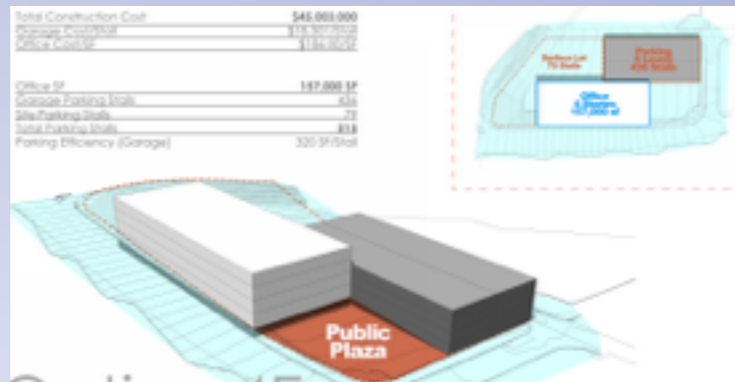
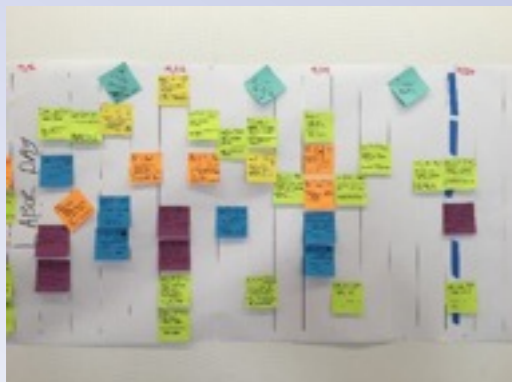
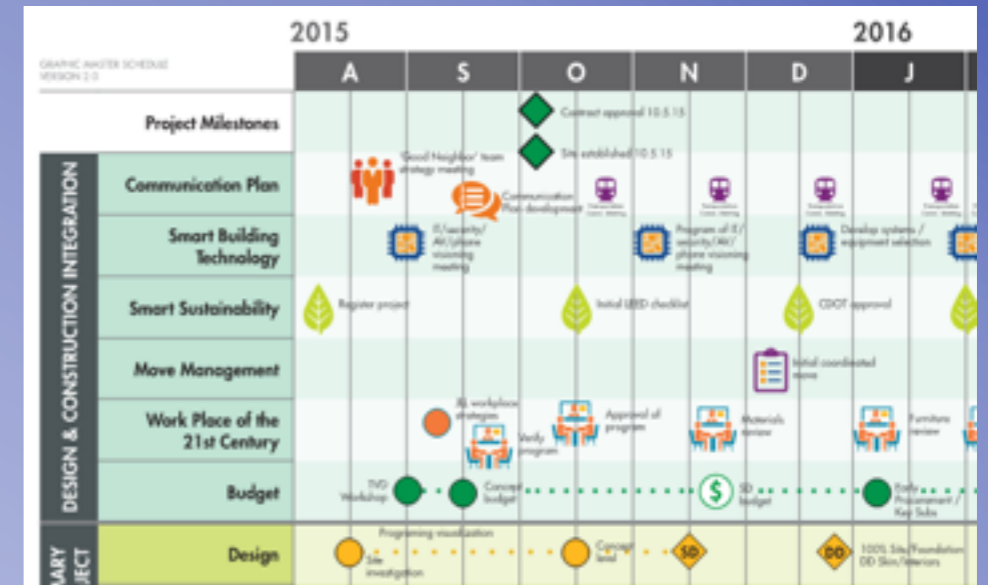
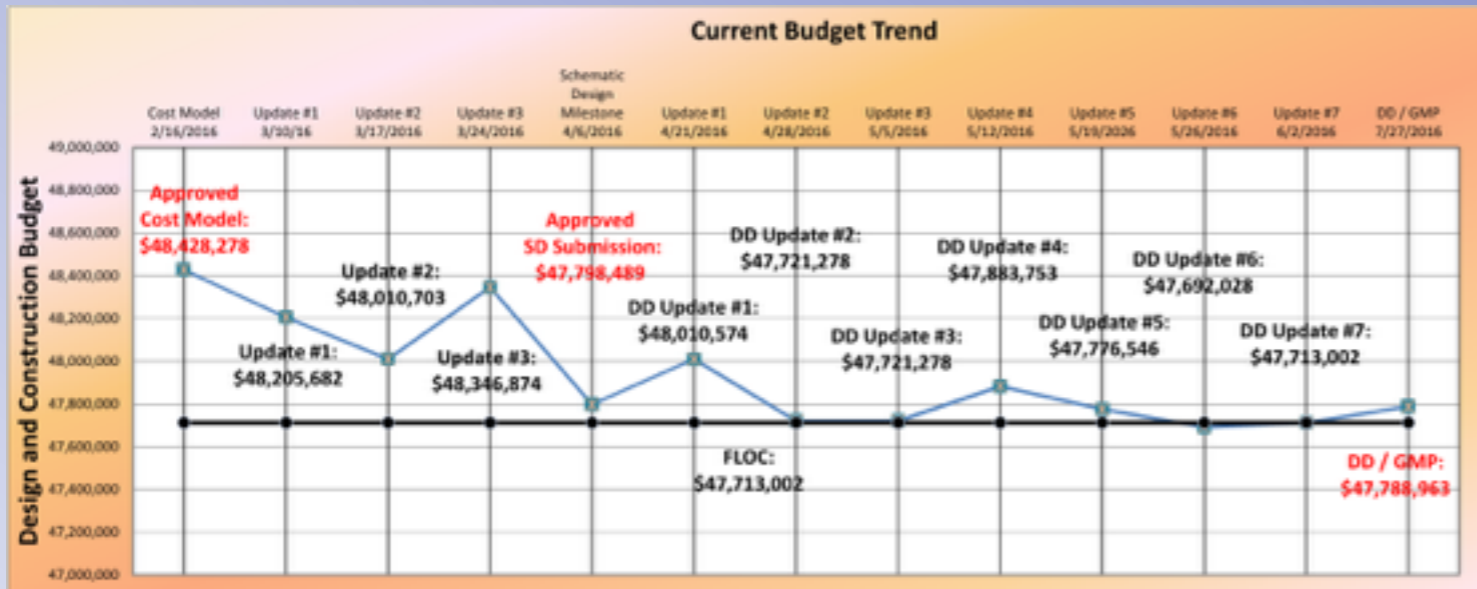


TARGET VALUE DESIGN AND OTHER COMMUNICATION TOOLS FOR THE DESIGN BUILD TEAM ... A CASE STUDY



	MONDAY	TUESDAY	WEDNESDAY	THURSDAY
TEAM MEETING (RNL INTERNAL IN-PERSON MEETING)		CONSULTANT STAND-UP CONFERENCE CALL REVIEW WORK REGISTER SHORT, 15-30 MIN. "CHECK IN"	CLIENT MEETINGS RNL & JE DUNN POINT OF CONTACT + CDOT TEAM IN-PERSON MEETING	WORKSESSION REVIEW OF CLUSTER VALUE MATRIX AROUND 3 1/2 TO 4 HOURS, STAGGERED MEETINGS OR DISCIPLINES MEET TO RESOLVE SPECIFIC ITEMS
		ALL CONSULTANTS, RNL, JE DUNN CALL-IN MEETING		ALL CONSULTANTS, RNL, JE DUNN IN-PERSON MEETING
		REVIT MODELS UPLOADED TO SHARED FOLDER		

Work Item	Task / Action to be taken	Perform
10	Update Elevator	N/A
11	Light Wall Barrier Detailing	N/A
12	Civil Grade Final Coordination	N/A
13	Update Stairs - Office	N/A
14	Update Stair Layout - Garage	N/A
15	Entry Equipment	N/A
16	Update RTUs	N/A
17	Civil Landscape Revisions	N/A



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 May 12, 2017

Chad Headlee - JE Dunn
 Carl Hole, AIA - RNL

TARGET VALUE DESIGN AND OTHER COMMUNICATION TOOLS FOR THE DESIGN BUILD TEAM ... A CASE STUDY

Project
Introduction

Overview of Tools

Tool Deep Dive

Owner
Engagement

Current Status



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Agenda

The project: CDOT Headquarters / Region 1



Summary Program

No specific site selected

\$45 Million Fixed Limit Estimated Budget

“Class B Office Building”

Knowns



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The project: CDOT Headquarters / Region 1



175,000 sf Office Building
34 Departments / 775 Staff



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May 12, 2017

Program information

The project: CDOT Headquarters / Region 1



175,000 sf Office Building
34 Departments / 775 Staff



424 Space Structured Parking (130,140 SF)
80 Spaces Surface Parking
Fleet / Staff / Visitor



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Program information

The project: CDOT Headquarters / Region 1



175,000 sf Office Building
34 Departments / 775 Staff



424 Space Structured Parking (130,140 SF)
80 Spaces Surface Parking
Fleet / Staff / Visitor



\$47.7 Million Fixed Limit
\$44.4 Million Construction



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Program information

The project: CDOT Headquarters / Region 1



175,000 sf Office Building
34 Departments / 775 Staff



424 Space Structured Parking (130,140 SF)
80 Spaces Surface Parking
Fleet / Staff / Visitor



\$47.7 Million Fixed Limit
\$44.4 Million Construction



“Class B Office Building”

Program Information

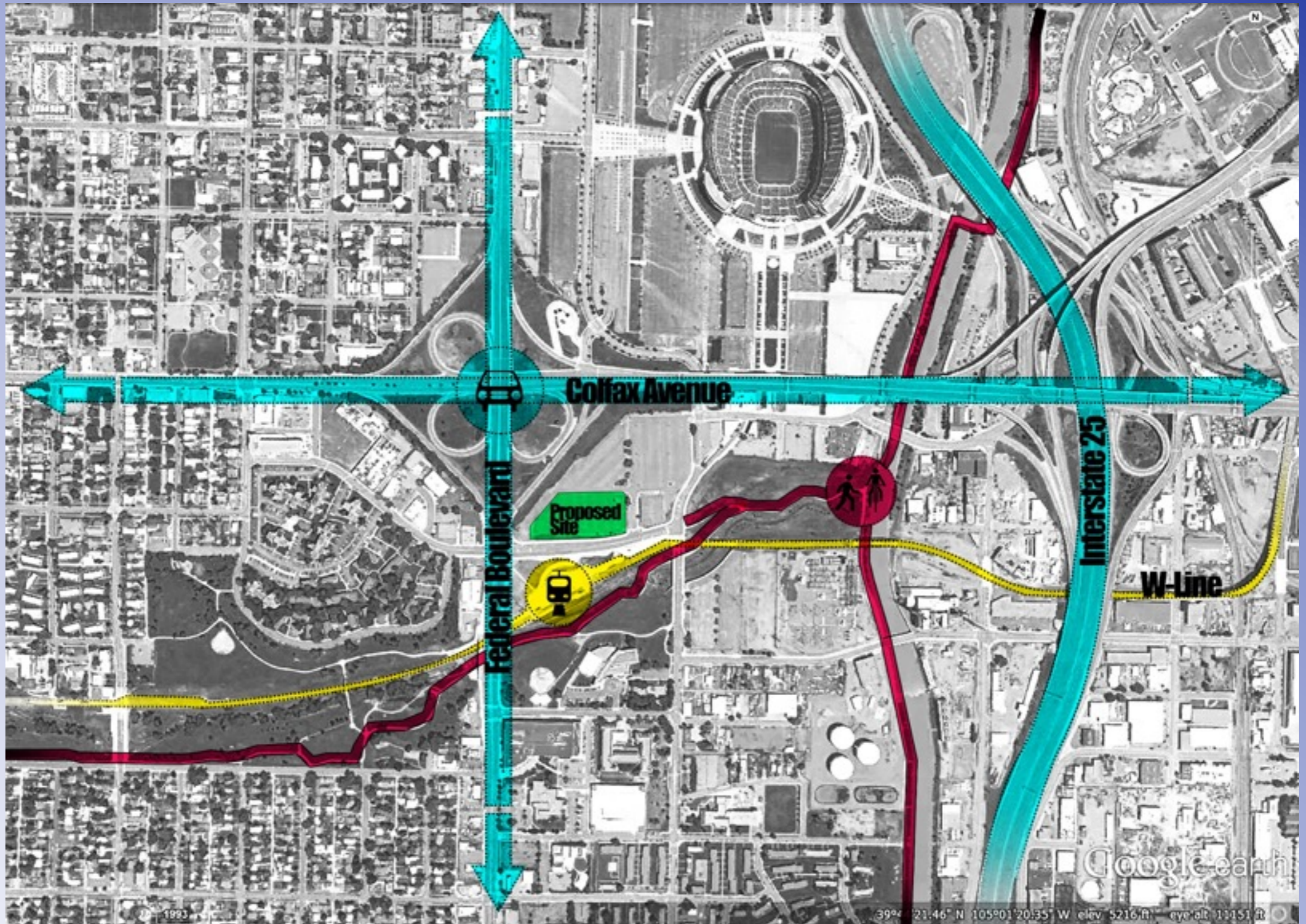


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The project: CDOT Headquarters / Region 1



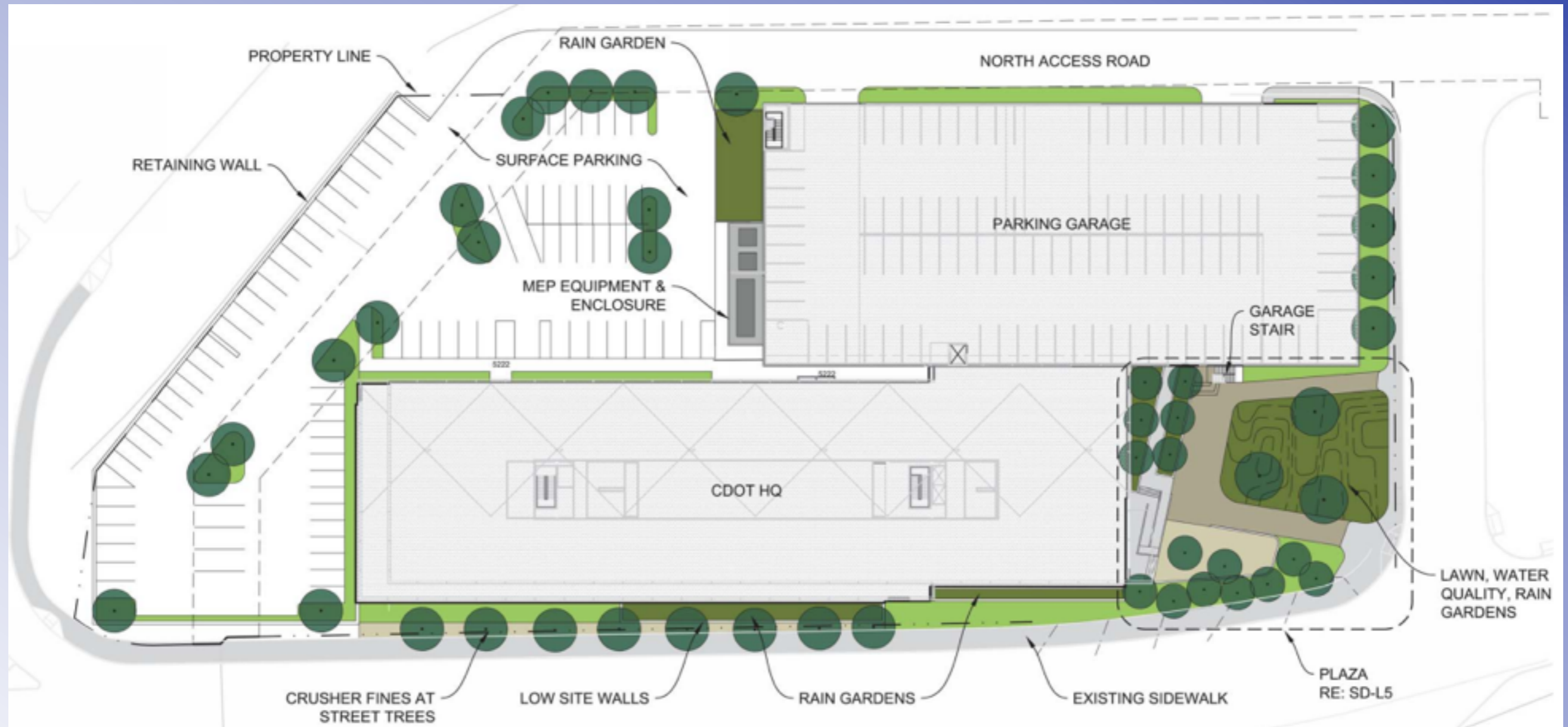
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Program Information

