

Pre-Project Scope of Work

**Long term & Medium term plan,
Timeline, Required sources, Profile**

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KEK Linear Collider Project Office
Masanobu Miyahara

Pre-Project Scope of Work

**Long term & Medium term plan,
Timeline, Required sources, Profile**

- **Pre-Construction Design Work**
- **Investigation Work**
- **Pre-Construction Schedule**
- **Summary**

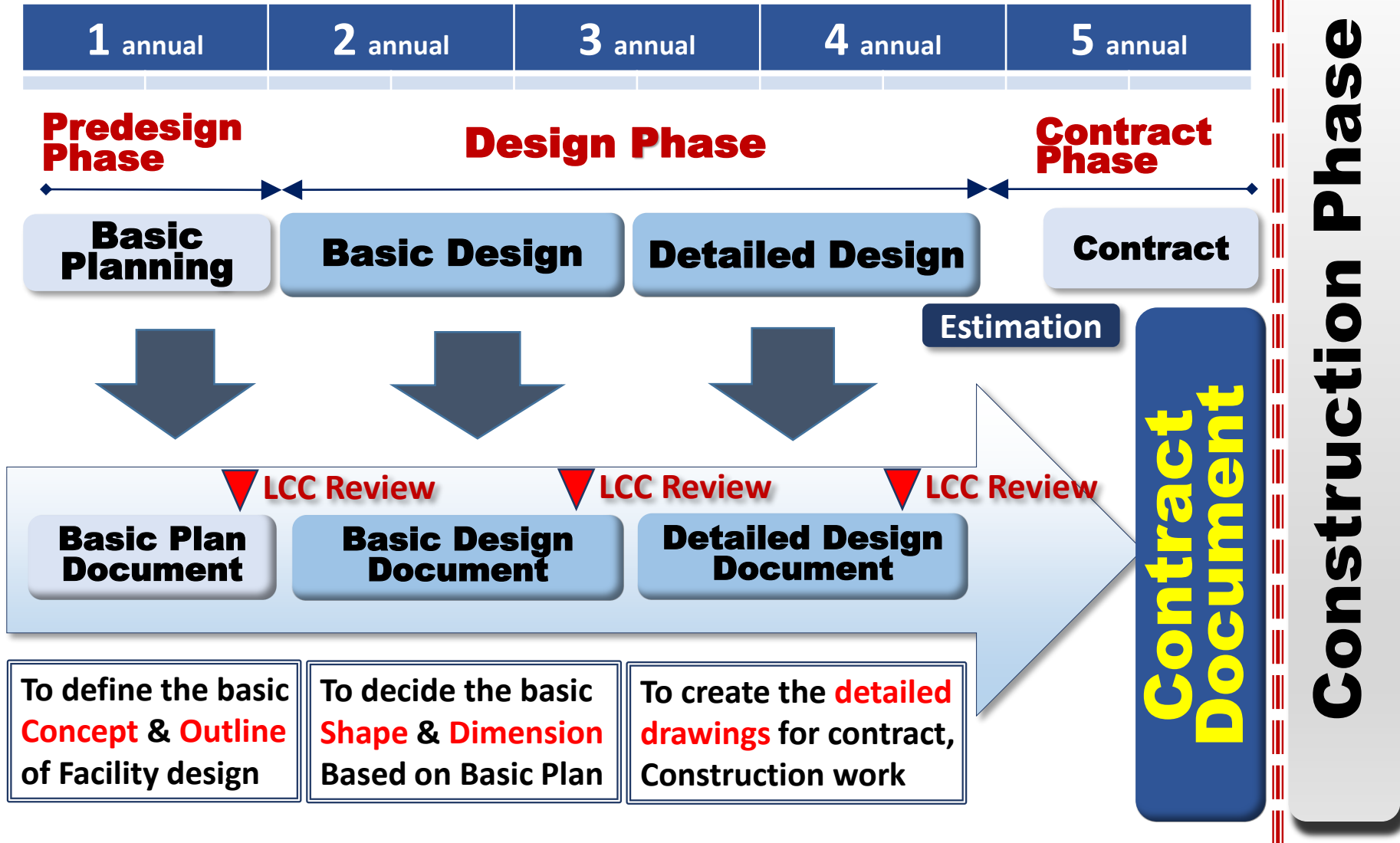
Pre-Construction Design Work

Civil Engineering Design

Electrical & Mechanical Design

Pre Construction Design Work

Design Phase Skeleton



Pre Construction Design Work

Civil Engineering Design

WORK SCOPE TABLE by every phase

	Basic Planning	Basic Design	Detailed Design
Facility Arrangement	R	OR	NR
	Determination of - IR point, Access system - BL Route & Elevation	Revision of - IR point, Access system - Site & Access portal	- Minor modifications of the basic design
Shape & Dimension	R	OR	NR
	Determination of - Cross Section Shape - Basic Dimension	Revision of - Cross section Shape - Whole Dimension	- Minor modifications of the basic design
Structure & Materials	-	OR	NR
		Structural planning - Load condition, Materials - Seismic Design plan	- Structural Design - Construction planning - Detailed Design
Schedule & Cost	R	NR	NR
	- Assumption Schedule - Outline Cost Estimation	Trial Estimation - Direct Cost, Unit cost	Cost Estimation - Final Cost for Bidding

Legend: R=Required OR=Optional Required NR=Not Required

Basic Planning Phase

What is the **Basic Planning**?

