Alaskan Way Viaduct & Seawall Replacement

Estimate of Engineering

SR99 Tunnel: Seismic Design Criteria White Paper

Summary Structural Hours Prioritized by Need.

Summary By Need Vs Discipline

Tag	Name	Description
I	Required	Needed for CE – In Scope
II	Needed	Needed for CE – Not in Current Scope
III	Useful	Good for CE – May be Postponed
IV	Good	Good for Clarity of Presentation
V	Project	Project Overhead Including Reviews & Meetings

Discipline		Required	Needed	Useful	Good	Project	*Sum*	Total
Start -- Insert Rows Below								
Engineering (Senior; QA/QC)	EngSr	69	0	0	0	0	**69**	***69***
Engineering	Eng	165	0	0	0	0	**165**	***165***
Drafting (Senior; QA/QC)	DrfSr	0	0	0	0	0	**0**	***0***
Drafting	Drf	0	0	0	0	0	**0**	***0***
Word Pro/Admin	Adm	15	0	0	0	0	**15**	***15***
End -- Insert Rows Above								
Total	249	**249**	**0**	**0**	**0**	**0**	***249***	***249***

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Running Total Raw	36.0	164.0	0.0	0.0	14.0	**214.0**		
Running Total Final	68.8	165.4	0.0	0.0	14.7	**248.9**		

Item Description Analysis	Hours (Raw) Engineer (Senior)	Hours (Raw) Engineer	Hours (Raw) Drafting (Senior)	Hours (Raw) Drafting	Hours (Raw) Admin	Total (Final) Hours	*Remarks*	Need
Start -- Insert Rows Below								
General						**0**		*I*
Calculations:						**0**		*I*
Coordinate w/ Geotechnical	*2.0*	*4.0*				**7**	*Assume BST Ground distortions applicable to Bore Tunnel. Use SB Undercross data developed for 108, 1000, and 2500 year events as applicable to South Portal. Mononobe-Okabe applicable to North Portal*	*I*
Bore Tunnel Ovaling – Classical Analysis	*2.0*	*8.0*				**12**	*Perform Hand Calculations Ovaling Analysis. Use BST Ground Distortion Curves. Apply J Wang close form solutions.*	*I*
Bore Tunnel Ovaling – Evaluation	*2.0*	*4.0*				**7**	*As part of CE work FLAC models will be run. Compare Hand Calculation to Numerical Analysis.*	*I*
Evaluate Deep Cut and Cover Section	*2.0*	*6.0*				**9**	*Assume Construction case developed as part of CE. Calculations to verify when slabs & deck are in place Seismic Does Not Control.*	*I*
South Portal Retaining Walls – Loads	*4.0*	*16.0*				**23**	*Evaluate w/ RISA3D Model for 108, 1000, 2500 year Loads for SB.*	*I*
South Portal Retaining Walls – Capacities	*4.0*	*24.0*				**33**	*Develop Applicable Criteria. Conflicting codes ATC-49 for 108, 2500 Year forced based; 1000-year AASHTO T3 deflection based. 108-year Elastic; 1000, 2500 year Plastic. Develop Consistent Approach.*	*I*
North Portal Retaining Walls – Loads	*4.0*	*16.0*				**23**	*Develop Mononobe-Okabe Loading. Evaluate w/ RISA3D Model for 108, 1000, 2500 year loads. Exterior Walls Secant Piles. Interior Walls MSE.*	*I*
North Portal Retaining Walls – Capacities	*2.0*	*16.0*				**21**	*Evaluate Capacities. Use procedures developed for S. Portal*	*I*
Develop Costs						**0**		*I*
Quantities.	*2.0*	*8.0*				**12**	*Develop the difference in quantities for controlling Seismic event, 108, vs 1000, 2500. Assume is mostly a difference in reinforcement ratio.*	*I*
Cost	*4.0*	*4.0*			*0.0*	**9**	*Develop cost: Assume use Unit cost already available. Develop appropriate raw cost multipliers for project cost.*	*I*
Write Report						**0**		*I*
Outline:		*2.0*			*1.0*	**4**	*Write Outline and QPL*	*I*
Introduction: Dual Criteria & Risk		*4.0*			*1.0*	**6**	*Discusses need for dual criteria and 2500 year upper level event. Draft version already largely done in draft technical memorandum.*	*I*
Other Jurisdictions Seismic Criteria	*2.0*	*8.0*			*1.0*	**13**	*Survey other jurisdictions seismic criteria. Need to be based on recent codes and understanding of seismic demands on tunnels.*	*I*
Analysis Procedure		*8.0*			*1.0*	**11**	*Briefly discusses the analysis performed and limitation.*	*I*
Findings		*8.0*			*1.0*	**11**	*Layout findings for Bored Tunnels, Cut and Cover, Retained Cuts*	*I*
Cost Comparison		*4.0*			*0.5*	**5**	*Summarize the cost differences. Present as percentage of tunnel construction cost and project cost.*	*I*
Conclusion		*4.0*			*0.5*	**5**	*Summary and Recommendations*	*I*
Technical Editing	*2.0*	*4.0*				**7**	*One round of technical edits and pick-ups.*	*I*
Final Version	*2.0*	*4.0*			*4.0*	**11**	*Incorporate Lead Agency Comments. Submit*	*I*
Reviews for Report						**0**		*I*
Discipline/IDCR		*8.0*			*2.0*	**12**	*4 reviewers @ 2Hr Ea*	*I*
Lead Agency	*2.0*	*4.0*			*2.0*	**9**	*Comment Resolution and Meeting*	*I*
End -- Insert Rows Above								
Totals	*36*	*164*	*0*	*0*	*14*	**249**		
Note: "Final Hours" Include QC and Coordination.								