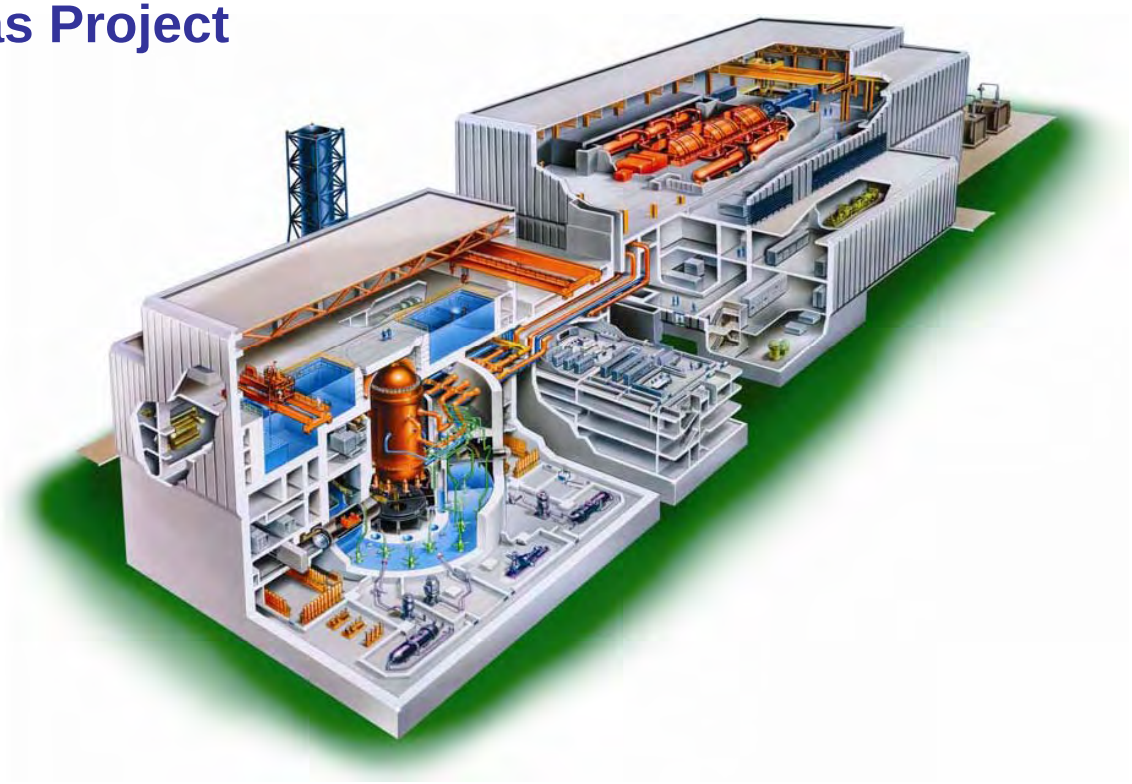
Public Meeting With STPNOC:

An Overview of Preconstruction Activities

South Texas Project
Units 3 & 4



Agenda and Desired Outcomes

Scott Head
STPNOC Regulatory Affairs Manager
STP Units 3 & 4

Agenda

- Introductions and Opening Remarks
- Desired Outcomes and Summary
- Scheduled Sequence of Preconstruction Activities
- Method for Evaluating Preconstruction Activities
- Evaluations of Preconstruction Activities
- Concluding Remarks

Attendees

Scott Head	STPNOC Regulatory Affairs Manager
Steve Blossom	STPNOC Construction Manager
Bill Mookhoek	STPNOC Licensing Supervisor
Dave Dujka	STPNOC Civil Engineering Supervisor
Coley Chappell	STPNOC Licensing Engineer
Bob Schrauder	TANE Vice President Licensing
Lanny Dusek	Fluor Regulatory Affairs Director
Bob Hooks	Sargent & Lundy Building Design Director
Javad Moslemian	Sargent & Lundy Building Design
Surendra Singh	Sargent & Lundy Building Design
Guy Winebrenner	MACTEC Sr. VP and Director, Energy Bus. Practice
Rob Smith	MACTEC Project Manager
Al Gutterman	Morgan, Lewis & Bockius LLP

Desired Outcomes

Shared understanding with the NRC of STP plans for Preconstruction activities:

- Sequence of site preparation prior to Combined License
- Standard evaluation methodology
- Evaluation of Crane Foundation Retaining Wall as a Preconstruction activity

Receive feedback from the NRC

Opening Remarks

- Preconstruction activities are scheduled to control project costs and to optimize construction efficiency.
- Preconstruction activities are designed in accordance with COL/ESP-ISG-004 to ensure compliance with 10 CFR 50.10(a)