1. Basic Planning is to define the **Preliminary design Concept** and **Outline** of the construction project in design phase start.
2. To confirm the consistency of the **Conceptual Design** and Space and Functional **Requirements**, Quality, Project Schedule, Construction Cost (super rough estimate).

TASKS

Basic Planning Document

- **Project Overview** / Project objective, Project scope and budget.
- **Site Condition** / Location, Topography, Geology.
- **Preliminary design** / Design concept, Facility arrangement, Space and functional requirement, Engineering features.
- **Project management** / Project analysis and feasibility.
- **Cost & Schedule** / Super-rough Estimate of Construction Cost.

Basic Design Phase

What is the **Basic Design**?

= *Schematic Design?*

1. To decide the **basic Shape** and **Dimension** based on the requirement such as **Space, Function** and **Quality**.
2. To establish the **design criteria** considering Japanese regulation, and to analyze the **cost and schedule** toward the development design stage.

TASKS

Basic Design Document

Contents of Basic Design drawing:

- **Underground structures** (Civil) & Architectural Design
- **Electrical facilities** / Power service & Distribution, etc
- **Mechanical facilities**/ Cooling water & Air conditioning system,
- **Basic Design Criteria** / material & structure
- **Project management** / Initial schedules and Cost estimation

Detailed Design Phase

What is the **Detailed Design**?

1. To create the Execution Drawing further developed the basic design with arrangements and Structural design.
2. All Design decisions are completed during this phase in order to prepare the subsequent **Construction Documents**.

TASKS

Design Development Document

- Civil & Architectural Design / Final results of Detailed Design
- Electrical Design / Development of previous electrical design
- Mechanical Design / Development of previous mechanical design
- **Specification** / Development of materials & system
- Project Scheduling / Review and update the project schedules
- **Project Estimate** / Review and refine the Project Cost

Pre Construction Work Scope

Electrical & Mechanical Design

WORK SCOPE TABLE by every phase

	Basic Planning	Schematic Design	Detailed Design
Electrical Facilities	<ul style="list-style-type: none"> ■ Basic policy - Basic conditions (power, Voltage, Number of lines, Supply system) - Consultation with local ■ Basic condition check - Power supply, DC range - Disaster prevention ■ Cost estimate(s-rough) 	<ul style="list-style-type: none"> ■ Basic drawing - power system concept - Main line distribution diagram - Concept diagram ■ Design summary book - System selection, capacity calculation ■ Cost Estimate (Rough) 	<ul style="list-style-type: none"> ■ Detailed Drawing - Substation equipment connection diagram - Experiment switchboard - Monitoring system ■ Specification - Particular specification ■ Cost Estimation (Budget document)
Mechanical Facilities	<ul style="list-style-type: none"> ■ Basic policy for air conditioning, Cooling water system, Sanitation, etc. ■ Basic condition check - Heat load condition - Circulating water temp. - Air-conditioning temp. - Energy-saving target ■ Cost estimate (s-rough) 	<ul style="list-style-type: none"> ■ Basic drawing - Demand condition table power of every part - Concept diagram (Heat source, air condition, ventilation, water supply) ■ Design summary book - capacity calculation - System selection ■ Cost Estimate (Rough) 	<ul style="list-style-type: none"> ■ Detailed Drawing - design statement - Piping, duct system - Fire-fighting equipment - Control equipment - Equipment list ■ Specification - Particular specification ■ Cost Estimation (for Bidding)