The project: CDOT Headquarters / Region 1



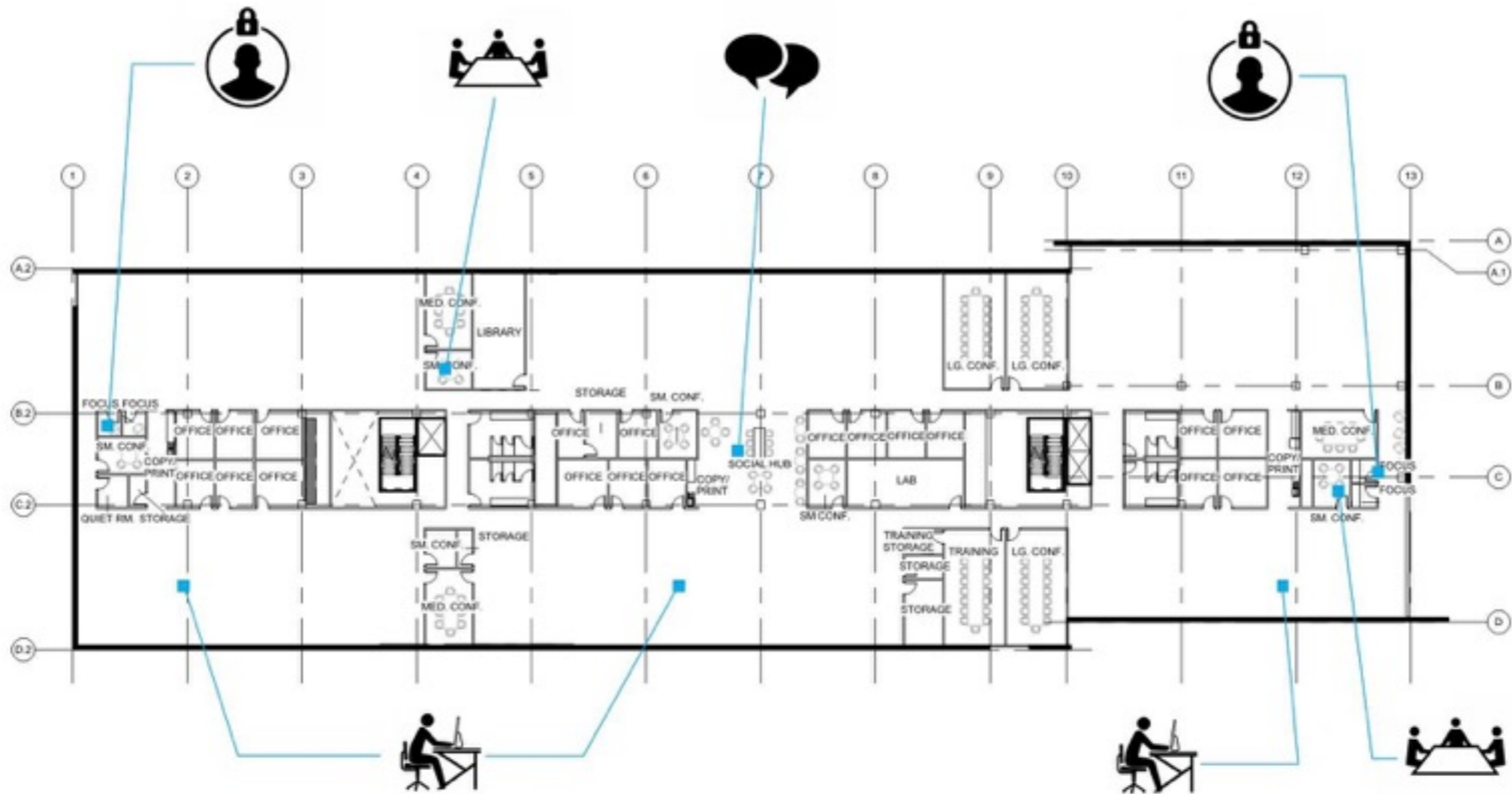
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Program Information

The project: CDOT Headquarters / Region 1



Typical Layout



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Program Information

The project: CDOT Headquarters / Region 1



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Program Information

The project: CDOT Headquarters / Region 1



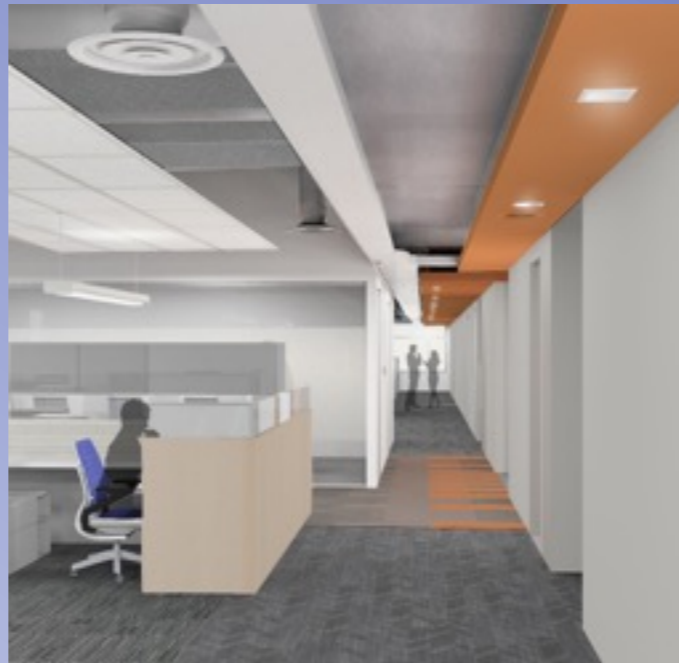
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Program Information

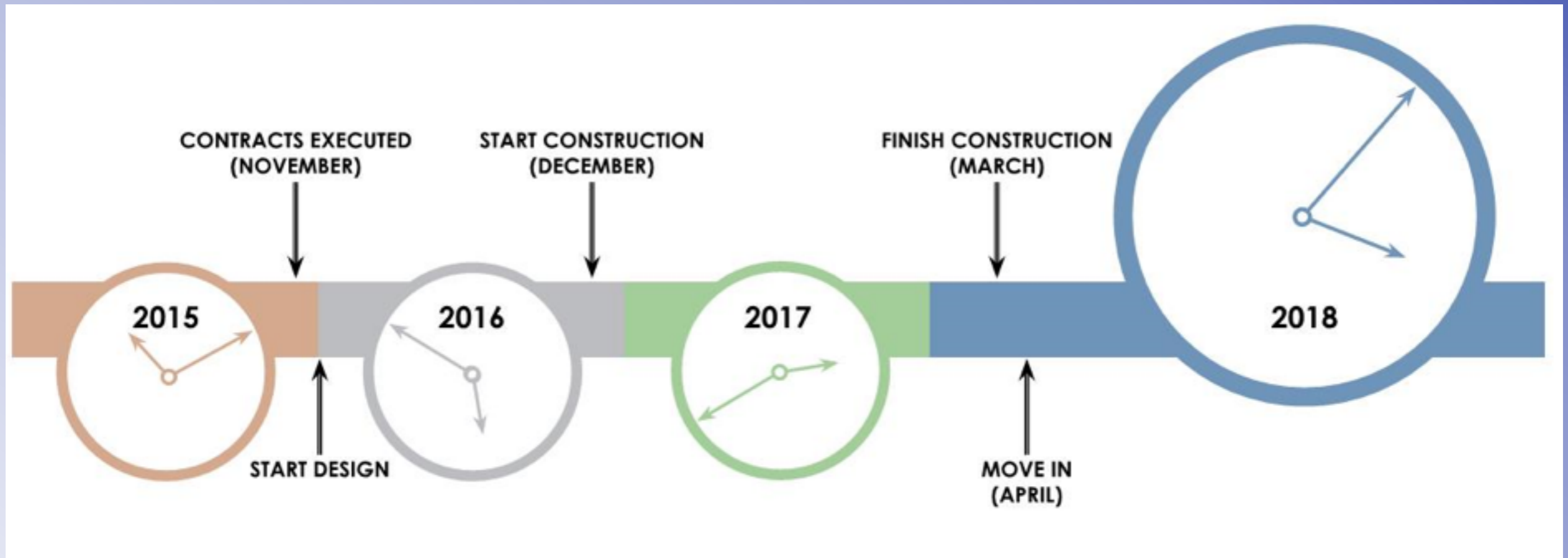
The project: CDOT Headquarters / Region 1



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Program Information

The project: CDOT Headquarters / Region 1

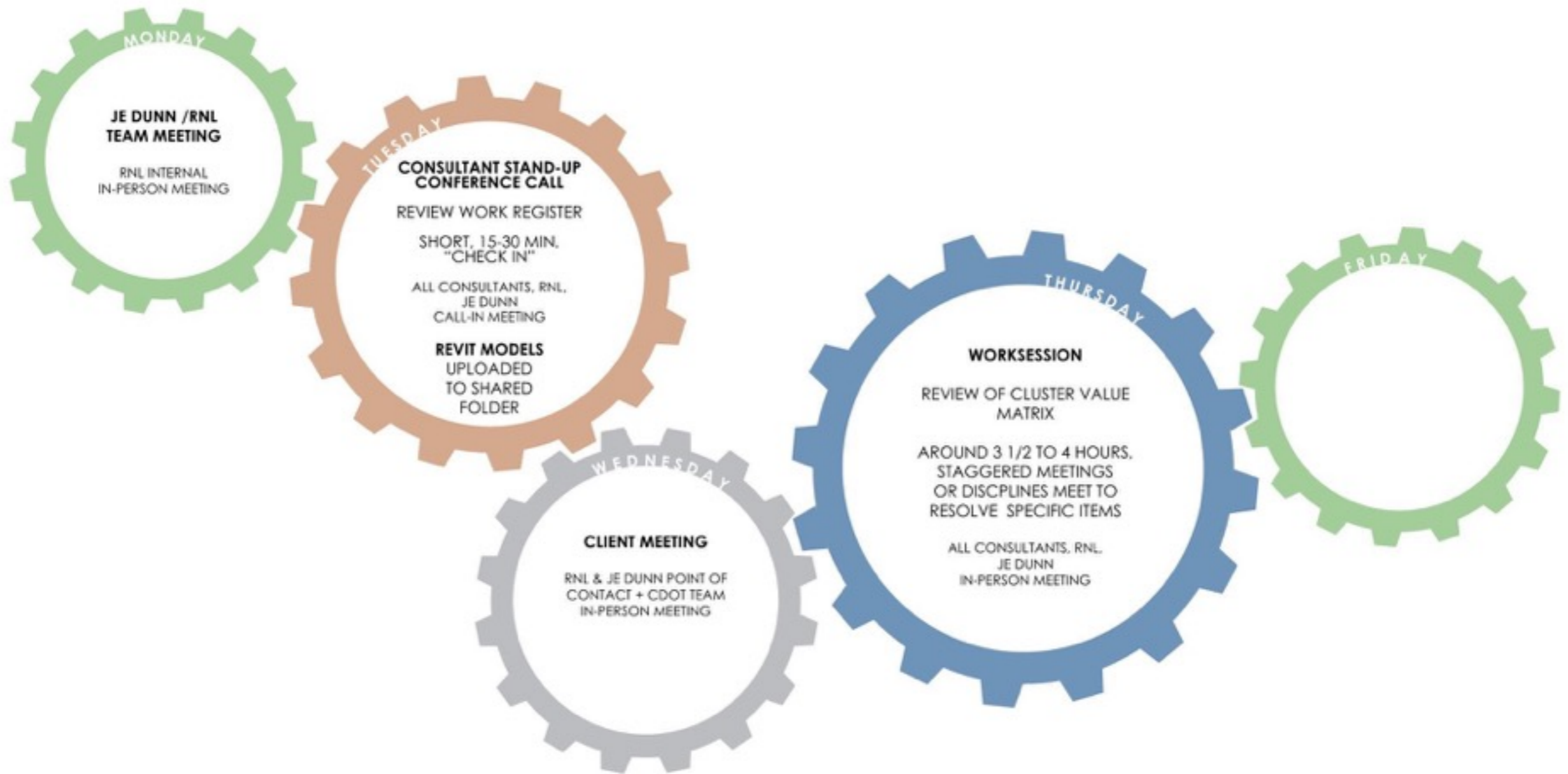


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Schedule

The project: CDOT Headquarters / Region 1



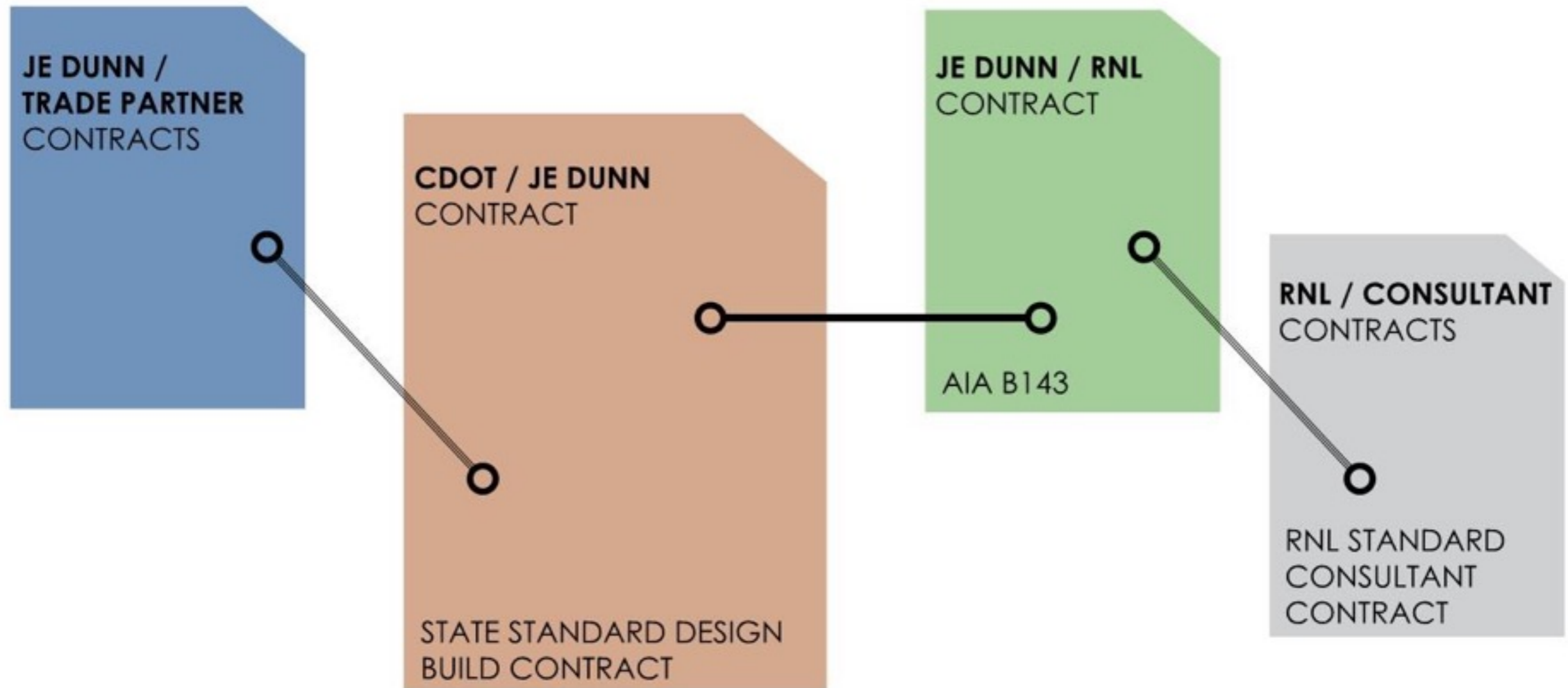
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Schedule

