Risk Evolution from Planning to Construction on the LA Metro Crenshaw/LAX Light Rail Transit Project

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Crenshaw/LAX Light Rail Transit Project Overview - North/South Line

Division 16 Southwestern Yard Maintenance Facility 8.5 miles Light Rail 8 Stations \$2,058.0 Million (Board approved revised LOP)

 Neighborhoods: Crenshaw, Inglewood, Westchester

Crenshaw/LAX Light Rail Transit Project Base Project – Vertical Profile





Crenshaw/LAX Light Rail Transit Project Risk Methodology and Approach

- FTA compliant Risk Management Program developed during the Planning Phase.
- Risk Workshops held at significant key project milestones.
- Register developed and maintained as a management tool throughout the project.
- Project elected to conduct an independent schedule assessment after 35% completion.

Crenshaw/LAX Light Rail Transit Project Risk Register Evolution

			Env	viron Plan	nmei ning	ntal 3		Pro	ocur	em	ent		Construction														
R	isk ID	Risk Description	2011-06	2011-09	2011-12	2012-03	2012-06	2012-09	2012-12	2013-03	2013-06	2013-09	2013-12	2014-03	2014-06	2014-09	2014-12	2015-03	2015-06	2015-09	2015-12	2016-03	2016-06	2016-09	2016-12	2017-03	2017-06
	10	Damage of existing utilities during construction	12	12	12	12	12	12	12	12	12	12	8	8	8	8	10	10	10	10	10	10	10	10	10	6	4
	72	Utility relocation costs and construction duration may be greater than that included in the baseline estimate.	10	10	10	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	0	0
	76	Utility relocation, including design and construction activities, delays construction activities. This is particularly significant under a design/build contracting scenario.	14	14	14	14	9	9	9	3	3	3	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0
	171	Temporary suspension of night time construction variance for one segment may impact the project schedule and cost.	0	0	0	0	0	0	0	0	0	0	11	11	5	11	5	3	3	3	3	3	3	3	3	5	3
	209	Construction operations exceeding allowable noise levels	0	0	0	0	0	0	0	0	0	0	12	12	16	12	16	12	12	12	12	12	12	6	6	0	0
	70	Cut and Cover at MLK Station Box; pedestrian, traffic and business disruptions	10	10	10	10	10	10	10	8	8	8	6	6	9	6	9	9	9	9	9	9	9	9	9	0	0
	172	Differing Site Conditions, such as: Excessive caving/cobbles/ groundwater treatment, cobbles, abrasive soils, H2S and CH4 gasses.	0	0	0	0	0	0	0	0	0	0	7	7	7	7	7	11	11	11	12	12	12	12	12	0	0
	262	Tunneling issues: Muck handling with limited storage areas available onsite, breakdowns & supporting equipment, launching TBM, ground settlement.	0	0	0	0	0	0	0	0	0	0	9	9	12	9	16	12	12	12	12	12	12	12	12	2	0
▶	141	Potential for added scope to the project due to community demands.	11	11	11	11	11	11	11	7	7	7	14	14	12	14	12	12	12	12	12	12	12	12	12	12	9
▶	250	Changes due to design comments during design review process.	0	0	0	0	0	0	0	0	0	0	16	16	18	16	14	14	14	14	14	12	12	12	12	12	12
▶	319	96th St Station - Metro future station accommodation.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	12	10	10	10	12	12	12	12	0	0
	71	Cut and Cover at Harbor Sub/Crenshaw box; pedestrian, traffic and business disruptions.	10	10	10	10	12	12	12	8	8	8	6	6	9	6	9	9	9	9	9	9	9	9	9	0	0
	143	Untimely interfaces between Design-Build Contract, Rail Operation Center, Maintenance Yard construction could add cost and schedule exposure.	0	0	0	9	9	9	9	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	0	0
	276	Cut over to the existing Rail (Green) Line - Delays Project (Wayside train control, ETS, Passenger Information, Change of the Operation)	0	0	0	0	0	0	0	0	0	0	20	20	18	20	18	18	18	18	18	16	16	16	16	4	4

