2009

Thames St. Wharf Office Building

Technical Assignment II

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Executive Summary

This technical assignment analyzes the key construction management aspects of The Thames St. Wharf Office Building. Included in this report is a detailed project schedule, a site plan for each phase of construction, a detailed structural estimate and a general conditions estimate. The detailed structural estimate is compared to the actual construction costs of the project. A review of some critical industries that were discussed at the 2009 Pace Roundtable is also included in this report.

The project schedule developed in this assignment contains a lot more detail and goes further in depth that the schedule in the previous technical assignment. It shows the major phases of construction and breaks down the major activities in each phase of construction. The major phases for the Thames St. Wharf Office Building are sitework, superstructure, enclosure and interior finishes. Each Phase is broken into multiple sub-phases and each sub-phase is broken into activities by floor. A schedule showing the phases with their corresponding sub-phases is shown as is a complete detailed schedule. Both schedules show the project being completed under ideal conditions and circumstances.

A site plan was developed for each of the four major phase of construction. The ample amount of space available on the site made site plans simple and straight forward to develop. Each site plan illustrates key equipment and space necessary to successfully complete its respective phase.

A detailed structural estimate was compiled including the costs for the foundation, post-tensioned structural concrete system and the structural steel penthouse. A detailed take-off was completed for each system and values from RS Means 2009 were used to determine the total cost. The cost for the entire concrete structural system, including the foundation, is $8,120,710. This estimate value is less than 1% of the actual construction cost for the concrete. The structural steel estimated cost is $782,347. This compares nicely with the total contract value of $1.1 Million for all of the metals used in the project.

The general conditions costs for The Thames St. Wharf Office Building were developed using RS Means 2009 and the general conditions costs in Justin Wingenfield's Tech II report. The total value for the general conditions costs was $1,746,410 over the life of the project. This breaks down to a value of $11,856 per week.

The final topic discussed in this report is a summary of the 2009 PACE Roundtable Conference. It includes a general overview of what took place and what was talked about at the conference, an in-depth look at the breakout session attended, an analysis of how the topics covered could be applied to The Thames St. Wharf Office Building, and any key industry contacts made.

Detailed Project Schedule

There detailed construction schedule was developed using four major phases of construction. The phases are sitework, superstructure, enclosure and interior finishes. The phases overlap slightly as show on the schedule. Listed below in table 1.1 is an abridged version of the schedule, for the complete detailed schedule please view **Appendix A.** It is important to note that MEP activities take place under each phase of construction except the enclosure phase.

Task Name	Duration	Start	Finish
- Construction	570 days	Mon 10/1/07	Fri 12/4/09
NTP	0 days	Mon 10/1/07	Mon 10/1/07
+ Sitework	97 days	Tue 10/2/07	Wed 2/13/08
- Superstructure	209 days	Thu 1/3/08	Tue 10/21/08
+ Concrete	200 days	Thu 1/3/08	Wed 10/8/08
+ Base Building MEP	157 days	Thu 1/10/08	Fri 8/15/08
+ Steel	15 days	Wed 10/1/08	Tue 10/21/08
- Enclosure	185 days	Mon 10/6/08	Fri 6/19/09
+ Masonry	116 days	Mon 10/6/08	Mon 3/16/09
+ Curtain Wall	140 days	Mon 12/8/08	Fri 6/19/09
+ Windows	96 days	Mon 12/22/08	Mon 5/4/09
- Interior Finishes	235 days	Mon 1/12/09	Fri 12/4/09
+ Ground Floor	155 days	Mon 1/12/09	Fri 8/14/09
+ Level 1	145 days	Mon 1/26/09	Fri 8/14/09
+ Level 2	145 days	Mon 2/2/09	Fri 8/21/09
+ Level 3	150 days	Mon 2/9/09	Fri 9/4/09
+ Level 4	174 days	Mon 2/16/09	Thu 10/15/09
+ Level 5	181 days	Mon 2/23/09	Mon 11/2/09
+ Level 6	188 days	Mon 3/2/09	Wed 11/18/09
+ Level 7	195 days	Mon 3/9/09	Fri 12/4/09
Substantial Completion	0 days	Fri 12/4/09	Fri 12/4/09