The project: CDOT Headquarters / Region 1



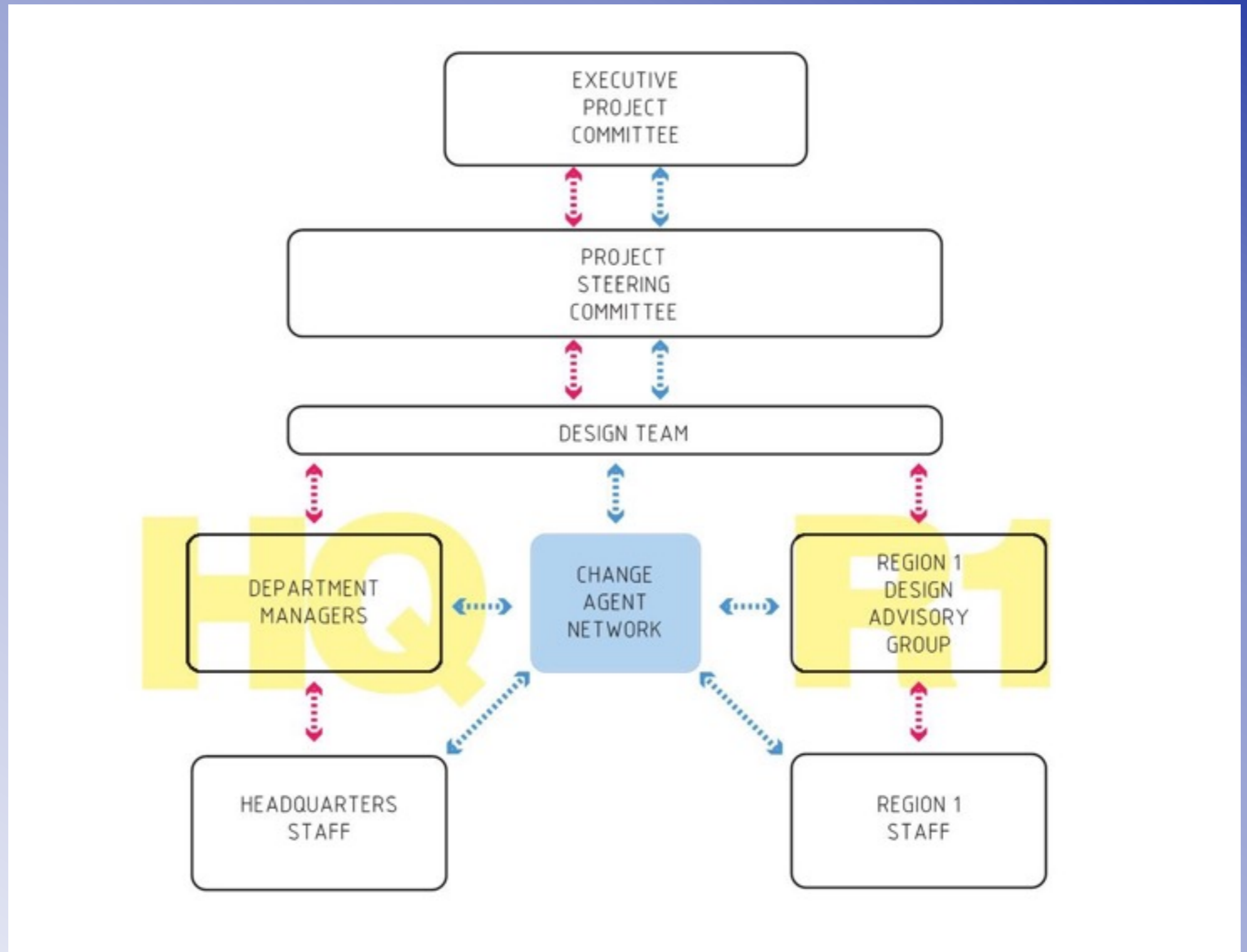
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Contracts

Owner Engagement



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Approval Process

The Tools

P3
Kaizen
Plus Delta
Level of Development
Cluster Meetings
Work Register
Trend Logs
Communication Plan
Ishikawa
Task Assignment
Cost Model

Conditions of Satisfaction
Onboarding
Action Items Log
Big Room
Target Value of Design
Last Planner
Pull Plan
A3
Reflection Meetings
Root Cause Analysis
Value Stream Mapping
5Y

Overview



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The Tools

3 Broad Team Goals

What Tools to Use?



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May 12, 2017

The Tools



No Surprises

What Tools to Use?



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The Tools



No Surprises



No Rework

What Tools to Use?



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"Progressive Design Build: Improving the Process"

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The Tools

No Surprises

No Rework

Drive Value to CDOT



What Tools to Use?



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The Tools

P3
Kaizen
Plus Delta
Level of Development
Cluster Meetings
Work Register
Trend Logs
Communication Plan
Ishikawa
Task Assignment
Cost Model

Conditions of Satisfaction
Onboarding
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Pull Plan
A3
Reflection Meetings
Root Cause Analysis
Value Stream Mapping
5Y

What Tools to Use?



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The Tools

Cost Model

A3

**Target Value of Design
Big Room...
Cluster Meetings...**

**Conditions of Satisfaction
Reflection Meetings**

**Last Planner
Level of Development...
Pull Plan...
Work Register...**

Onboarding

What Tools to Use?



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The Tools: Deep Dive

Tool

How it was used

Outcome



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"Progressive Design Build: Improving the Process"

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The Tools: Deep Dive

CDOT Headquarters
Denver, CO
January 27, 2016
 Conceptual Cost Modeling

Description	Option 1A 7-Story Articulated Office 175,000 sf 518 parking spaces (350 Structured Podium and 168 Surface)	Option 2A 7-Story Articulated Office 175,000 sf 457 parking spaces (350 Structured and 107 Surface)	Option 2B 7-Story Articulated Office 175,000 sf 518 parking spaces (411 Structured and 107 Surface)	Option 2C 7-Story Articulated Office 175,000 sf 825 parking spaces (758 Structured and 67 Surface)	Option 3A 7-Story Rectangular Office 175,000 sf 466 parking spaces (350 Structured and 116 Surface)	Option 3B 7-Story Rectangular Office 175,000 sf 518 parking spaces (402 Structured and 116 Surface)	Option 3C 7-Story Rectangular Office 175,000 sf 825 parking spaces (750 Structured and 75 Surface)
Sitework	1,480,731	1,888,088	1,884,118	1,852,409	1,890,835	1,887,350	1,863,455
Parking Garage	11,306,632	7,658,151	8,857,854	14,846,086	7,665,332	8,691,035	14,709,882
Office Building	36,885,543	36,393,288	36,316,752	35,985,100	35,902,754	35,836,591	35,498,665
Construction Subtotal	49,673,000	45,940,000	47,059,000	52,684,000	45,459,000	46,415,000	52,072,000
Design Fees & Reimbursables	3,167,841	3,167,841	3,167,841	3,167,841	3,167,841	3,167,841	3,167,841
Design/Bidding Contingency	1,321,019	1,227,684	1,255,664	1,396,286	1,215,669	1,239,570	1,380,996
Construction Contingency	1,738,552	1,607,883	1,647,055	1,843,926	1,591,062	1,624,524	1,822,520
Preconstruction	164,000	164,000	164,000	164,000	164,000	164,000	164,000
Total Construction Cost	\$56,064,000	\$52,107,000	\$53,294,000	\$59,256,000	\$51,598,000	\$52,611,000	\$58,607,000
Metrics							
Site Area	2.96 Acres	2.96 Acres	2.96 Acres	2.96 Acres	2.96 Acres	2.96 Acres	2.96 Acres
Office Footprint	30,000 SF	30,000 SF	30,000 SF	30,000 SF	25,000 SF	25,000 SF	25,000 SF
Office SF	175,000 SF	175,000 SF	175,000 SF	175,000 SF	175,000 SF	175,000 SF	175,000 SF
Office	7 Story	7 Story	7 Story	7 Story	7 Story	7 Story	7 Story
Garage Cost/Stall	5 Story, 2 Bay	5 Story, 2 Bay	5 Story, 2 Bay	6 Story, 3 Bay	5 Story, 2 Bay	5 Story, 2 Bay	6 Story, 3 Bay
Garage Parking Stalls	350	350	411	758	350	402	750
Site Parking Stalls	168	116	107	67	107	116	75
Parking Efficiency Garage	410 SF/Car	375 SF/Car	375 SF/Car	375 SF/Car	375 SF/Car	375 SF/Car	375 SF/Car
Parking Efficiency Site	375 SF/Car	375 SF/Car	375 SF/Car	375 SF/Car	375 SF/Car	375 SF/Car	375 SF/Car
Market Range Garage Cost/Stall				\$20,000-\$25,000/Stall			
Market Range Building Cost/SF				\$200-\$220/SF			



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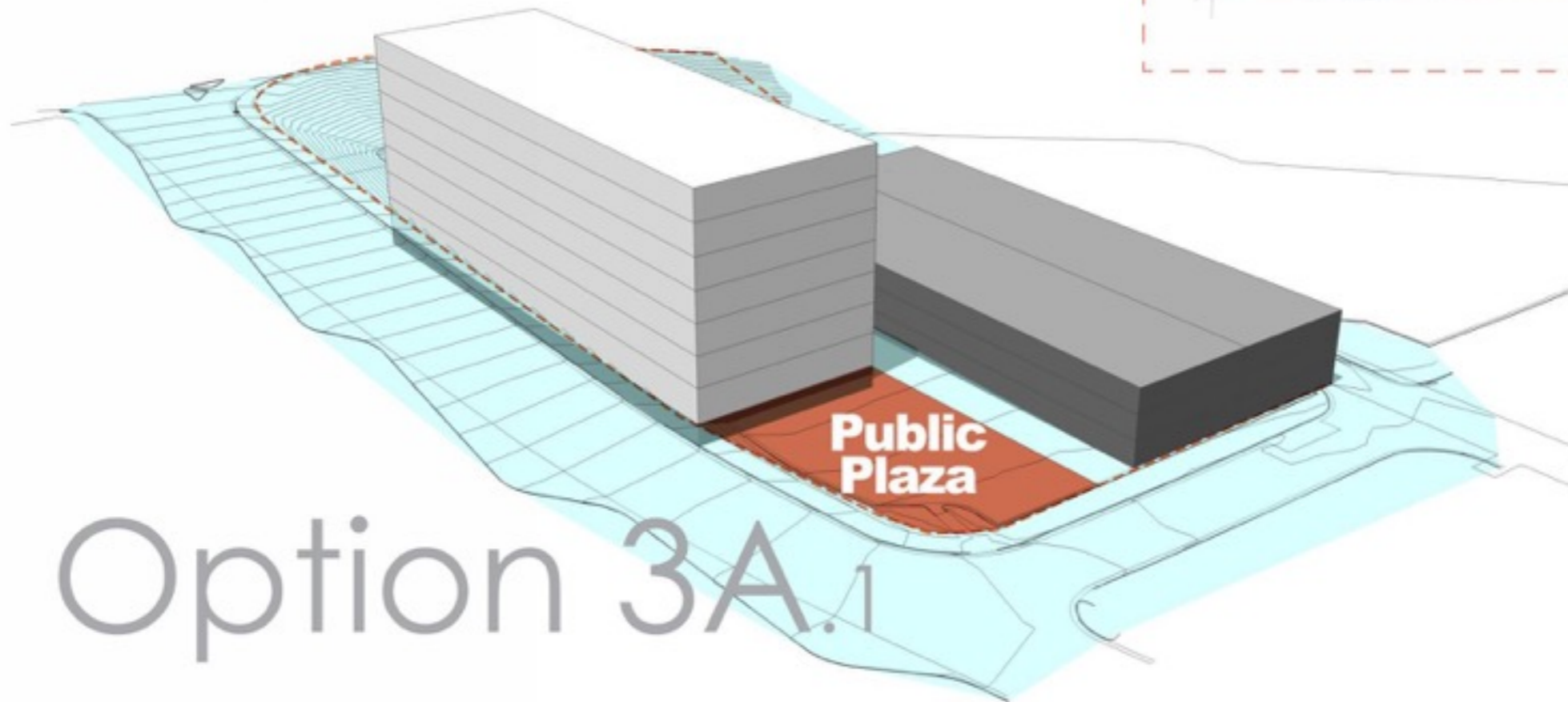
May 12, 2017

Cost Model

The Tools: Deep Dive

Total Construction Cost	\$49,233,000
Garage Cost/Stall	\$18,191/Stall
Office Cost/SF	\$198.07/SF

Office SF	175,000 SF
Garage Parking Stalls	365
Site Parking Stalls	114
Total Parking Stalls	479
Parking Efficiency (Garage)	320 SF/Stall



Option 3A.1



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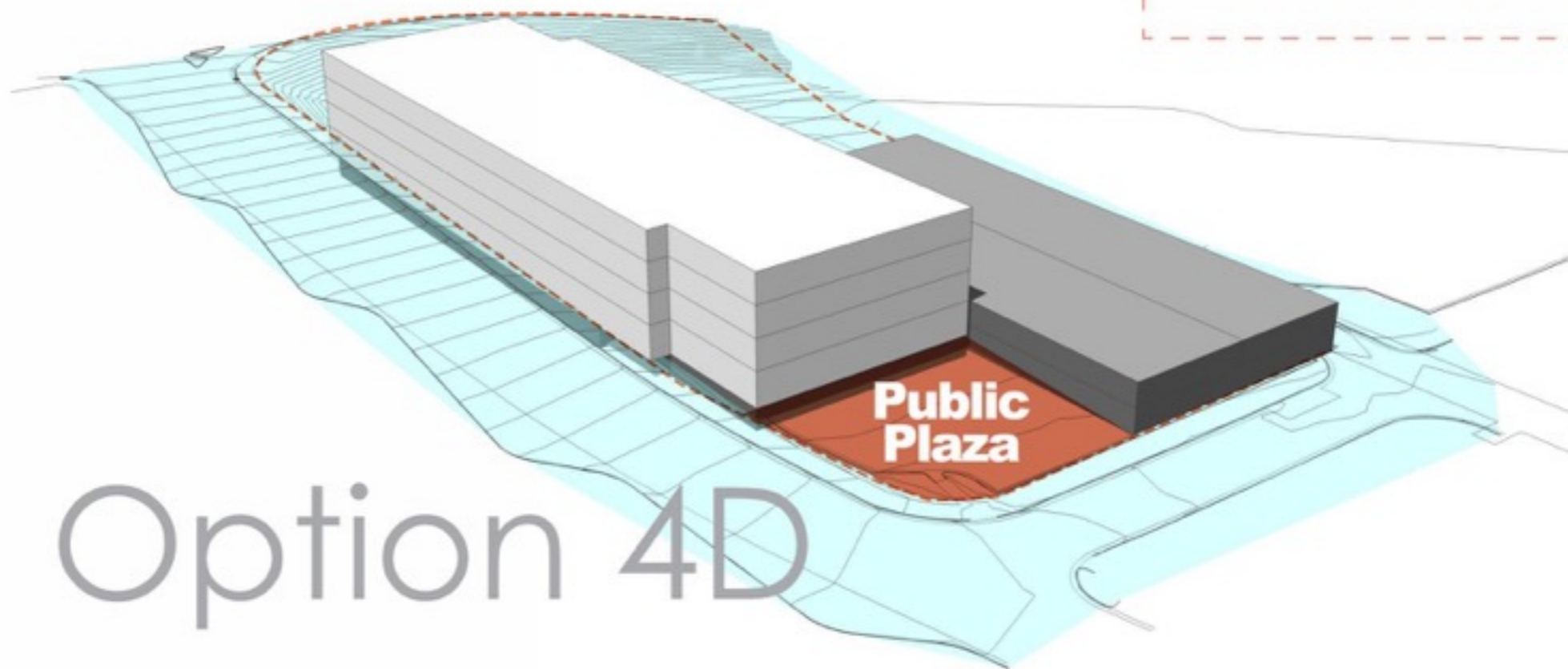
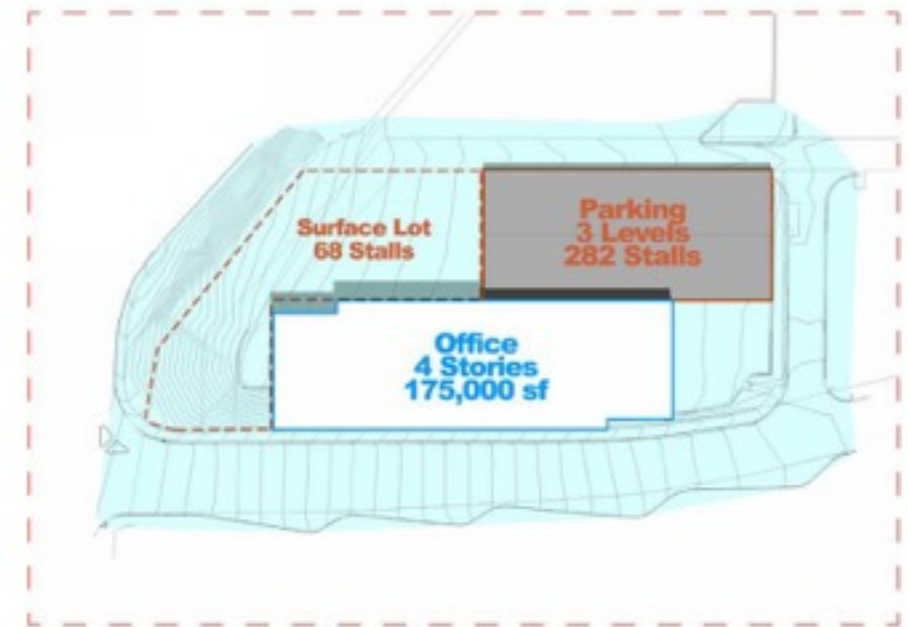
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Cost Model