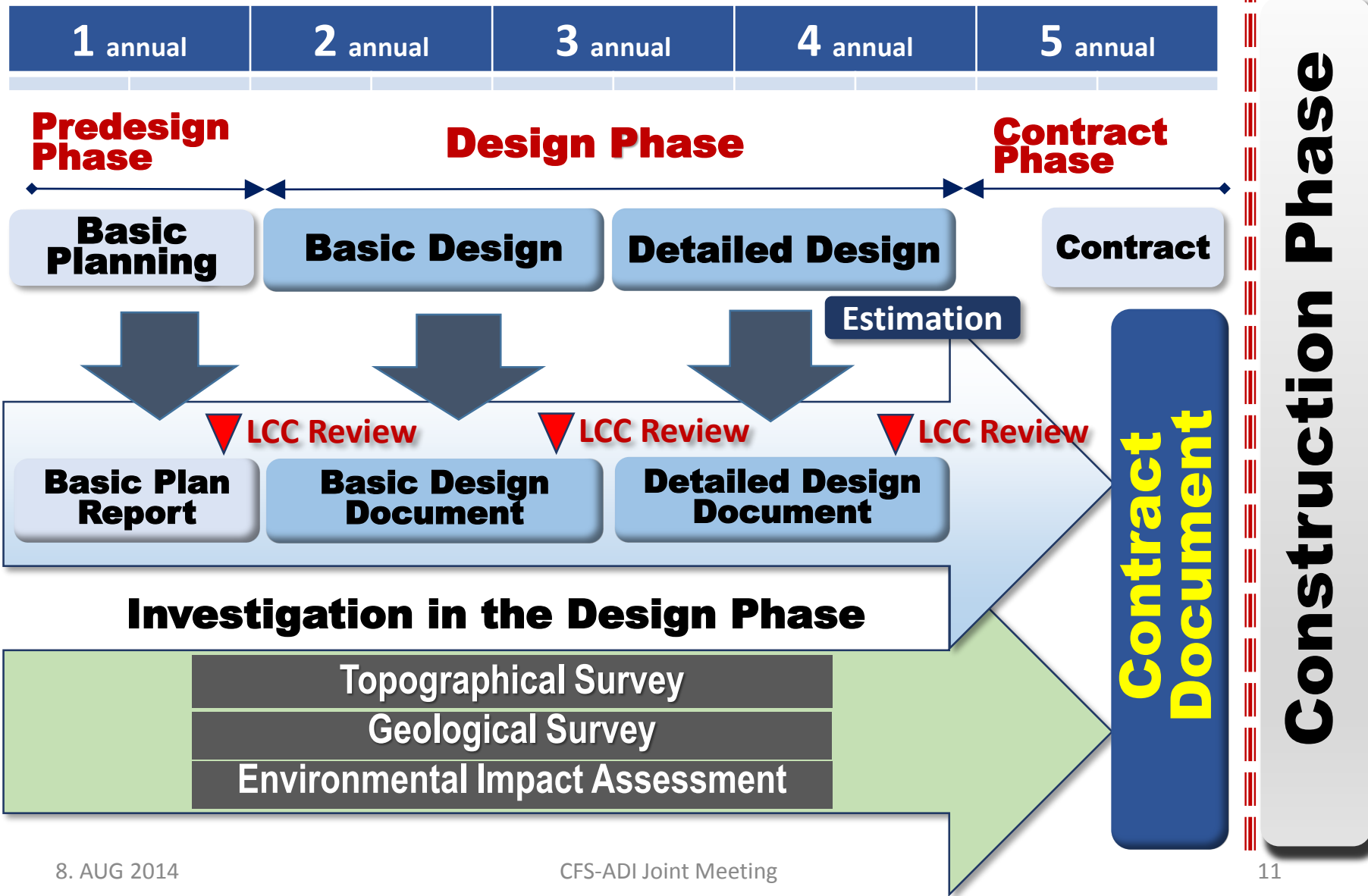
Pre Construction Work Scope

Investigation Work

- Topographical Investigation**
- Geological Investigation**
- Environmental Impact Assessment**

Pre Construction Schedule

Long term & Medium term



Investigation Plan

Investigation Required by each phase			
	Basic Planning	Basic Design	Detailed Design
Topographical Investigation	Preparation	Basic Survey	Additional Survey
	Collection of the exiting Data & Materials - 1/10,000 map	Creating a topographical map in the ground site - 1/500~1/1,000	Optional Survey: - Construction site - Temporary site
Geological Investigation	Preliminary Survey	Basic Survey	Additional Survey
	Necessary Survey: - Boring: 1(near DH) - Seismic wave Survey (1 km, near DH)	Necessary Survey: - Borehole investigation: 4(near DH) & 6 (near AH) - Seismic wave Survey: (1,000m × 5, near A/P)	Optional Survey: - 10 Boreholes(?) - Unknown place of geological conditions - Design problem part
Environment Impact Assessment	Preparation	Environmental assessment survey	
	- Draft plan for Field Investigation - Literature Research	- Field Investigation(1) - Making the Submitted document	- Field Investigation(2) - Creating an Evaluation document

Topographical Survey

- **Surveying for the Planning and Design**
 - Surveying for the facilities arrangement in the yards above the ground
 - Basic surveying required for site development plan and site drawing of the construction site
 - Topographical map (1:10,000 map)
- **Surveying for Land Acquisition**
 - Cadastral surveying
 - Surveying with compensation duties

< Out of CFS duties >

Geological Investigation

Proposal from JSCE/ILC Committee Guidelines for the Civil Engineering Work of ILC Facilities