Scheduled Sequence of Preconstruction Activities

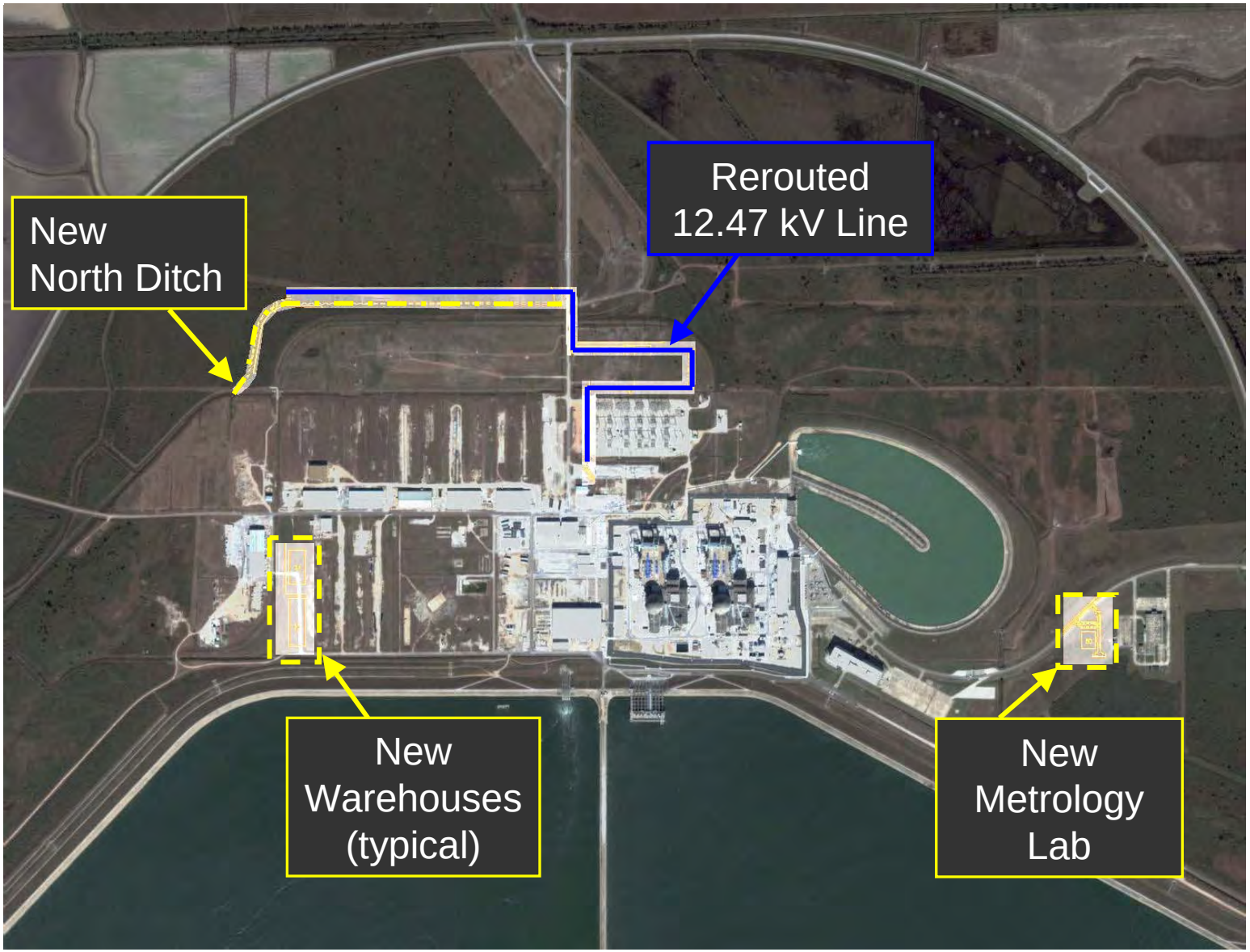
Steve Blossom

Construction Manager - STPNOC

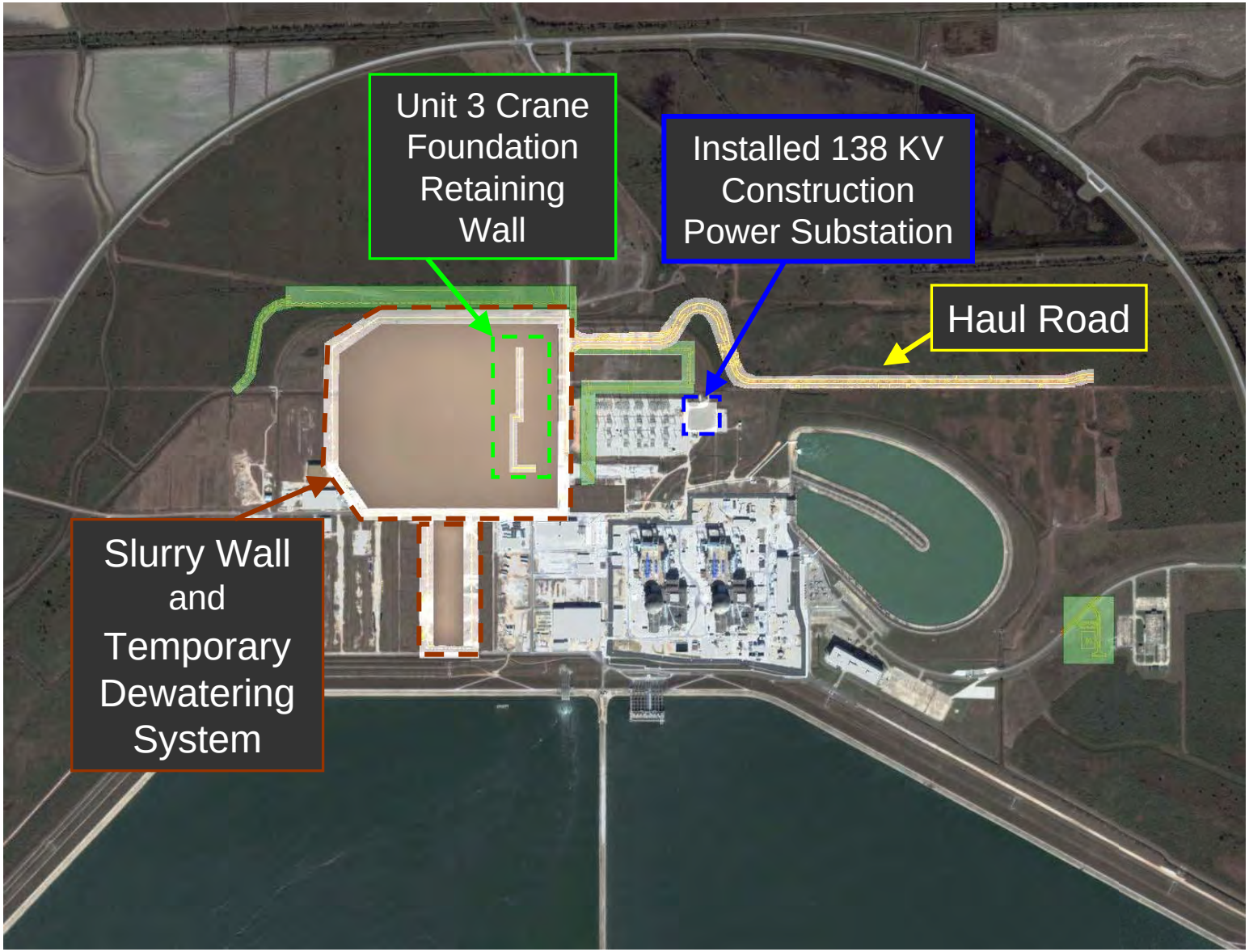
STP Units 3 & 4

August 2009: Existing Site Conditions

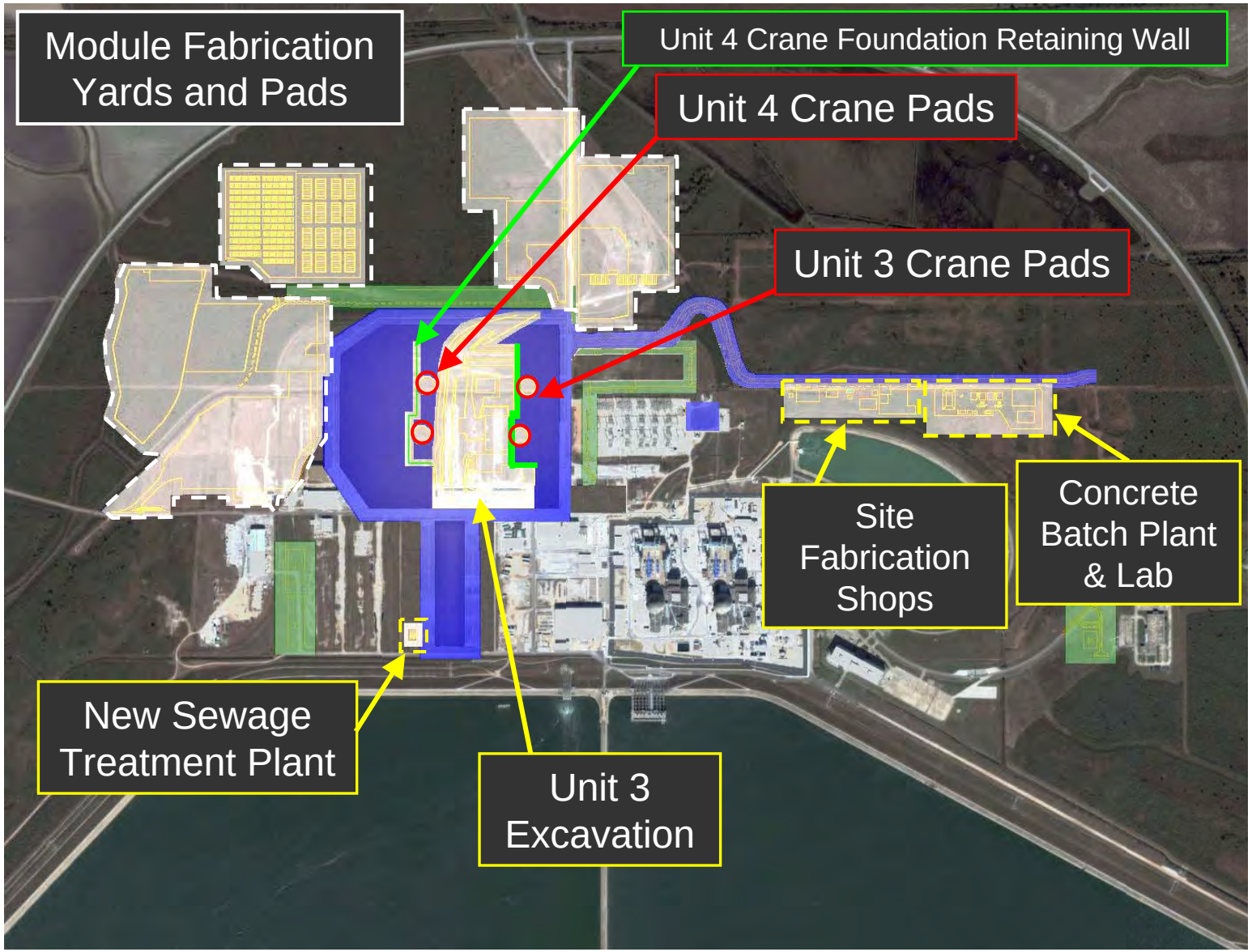
July 2010 Scheduled Progress



April 2011 Scheduled Progress

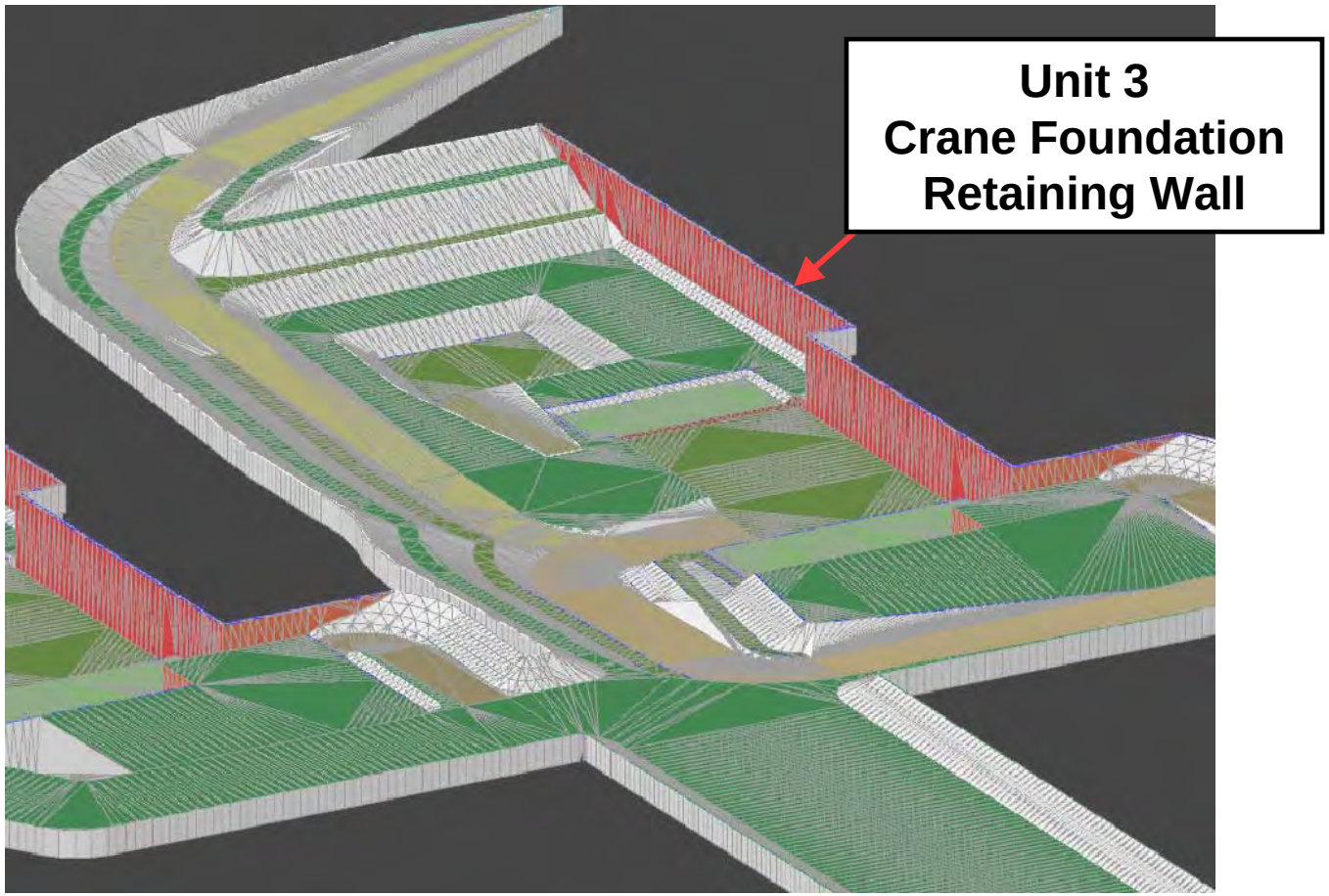


Early 2012 Scheduled Progress



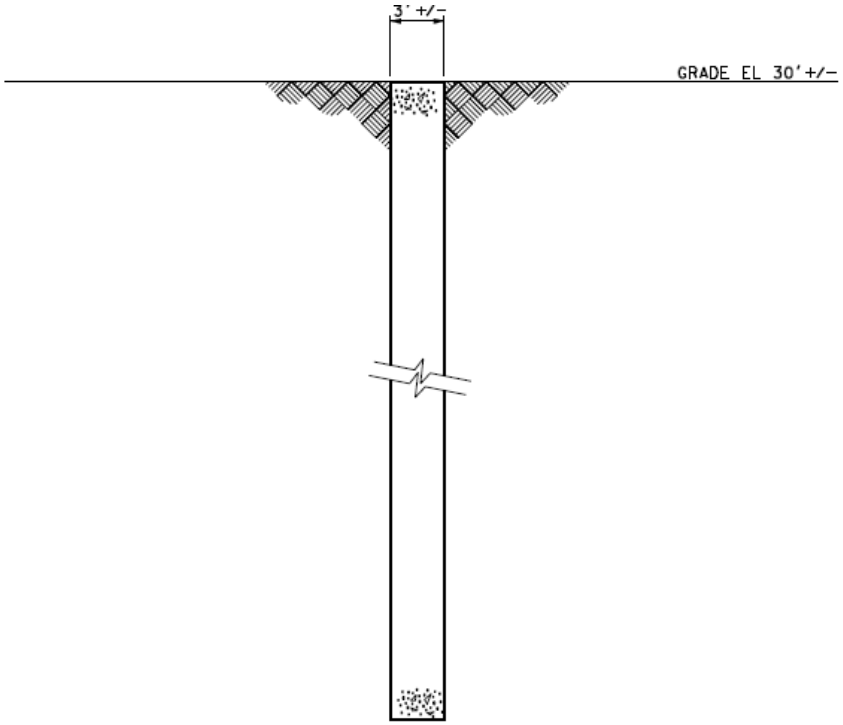