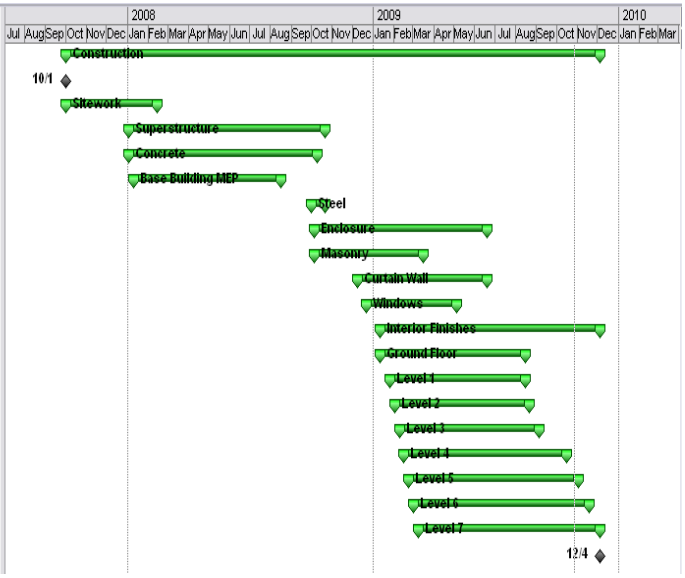


Table 1.1 – Abridged Detailed Project Schedule

The sitework phase is broken up by activity and includes demolition of the existing parking lot because it is a small activity. The superstructure and interior finishes phases are broken up by floor and the enclosure phase is broken up by each face of the building. The superstructure phase includes the concrete pile caps and slab on grade because they are done by the same subcontractor as the rest of the concrete structural system. It is important to note that on the actual finish schedule the Ground Level – Level 3 are broken into two sub-categories, floor wide and core, but they were condensed on this schedule to limit the number of activities. Levels 4 – 7 are broken into four sub-categories; floor wide, core, tenant fit out and central command/ IDF room. Again floor wide and core have been condensed into one sub-category.

For the finish phase work began on the ground floor and moved up for everything except for framing and finishing which started on the Level 1 and moved vertically and finished on the Ground Level. This is what causes the gap between "Frame, Finish & Paint – Core" and "Duct Layout" to increase on each floor. The reason this sequence was chosen is currently unknown.

This schedule illustrates ideal conditions for the project. Unfortunately delays have occurred so far in the project. The actual extent and reason for the delays is unknown due to the inability to contact the original construction manager. All that is currently known is that there was a delay with the backfilling and the underground utilities that caused the concrete contractor to mobilize, demobilize for six weeks and then remobilize again. What caused the delay in backfilling and the underground utilities

is unknown. There were also issues with the concrete construction that also caused delays; the extent and reason are also unknown. Work sequencing was also disrupted slightly during the switch from SBER construction to Armada Hoffler Construction. Some work was paused as contracts were finalized and agreements were reached. The sequence disruption cost approximately two weeks of delay but there is hope that the lost time can be made up.

