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STRUCTURED DESIGN PROCESS IMPROVEMENT FOR COMPLEX SEDIMENT SITES

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Presenter

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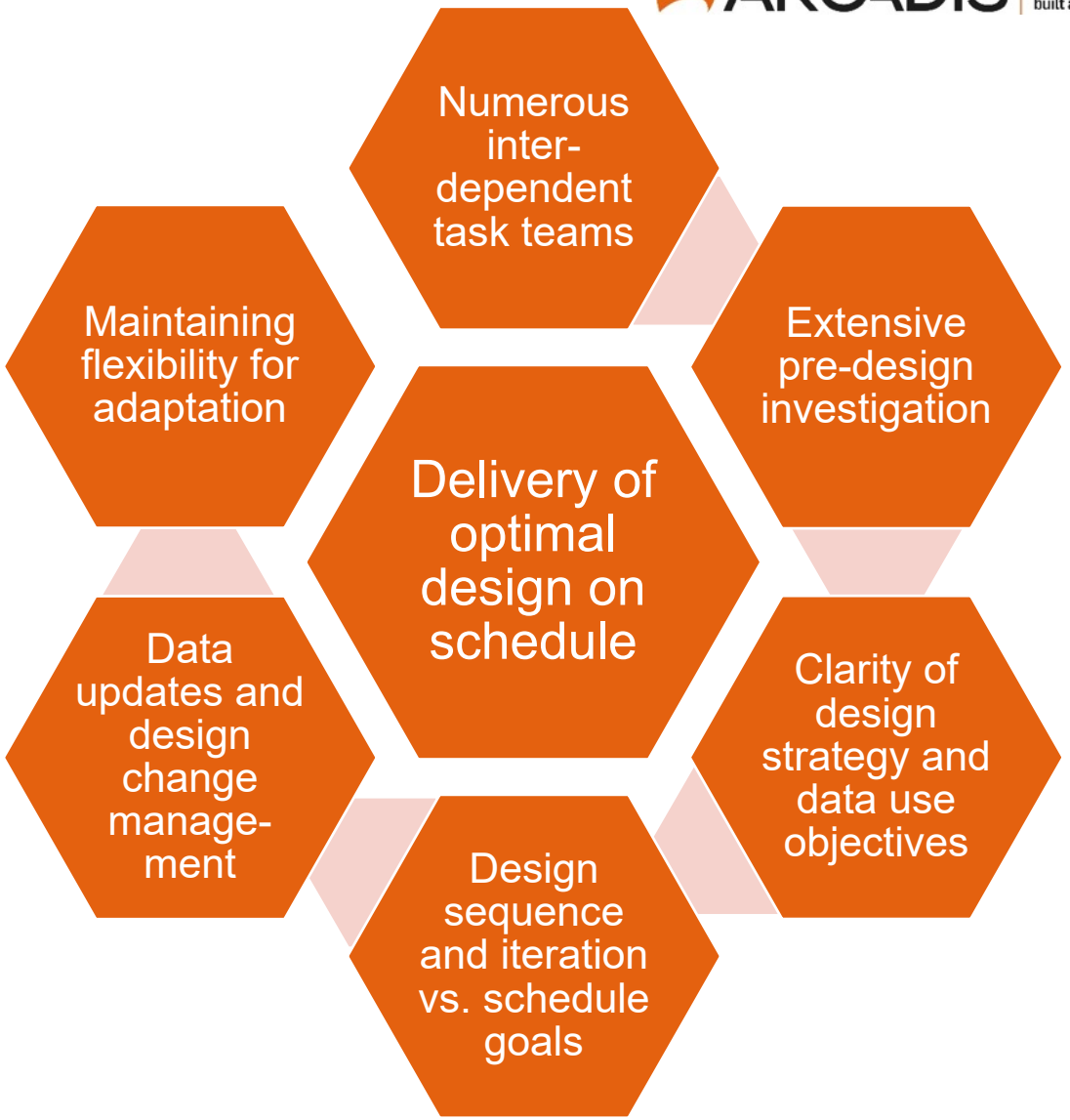
Overview