Excavation Areas

Unit 3 Excavation - Cutaway View



Crane Foundation Retaining Wall Location

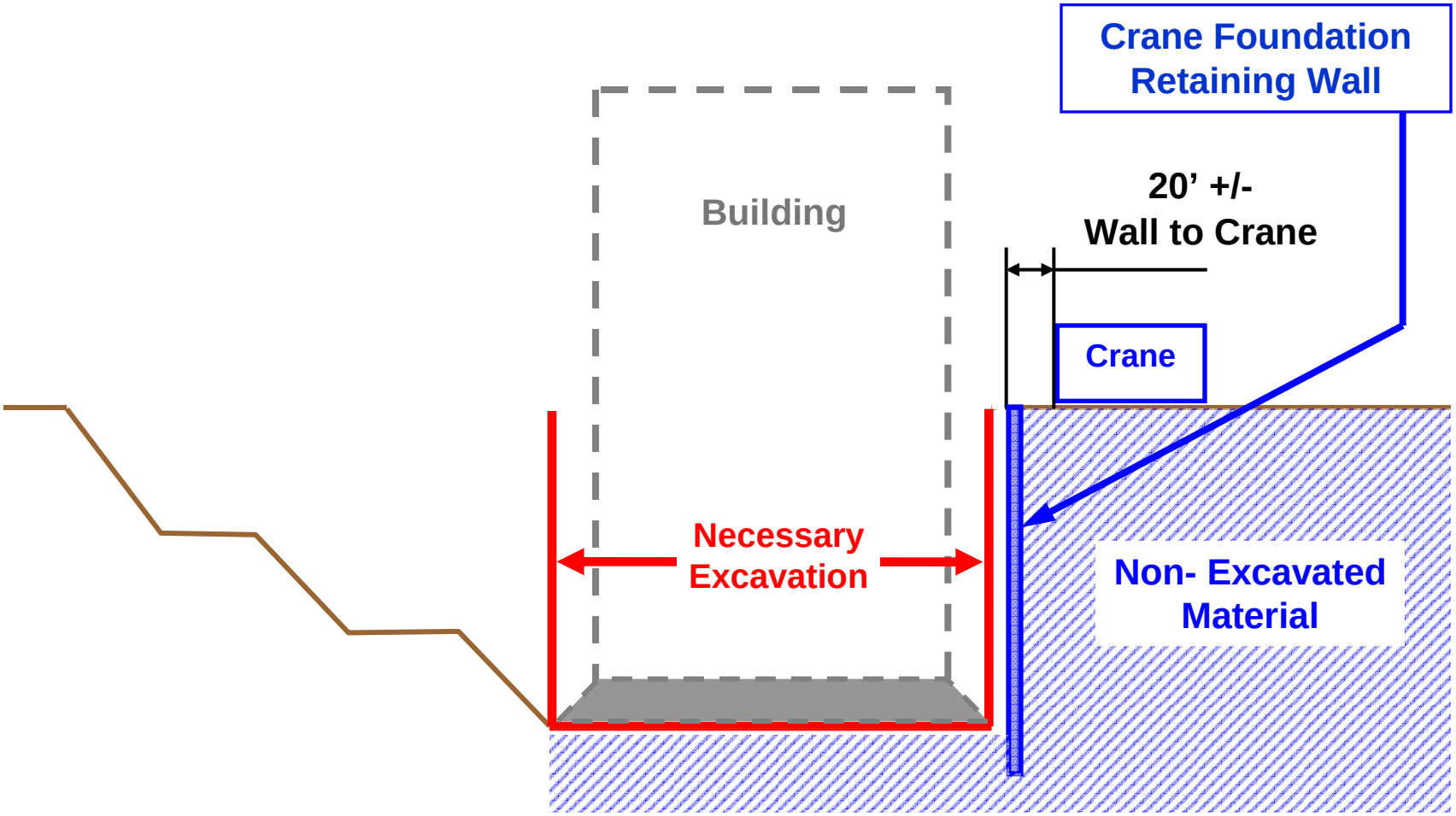
Prior to excavation:



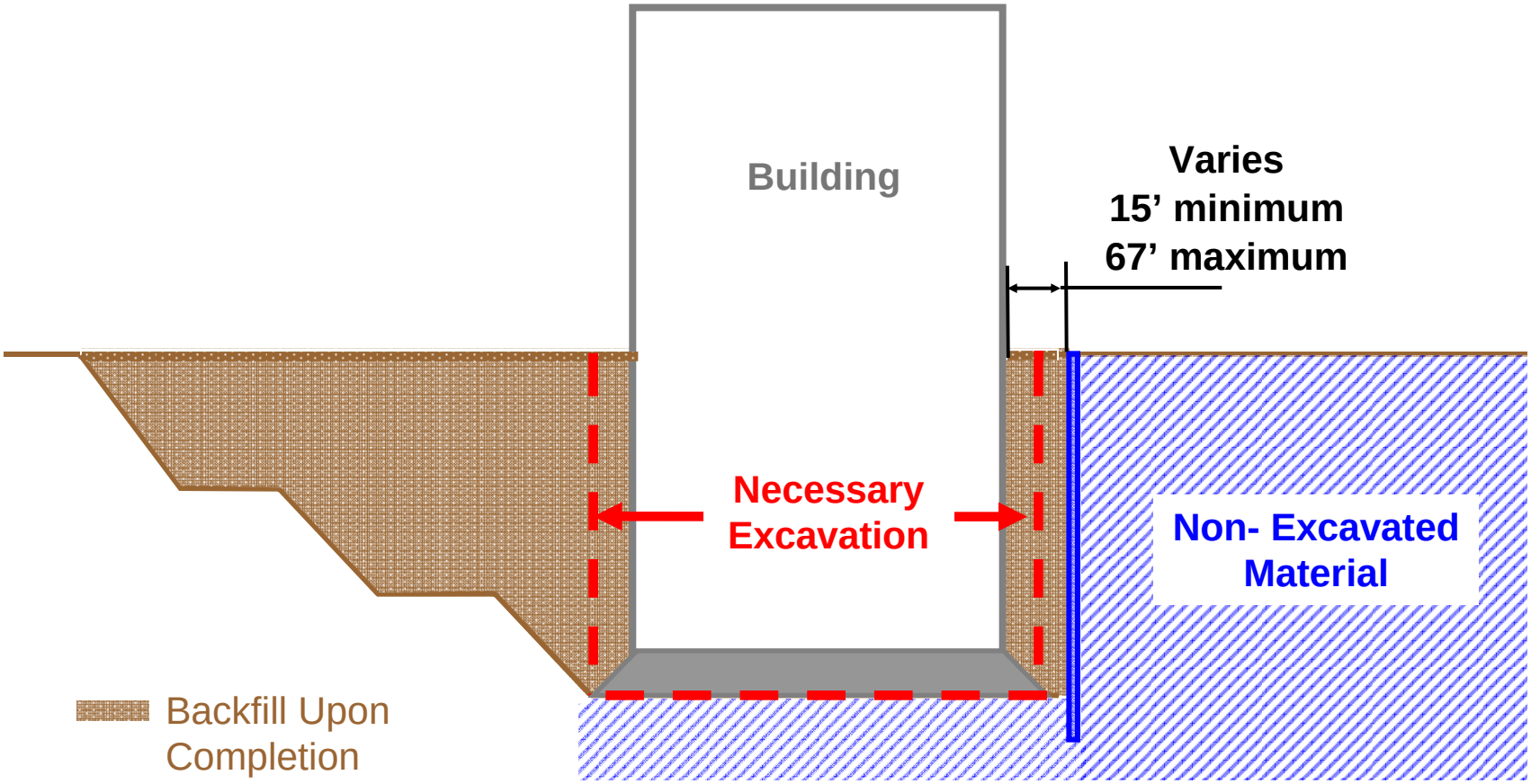
Necessary Excavation
(COL/ESP-ISG-004)

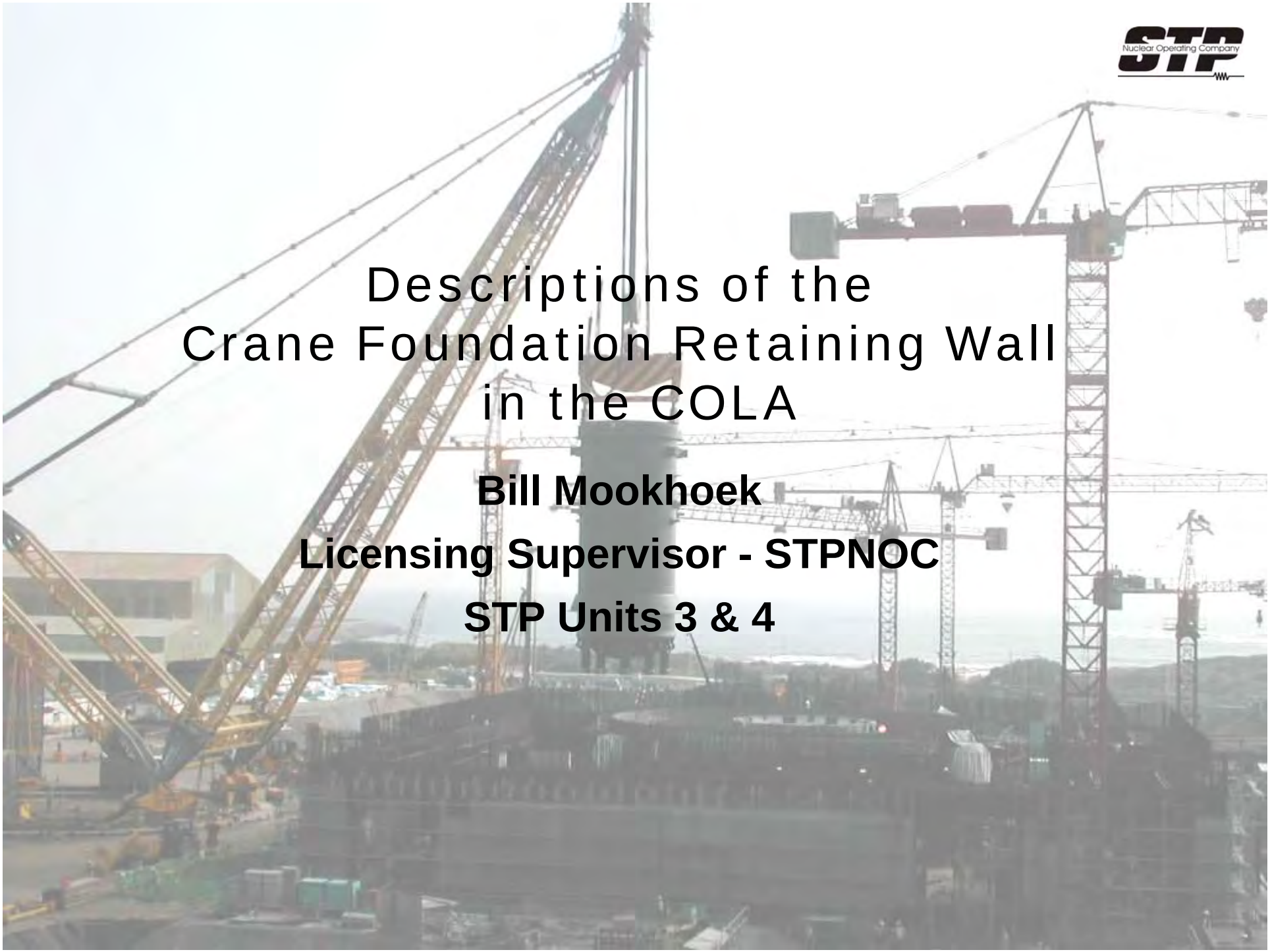
A necessary excavation is the portion of an excavation that provides sufficient access to the structures that are within the definition of construction.