5 Sectional Meetings

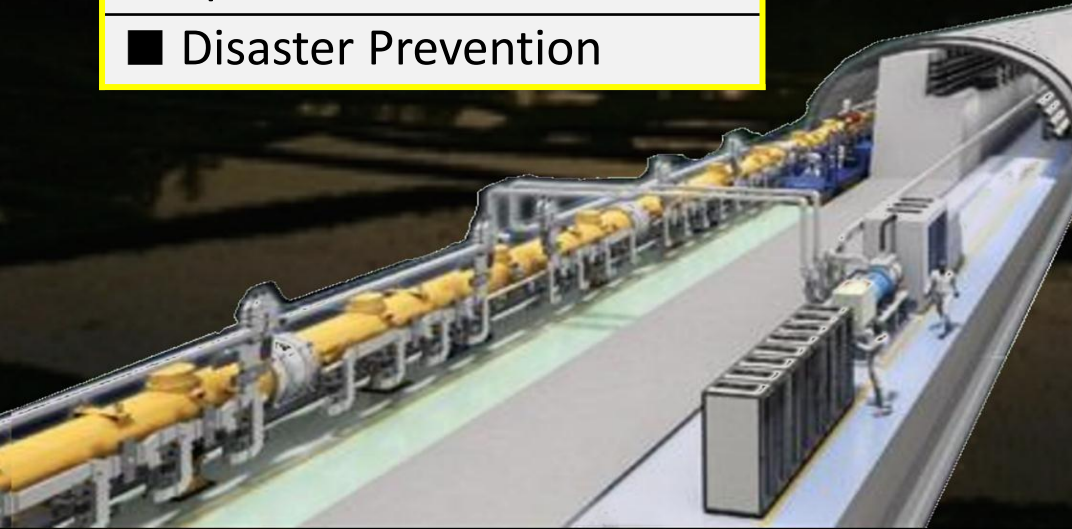
■ Project Investigation

■ Large Cavern

■ Horizontal Tunnel

■ Special Tunnel

■ Disaster Prevention



NEWSLINE
THE NEWSLETTER OF THE LINEAR COLLIDER COMMUNITY

AROUND THE WORLD 3. Apr 2014

Guideline for ILC civil engineering completed

Rika Takahashi | 3 April 2014

Artistic view of the future ILC tunnel. Image: Ray Horvath/KEK

Involved in the project. They also gathered and analysed a huge amount of information on large-scale constructions, such as case examples of use of underground space, and their guidelines and standard specifications.

Based on those works, this guideline was put together to ensure most cost-effective construction of the ILC, avoiding any possible duplications in the process. This guideline was adapted to the environment to realise the best practice on the ILC construction. The committee believes it will be effective for the construction sites, and also useful to other large-scale underground constructions.

Prior to this guideline, a special team of the subcommittee on engineering for the ILC under the JSCE's Committee on Road Engineering produced two reports on the ILC site study in 2009 in cooperation with KEK's then Director General, Totsuka, in 2005. Then, timed to coincide with the release of the Technical Design Report (TDR), they completed this guideline.

Group photograph of the project team members in a meeting room.

Geological Investigation

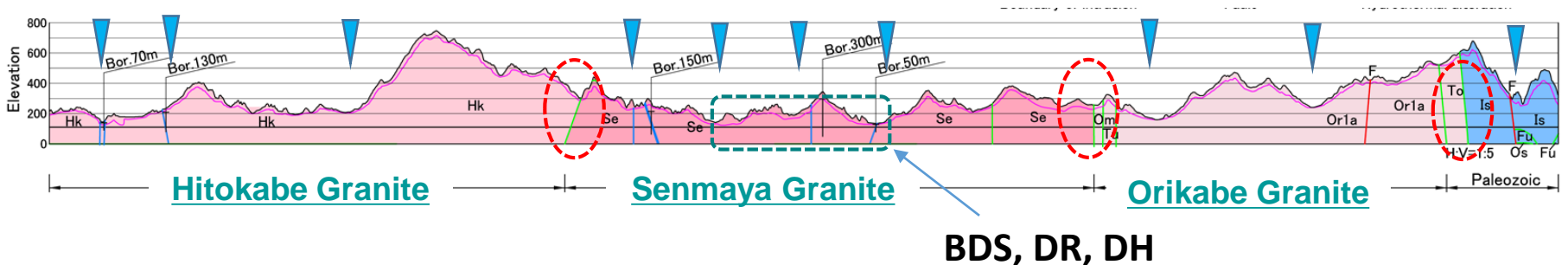
- **Proposal from JSCE in the Guideline (1)**
- **Consideration in charge of Investigation**
 - ILC Facility site and route has selected the range of the **granite zone extremely stabilized** as natural ground conditions.
 - However, this project intends for a very large area of tunnel extension 50km and in deep underground.
 - Therefore, it is necessary to investigate adequately about the wide range of **Topography, Geology, Hydrology**.
 - In addition, it is important to carry out the investigation at the execution plan stage from design stage while **raising precision step by step**.

Geological Investigation

- **Proposal from JSCE in the Guideline (2)**
- **Investigation at the Design Stage**
 - Surface exploration
 - Geophysical Exploration
 - Borehole Investigation
 - Borehole Test, Well logging (Loading test, Velocity logging, Electric logging, Earth pressure measurement,)
 - Hydrological Survey

