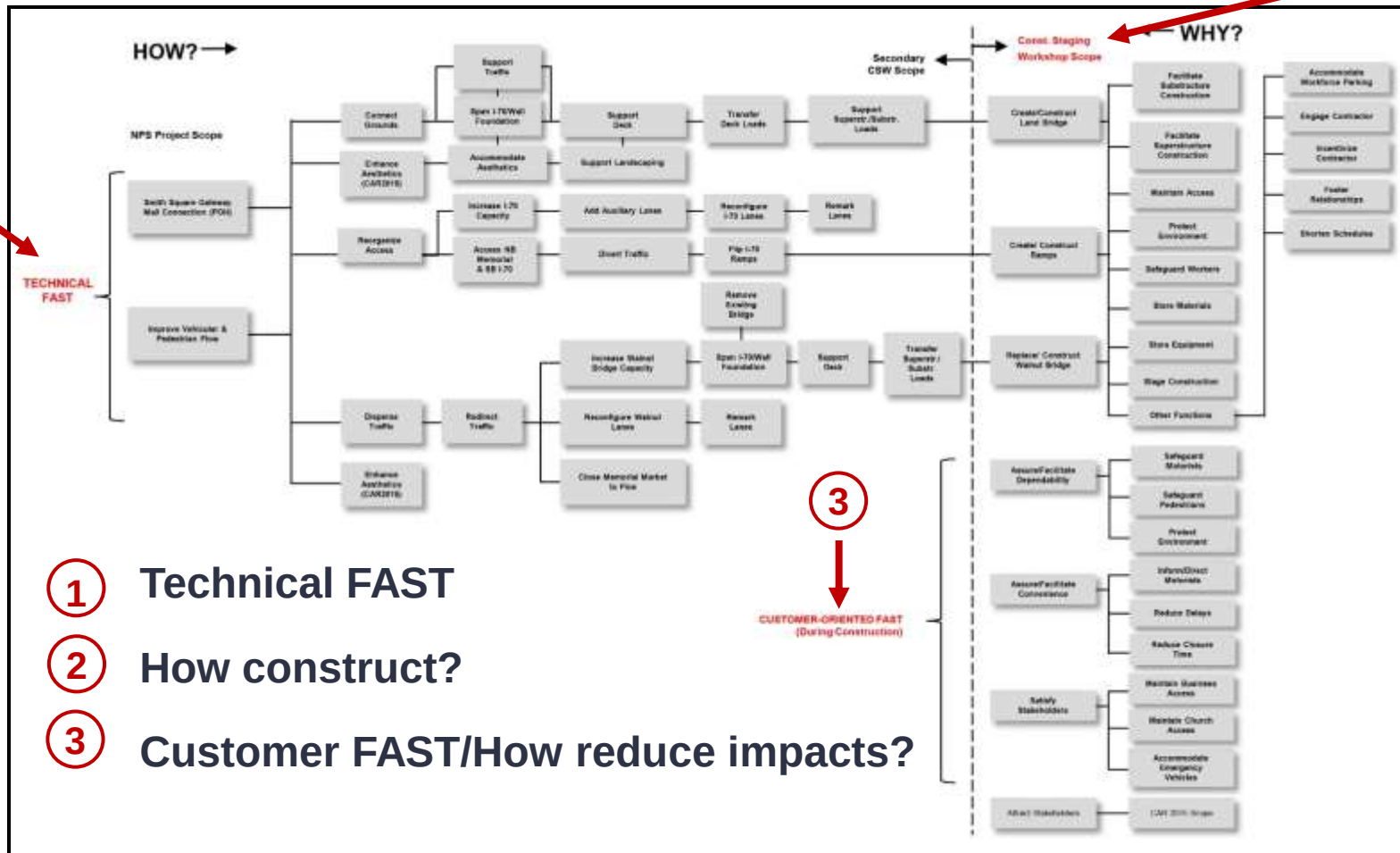
Project Functionality Review

- **User-Operations Functions**
 - **Satisfy stakeholders examples**
 - **Maintain business access**
 - **Maintain church access**
 - **Accommodate emergency vehicles**