Necessary Excavation – Simplified



Extent of Backfill





Descriptions of the Crane Foundation Retaining Wall in the COLA

Bill Mookhoek

Licensing Supervisor - STPNOC

STP Units 3 & 4

Reinforced Concrete Retaining Walls

FSAR Section 2.5S.4.5.2.4

At the east edge of the Reactor Buildings and Turbine Buildings, a retaining wall is required to accommodate the reach of a heavy lift crane needed to place the reactor vessels. This crane is capable of performing a 1275 metric tonne lift at a reach of approximately 235 feet.

Non-safety related reinforced concrete retaining walls are installed on the east side of STP 3 and also on the east side of STP 4. The sole purpose for these walls is to facilitate excavation activities. These two walls will retain the soil next to the deep excavations of the Reactor, Control and Turbine Building foundations and allow the crane areas to be at grade and near the buildings. The area on the west side of the retaining walls will be backfilled as construction progresses and the walls will be abandoned in place.

Reinforced Concrete Retaining Walls
FSAR Section 2.5S.4.5.2.4 (continued)

The reinforced concrete retaining walls will vary in exposed height to a maximum of 90 feet. Lateral support of the retaining wall is provided by a tieback and whaler system with horizontal and vertical spacing to be determined by analysis of the wall and soil interaction. The analysis is based on lateral pressure profiles for soil and hydrostatic conditions both during and after construction.

Reinforced Concrete Retaining Walls

FSAR Section 2.5S.4.5.2.4 (continued)

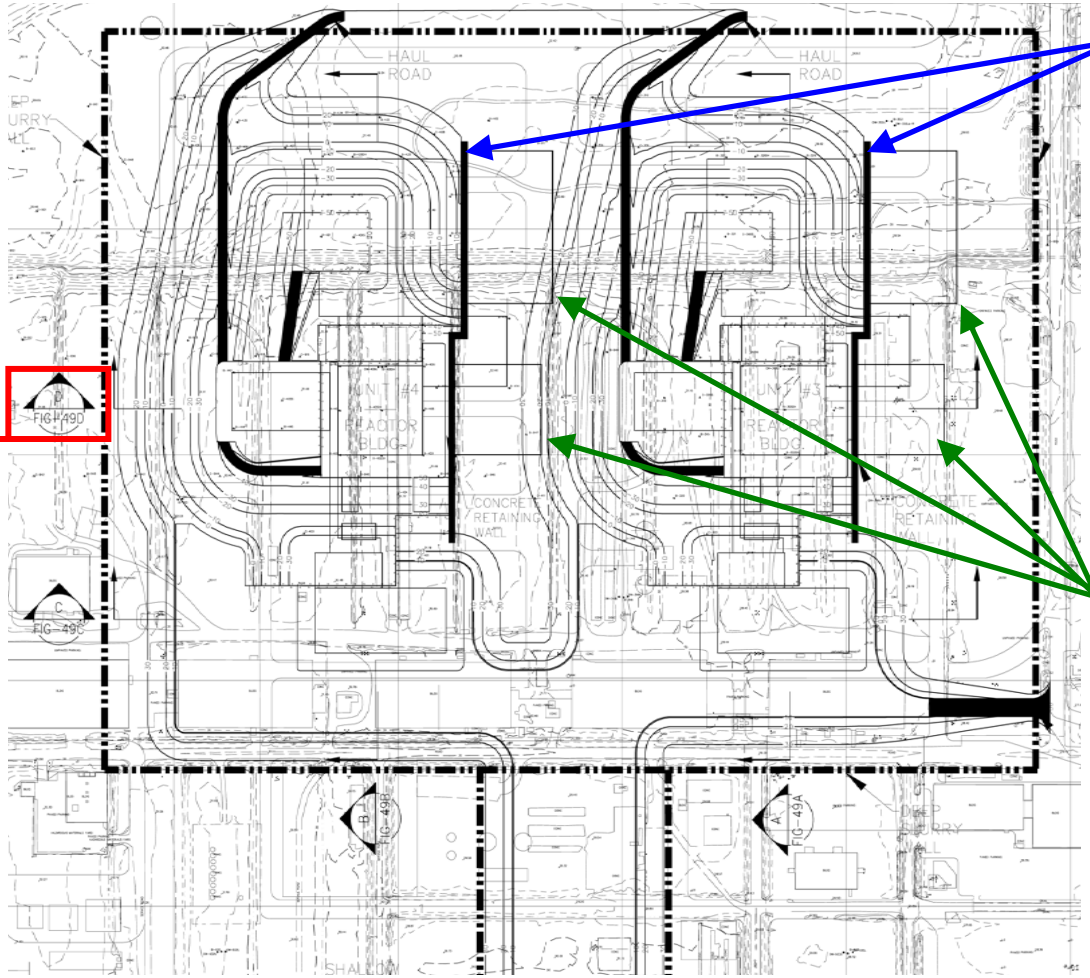
The locations of the walls are shown in plan on Figures 2.5S.4-48, and 2.5S.4-48A through 48B, and a typical wall section is shown on Figure 2.5S.4-54.

At grade crane areas are provided east of the STP 3 & 4 Reactor and Turbine Buildings for an equipment setting crane. A pile supported reinforced concrete foundation is provided for each area to support the equipment setting crane. The foundation and piles are designed to accommodate the crane loads and to minimize the surcharge load on the adjacent reinforced concrete retaining wall. The crane areas are shown in plan on Figures 2.5S.4-48, and 2.5S.4-48A through 48B.