Geological Investigation

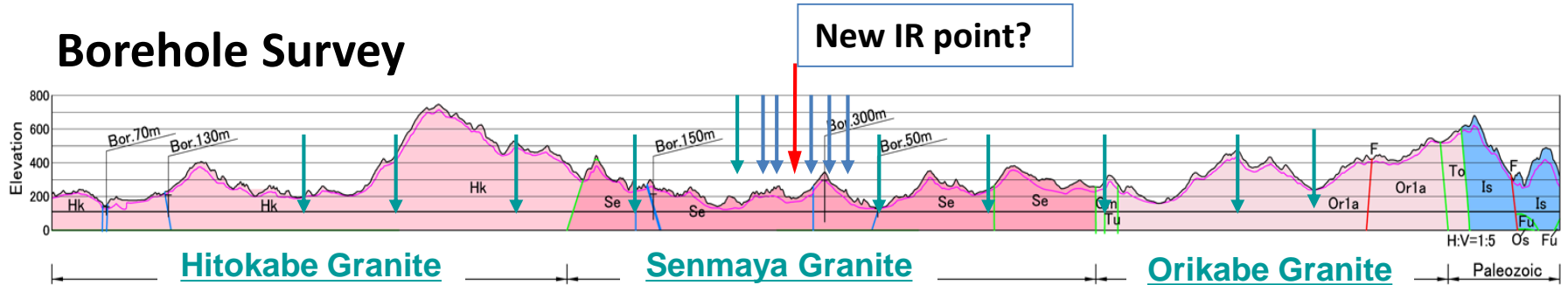
- **Proposal from JSCE in the Guideline (3)**
- **Important place of Investigation**
 - Boundary zone with different rock kind (fracture zone, Weathering zone, etc.)
 - Place of the Topography changes such as a Valley part and the river-bed part
 - Important place of performance and function for the accelerator facility



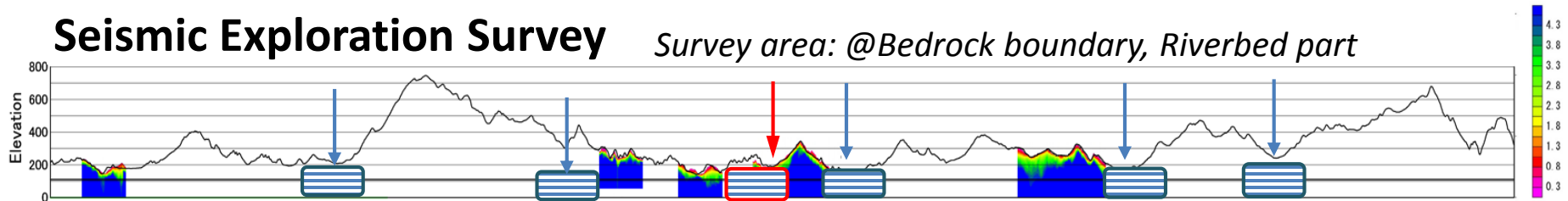
Geological Investigation

□ Profiles of Geological Surveys along the project

Borehole Survey



Seismic Exploration Survey



Geological Survey at pre-construction stage

	Basic Planning	Schematic Design	Detailed Design
Borehole Survey	- 1 p DH area	- 5 p DH/DR area	- 10 p along the BL
Seismic Exploration	- 1 area /1,000m	- 5 area /5,000m	0 (Additional)

Environmental Assessment - I

- **System of Environmental assessment**
 - Environmental impact assessment by Law *targeted to large-scale development projects. (Dam, Road, Railroad, etc.)*
 - Environmental Impact Assessment by Ordinance (Prefecture) *targeted to projects not covered in the national system.*
 - An enterprise cannot be started until it submits an evaluation document.
- **Application to the ILC project**
 - Environmental impact assessment law
 - Environmental Impact Assessment Ordinance
Not applicable (IWATE & MIYAGI pref.)

The pilot survey of the Raptores
Field survey takes time most is on going.