- Complex site design challenges
- Our design philosophy
- What does a defined process look like in practice?
  - Design Principles
  - Information Management Plan
- Lessons learned – process improvements

Complex Site Design Process Challenges

- Avoiding opportunity costs of incomplete pre-design planning
- Avoiding remedial design (RD) schedule jeopardy associated with team awareness and communication
- Consistent application of design principles and adaptive management



Our Design Philosophy

- Design ***must follow content*** of the Record of Decision (ROD) and implementing agreements
- Design ***approach should not be constrained*** by the feasibility study, ROD and implementing agreements
- ***Flexibility and uncertainty are to be embraced*** in design – adaptive design leads to innovation and optimal designs
- ***High team member awareness*** of design strategy and effective inter-team communication is key to high performing design teams

These ideas and experience led us to a more defined planning process

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What Does a Defined Design Process Look Like in Practice?

Design Process Types

Default	Defined
ROD-driven submittals	Design strategy founded in vision of the best design (consistent with ROD)
Pre-design investigation (PDI) based on generalized DUOs	PDI focused on refined DUOs working backwards from the vision
Milestone focus	Detailed team awareness of the strategy and vision

Tools to Complement the Defined Design

Typical RD Work Plan Content	Design Tools Typically Not Identified by RD Agreements
• QAPP • Project Management Plan • Pre-Design Investigation Plan • RD Work Plan • Design Criteria • Basis of Design Report (BODR) • 30 Percent Design (PD) • 60 PD • 95/Final PD • Monitoring Plans • Etc.	• **Design Principles** • **Information Management Plan (IMP)** – Design element breakdown – Information needs and sources – Users – Dependencies • **IMP Communications Plan** – Team member roles – Events – Who, how, when

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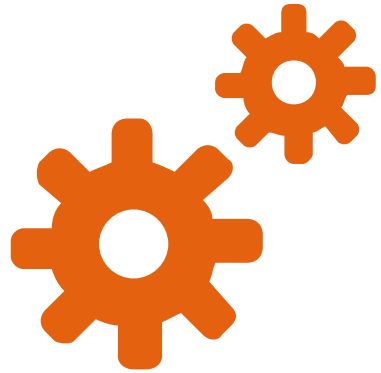
Design Principles

Design Principles Matrix

- Identifies hierarchy of design choices
- Forces prioritization of potentially conflicting design principles
- Structured to incorporate the Design Criteria, which are developed hand in hand
- Provides a design process verification tool for quality control by back checking that the intended information was applied



Design Principle Examples

Manage structural instability risks and shoreline debris concentrations with dredge limit setbacks based on observed structural condition and debris mapping.

Configure navigational channels to extent possible based on planform to promote self-maintaining channel forms and reduce dredge volumes.

Define a remedy construction sequence that best facilitates achievement of remedial action objectives.

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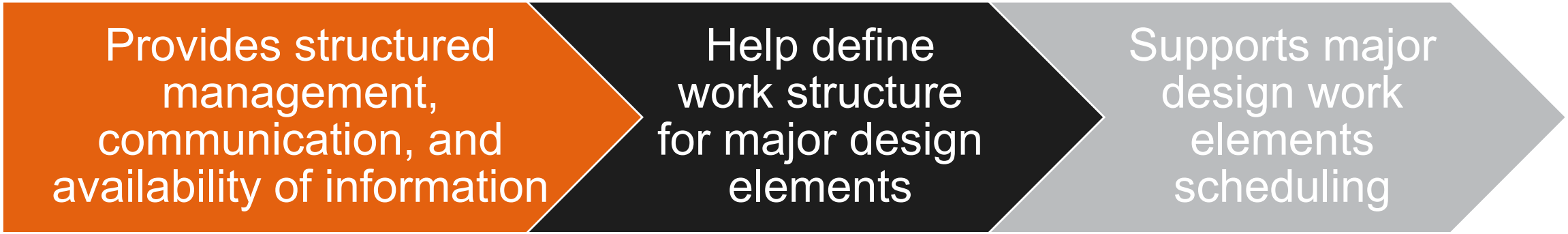
Information Management Plan