Site Layout Planning

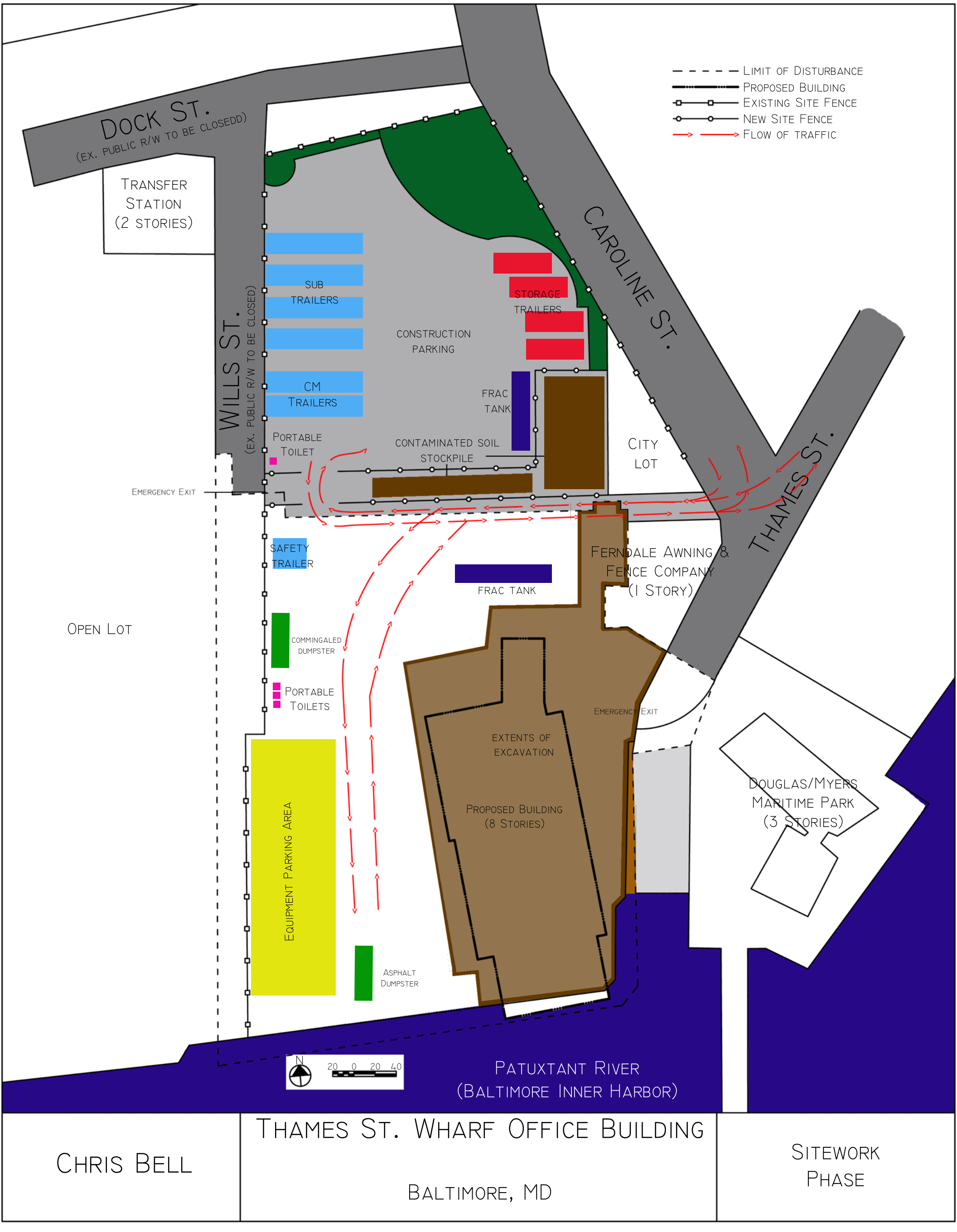
No actual site plans were available for reference so a site plan has been created for each phase of construction based on what knowledge was available and what would create the least cluttered site. Fortunately the site is very large and already separated into a northern and a southern portion by Block St. This allows for the site trailers, storage sheds and construction parking to be located away from all construction activities and therefore safe. The northern half of the site plan does not change between each phase of construction. The site fencing and on-site traffic patterns do not change between phases either.

Sitework:

The sitework phase of construction was the shortest phase of construction and had the least number of people involved with it. The entire parking lot in the southern portion of the site did not need to be removed for construction to be successfully completed so it was only demolished in areas that needed to be excavated for underground utilities and pile driving. The soil that was excavated was moved into a segregated section in the northern half of the site plan and separated into two piles. The first pile was for the soils that contained the most contamination and the other pile was for soils that only had a limited amount. The cut off point for each contamination level is not known. The more contaminated soil was to be stored on-site until a disposal facility could be found. The soil with the lower contamination level was also to be stored on-site and used as controlled backfill later in the sitework phase. The remaining low contamination soil was then to be disposed of with the high contamination soil. Frac tanks were placed at two locations on site to help gather contaminated particles after a rain and would be removed as they were deemed no longer necessary. No excavation support was needed soil cohesiveness allowed for a step back of 2:1

A separate asphalt dumpster was utilized because the asphalt also had traces of volatile compounds and needed to be disposed of properly. Additionally a commingled dumpster was placed on-site for the remainder of the refuse created. Commingled dumpsters were used to make recycling easier and lower the number of dumpsters needed on-site at one time. If separate dumpsters were used for each material at least four dumpsters would be needed on-site at any one time, at one for each material.