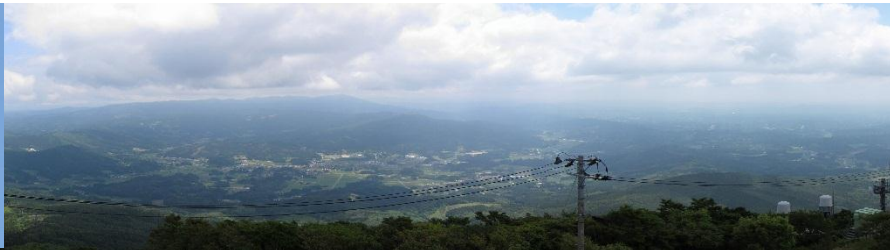
Environmental Assessment – II

- **Voluntary Assessment**

- We should do perform assessment **strategically (SEA)**

Strategic Environment impact assessment

Northern goshawk



Golden eagle

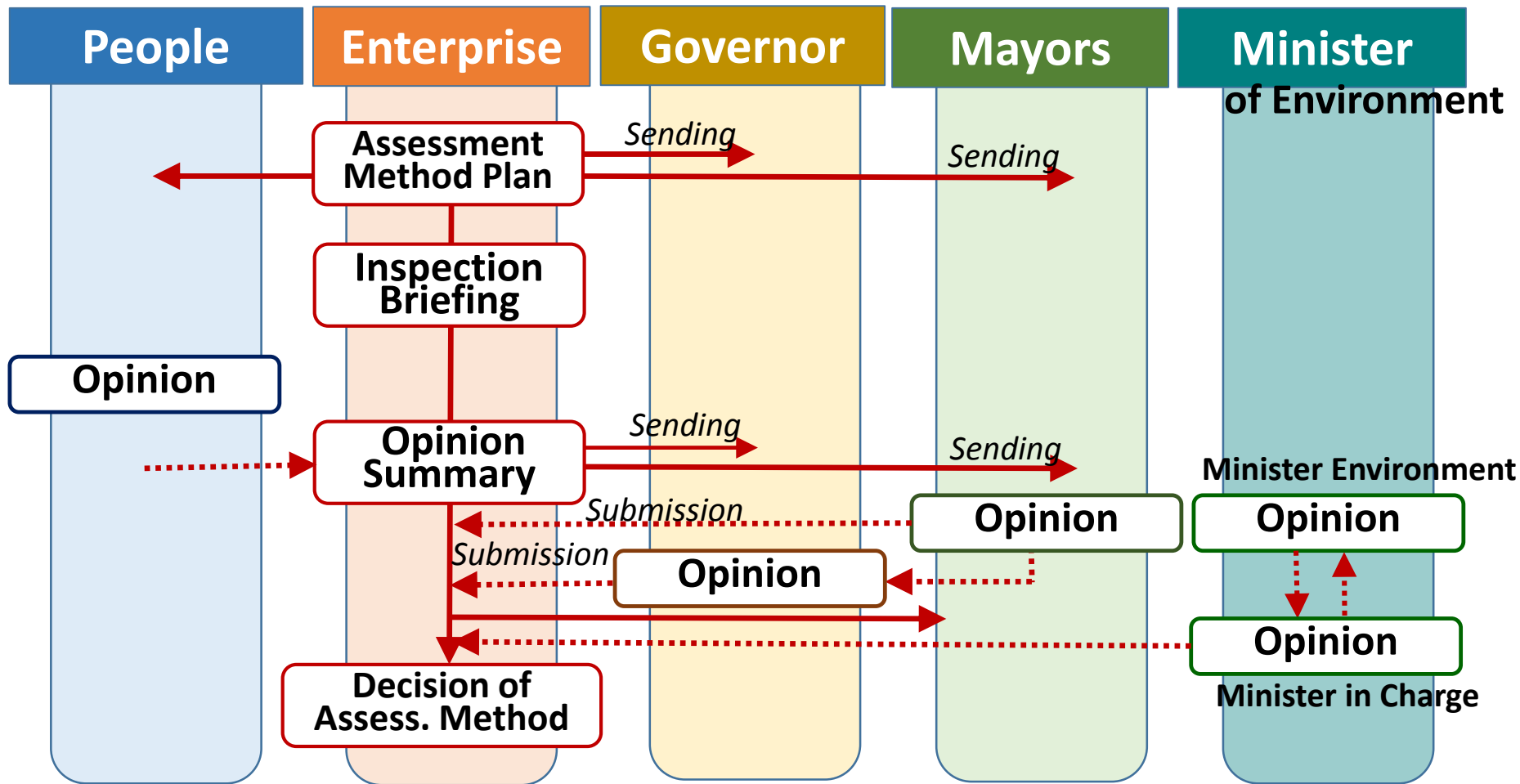


Main Survey Item in Environmental assessment

Air Environment	Air quality	Other environmental	Geology
	Noise		Noise
	Vibration		Foundation
	Stench		Soil
Water environment	Dirt of water	Animal	Rare Creature: Raptores Survey
	Water turbidity	plant	
	Groundwater	Waste	
Landscape		Greenhouse gas	