Risk Rating	Cost	Schedule	Probability	
1	<\$250,000	< 1 month	<10%	
2	\$250,000 - \$1,000,000	1-3 months	10 - 50%	
3	\$1,000,000 - \$3,000,000	3-6 months	50 - 75%	
4	\$3,000,000 - \$10,000,000	6-12 months	75 - 90%	
5	>\$10,000,000	> 12 months	>90%	

Crenshaw/LAX Light Rail Transit Project Risk Metrics



Crenshaw/LAX Light Rail Transit Project Risks – Interfaces



Crenshaw/LAX Light Rail Transit Project Risks – Interfaces

143	Untimely interfaces between Design-Build Contract, Rail Operation Center, Maintenance Yard construction could add cost and schedule exposure.	0	0	0	9	9	9	9	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	0	0
276	Cut over to the existing Rail (Green) Line - Delays Project (Wayside train control, ETS, Passenger Information, Change of the Operation)	0	0	0	0	0	0	0	0	0	0	20	20	18	20	18	18	18	18	18	16	16	16	16	4	4
319	96th St Station - Metro future station accommodation.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	12	10	10	10	12	12	12	12	0	0

- Untimely interfaces between the Main Line DB, Yard DB, and Metro Rail Operation Center could add cost and schedule exposure.
- Cutover to the existing Metro Rail Line delays the project.
- Impact to construction due to accommodating the future 96th St Rail Station for connection to LAX Airport.

- Address integration issues early after contract award; proactive Owner in issuing Change Orders if warranted.
- Develop the Systems Integration Testing Plan well in advance (e.g., 2+ years)
- Apply a fresh perspective and collaborate with all stakeholders to determine the solution, even for late changes.

Crenshaw/LAX Light Rail Transit Project Risks – Stakeholder Management



Crenshaw/LAX Light Rail Transit Project Risks – Stakeholder Management

141	Potential for added scope to the project due to community demands.	11	11	11	11	11	11	11	7	7	7	14	14	12	14	12	12	12	12	12	12	12	12	12	12	9
250	Changes due to design comments during design review process.	0	0	0	0	0	0	0	0	0	0	16	16	18	16	14	14	14	14	14	12	12	12	12	12	12
72	Utility relocation costs and construction duration may be greater than that included in the baseline estimate.	10	10	10	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	0	0
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- Potential for added scope to the project due to community demands.
- Changes due to design comments during design review process.
- Utility Relocation costs and durations may be greater than that included in the baseline estimate and schedule.

- Work closely with key elected officials to monitor scope requests.
- Escalation ladder that includes upper management from the Agency and Cities.
- Higher level of design; sign-off of scope by stakeholder representatives with authority.
- Design progress must be sufficient to allow third party to estimate value to work.

Crenshaw/LAX Light Rail Transit Project Risks – Underground Construction



Crenshaw/LAX Light Rail Transit Project Risks – Underground Construction

262 Tunneling issues: Muck handling with limited storage areas available onsite, breakdowns & supporting equipment, launching TBM, ground settlement.

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- Caving/cobbles/Groundwater and other issues with piling will impact critical path.
- Laydown yard and traffic control limitations may impact production.
- Muck handling landfill closures from bad weather and off hours can halt tunneling.
- Equipment Breakdowns.

- Engage the Engineer-of-Record for Geotechnical Baseline Report, for periodic site visits and to log soils during excavation. Collaborated with Contractor's Geotech/team.
- Approved traffic control plans and haul routes in contract can reduce risk to Project.
- Specify requirements for redundant back-up equipment.

Crenshaw/LAX Light Rail Transit Project Risks – Tunneling Construction



Crenshaw/LAX Light Rail Transit Project Risks – Tunneling Construction

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Differing Site Conditions, such as: Excessive caving/cobbles/ groundwater treatment, cobbles, abrasive soils, H2S and CH4 gasses.
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- Tunneling risks are usually high stake and impact both schedule and budget.
- Ground loss/settlement
- Differing Site Conditions excessive cobbles or abrasive soils.
- Hydrogen Sulfide/Methane gasses
- There are others...

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- Monitoring for ground loss tied directly to tunnel boring activities and in real time; best managed by the Contractor.
- Potholing, test pits, and additional bore holes will contribute to a tighter Geotechnical Baseline Report (GBR).
- Prescriptive requirements for ventilation at tunnel heading.

Crenshaw/LAX Light Rail Transit Project

Questions?