The following page illustrates the site plan for the sitework phase.



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SITEWORK PHASE

Superstructure:

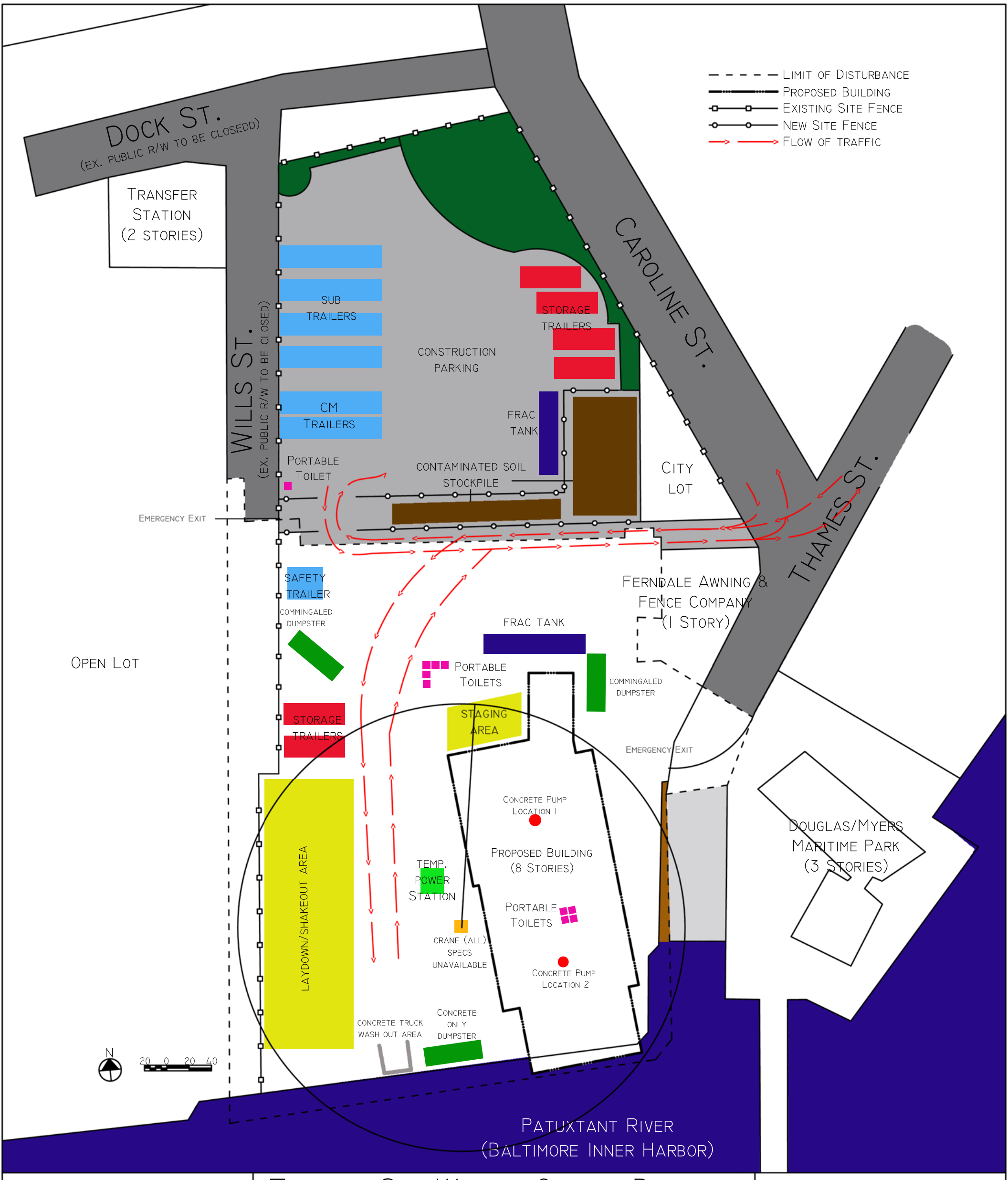
The superstructure phase was the only phase of the project that utilized a permanent tower crane. It was placed outside the building limits because there was available space and it was easier to erect and dismantle. The exact specifications of the crane are not known but it is known that it covered the entire floor area for L1-PH. The only area of the building that was not under the reach of the tower crane was northern extension on the ground floor. To place the rebar cages for the columns in that area a boom lift was used and concrete was pumped into the formwork.