Information Management Plan Purpose

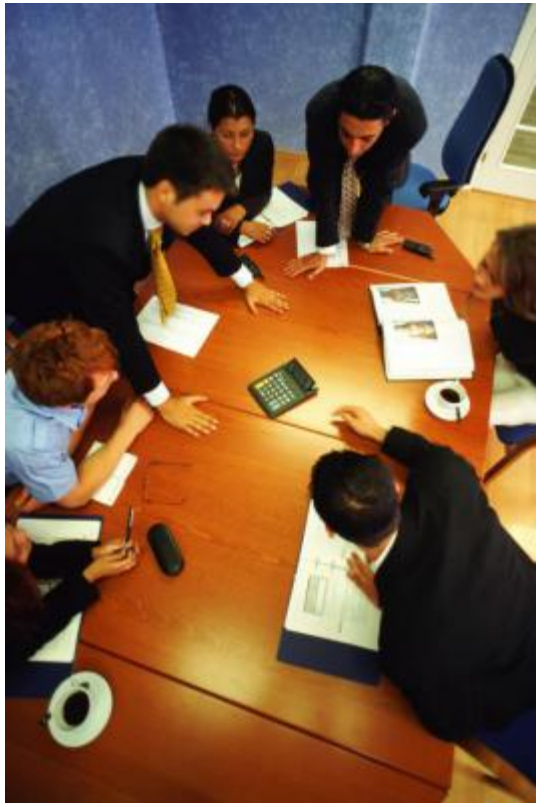


It is not:

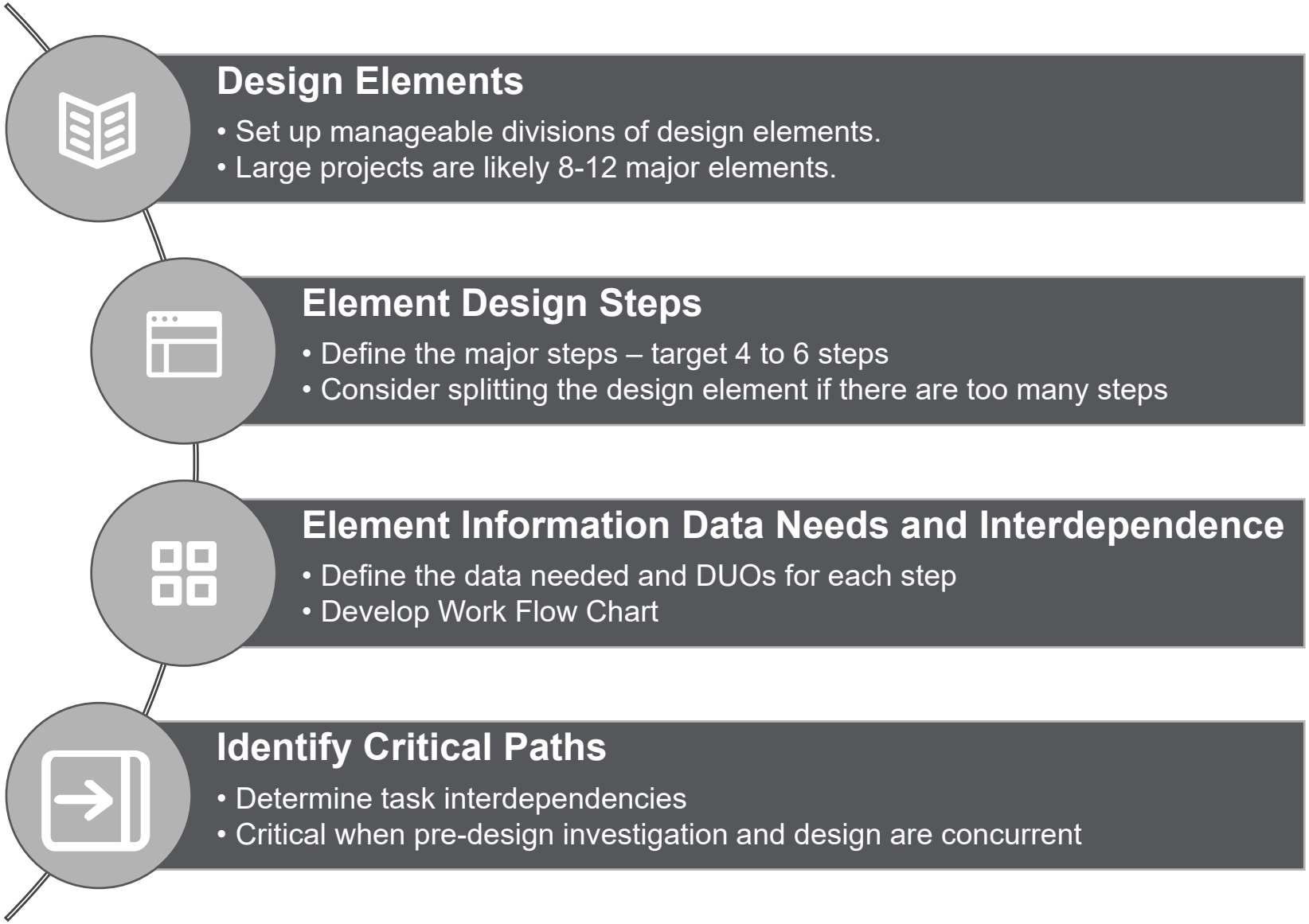
- A replacement for the RD Work Plan
- A duplication of the Quality Assurance Project Plan
- An analytical data management process
- A replacement of the milestones schedule