The Tools: Deep Dive

Total Construction Cost	\$44,995,000
Garage Cost/Stall	\$18,540/Stall
Office Cost/SF	\$183.14/SF

Office SF	175,000 SF
Garage Parking Stalls	282
Site Parking Stalls	68
Total Parking Stalls	350
Parking Efficiency (Garage)	320 SF/Stall



Option 4D



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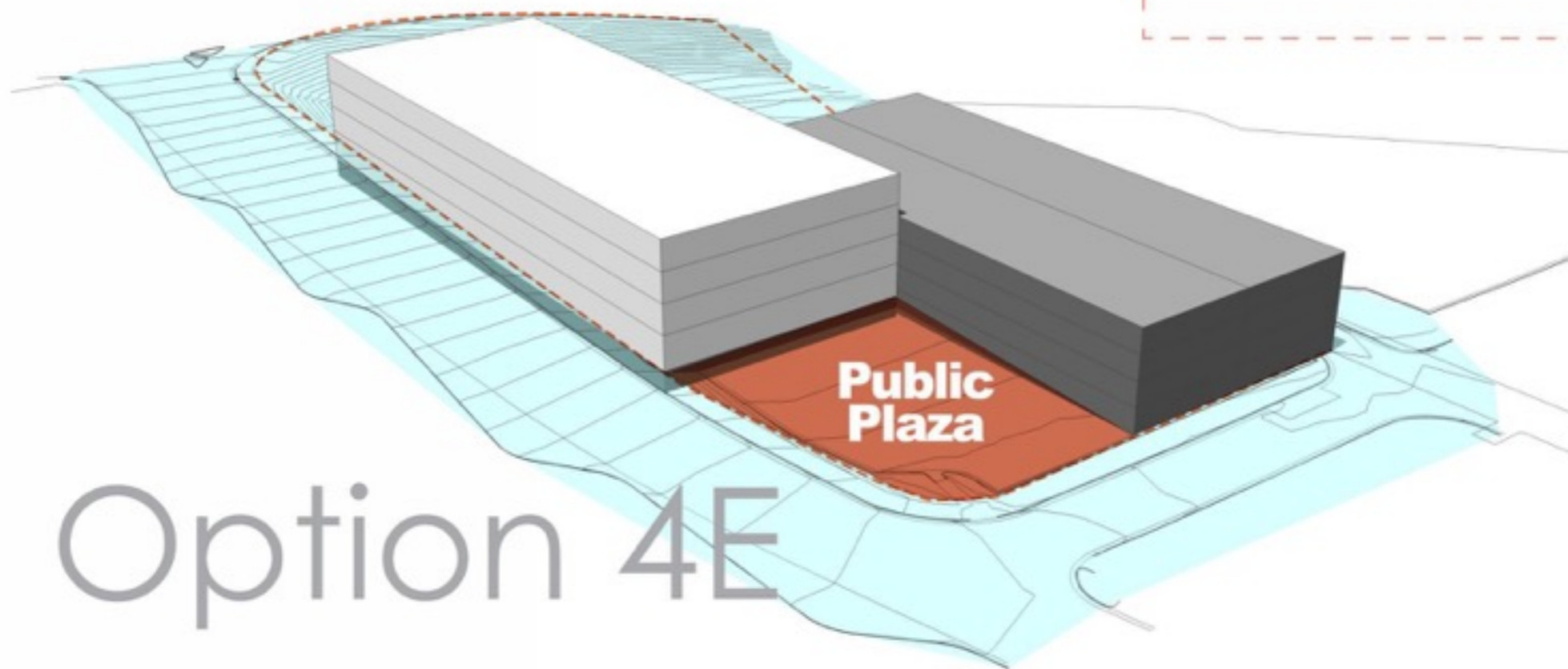
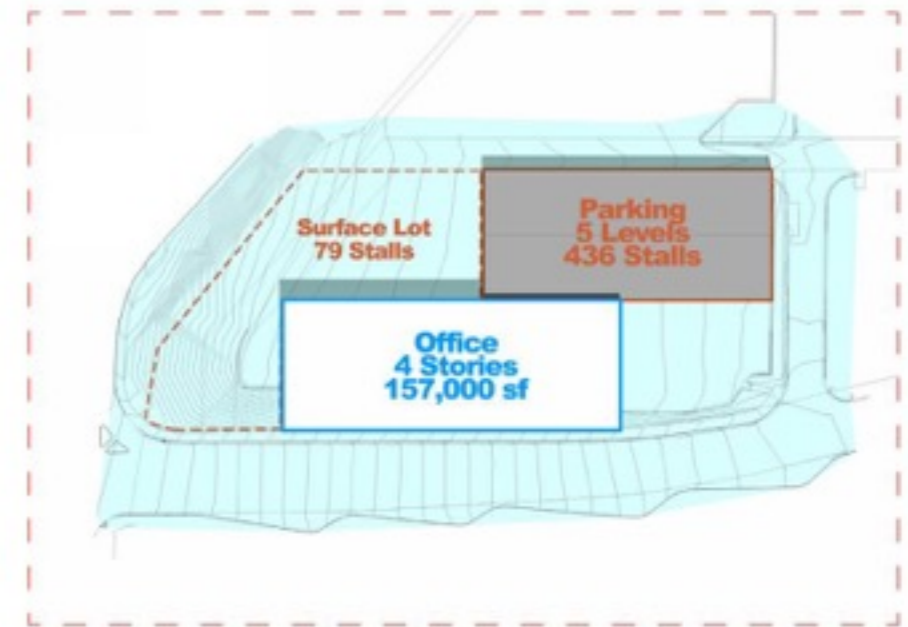
May 12, 2017

Cost Model

The Tools: Deep Dive

Total Construction Cost	\$45,003,000
Garage Cost/Stall	\$18,301/Stall
Office Cost/SF	\$186.00/SF

Office SF	157,000 SF
Garage Parking Stalls	436
Site Parking Stalls	79
Total Parking Stalls	515
Parking Efficiency (Garage)	320 SF/Stall



Option 4E



2017 Regional Conference

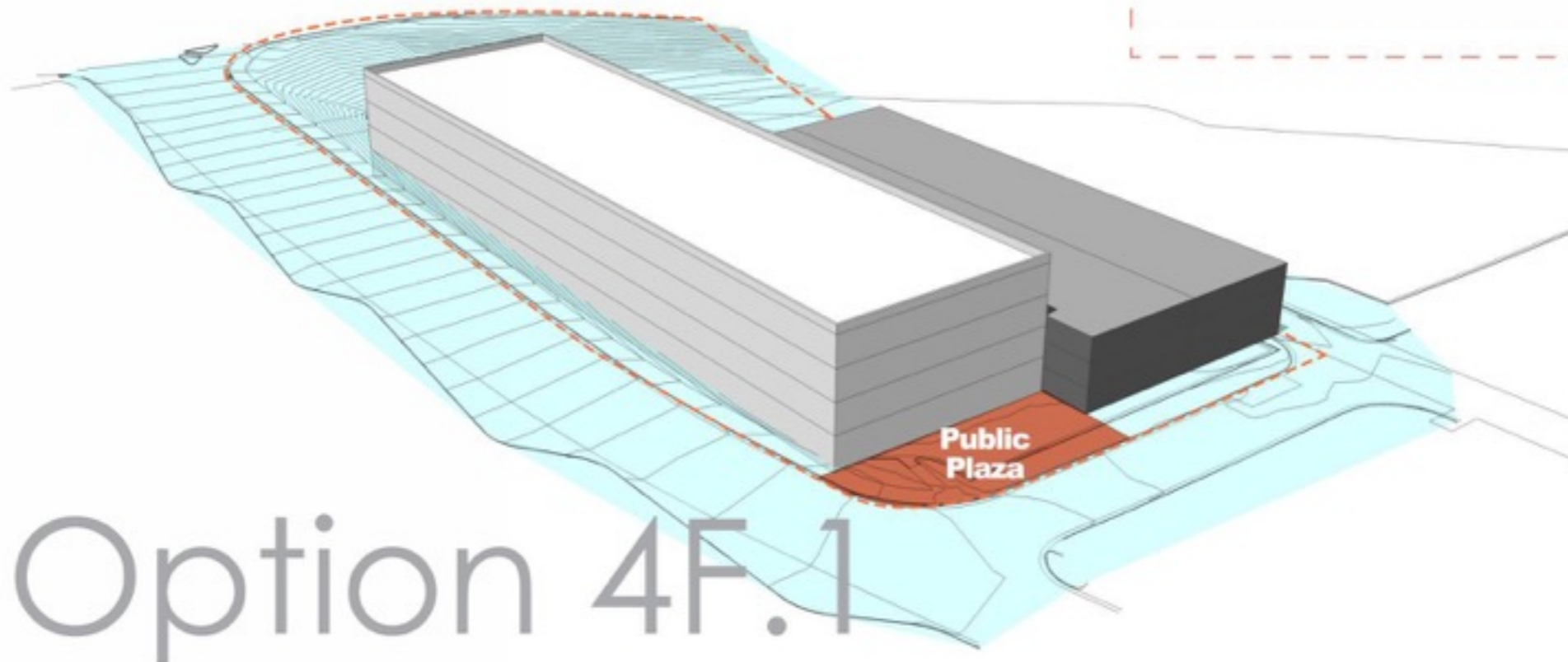
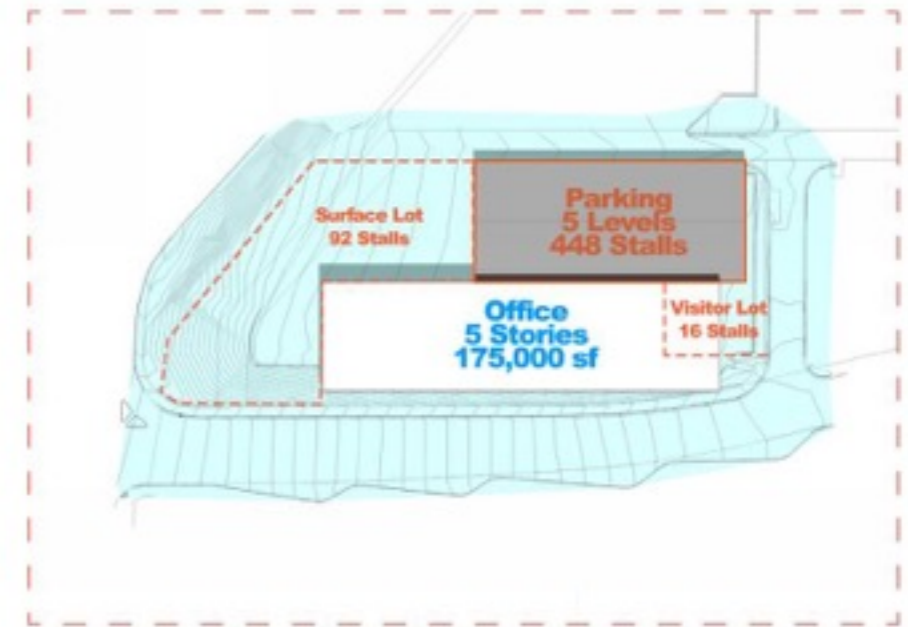
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Cost Model

The Tools: Deep Dive

Total Construction Cost	\$47,624,000
Garage Cost/Stall	\$18,144/Stall
Office Cost/SF	\$183.95/SF

Office SF	175,000 SF
Garage Parking Stalls	442
Site Parking Stalls	93
Total Parking Stalls	515
Parking Efficiency (Garage)	320 SF/Stall



Option 4F.1



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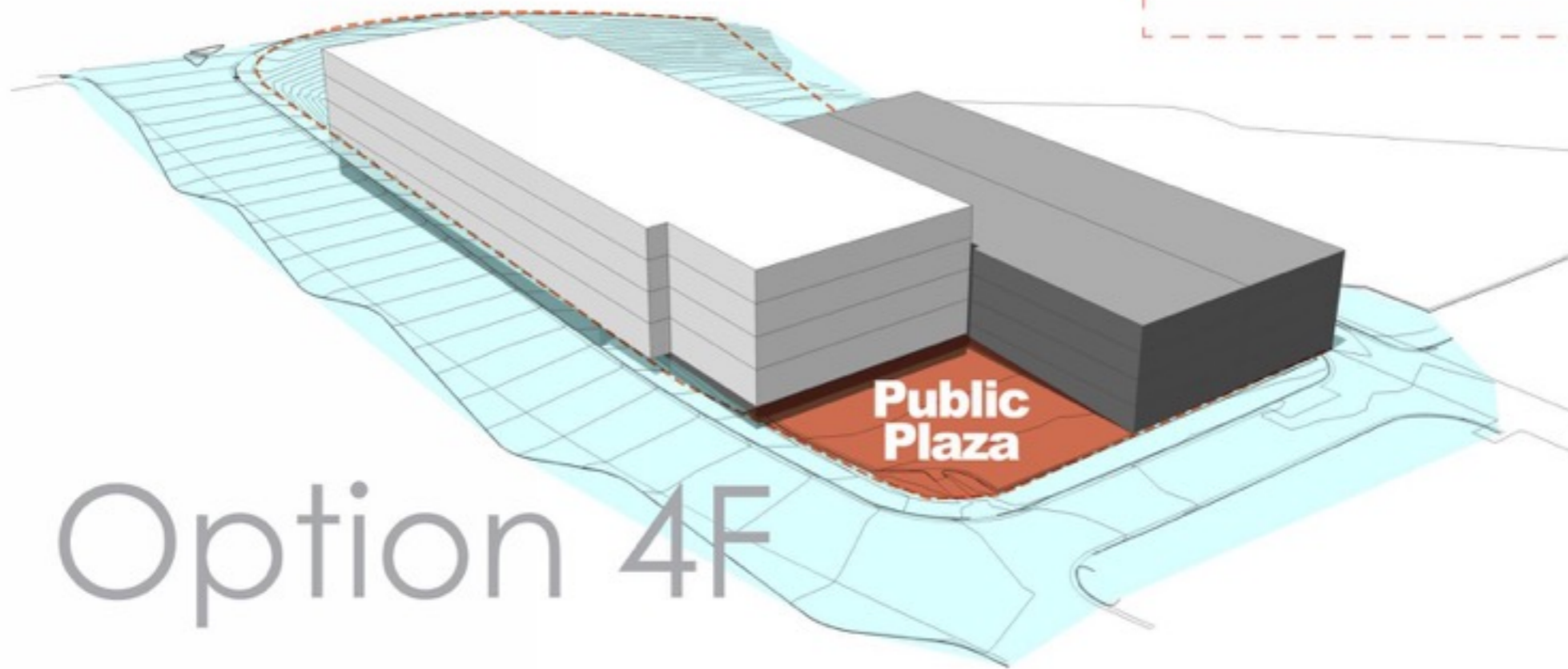
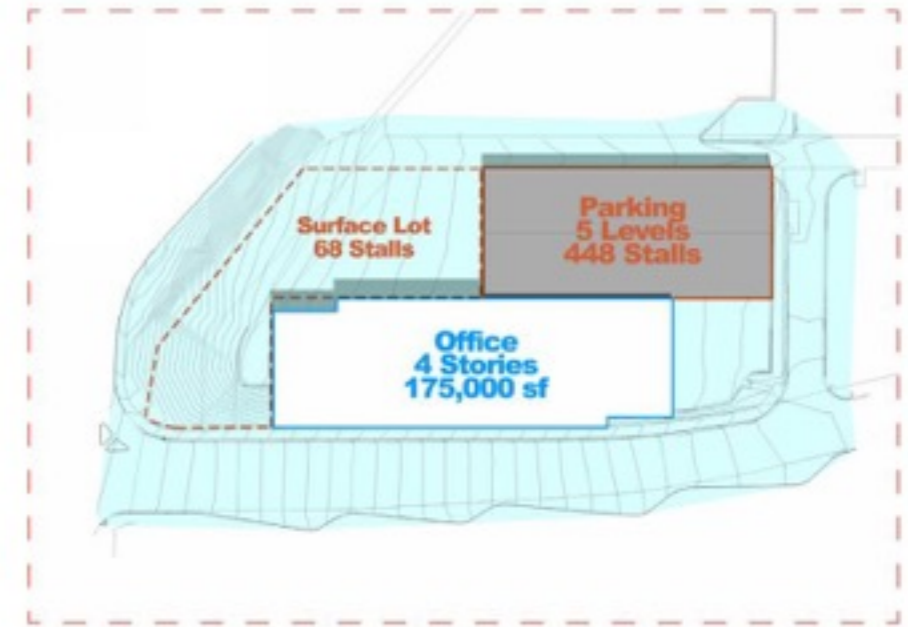
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Cost Model