The rest of the columns in the building were placed using crane and bucket. The floor slabs and shear walls were all placed by pumping. There were two pump locations in the building footprint. Pump Location 1 was used to place the northern 2/3^{rds} of the slabs and the northern shear walls. Pump Location 2 was used for the southern 1/3rd and for the southern shear walls. All reinforcing deliveries were made to the lay down/shakeout area to the west of the building and the days picks would be organized in the staging area to the north of the building.

For the steel construction in the PH the steel contractor brought in their own crawler crane. It was parked in the same location as the tower crane. Again the crane specifications are unknown.

Other notable changes in the site plan are the addition of a dedicated concrete dumpster and another commingled dumpster. A wash out area for the concrete trucks was placed next to concrete dumpster. More personnel are expected on-site during this phase so additional portable toilets are on-site, including some inside the building limits that are lifted from floor-to-floor as work progresses vertically. A temporary power station was also established during this phase. It powers everything needed for construction including the crane. The exact specs of the temporary power system are unknown. Additional material storage trailers were added on the southern half of the site for the mechanical and electrical subcontractors. They were placed in the southern half to limit the distance those subs needed to transport their materials. The northern storage trailers were used mostly for equipment storage.

The following site plan illustrates the superstructure phase with the tower crane. The crawler crane was omitted in favor of clarity on the drawing.