IMP Function

- Flow charting of information required for major design elements
- Ensure needed information provided to primary users when needed
- Ensure task outcomes and information disbursed to Secondary users when needed
- Confirms information availability/accuracy/sufficiency to support design schedule and strategy
- Consistently communicate design strategy and process at RD Management Team and Task Team levels
- Back-checks provide validation to RD Management Team



IMP Planning Sequence



Design Elements

- Set up manageable divisions of design elements.
- Large projects are likely 8-12 major elements.

Element Design Steps

- Define the major steps – target 4 to 6 steps
- Consider splitting the design element if there are too many steps

Element Information Data Needs and Interdependence

- Define the data needed and DUOs for each step
- Develop Work Flow Chart

Identify Critical Paths

- Determine task interdependencies
- Critical when pre-design investigation and design are concurrent

Structured planning adds value in capturing PDI and RD opportunities for efficiency and avoiding delays

Example Design Elements Identification

Q1 Q2 Q3 Q4

Treatability Studies

Hydrodynamic Modeling

PDI Data Development

Major Design Elements

- Dredge method selection
- Navigation channel modification
- Cap design
- Dredge material transport
- Staging site selection and layout
- Cap erosion/armor analysis
- Sediment dewatering and processing
- Structures stability
- Waste T&D approaches
- Debris management
- Flood plain storage modeling

Design Content

- Design criteria report
- Basis of design
- Preliminary drawings and specifications
- Outline of specifications
- Design elements
- Draft remedial action schedule
- Draft T&D Plan

USEPA Led Aspects

- Performance standards input
- Design criteria acceptance

Minor Design Elements

Archeology/cultural
permit analysis
Access
Institutional controls
Contracting

O&M requirements
Piping diagrams
Waste character.
Utility mapping
etc.