The Tools: Deep Dive

Total Construction Cost	\$47,805,000
Garage Cost/Stall	\$18,158/Stall
Office Cost/SF	\$181.76/SF

Office SF	175,000 SF
Garage Parking Stalls	448
Site Parking Stalls	68
Total Parking Stalls	516
Parking Efficiency (Garage)	320 SF/Stall



Option 4F



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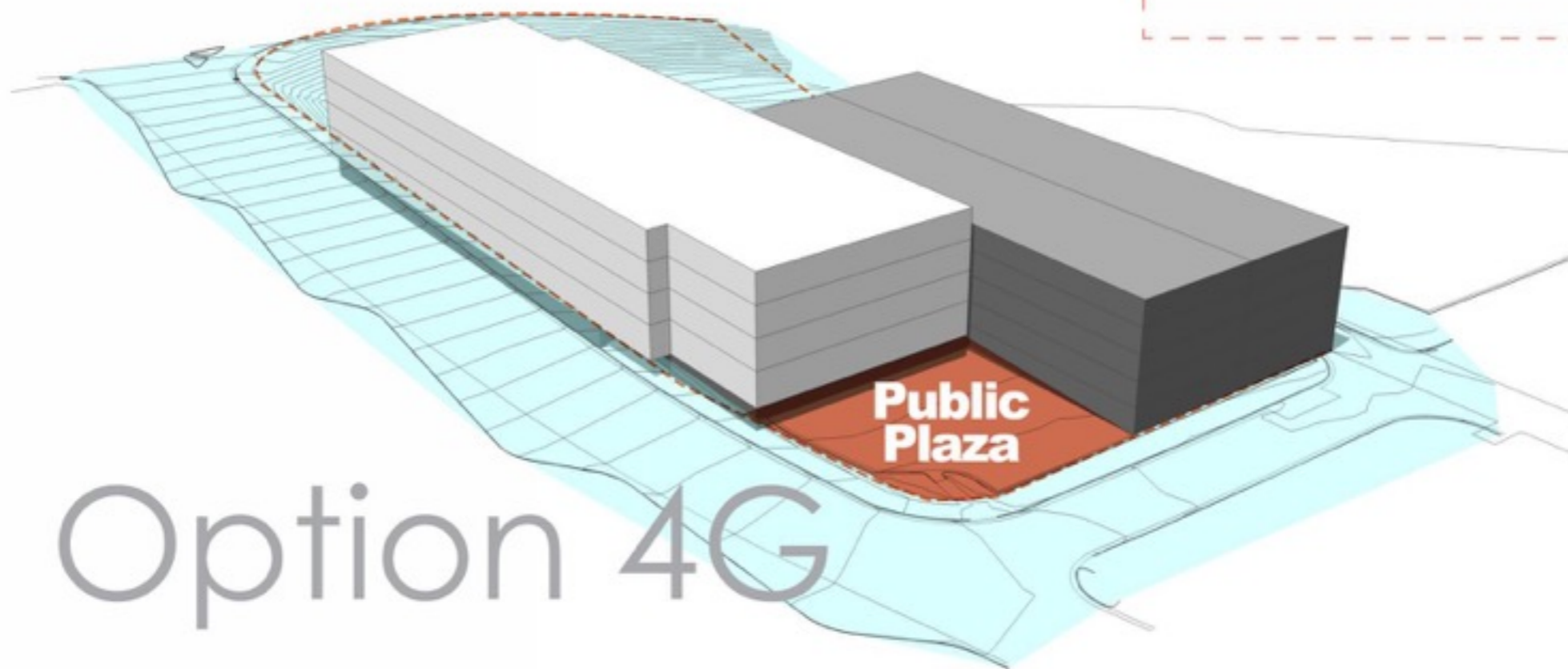
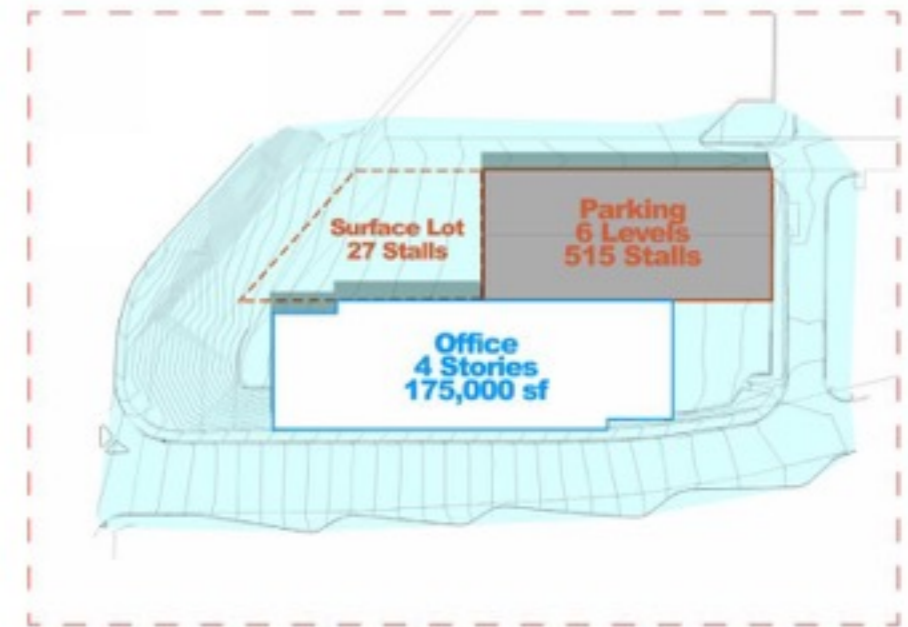
May 12, 2017

Cost Model

The Tools: Deep Dive

Total Construction Cost	\$49,127,000
Garage Cost/Stall	\$18,672/Stall
Office Cost/SF	\$181.24/SF

Office SF	175,000 SF
Garage Parking Stalls	515
Site Parking Stalls	27
Total Parking Stalls	542
Parking Efficiency (Garage)	320 SF/Stall



Option 4G



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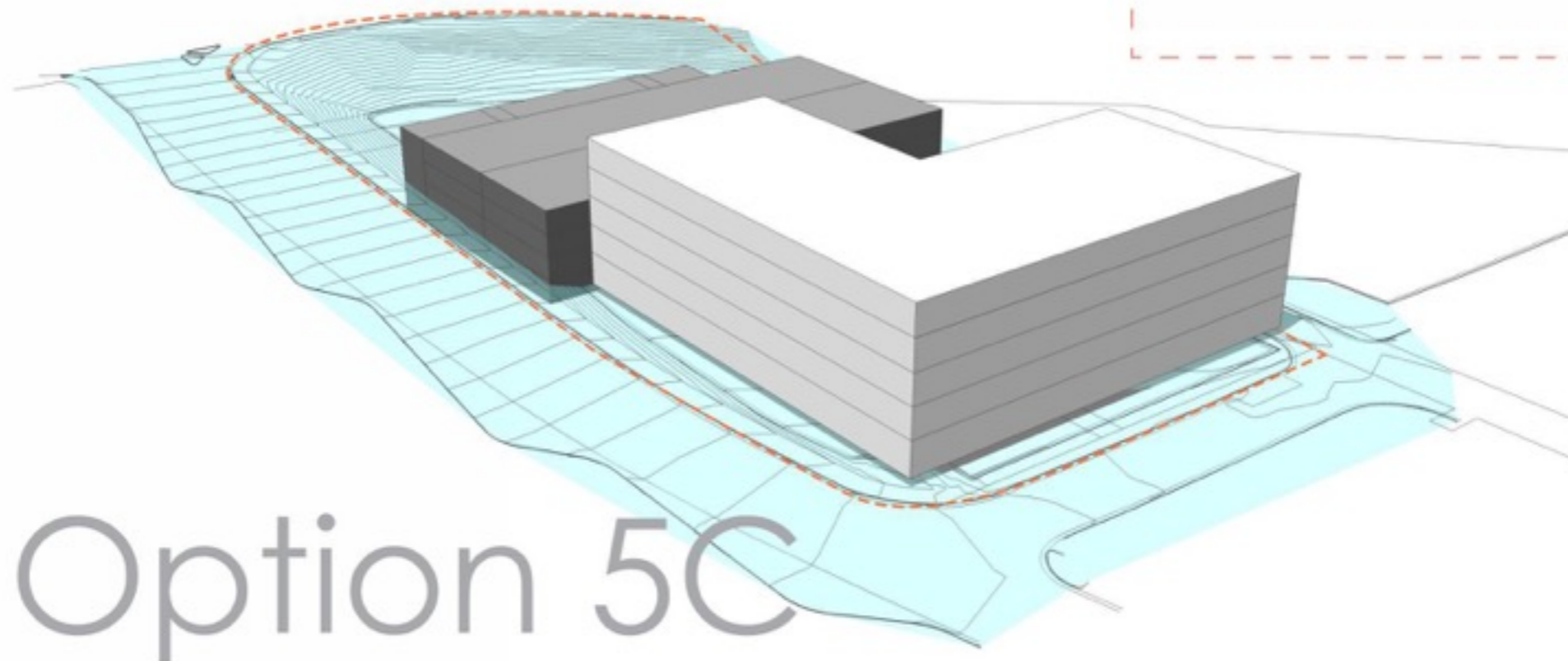
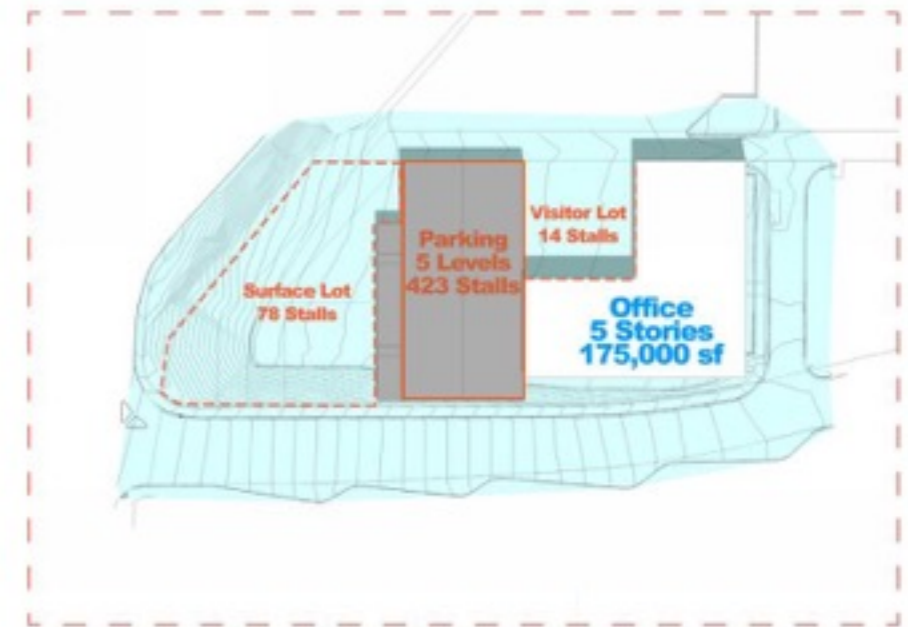
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May 12, 2017

Cost Model

The Tools: Deep Dive

Total Construction Cost	\$49,452,000
Garage Cost/Stall	\$19,525/Stall
Office Cost/SF	\$190.51/SF

Office SF	175,000 SF
Garage Parking Stalls	423
Site Parking Stalls	92
Total Parking Stalls	515
Parking Efficiency (Garage)	367 SF/Stall



Option 5C



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May 12, 2017

Cost Model

The Tools: Deep Dive

CDOT Headquarters
Denver, CO
January 27, 2016
Conceptual Cost Modeling

Description	Option 1A 7-Story Articulated Office 175,000 sf 518 parking spaces (350 Structured Podium and 168 Surface)	Option 2A 7-Story Articulated Office 175,000 sf 457 parking spaces (350 Structured and 107 Surface)	Option 2B 7-Story Articulated Office 175,000 sf 518 parking spaces (411 Structured and 107 Surface)	Option 2C 7-Story Articulated Office 175,000 sf 825 parking spaces (758 Structured and 67 Surface)	Option 3A 7-Story Rectangular Office 175,000 sf 466 parking spaces (350 Structured and 116 Surface)	Option 3B 7-Story Rectangular Office 175,000 sf 518 parking spaces (402 Structured and 116 Surface)	Option 3C 7-Story Rectangular Office 175,000 sf 825 parking spaces (750 Structured and 75 Surface)
Sitework	1,480,731	1,888,088	1,884,118	1,852,409	1,890,835	1,887,350	1,863,455
Parking Garage	11,306,632	7,658,151	8,857,854	14,846,086	7,665,332	8,691,035	14,709,882
Office Building	36,885,543	36,393,288	36,311,325	35,665,106	35,912,751	36,815,514	35,133,225
Construction Subtotal	49,673,000	45,940,000	47,059,000	52,684,000	45,459,000	46,415,000	52,072,000
Design Fees & Reimbursables	3,167,841	3,167,841	3,167,841	3,167,841	3,167,841	3,167,841	3,167,841
Design/Bidding Contingency	1,321,019	1,127,684	1,055,634	1,139,326	1,315,669	1,221,500	1,389,336
Construction Contingency	1,738,552	1,607,883	1,647,055	1,843,926	1,591,062	1,624,524	1,822,520
Preconstruction	164,000	164,000	164,000	164,000	164,000	164,000	164,000
Total Construction Cost	\$56,064,000	\$52,107,000	\$53,294,000	\$59,256,000	\$51,598,000	\$52,611,000	\$58,607,000
Metrics							
Site Area	2.96 Acres	2.96 Acres	2.96 Acres	2.96 Acres	2.96 Acres	2.96 Acres	2.96 Acres
Office Footprint	30,000 SF	30,000 SF	30,000 SF	30,000 SF	25,000 SF	25,000 SF	25,000 SF
Office SF	175,000 SF	175,000 SF	175,000 SF	175,000 SF	175,000 SF	175,000 SF	175,000 SF
Office	7 Story	7 Story	7 Story	7 Story	7 Story	7 Story	7 Story
Garage Cost/Stall	5 Story, 2 Bay	5 Story, 2 Bay	5 Story, 2 Bay	6 Story, 3 Bay	5 Story, 2 Bay	5 Story, 2 Bay	6 Story, 3 Bay
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Parking Efficiency Site	375 SF/Car	375 SF/Car	375 SF/Car	375 SF/Car	375 SF/Car	375 SF/Car	375 SF/Car
Market Range Garage Cost/Stall				\$20,000-\$25,000/Stall			
Market Range Building Cost/SF				\$200-\$220/SF			