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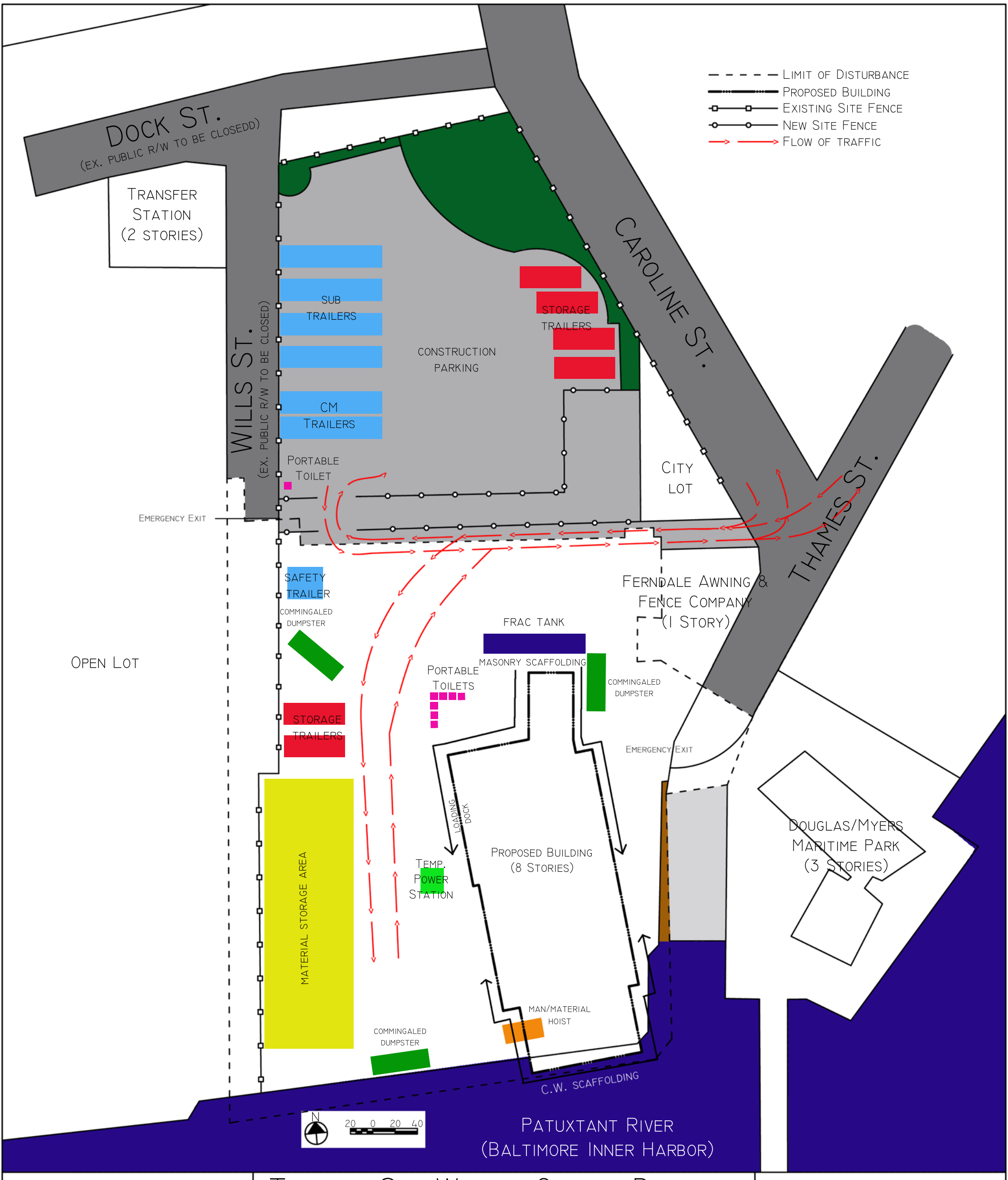
SUPERSTRUCTURE PHASE

Enclosure:

The enclosure phase of the project is the phase with the least amount of information available. Scaffolding was used to for both the brickwork and the curtain wall installation. Based on the limited schedule that is available for this phase the assumed work progression is from north-to-south for the masonry, starting on the North and East faces of the building and the curtain wall started in the south and worked north. The curtain wall was stick built and the pieces were light enough to be lifted by one or two people so no cranes were needed. The windows were installed from the inside so no scaffolding was needed.

The tower crane is no longer needed for construction and has been replaced with a man and materials elevator on the south-western corner of the building. There is also a loading dock on the western face of the building in the northern half. During the enclosure phase the soil stockpiles were removed reducing the need for two frac tanks on-site. One was kept just as a safety precaution in case there were severe weather conditions that dictated a need for one. The concrete wash out area was removed and the concrete only dumpster was replaced with a commingled dumpster. The lay down/shakeout area is now a material storage area during this phase.

The following site plan illustrates the enclosure phase.