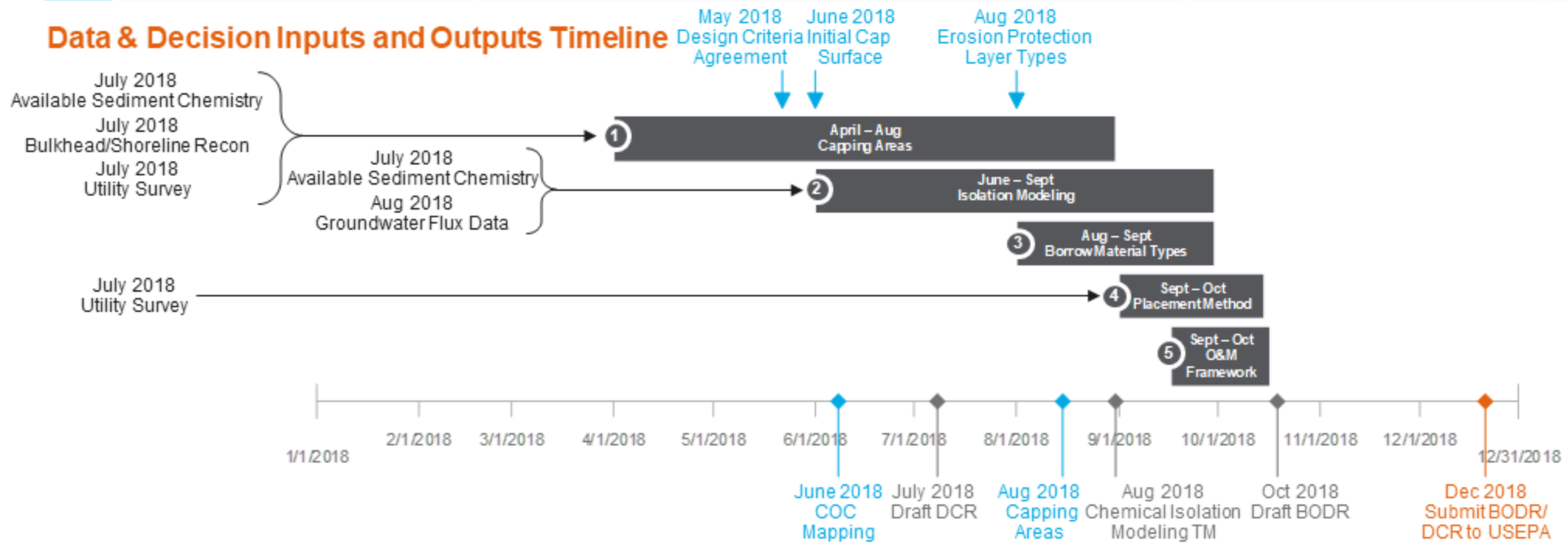
Strategic Decisions

- Role of pilots / phasing
- Adaptive management framework

Chemical Isolation Design Element: Data & Decision Inputs to 30% BODR

	1 Capping Areas (COC Mapping)	2 Isolation Modeling	3 Borrow Material Types	4 Cap Placement Method	5 O&M Framework
PDI DATA REQUIRED	• Sediment chemistry • In-river and shoreline structures • Refined utility buffer zones • NAPL extent / characteristics * • Geomorphology • Underwater cultural resource	• Sediment chemistry • Groundwater flux and seepage • Porewater concentrations * • Partitioning coefficients and amendment performance (TS)	• Borrow material sources * • Amendment sources *	• In-river and shoreline structures • Refined utility buffer zones • Fish window * • Material settling and constructability evaluation (TS)	• Bathymetry
KEY DECISIONS OR INFO NEEDED	1. Initial cap surface (including navigation channel configuration) 2. Intertidal mudflat approach (e.g., dredging vs offsets) 3. Geotechnical restrictions 4. Interpolated COC maps	1. Design criteria 2. Model approach 3. NAPL management approach 4. Assumptions regarding natural habitat layer formation and deposition rates	1. Erosion protection layer types	1. Erosion protection layer types 2. Stabilization layer (dredge design) 3. Sequencing (dredge design)	1. Design criteria 2. Comparison to prior bathymetry for bed elevation change (flood elevation model)