Confirm budget and program

**Alignment of DB Team and Owner:
Cost, program and design approach**



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"Progressive Design Build: Improving the Process"

May 12, 2017

Cost Model

The Tools: Deep Dive



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"Progressive Design Build: Improving the Process"

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Target Value of Design

The Tools: Deep Dive

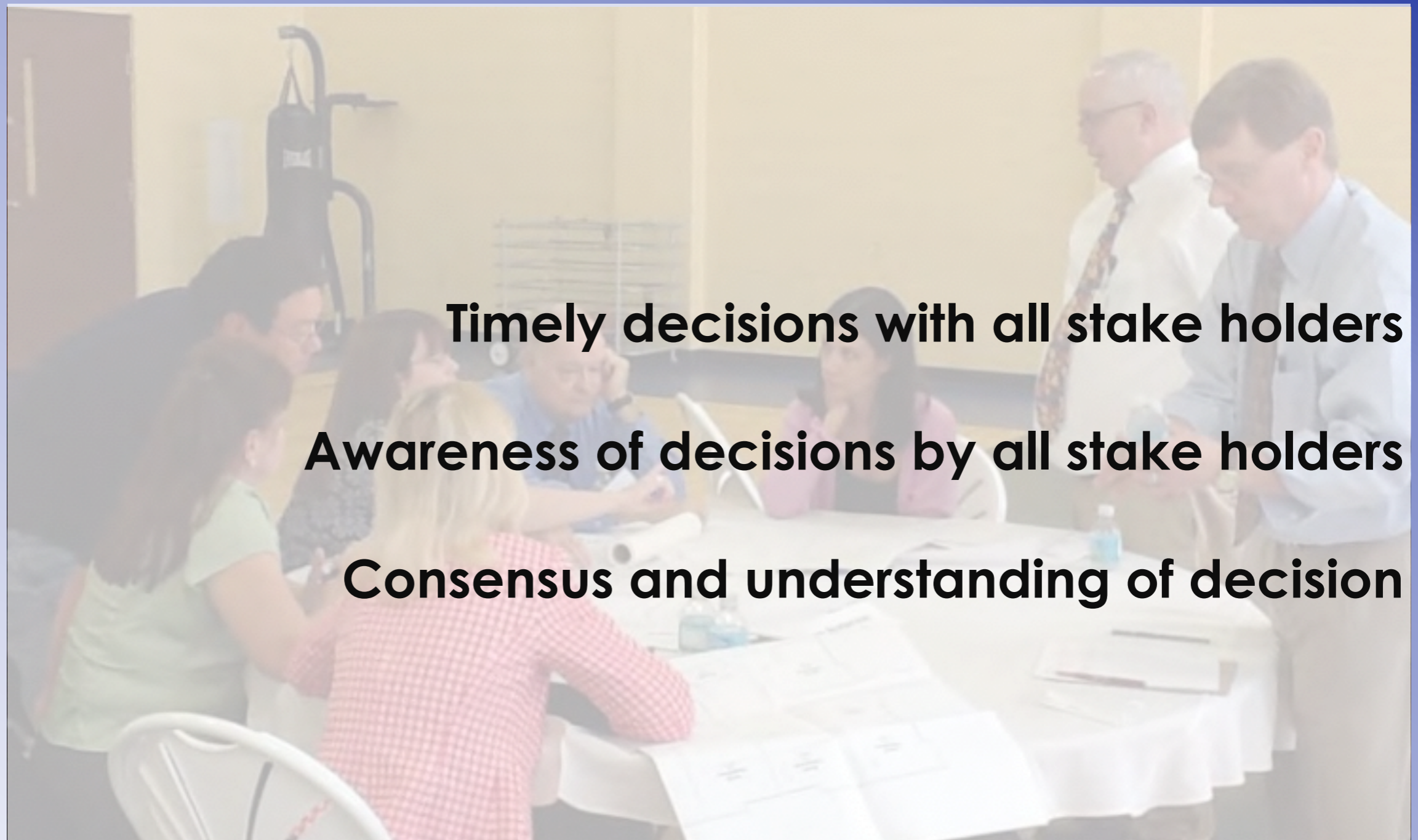


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May 12, 2017

Big Room

The Tools: Deep Dive



Timely decisions with all stake holders

Awareness of decisions by all stake holders

Consensus and understanding of decision



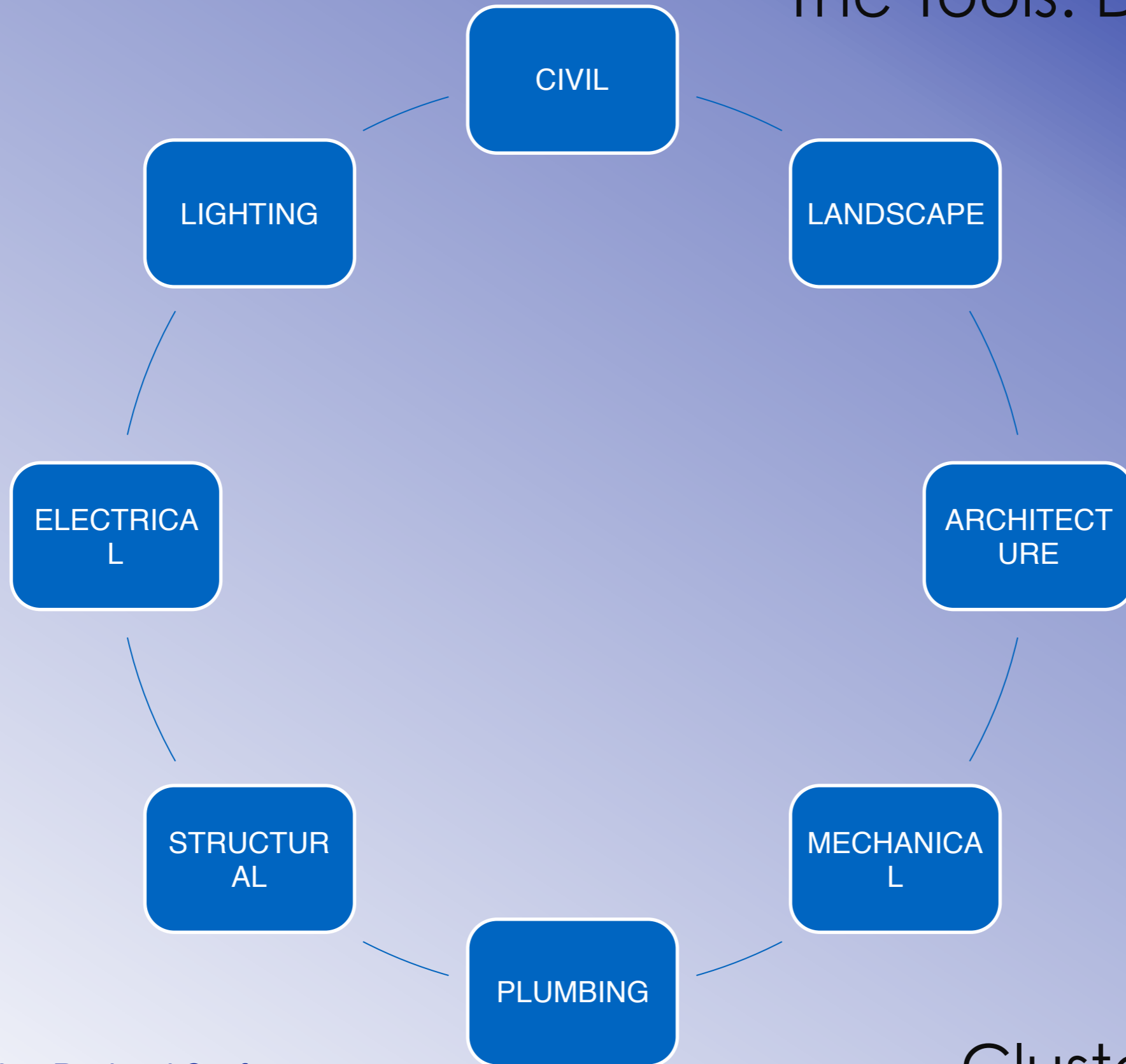
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Big Room

The Tools: Deep Dive



Cluster Meeting

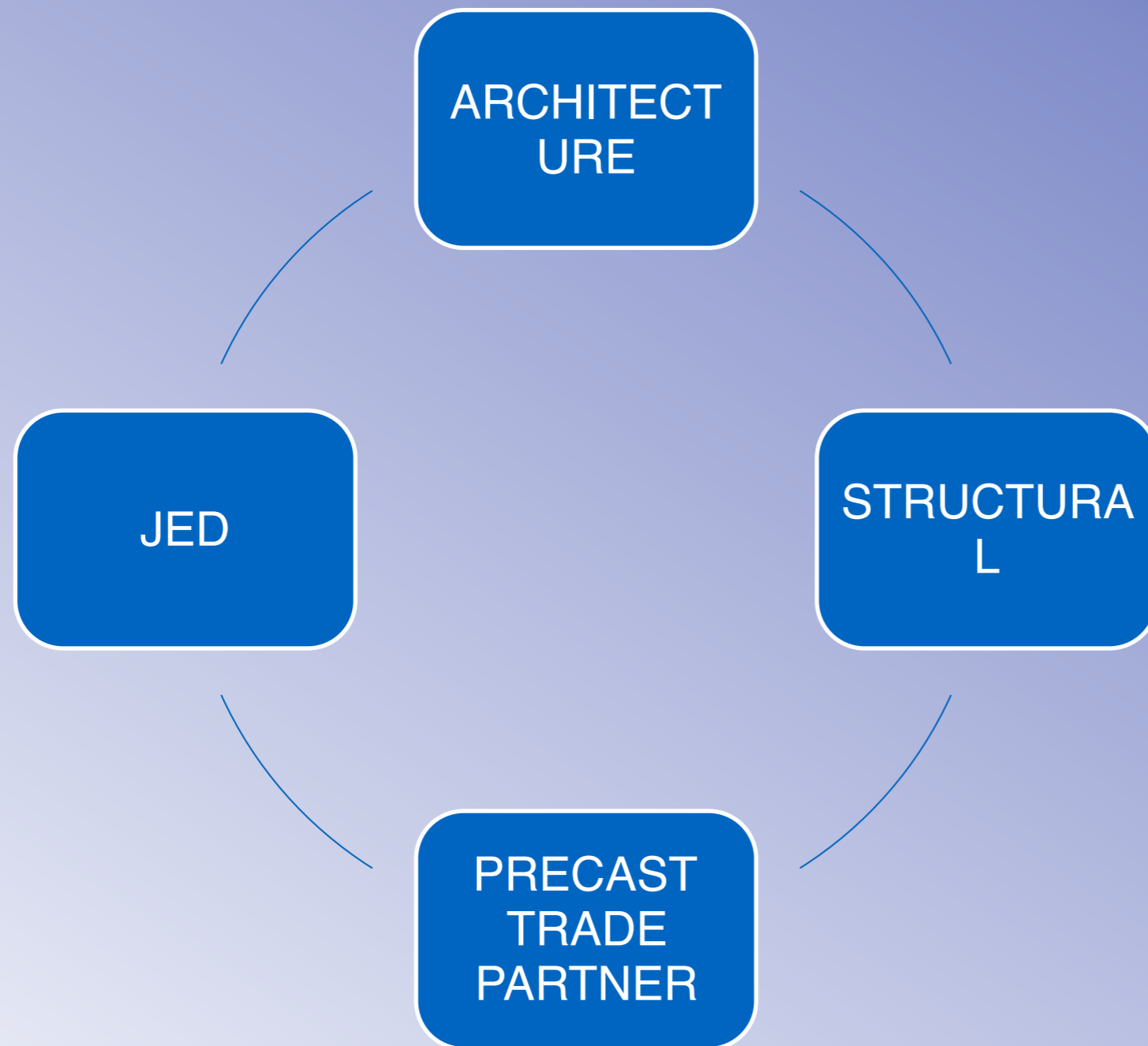
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May 12, 2017



The Tools: Deep Dive



**Example:
Precast
Design**

Cluster Meeting

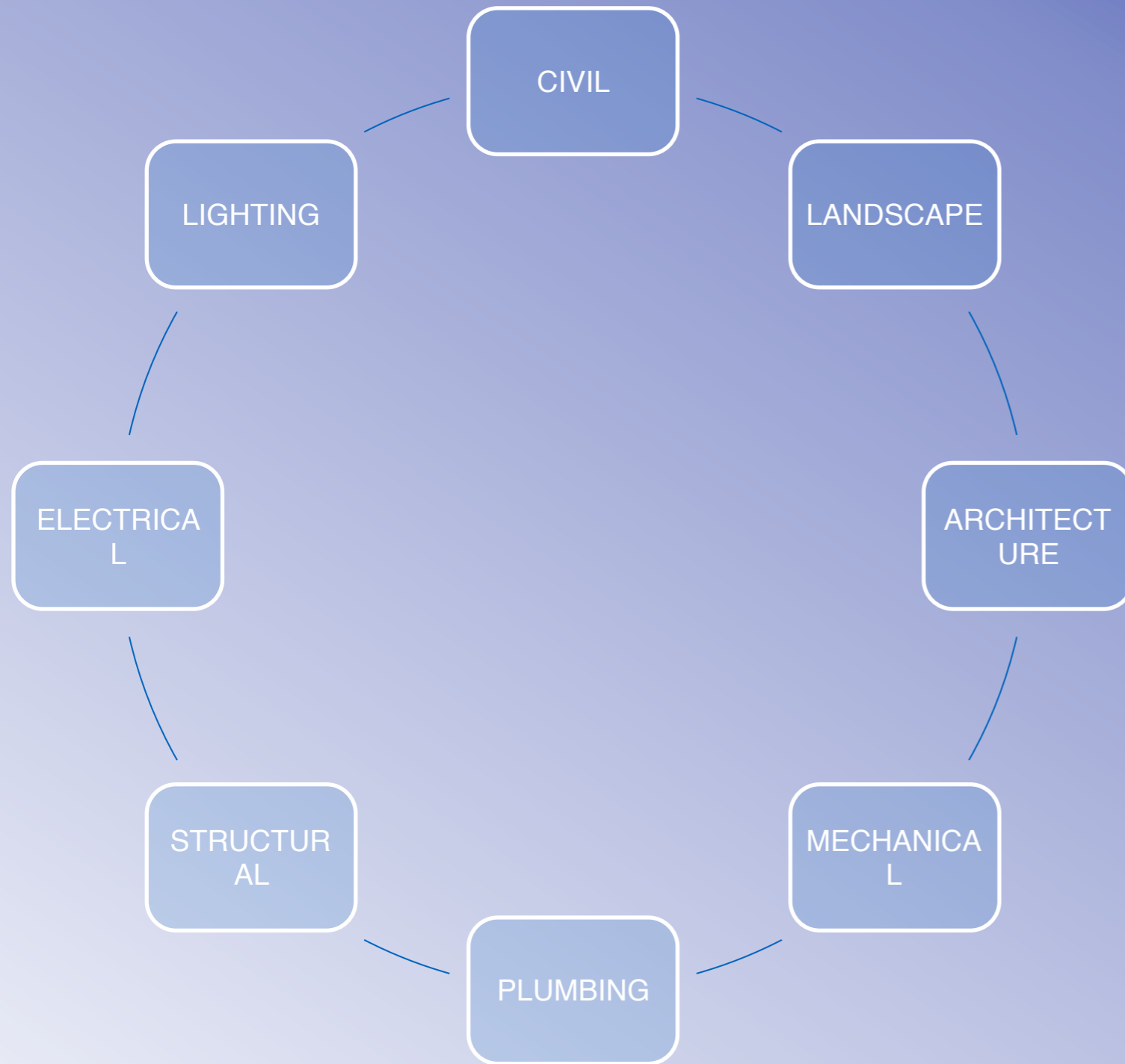


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"Progressive Design Build: Improving the Process"