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ENCLOSURE PHASE

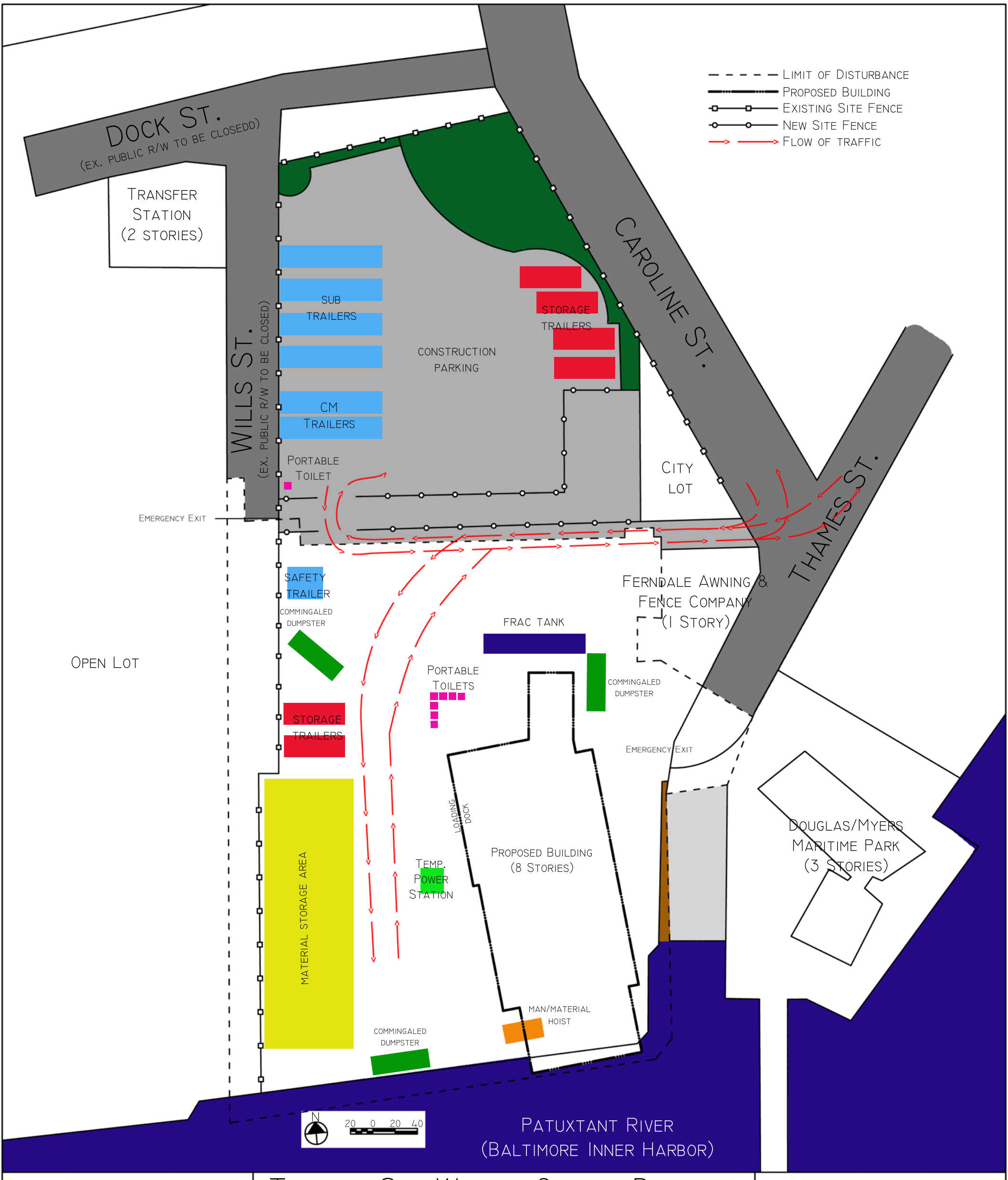
Interior Finish:

The interior finish phase is the final phase of construction. There are very few changes on the site plan from the enclosure phase. These two phases overlap a significant amount giving reason to the similarities in the site plans. The only major difference is the absence of scaffolding.

All materials that need be stored on-site and protected from the weather are stored inside of the building. There is a lot of empty space inside the building because the floors from the Ground Level through Level 3 are being built as core and shell.

To place the roof mechanical equipment the mechanical subcontractor brought in a crawler crane as well. It was also placed in the same place as the other two cranes had been previously; it was left out of this site plan for clarity. Again the specs for the crane are unknown. To move and install the SCU's on each floor a fork lift was used. The mechanical subcontractor was responsible for the forklift.

The following site plan illustrates the interior finish phase.



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BALTIMORE, MD

INTERIOR FINISHES PHASE

Detailed Structural Systems Estimate

The Thames St. Wharf Office Building consists of a reinforced concrete on metal piles foundation, a post-tensioned concrete superstructure and a structural steel penthouse. The estimates for the foundation and structural steel were created using a complete takeoff of both systems. For the post-tensioned concrete superstructure a take-off was done for Level 4 and used as the average for the other levels. All of the unit prices for the estimate come from RS Means Online using the 2009 cost book with the location factor for Baltimore, MD included. Table 3.1 - Table 3.3 show the estimate results. For an overview of the estimate take off quantities please refer to **Appendix B**. The complete take off is not provided due to its length and size.