Data & Decision Inputs and Outputs Timeline



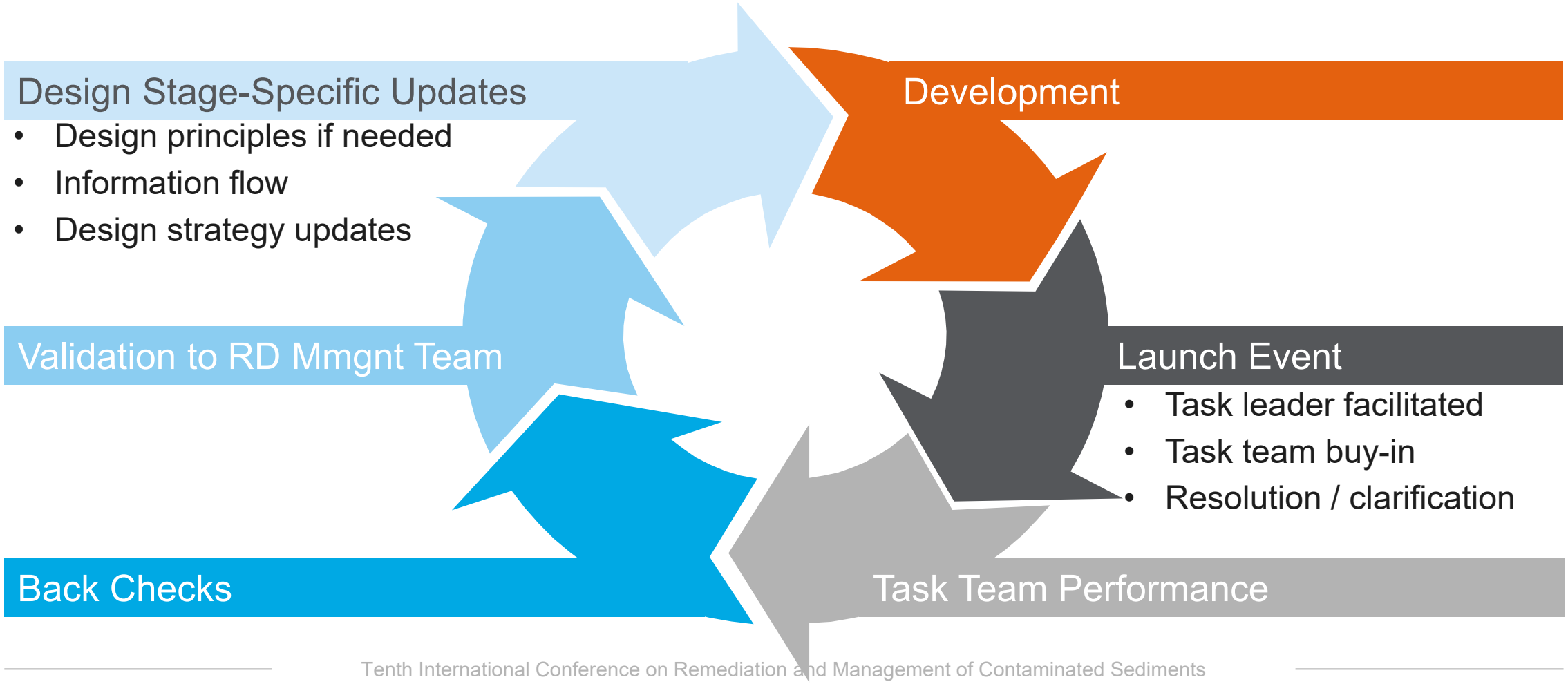
*** PDI DATA & DECISION INPUTS TO 60%**

- Bulkhead & shoreline borings
- Porewater concentrations
- Borrow material sources
- Fish study
- NAPL
- Supplemental sediment chemistry

TREATABILITY STUDY (TS) INPUTS TO 60%

- Partitioning coefficients and amendment performance
- Material settling and constructability evaluation

IMP Operation



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Lessons Learned

Designing the Design Process

- Typical RD implementation agreements are structured to meet agency needs, not the RD team's planning needs
- The design process must be structured beyond the "default", especially for large team, complex site RD delivery
- RD Management Team ability to clearly see and validate the process reduces risk for all participants
- Design Principles matrix, Design Elements work flow charting, and Information Management Plan tools presented here have met these needs

Use of these design process improvements will improve delivery of your complex sediment site remedial design

"Plans are nothing, planning is everything"

–Dwight D. Eisenhower

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