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The Tools: Deep Dive



Focused problem solving

Cluster Meeting

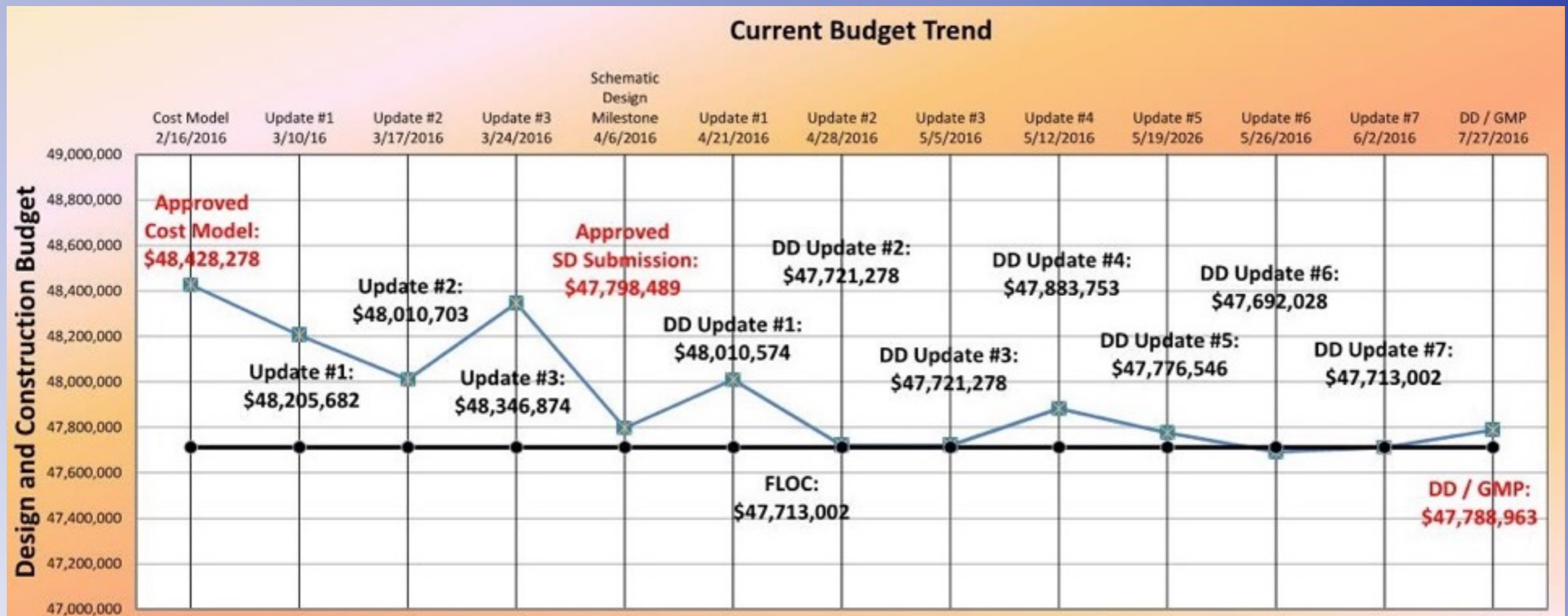


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The Tools: Deep Dive



Alignment of cost and design with no value engineering phase

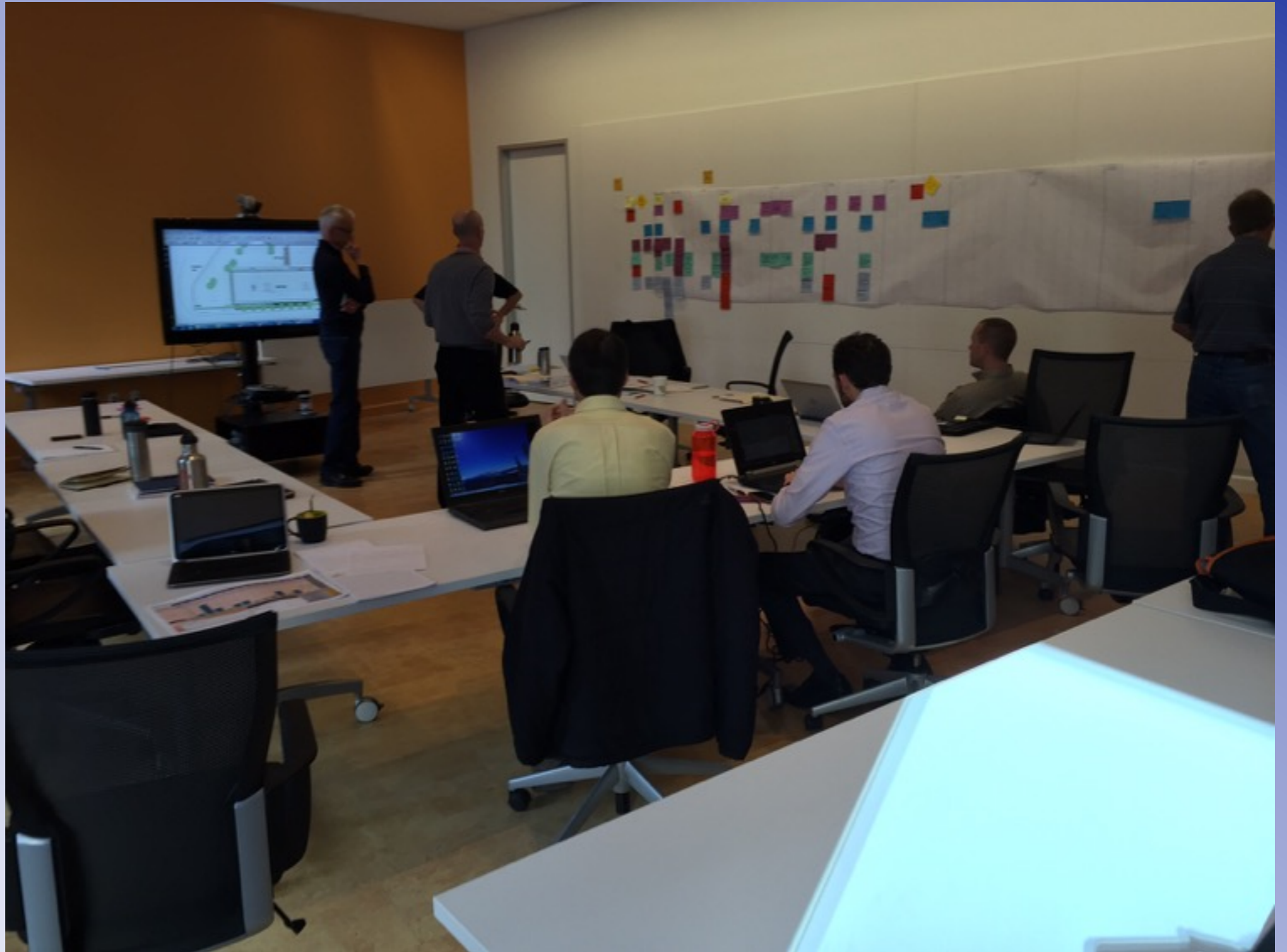


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"Progressive Design Build: Improving the Process"
May 12, 2017

Target Value of Design

The Tools: Deep Dive



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"Progressive Design Build: Improving the Process"

May 12, 2017

Last Planner

The Tools: Deep Dive

CDOT HEADQUARTERS AND REGION 1 OFFICE BUILDING														
LEVEL OF DEVELOPMENT														
	CONCEPT			SCHEMATIC DESIGN				DESIGN DEVELOPMENT				CONSTRUCTION DOC		
	STATE *	CODE*	DB	STATE *	CODE*	ENTIT	DB	STATE *	CODE*	ENTIT	DB	STATE *	CODE*	DB
C CIVIL											400			400
Target Value / Estimate			200	200			200	200			400	400		400
Site Plan						200	100	200	200	400	400	300	300	400
Utilities						100	100			400	400	300	300	400
Specifications											400			400
L LANDSCAPE											300			400
Target Value / Estimate			200	200			200	200			300	400		400
Site Plan				100	100	100	100	200	200	200	200	300	300	400
Landscape Plan										400	300	300	300	400
Hardscape Plan										400	400	300	300	400
Details											300	300	300	300
Specifications											300			400
S STRUCTURE											400			400
Target Value / Estimate			200	200			200	200			400	400		400
Narrative														
System Descriptions				200	200		200				NA			NA
Live Loads								300	300		400	300	300	400
Dead Loads								300	300		400	300	300	400
Material Strength								300	300		400	300	300	400
Foundation Plan								200	200		400	300	300	400
Structural Plans								200	200		400	300	300	400
Precast Elements											300			300
Miscellaneous Metal Items											400			400
Sketches				200	200		200				NA			NA
Details								200	200		400	300	300	400
Calculations											400	300	300	400
Specifications											400			400
A ARCHITECTURE											300			400
Target Value / Estimate			200	200			200	200			300	400		400



The Tools: Deep Dive

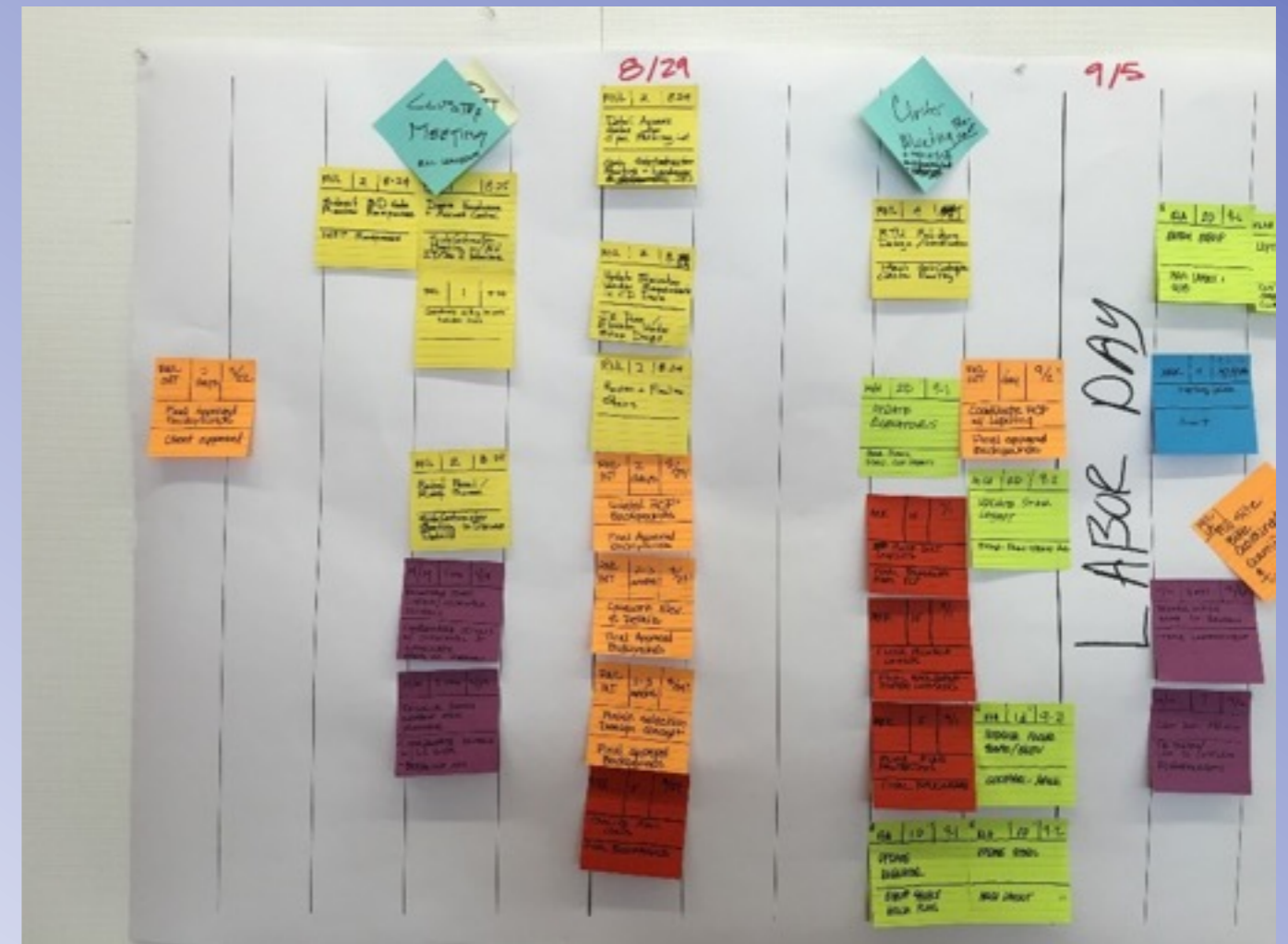
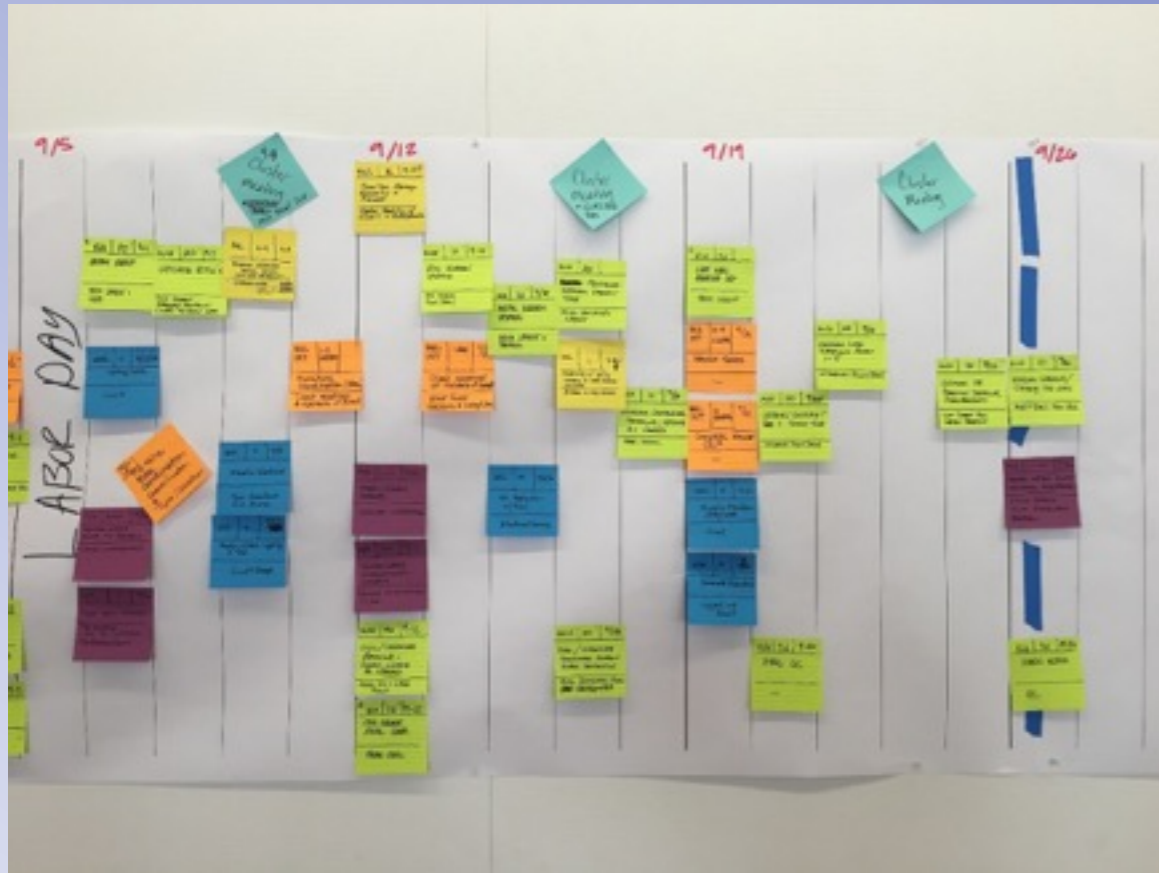
CDOT HEADQUARTERS AND REGION 1 OFFICE BUILDING														
LEVEL OF DEVELOPMENT														
	CONCEPT			SCHEMATIC DESIGN				DESIGN DEVELOPMENT				CONSTRUCTION DOC		
	STATE *	CODE*	DB	STATE *	CODE*	ENTIT	DB	STATE *	CODE*	ENTIT	DB	STATE *	CODE*	DB
C CIVIL											400			400
Target Value / Estimate			200	200			200	200			400	400		400
Site Plan						200	100	200	200	400	400	300	300	400
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Specifications											400			400
A ARCHITECTURE											300			400
Target Value / Estimate			200	200			200	200			300	400		400