Overall Excavation Plan

From FSAR Figure 2.5S.4-48

Section “D” view shown on next slide

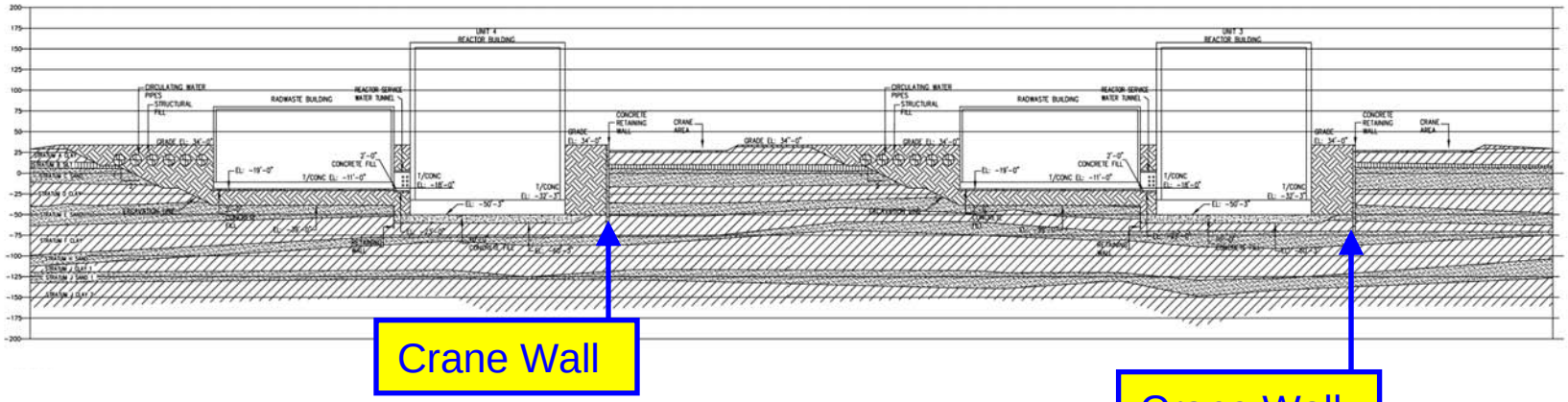


Crane Walls

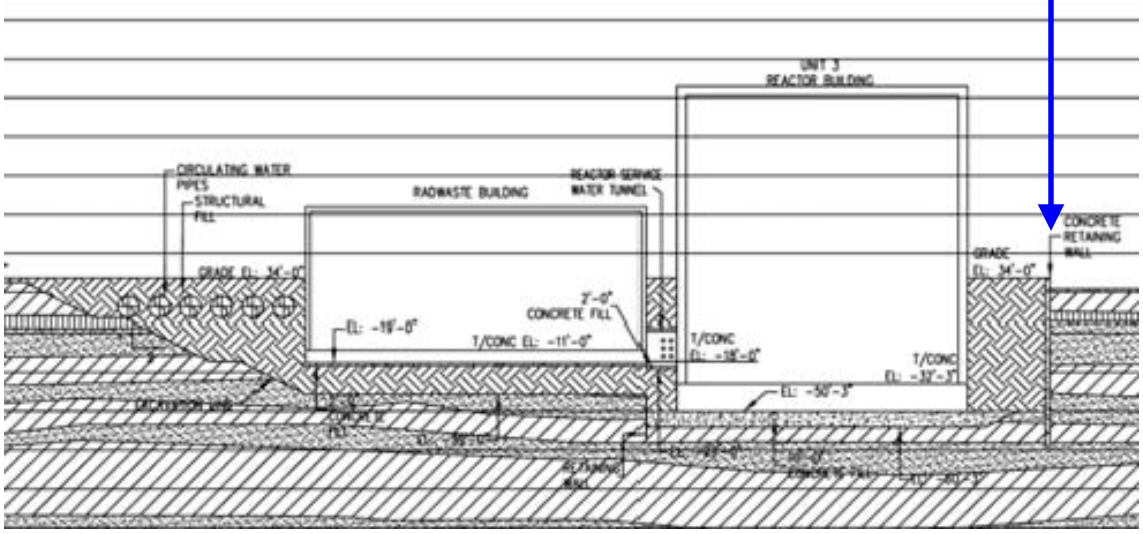
Crane Areas

Cutaway View

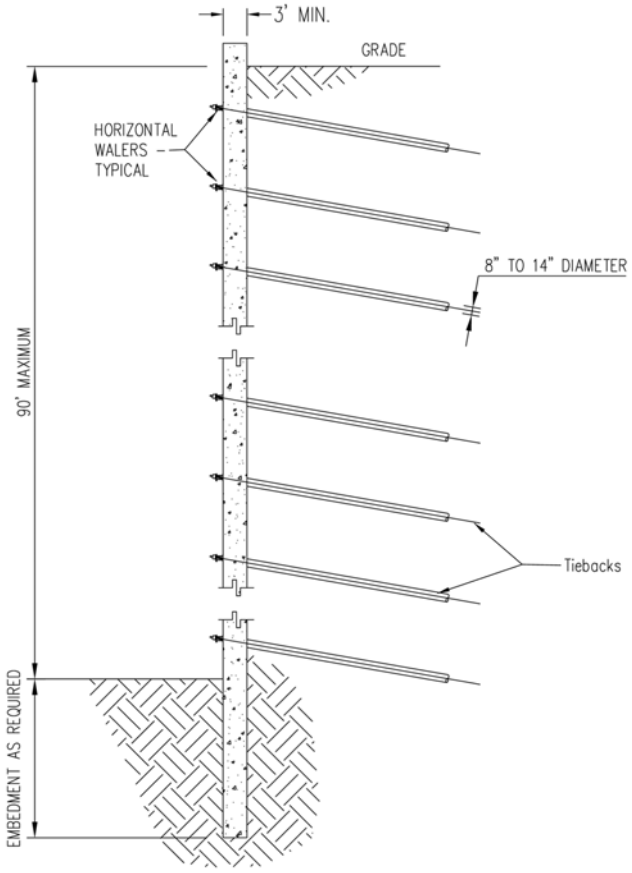
From FSAR Figure 2.5S.4-49D Section “D”



From South of the Reactor Buildings looking North



Reinforced Concrete Retaining Wall Section
FSAR Figure 2.5S.4-54



Concrete Retaining Wall Installation

FSAR Section 2.5S.4.5.4.4

The concrete retaining walls are installed utilizing the "slurry trench" method.

This method consists of excavating a "one bucket wide" trench that is continuously filled with "slurry". The slurry exerts positive hydrostatic pressure against the trench wall, thereby maintaining vertical excavation sidewalls, even below the groundwater table, which enables the placement of reinforcing and concrete.

Concrete Retaining Wall Installation

FSAR Section 2.5S.4.5.4.4 (continued)

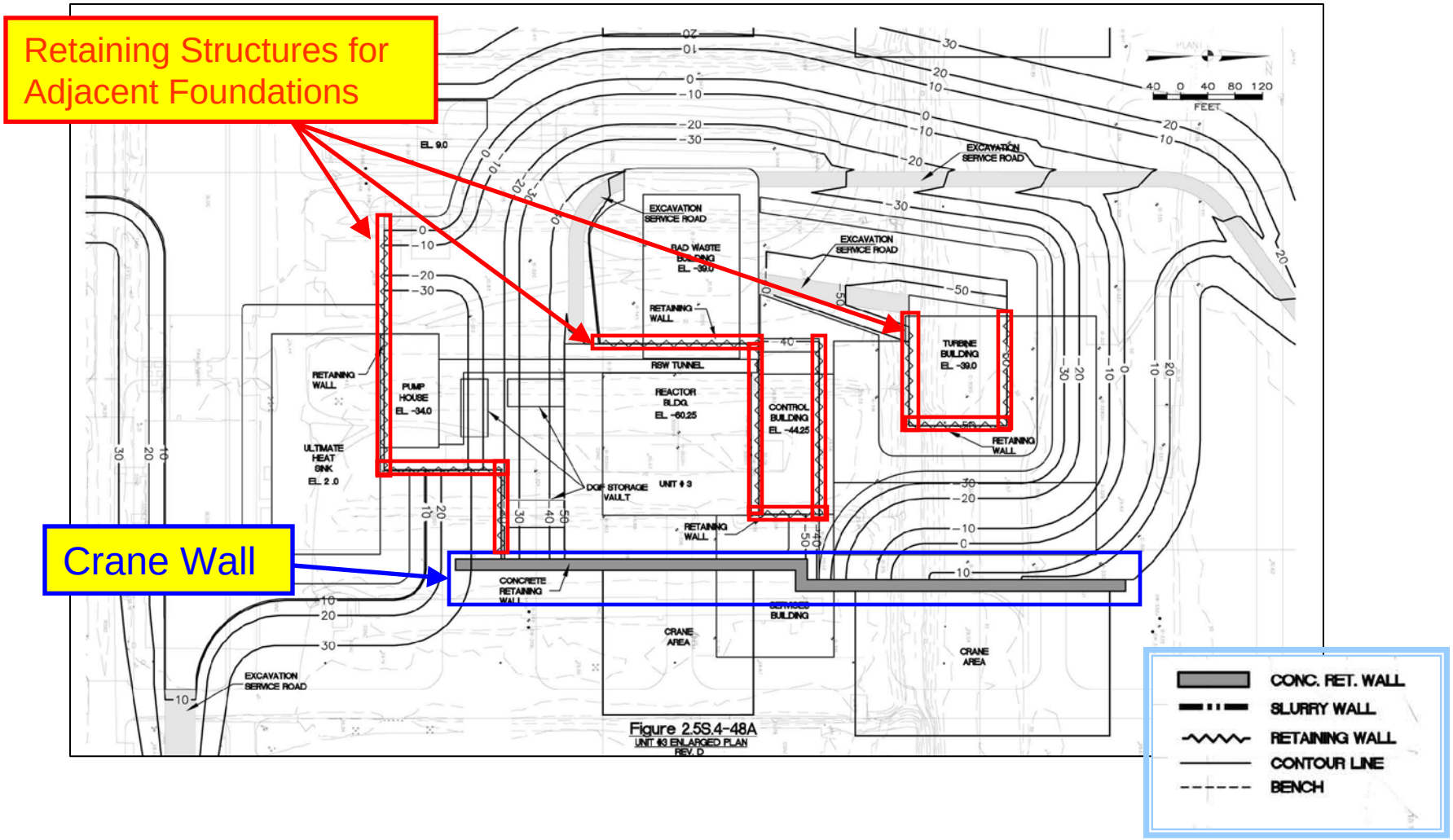
The anticipated sequence for construction of the retaining wall is as follows:

- A full depth and width slurry excavation is made with the excavation being maintained by the slurry
- Reinforcing is placed in the slurry filled trench
- Concrete is placed by tremie in the excavation from bottom up
- As the site construction excavation proceeds on the west side of the wall, tiebacks and whalers are installed

At grade, crane foundations are installed at each of the heavy lift crane areas. Auger cast or slurry displaced drilled shafts are drilled and installed. A reinforced concrete pile cap is installed on the piles. The pile cap will provide a stable foundation for the heavy lift crane.

Unit 3 Enlarged Plan

FSAR Figure 2.5S.4-48A



Retaining Structures for Adjacent Foundations

FSAR Section 2.5S.4.5.2.3

Excavation plan and sections, Figures 2.5S.4-48, 2.5S.4-48A through 48C and 2.5S.4-49A through 2.5S.4-49B show the approximate limits of temporary ground support. These will remain in place and will not support permanent structural loads. A soil retaining structure is provided for three sides of the STP 3 & 4 Control building foundations. This structure is required due to the proximity and difference in elevation of the Reactor Building foundation to the south and the Turbine Building foundation to the north of the Control Building foundation. At the south edge of the Turbine Buildings, there is an abrupt change in grade (from the subgrade levels of the Control Buildings at El. -42 feet, to the subgrade levels of the Turbine Buildings at El. -26 feet) that cannot be accommodated by a stable soil slope. A retaining wall will be required on the east side of the Radwaste Buildings to facilitate excavation and construction activities. In order to facilitate the installation of the Circulating Water Pipes under the Turbine Building additional retaining structures will be installed. Both the Turbine retaining structures and the Radwaste retaining structures are anticipated to be left in place and backfill placed around both sides.

Method for Evaluating Preconstruction Activities

Lanny Dusek

Regulatory Affairs Director – Fluor

STP Units 3 & 4

Primary References

- Limited Work Authorization Final Rule with Statements of Consideration, October 9, 2007 (72 FR 57415)
- 10 CFR 50.10, “License Required; Limited Work Authorization”
- “Response to Public Comments on COL/ESP-ISG-4, ‘Interim Staff Guidance on the Definition of Construction and on Limited Work Authorizations,’” (ML083540279)
- NEI Letter to NRC Chief, Rulemaking, Guidance and Advanced Reactor Branch, “Revised and Additional Examples of Preconstruction Activities,” January 7, 2009

Primary References **(continued)**

- COL/ESP-ISG-004, Interim Staff Guidance on the Definition of Construction and on Limited Work Authorizations, February 9, 2009
- NRC EDO Memorandum to the Commission, “Update on Implementation of the Limited Work Authorization Rulemaking,” March 17, 2009 (ML090350121)

Background

10CFR50.10, “License Required; Limited Work Authorization”

Rule Change October 9, 2007 (72 FR 57415)

Major change was a change to the definition of construction in 10 CFR 50.10(a) to exclude those activities that have no reasonable nexus to radiological health and safety or common defense and security.

10 CFR 50.10(a)(1)

(1) **Activities constituting construction** are the driving of piles, subsurface preparation, placement of backfill, concrete, or permanent retaining walls within an excavation, installation of foundations, or in-place assembly, erection, fabrication, or testing, which are for:

(i) Safety-related structures, systems, or components (SSCs) of a facility, as defined in 10 CFR 50.2;

(ii) SSCs relied upon to mitigate accidents or transients or used in plant emergency operating procedures;

(iii) SSCs whose failure could prevent safety-related SSCs from fulfilling their safety-related function;

10 CFR 50.10(a)(1) Preconstruction Screening Evaluation **(continued)**

(iv) SSCs whose failure could cause a reactor scram or actuation of a safety-related system;

(v) SSCs necessary to comply with 10 CFR part 73;

(vi) SSCs necessary to comply with 10 CFR 50.48 and Criterion 3 of 10 CFR part 50, Appendix A; and

(vii) Onsite emergency facilities, that is, technical support and operations support centers, necessary to comply with 10 CFR 50.47 and 10 CFR part 50, appendix E.