Environmental assessment – III

Scoping procedure process

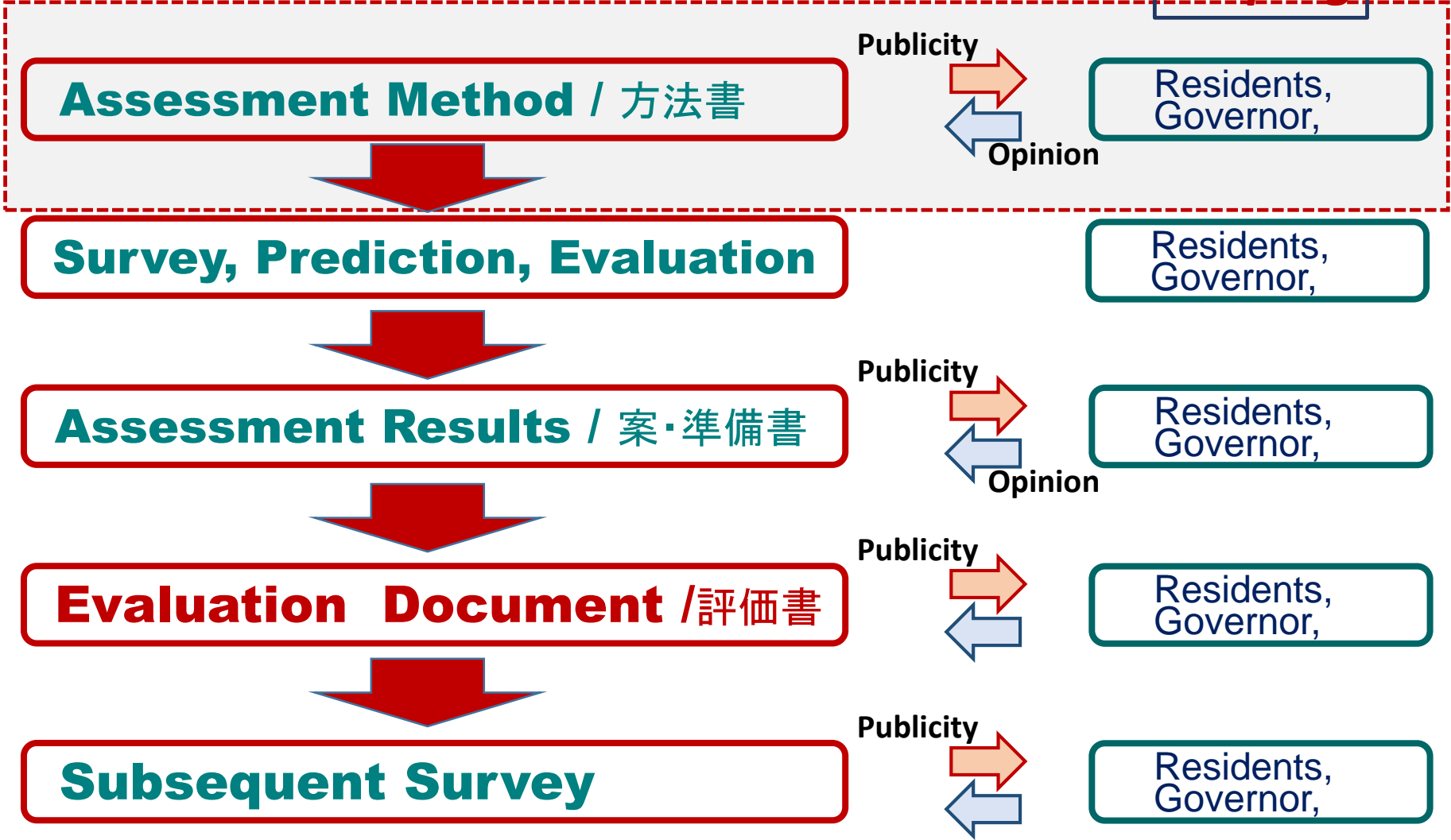


Environmental assessment -IV

Fundamental procedure

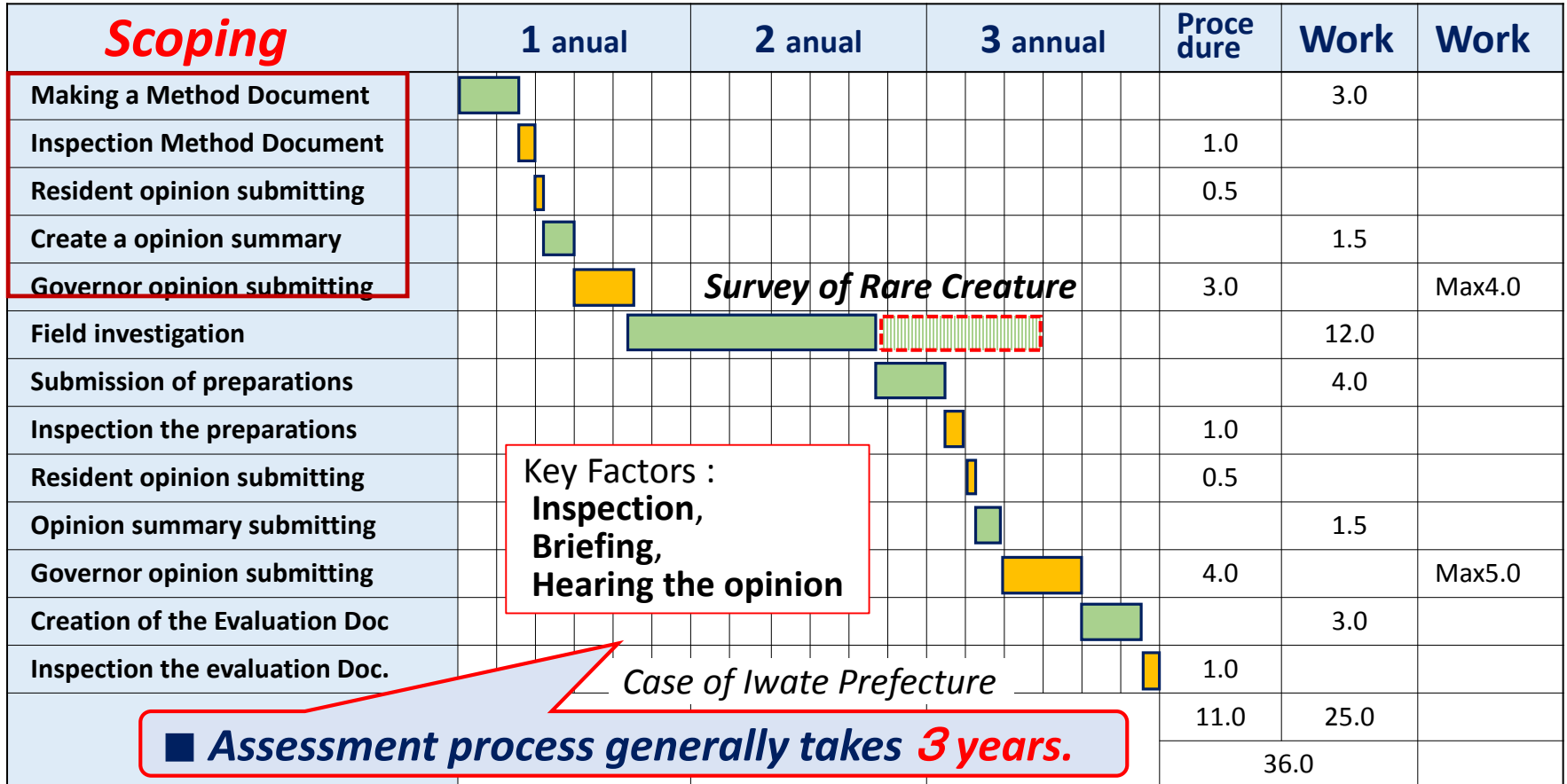
Enterprise=ILC

Scoping



Environmental assessment – V

Standard schedule based on the local government regulation

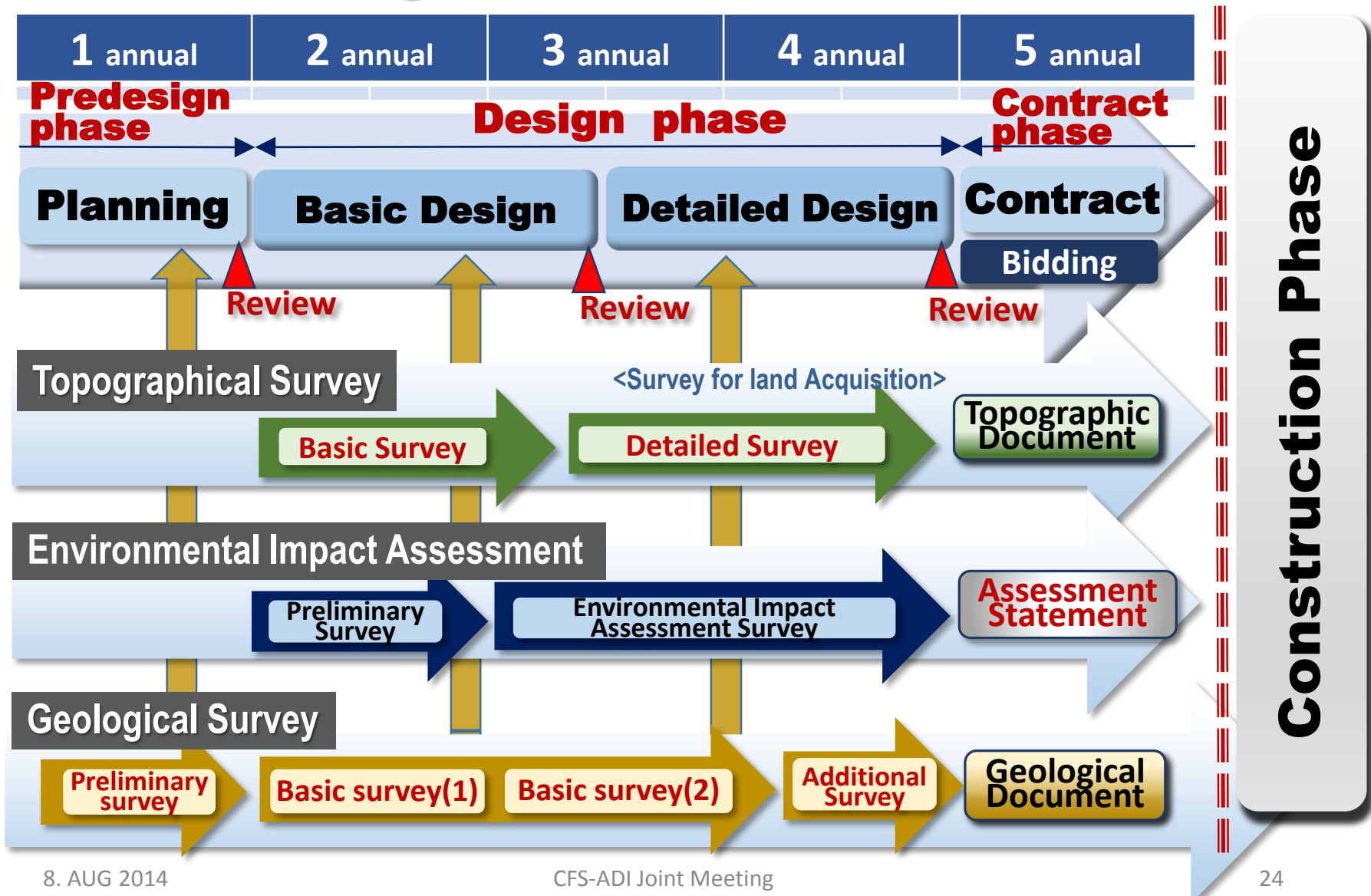


■ **Pilot Survey is on going by local government !**

The Raptors investigation which a field survey takes time most

Pre Construction Schedule

Long term & Medium term



Summary

1. It takes a period of at least five years for preparation and design phase to the Construction start.
2. We have many issues which should be done by Project budget acquisition. Even if less budget, we can do that too many.
3. Geological Investigation should be to proceed in step by step each design phase. But planning of investigation just enough is important.
4. We should push forward preparations for Environmental Assessment strategically even if not applying law.
5. Basic planning in pre-design phase is critical component for the ILC Construction Project.

End