Guided team on what was important to focus on at each milestone

Defined how developed the information needed to be



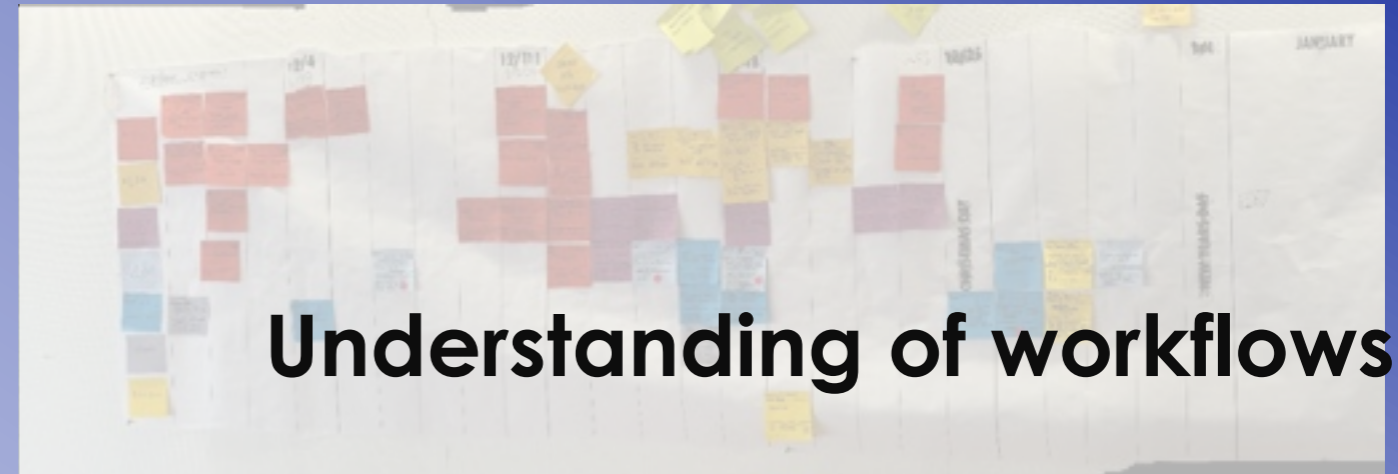
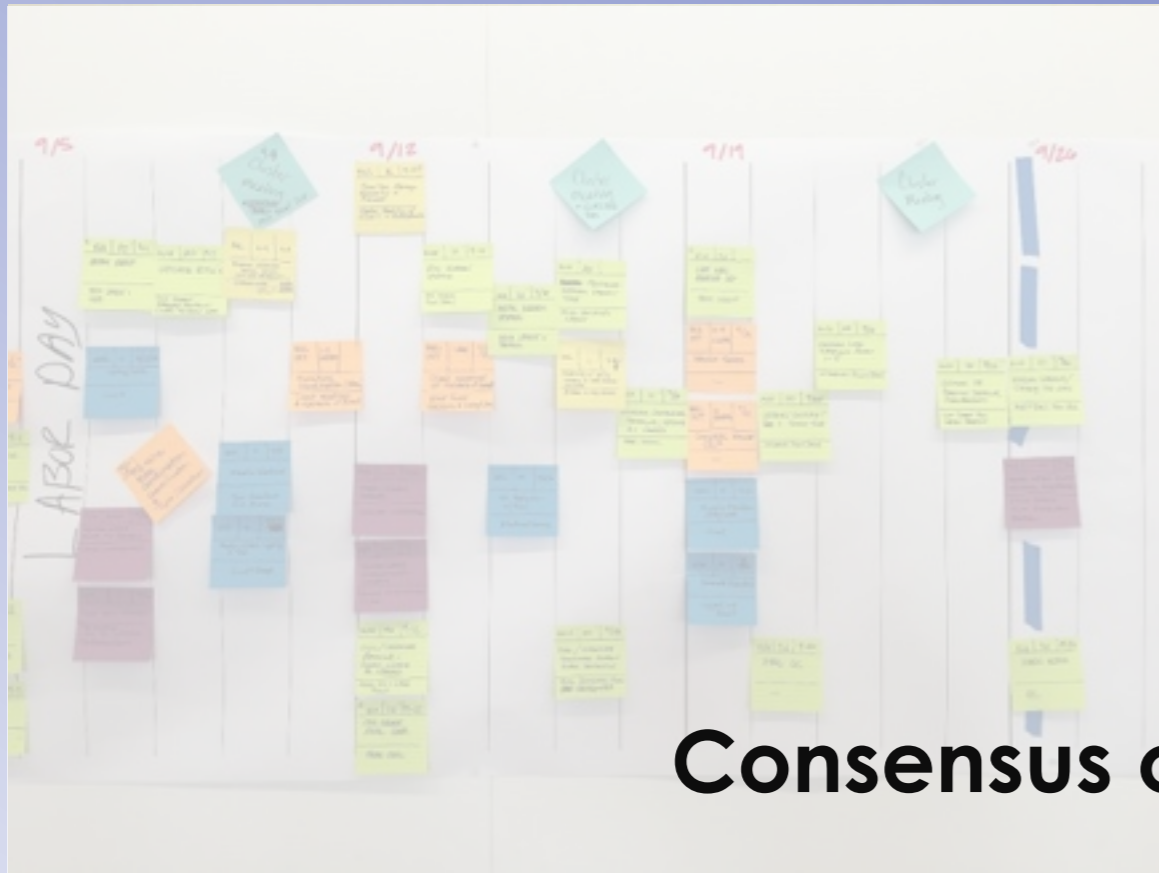
The Tools: Deep Dive



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Pull Plan

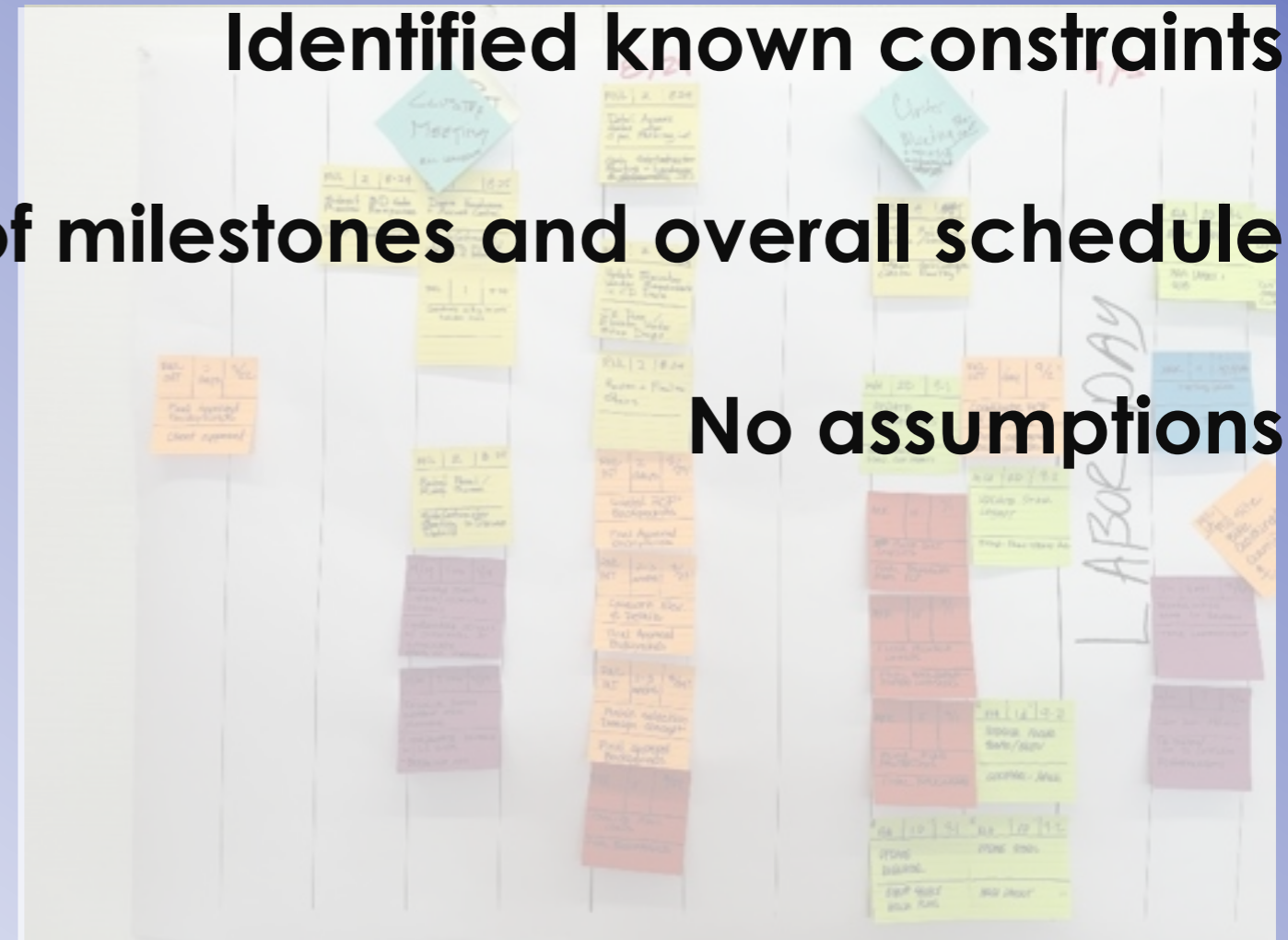
The Tools: Deep Dive



Understanding of workflows

Identified known constraints

Consensus of milestones and overall schedule



No assumptions

Pull Plan



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The Tools: Deep Dive

Project: CDOT Design Cycle: Design Development								
Work Item	Task / Action to be taken	Firm Customer / Requestor	Individual Performer	Firm Assigned To	Discipline	Due date	Estimated Effort	Task Status
72	Energy final analysis report and alternatives selection	MKK/RNL	LM	Ambient		6/22/16	7d	In Progress
300	Approval of DD Set			CDOT		8/22/16		Not Started
101	Finalize GMP Exhibits		PT	JED		7/18/16	1d	Not Started
231	Key Sub Interviews Start			JED		7/13/16		Not Started
98	Receive Sub Bids		PT	JED		6/30/16	1d	Not Started
93	Issue Final Pricing Addendum		PT	JED		6/28/16	1d	Not Started
91	Total Cost Of Ownership Documents		PT	JED/RNL		7/9/16	1d	Not Started
102	SUBMIT GMP			JED/RNL		7/25/16	1D	Not Started
51	Review FP concept w/ Den Fire for Prelim approval	MKK		MKK	Fire	6/24/16	5d	Not Started
11	Exist ESMT vacations		RF	MM		8/3/16	80d	In Progress
96	Revise and Resubmit Civil Eng		RF	MM		7/22/16	10d	Not Started
95	Receive 1st city eng. Comments		RF	MM		7/1/16	1d	Not Started
81	Zone lot amendment		RF	MM		6/30/16	5d	Not Started
42	Drainage report and storm plans - 1st submission		RF	MM		6/17/16	20d	In Progress
54	Transportation Letter - 1st Submittal		RF	MM		6/15/16	15d	In Progress



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Work Register

The Tools: Deep Dive

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Living document of the Pull Plan

Accountability

Captures progress



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Work Register

The Tools: Deep Dive



Focus on what matters

Builds Consensus

Accountable

Last Planner



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The Tools: Deep Dive

A3 No.	Title	Revision	Champion	Date Started	Collaborators	Approved by:	Approved date:	Status
001	CONCEPT DESIGN DIRECTION	001	WEILMINSTER	03/02/16	HEADLEE, TRONNIER, HOLE, WEISKOPF			<input type="checkbox"/> Development <input type="checkbox"/> Collaborative review <input checked="" type="checkbox"/> Implementation

SECTION 1 – Issue/Background

\$45 Million Budget; 2.98 Acre Site; 175,000 SF Program; 515 Parking spaces (per RFP)

SECTION 2 – Problem Statement/Current Condition

- Construction Budget based on \$156 / SF office building. Based on current market conditions this did not yield a building solution that was workable on the current site and acceptable to CDOT.
- Parking study showed a need for 825 vehicles vs RFP's 515 vehicle requirement.
- Program exceeds 175,000 SF by 14,000 SF.
- Due to site constraints, structured parking is a substantial necessity

SECTION 3 – Future State/Target Condition

CDOT's acceptance of Concept Design

SECTION 4 – Root Cause Analysis



SECTION 5 – Proposal

PARKING

- Identify final parking quantities: Client input and pricing/massing comparisons
- Design site to maximize surface parking and minimize structure parking
- Adjust per stall areas to 320 SF/space (in structured parking)

PROGRAM

- Coordinate with CDOT to reduce ancillary spaces (i.e. storage)
- Revise space standards relative to industry standards

SITE

- Optimize building & structured parking layout /footprint efficiency (see attached progression of options)
- Derive a design to meet height limit

CONSTRUCTION BUDGET

- Create a simple building geometry to drive efficiency in systems
- Explore tilt-wall and bar joist for cost/design
- Utilize target-value design for building systems

SECTION 6 – Confirmation / Check Results

PARKING

- Client accepted a total parking count of 515 (150 Fleet, 365 other) on Feb. 2.
- PSA requires 365 spaces but PSA will be modified so structured parking is not required

PROGRAM

- Program was adjusted to 173,400 SF on Feb. 23.

SITE

- CDOT Approved a 5 story building & 4 story structured parking solution on Feb. 18 (Concept 5A)

CONSTRUCTION BUDGET

- CDOT approved moving into Schematic Design with a \$48.4 million solution while continuing to evaluate the budget and wait on site appraisal for potential funds to be added to the construction budget.

SECTION 7 – Follow-up (Act)

Verify Parking, Program, Site and Construction Budget at end of Schematic Design



The Tools: Deep Dive

- Conditions of Satisfaction:
 - Treat each other with respect
 - Exceptional teamwork
 - High quality the first time – no rework
 - Continuous improvement – Reflection meetings throughout project
 - Open communication throughout project
 - Collaboration with all our teams (consultants and subcontractors)
 - Innovation through our processes
 - Last Planner in Design
 - BIM practices – LENS and other
 - A3 problem solving
 - Drive financial value to the client
 - Reduce RFI's through our D/B delivery
 - Deliver to CDOT
 - Deliver significant improvement to their everyday workplace
 - Safety by design
 - Provide a nice public space
 - Review original presentation at every milestone to make sure we are hitting the over-arching points
 - Be Profitable



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Conditions of Satisfaction

The Tools: Deep Dive

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Alignment of project goals



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Conditions of Satisfaction

The Tools: Deep Dive



**Platform for open dialogue:
What worked / what did not**



Reflection Meetings



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The Tools: Deep Dive



Continuous Improvement

Reflection Meetings



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The Tools: Deep Dive



Project Introduction

Overview of goals

Expectation of members

Onboarding



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The Tools: Deep Dive



Communication of project goal

Alignment of personalities with project goals

Onboarding



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Current Project Status



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Last Planner in Construction

Current Project Status



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Site Activities

TARGET VALUE DESIGN AND OTHER COMMUNICATION TOOLS FOR THE DESIGN BUILD TEAM ... A CASE STUDY

Use tools that bring value to the project

Make the tools flexible

Maintain open dialogue

Make continues improvement



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Summary

TARGET VALUE DESIGN AND OTHER COMMUNICATION TOOLS FOR THE DESIGN BUILD TEAM ... A CASE STUDY



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Chad Headlee - JE Dunn
Carl Hole, AIA - RNL