10 CFR 50.10(a)(2) Preconstruction Screening Evaluation

(2) **Construction does not include**:

(i) Changes for temporary use of the land for public recreational purposes;

(ii) Site exploration, including necessary borings to determine foundation conditions or other preconstruction monitoring to establish background information related to the suitability of the site, the environmental impacts of construction or operation, or the protection of environmental values;

(iii) Preparation of a site for construction of a facility, including clearing of the site, grading, installation of drainage, erosion and other environmental mitigation measures, and construction of temporary roads and borrow areas;

(iv) Erection of fences and other access control measures;

(v) Excavation;

10 CFR 50.10(a)(2) Preconstruction Screening Evaluation **(continued)**

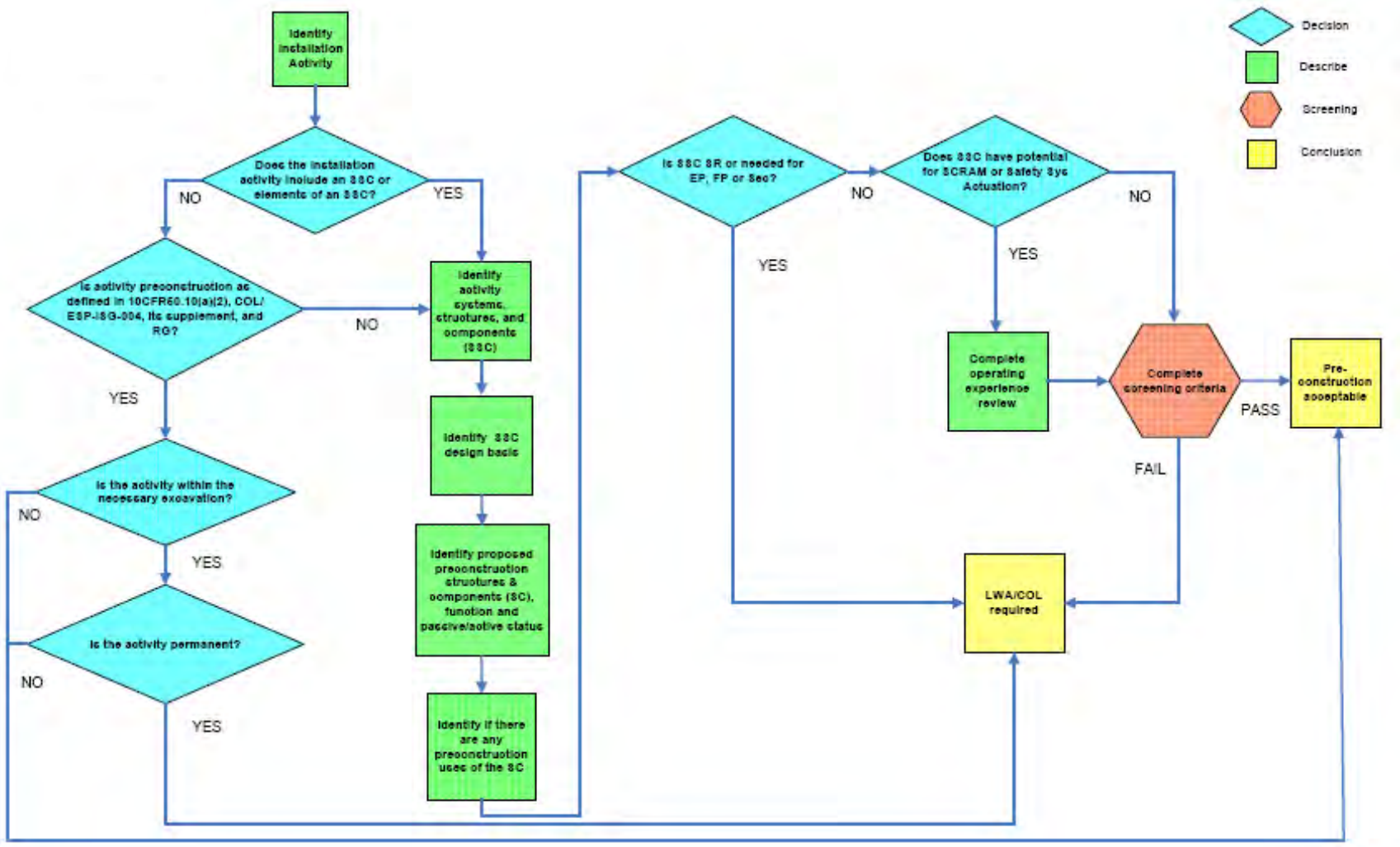
(vi) Erection of support buildings (such as, construction equipment storage sheds, warehouse and shop facilities, utilities, concrete mixing plants, docking and unloading facilities, and office buildings) for use in connection with the construction of the facility;

(vii) Building of service facilities, such as paved roads, parking lots, railroad spurs, exterior utility and lighting systems, potable water systems, sanitary sewerage treatment facilities, and transmission lines;

(viii) Procurement or fabrication of components or portions of the proposed facility occurring at other than the final, in-place location at the facility;

(ix) Manufacture of a nuclear power reactor under a manufacturing license under subpart F of part 52 of this chapter to be installed at the proposed site and to be part of the proposed facility;

Preconstruction Screening



Summary of Evaluations

- **Slurry Wall → Preconstruction**
  - Installed to allow excavation and dewatering for U3&4 without affecting groundwater levels associated with supporting U1&2 (i.e., site preparation).
  - Outside the excavation area.
- **Activities outside Slurry Wall boundary → Preconstruction**
  - General site preparation activities and permanent plant facilities not under 10 CFR 50.10(a)(1).
  - Outside the excavation area.
- **Circulating Water System Piping → Preconstruction**
  - Installed and buried in its excavated trench represents installation of an SSC with no reasonable nexus to radiological health and safety or common defense and security.
  - Not within the Necessary Excavation.

Summary of Evaluations (continued)

- **Sheet Piling and Associated Tie-Backs in Unit 3 Excavation between the Reactor Building and the Control Building**

  → **LWA or COL is Required**

  – Sheet piling would be driven to retain soil to allow deeper excavation of a portion of the necessary excavation for U3&4 (i.e., site prep).

  – Sheet piling would not support any portion of U3&4 structures.

  – Within the Necessary Excavation for safety-related SSCs.

Summary of Evaluations (continued)

- **Crane Foundation Retaining Wall → Preconstruction**
  - is an aid to Construction;
  - is not within the Necessary Excavation;
  - is not for any of the items listed under 10CFR 50.10(a)(1); and
  - has no adverse interactions with Construction-related SSCs

Evaluation of Crane Foundation Retaining Wall

Bob Hooks

Building Design Director – Sargent & Lundy

STP Units 3 & 4

Evaluation of Crane Foundation Retaining Wall

1. **Does the installation activity include an SSC or elements of an SSC that will be a permanent part of the operating plant?**

   ☐ Yes ☑ No

2. **Is the activity preconstruction as defined in 10CFR50.10(a) and COL/ESP-ISG-004?**

   ☑ Yes ☐ No

   - Installed in situ via continuous vertical excavation/slurry installation.
   - Installed to retain soil upon which the crane pads will be installed while allowing for digging a portion of the necessary excavation for U3&4.
   - As excavation proceeds, crane wall lateral support is provided by the installation of soil anchors.
   - Retaining wall will not support any portion of U3&4 structures.

3. **Is the activity taking place within the necessary excavation?**

   ☐ Yes ☑ No

Conclusion = Preconstruction Activity

Construction Crane Foundations and Support Pads **(COL/ESP-ISG-004)**

Construction includes placing permanent features (e.g., retaining walls and foundations) within the necessary excavations for SSCs within the definition of construction.

- STP 3 & 4 Crane Foundation Retaining Walls are being installed outside the Necessary Excavation; and
- Not for any SSCs within the definition of construction.

Site preparation activities that are performed outside the necessary excavations are considered preconstruction.

Necessary Excavation
(COL/ESP-ISG-004)

A necessary excavation is the portion of an excavation that provides sufficient access to the structures that are within the definition of construction.

Applicants should ensure that these preconstruction activities are separate from, and do not result in adverse interactions with, construction-related SSCs, including influence on the stability (static and dynamic) analyses.

Demonstration of No Influence
(COL/ESP-ISG-004)

In order to show that the Crane Foundation Retaining Wall installation does not influence the stability (static and dynamic) analyses, three aspects were addressed:

- Seismic Soil Structure Interaction (SSI)
- Static Bearing Capacity
- Dynamic Bearing Capacity

Seismic Soil Structure Interaction (SSI)

Net Effect on SSI is Negligible

- The presence of the Crane Foundation Retaining Wall does not affect the Seismic Analysis and Design of either the Reactor Building or the Control Building.
- The project's Site Specific seismic analyses are based on the models described in the DCD
  - 3D SASSI Models as described in the DCD
  - Site Specific Soil Properties
  - Site Specific SSE

Seismic Soil Structure Interaction (SSI)

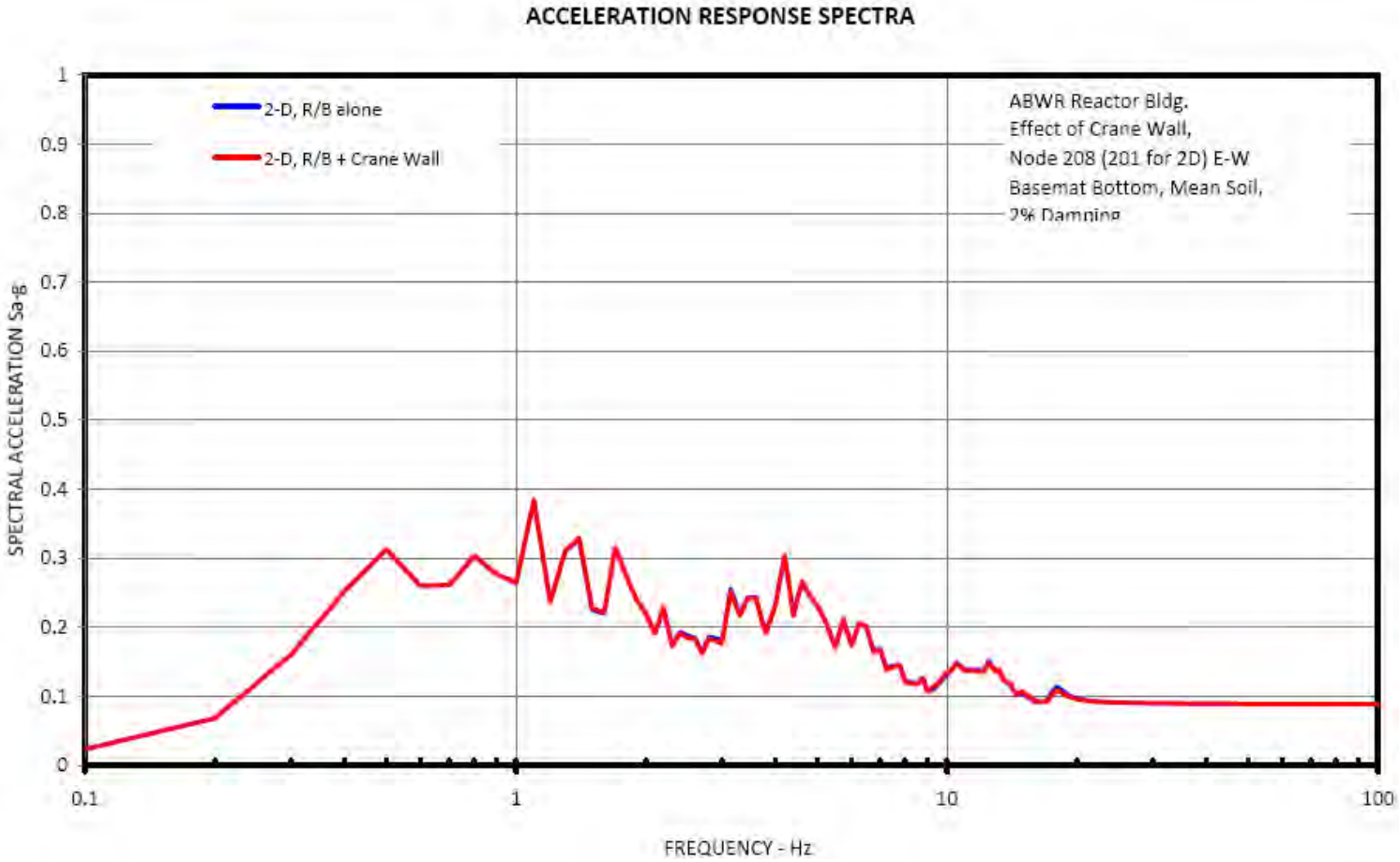
Crane Foundation Retaining Wall evaluation*