Project Functionality Review

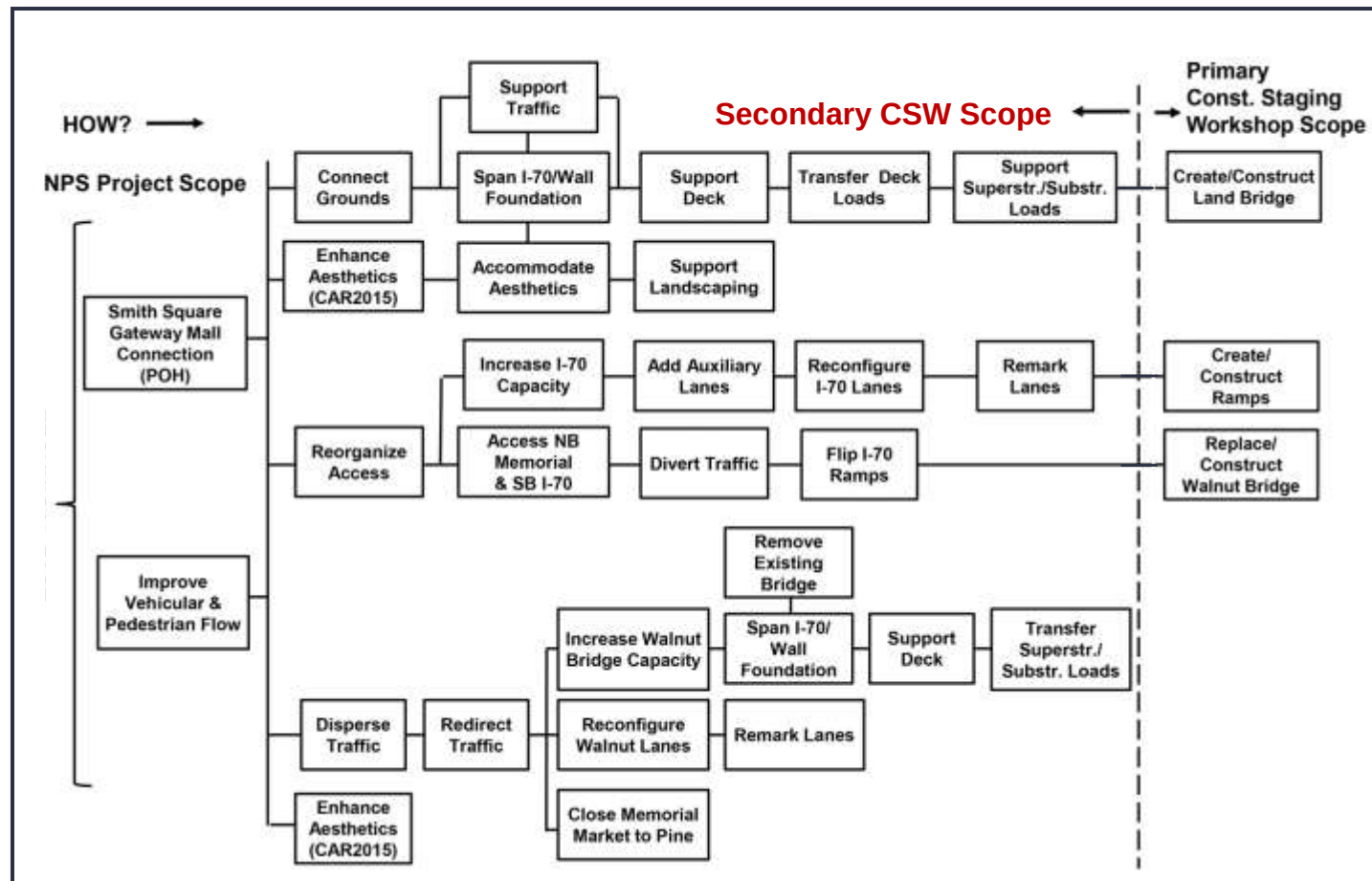
Overall POH/Ramps FAST Diagram

②



Project Functionality Review

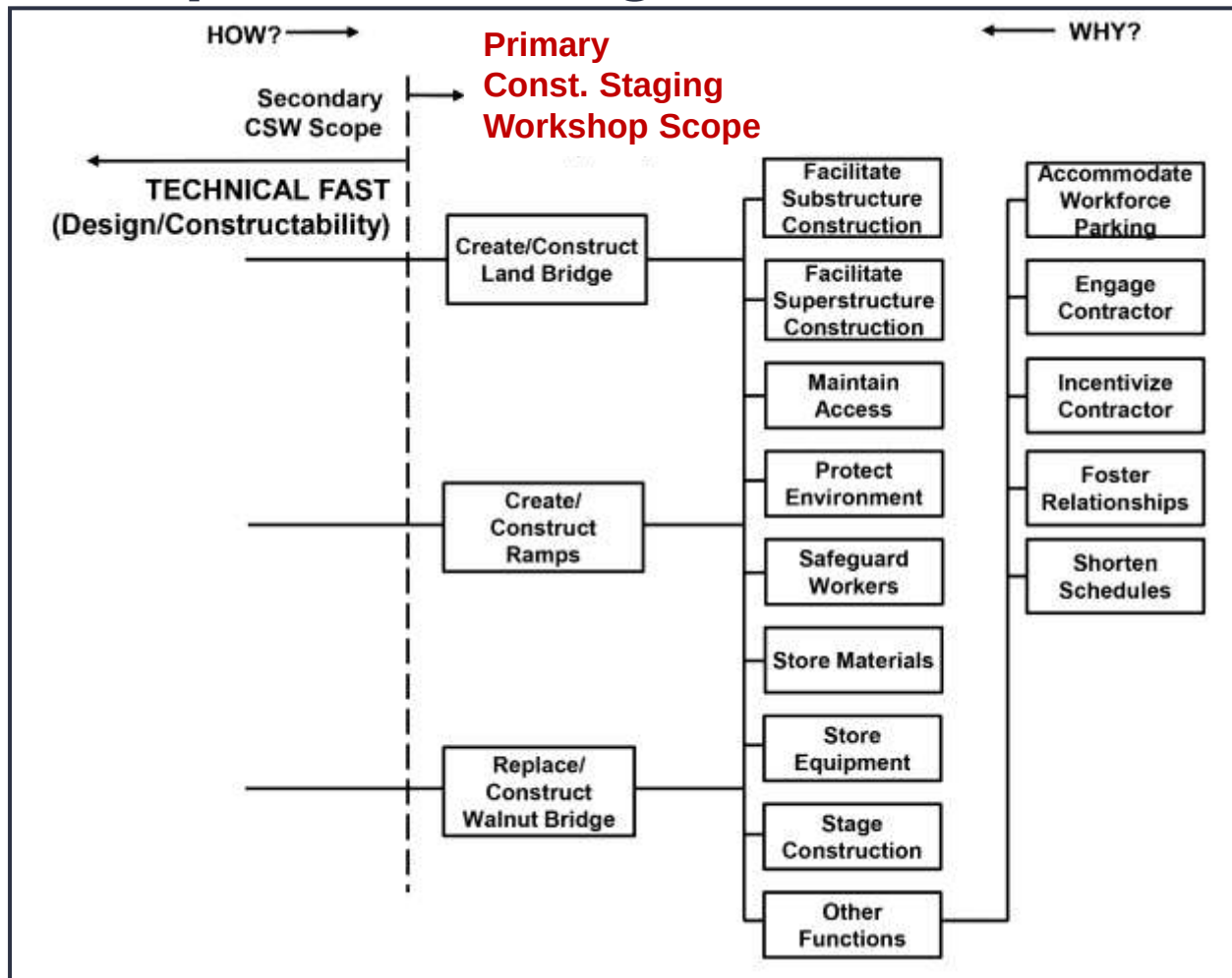
POH/Ramps **Technical** FAST Diagram



Design/Constructability Portion – **Facility** Functions

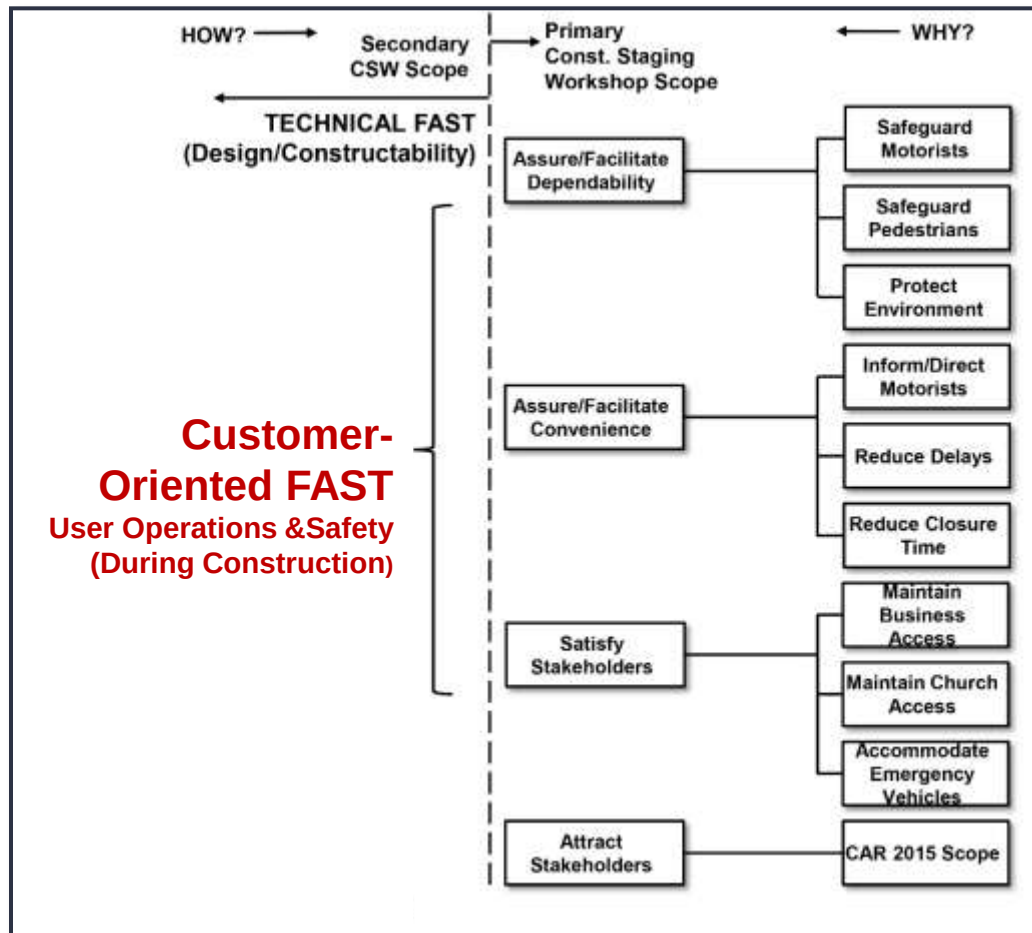
Project Functionality Review

POH/Ramps FAST Diagram – *How construct?*



Project Functionality Review

POH/Ramps FAST Diagram – *How reduce impacts?*



Customer-Oriented Portion – User Operations & Safety Functions

Creative Phase

Three sub-teams:

1. Facility Design (designer viewpoint)

- Focus on **Facility** functions
- Objective: increase value and constructability; identify potential VECs



Facilities design

Creative Phase

2. Constructability/Construction Staging (contractor viewpoint)

- Focus on ***Means & Methods*** functions
- Objective: increase constructability, optimize construction staging; identify options to shorten schedule



Construction/staging

Creative Phase

3. User Operations & Safety (stakeholders/users viewpoint)

- Focus on **Operations & Safety** impacts
- Impacted users: MoDOT, Park Service, city, Metro transit, businesses, organizations, motorists, pedestrians
- Objective: reduce adverse impacts



User operations & safety

Creative Phase

- **After sub-teams brainstormed creative ideas separately:**
 - Sub-teams reported ideas to whole team
 - Whole team added ideas to sub-team lists