- Developed a 2D SSI model for the Reactor Building and performed an analysis with SASSI using Site Specific Soil Properties and SSE
- Compared the results of the 2D analyses with the Site Specific 3D analyses
- Determined that the 2D model and analysis results are compatible with the 3D model and results
- Performed an analysis with SASSI using Site Specific Soil Properties and SSE with the Crane Foundation Retaining Wall incorporated into the 2D model
- Compared the results of the analyses with and without the Crane Foundation Retaining Wall

* Calculations supporting these evaluations have been completed. These calculations will be placed in project files when all QA program requirements have been completed.

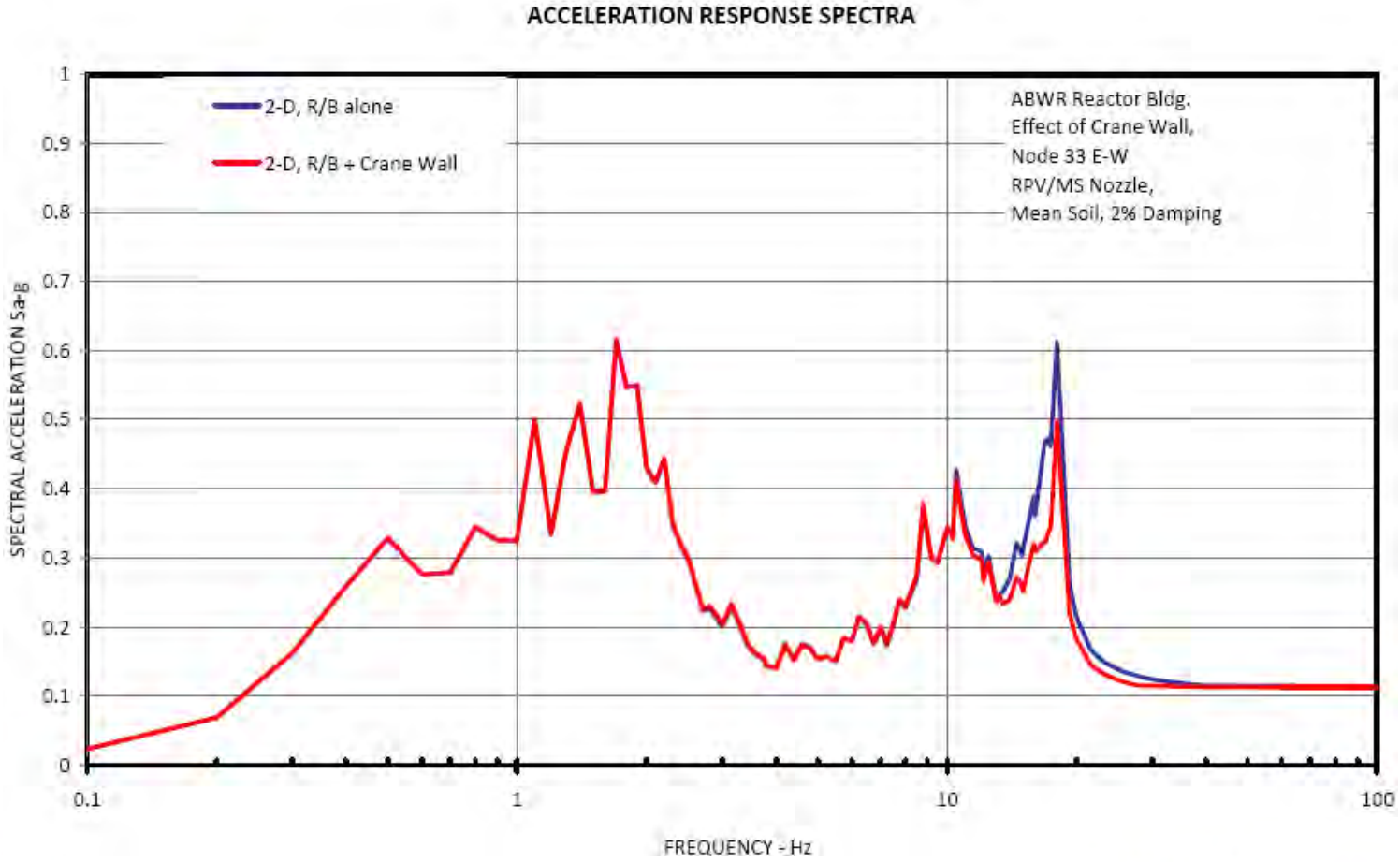
Seismic Soil Structure Interaction (SSI)

- Basemat Bottom Response Spectra – no significant difference in magnitude or frequency response



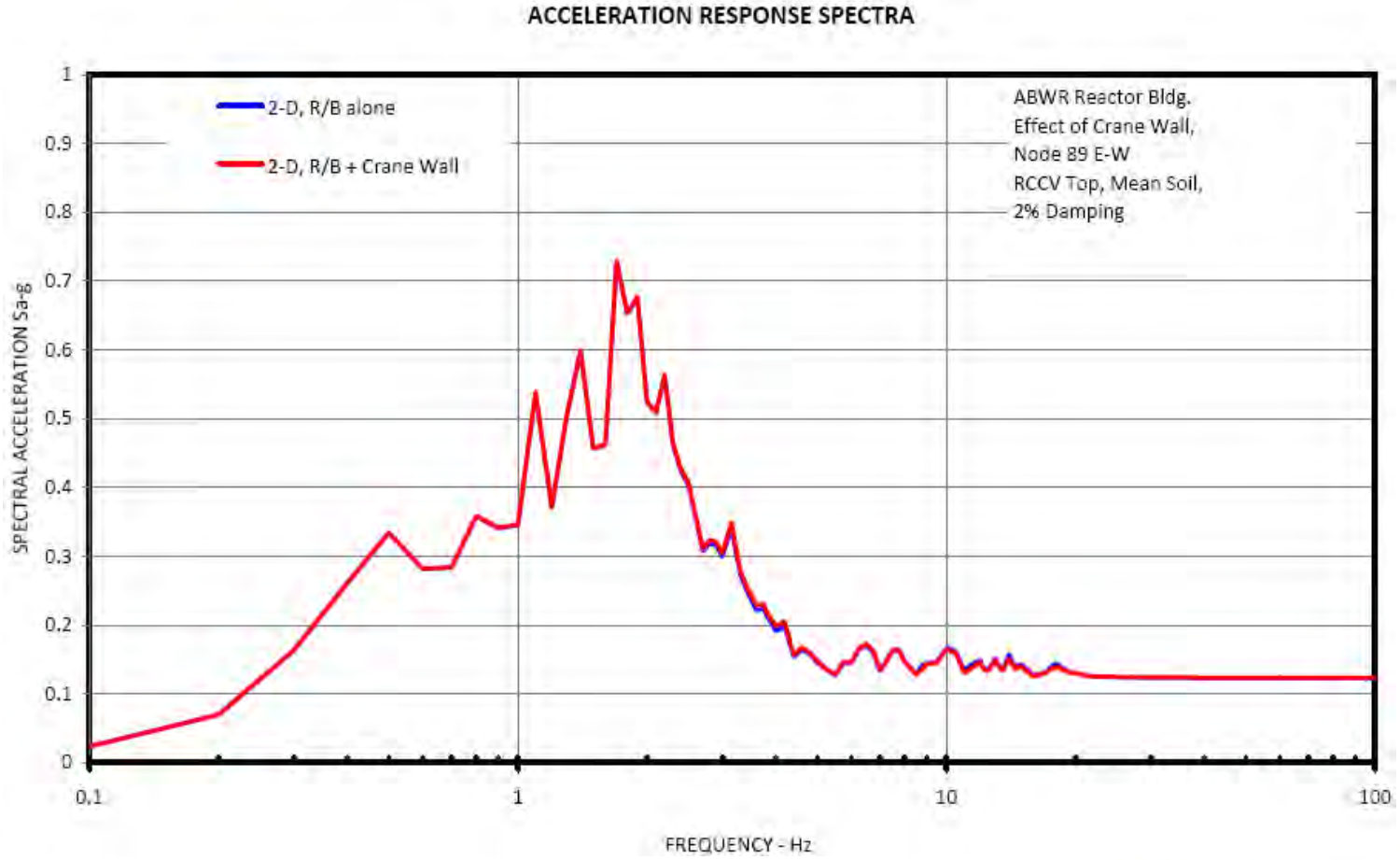
Seismic Soil Structure Interaction (SSI)

- RPV/MS Nozzle Response Spectra – no significant difference in magnitude or frequency response