Evaluation Phase

- Qualitative impact classification: cost, time & user impact

		PROBABLE EFFECT ON COST/TIME/CONSTRUCTABILITY		
		Increase	Same	Decrease
PROBABLE EFFECT ON FUNCTION	Increase	Requires additional funding (2+)	(4)	(5)
	Same	X (1)	Possible different approach (3)	(4)
	Decrease	X (1)	X (1)	Scope deferral or elimination (2-)

- Idea rating by team voting
- Workshop output: **classified/rated idea list**

Development Phase

■ Post-Workshop Tasks

- Draft *Workshop Summary* – by workshop facilitator
 - Ideas grouped & tabulated by sub-team category
 - Idea classifications & team ratings included

Development Phase

■ Post-Workshop Tasks

- ***Supplemental Constructability Memorandum*** – by construction specialist
 - Comments on workshop ideas & additional ideas
 - Estimates of time savings
 - Monetization of estimated time savings

Development/Presentation Phase

■ Post Workshop Tasks

- Design team analysis & development of feasible ideas
- Preliminary disposition of ideas by design team
- Presentation/preliminary dispositions meeting - 6 weeks after workshop

Disposition/Implementation

- Final dispositions by MoDOT
- Updated *Workshop Summary* sent to all workshop team members for comment
- Final ***Workshop Report*** incorporating workshop team comments
- Incorporation of accepted ideas into final construction documents

Workshop Results

Workshop Time Allocation

Phase	Workshop Hours
Information	3.50
Functionality Review	1.00
Creative	1.50
Evaluation	1.00
Development	post-workshop
Presentation	post-workshop
Lunch & Breaks	1.00
TOTAL	8.00

Workshop Results

Creative Ideas Summary by Category

Facility design	33
Constructability/staging	49
User operations & safety	44
TOTAL	126

Workshop Results

Disposition Summary

<u>Sub-Team</u>	<u>A</u>	<u>A-M</u>	<u>A*</u>	<u>R</u>	<u>OS</u>	<u>Total</u>
Facility Design	3	3	5	18	4	33
Constructability/construction staging	9	1	21	10	8	49
User operations & safety impacts	15	2	11	1	15	44
TOTALS	27	6	37	29	27	126

TOTAL ACCEPTED IDEAS: 27 + 6 = 33

A = accepted; A-M = accepted with modifications; A* = accepted, already in baseline design; R = rejected; OS = out of scope

Workshop Results

■ Example Accepted Ideas

- Single construction contract
- Close Walnut Street bridge/detour Old Cathedral traffic
- Incentivize Walnut Street bridge construction
- Material storage in Luther Ely Square
- Pedestrian wayfinding message boards

Workshop Results

■ Construction Time Savings

- 14 of 33 accepted ideas reduced calendar time
- Estimated net calendar day savings: 3-4 months
- Benefit: shortened schedule or schedule contingency

Workshop Results

■ Construction Cost Savings

- Cost savings of individual accepted ideas not calculated
- Monetization of estimated time savings: \$0.8 to \$1.1 million

Workshop Results

- **Stakeholder/User Operations & Safety Impact Reductions**
 - Shortened schedule = reduced user, stakeholder and economic impacts

Summary

■ Workshop Goals Met

- **33 accepted ideas vs. 10-12 goal**
- **Improved constructability/shorter schedule (3-4 months shorter)**
- **Reduced user/stakeholder impacts**
- **Potential \$0.8 to \$1.1 million cost savings**
- **Increased agency unity/cooperation**

Conclusions

- Value Methodology has wide range of applications
- Value Methodology can be used for a *Construction Staging Workshop*

Application

- **Other Potential *Construction Staging Workshop* Applications**
 - Supplement a VE Study performed in concept stage
 - Smaller projects with no VE study
 - Multiple-agency project needing harmonization
 - Post award with awarded contractor

Project Construction

***H-pile
installation***



***Girders in
place***



***Walnut
Street deck
placement***



***Completed
land bridge
deck***



Questions?

Construction Staging Workshop **An Effective Value Methodology Application**

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