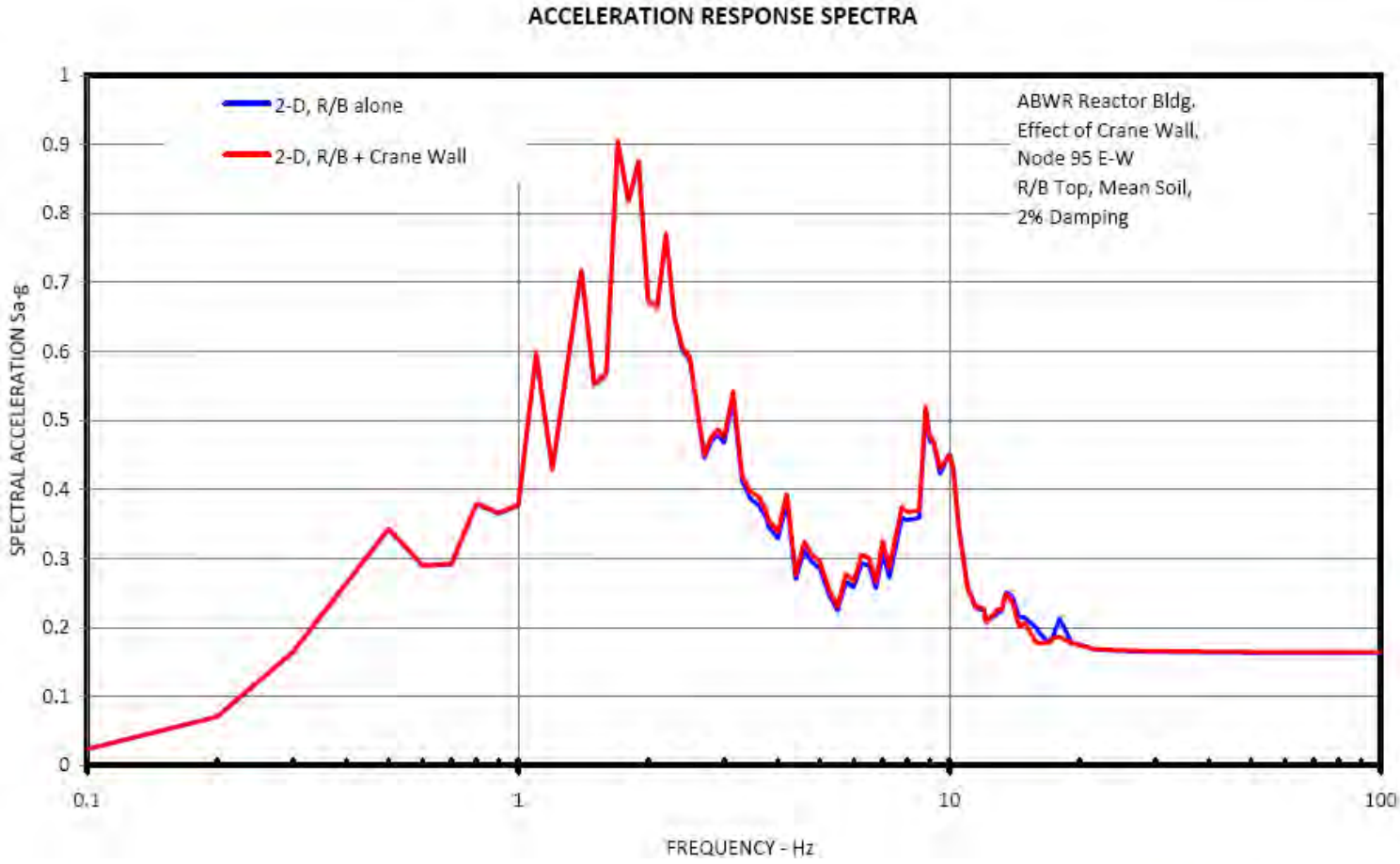
Seismic Soil Structure Interaction (SSI)

- RCCV Top Response Spectra – no significant difference in magnitude or frequency response



Seismic Soil Structure Interaction (SSI)

- R/B Top Response Spectra – no significant difference in magnitude or frequency response



Seismic Soil Structure Interaction (SSI)

- Forces – no significant difference

Effect Of Crane Wall on Maximum Forces, Mean Soil				
			Model in SASSI Analysis	
			2-D R/B (alone)	2-D R/B + Crane
Beam Element	Location	Response Type	RM94X	RWM97X
28	Shroud Support	Shear	119	119
		Moment	2,494	2,492
69	RPV Skirt	Shear	371	372
		Moment	6,490	6,433
78	RSW Base	Shear	313	315
		Moment	4,750	4,752
86	Pedestal Base	Shear	1,815	1,825
		Moment	110,857	111,627
89	RCCV at Grade	Shear	5,704	5,729
		Moment	286,375	289,930
99	R/B at Grade	Shear	13,851	13,951
		Moment	1,057,415	1,064,920

Seismic Soil Structure Interaction (SSI)

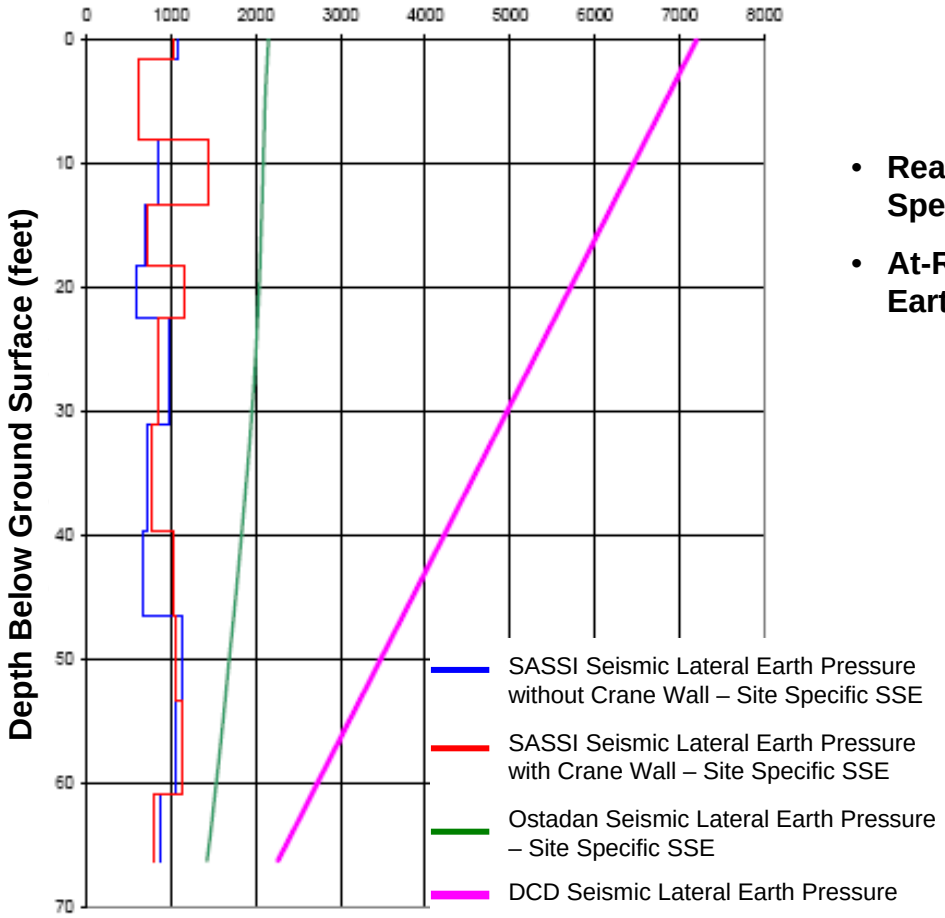
Lateral Wall Pressure

- The Reactor Building exterior walls are designed for the larger of:
  - **Lateral earth pressures determined from the methods and properties described in the DCD**
  - **Lateral earth pressures determined from Site Specific soil properties using the alternate method described in the COLA (Reference 2.5S.4-62*)**
- Both of the methods described above yield results substantially more conservative than the values obtained from the SASSI analysis
- As expected, lateral soil pressures on R/B walls, obtained from SASSI analysis, are increased due to the presence of the crane foundation wall
- Lateral soil pressures obtained from the SASSI analysis are not relied upon for design since they are enveloped by the other analyses

* The alternate method described in the COLA is based upon "Seismic Soil Pressure for Building Walls – An Updated Approach," The 11th International Conference on Soil Dynamics and Earthquake Engineering (11th ICSDEE) and the 3rd International Conference on Earthquake Geotechnical Engineering (3rd ICEGE), Ostadan, F., 2004.

Seismic Soil Structure Interaction (SSI)

- Comparison of Lateral Wall Pressures



- **Reactor Building Site Specific SSE**
- **At-Rest Seismic Lateral Earth Pressure (psf)**

Seismic Soil Structure Interaction (SSI)

Net Effect of the Crane Foundation Retaining wall on SSI is Negligible

- Similar analyses were performed for the Control Building, yielding similar results.
- The presence of the Crane Foundation Retaining Wall does not affect the Seismic Analysis and Design of either the Reactor Building or the Control Building.

Static Bearing Capacity

Net Effect on Static Bearing Capacity is Negligible

- Ultimate bearing capacity will exceed the applied soil bearing pressures by an adequate safety factor of three

- Bearing pressures beneath the Crane Foundation Retaining Wall are less than one-tenth of the bearing pressures applied by the adjacent SSCs

Static Bearing Capacity (continued)

Assessment Considerations:

- Change in settlement caused by a smaller backfill zone between the structure and the Crane Foundation Retaining Wall
- Impact to settlement due to adhesion created between the structural fill and the Crane Foundation Retaining Wall
- Impact of adhesion on soil rebound

Static Bearing Capacity (continued)

Assessment Considerations (continued):

- Total settlement increases slightly at side closest to the Crane Foundation Retaining Wall due to change in configuration of the backfill
- The settlement increase is negated from the reduction in settlement caused by adhesion between the soil and the Crane Foundation Retaining Wall
- The net result shows little difference in the overall settlement previously calculated
- Angular distortion is slightly reduced

Net Effect on Static Bearing Capacity is Negligible

Dynamic Bearing Capacity

Net Effect on Dynamic Bearing Capacity is Negligible

- The concrete elements replacing the equivalent soil have a negligible effect on the input parameters used in evaluating the dynamic soil bearing capacity

Dynamic Bearing Capacity (continued)

Assessment Considerations:

- The Crane Foundation Retaining Wall occupies a very small volume relative to the overall soil mass and represents a small increase in overall weight as compared to the replaced soil (150 pcf vs. 125 to 130 pcf)
- The horizontal slab (crane pad) has only a small increase in overall weight as compared to the replaced soil
- Concrete is stiffer than the soil and has slightly higher dynamic parameters as compared to the replaced soil
- The bottom of the Crane Foundation Retaining Wall is below the bottom of the excavation therefore the wall has no loading effect on the foundations

Net Effect on Dynamic Bearing Capacity is Negligible

Demonstration of No Influence

Conclusions

The Crane Foundation Retaining Wall installation **does not influence** the stability (static and dynamic) analyses. Three aspects have been analyzed:

- Seismic Soil Structure Interaction (SSI)
  - The presence of the Crane Foundation Retaining Wall **does not affect** the Seismic Analysis and Design of either the Reactor Building or the Control Building.
- Static Bearing Capacity
  - Net Effect on Static Bearing Capacity is **Negligible**
- Dynamic Bearing Capacity
  - Net Effect on Dynamic Bearing Capacity is **Negligible**

Concluding Remarks

Scott Head

Regulatory Affairs Manager - STPNOC

STP Units 3 & 4