Material Costs		
Item	Quantity	Total Cost
Concrete	13144 CY	$ 1,597,868
Mild Steel	13.28 Tons	$ 2,059,134
PT Tendons	38129 lbs	$ 77,784
Formwork	403765 SF	$ 1,534,610
Piles	19769 VLF	$ 655,611
Structural Steel		$ 737,758.32
	Total	$ 6,662,765

Table 3.1

Detailed Concrete Estimate						
Piles						
Item	Quantity	Unit	Material Cost	Labor Cost	Eqpt Cost	Total Cost
14" Piles - Concrete Pile	15839.21	V.L.F	509705.78	87274.05	82522.28	$ 679,502
16" Piles - Concrete Pile	3929.58	V.L.F	145905.12	22948.72	21612.66	$ 190,467
					Subtotal	$ 869,969
Concrete						
Item	Quantity	Unit	Material Cost	Labor Cost	Eqpt Cost	Total Cost
4000 psi concrete - pumped	1455.54	CY	154287.58	24307.57	8878.81	$ 187,474
5000 psi concrete - pumped	9096.82	CY	1009746.74	288823.95	65724.51	$ 1,364,295
5000psi concrete - crane and bucket	597.33	CY	66304.00	20906.67	4241.07	$ 91,452
5000 psi concrete - direct chute	456.30	CY	50649.25	8053.69	264.65	$ 58,968
8000 psi concrete - pumped	1538.25	CY	316880.01	30380.49	11075.42	$ 358,336
					Subtotal	$ 2,060,524
PT Tendons						
Item	Quantity	Unit	Material Cost	Labor Cost	Eqpt Cost	Total Cost
PT Tendons	0.00	lb	0.00	0.00	0.00	$ -
					Subtotal	$ -
Mild Reinforcing						
Item	Quantity	Unit	Material Cost	Labor Cost	Eqpt Cost	Total Cost
#3-#7	706.90	Ton	1087728.41	284993.85	0.00	$ 1,372,722
#8-#18	621.12	Ton	971405.33	180405.18	0.00	$ 1,151,811
Sorting	1328.02	Ton	0.00	16919.01	10996.03	$ 27,915
Crane	1328.02	Ton	0.00	18419.68	11965.49	$ 30,385
					Subtotal	$ 2,582,833
Formwork						
Item	Quantity	Unit	Material Cost	Labor Cost	Eqpt Cost	Total Cost
Slab Formwork	214641.46	SF	989497.11	474357.62	0.00	$ 1,463,855
Beam Formwork	179196.05	SF	510708.74	582387.16	0.00	$ 1,093,096
Column & SW	6858.44	SF	24244.60	9601.82	411.51	$ 34,258
Grade beams	3069.33	SF	10159.49	6015.89	0.00	$ 16,175
					Subtotal	$ 2,607,384
					Total	$ 8,120,710

Table 3.2

Detailed Steel Estimate							
Beams							
Type	Size	Length[ft]	Quantity	Material Cost	Labor Cost	Eqpt. Cost	Total Cost
W	18X35	36	9	$ 17,641.80	$ 923.40	$ 1,075.68	$ 19,640.88
W	10x49	36	3	$ 8,739.36	$ 307.80	$ 358.56	$ 9,405.72
W	18x40	30	3	$ 6,092.10	$ 256.50	$ 298.80	$ 6,647.40
W	18x40	24	4	$ 6,498.24	$ 273.60	$ 318.72	$ 7,090.56
W	18x40	38	1	$ 2,572.22	$ 108.30	$ 126.16	$ 2,806.68
W	10x12	40	2	$ 1,582.40	$ 208.80	$ 243.20	$ 2,034.40
W	21x44	40	5	$ 14,486.00	$ 440.00	$ 368.00	$ 15,294.00
W	12X48	40	3	$ 9,890.40	$ 250.80	$ 291.60	$ 10,432.80
W	24X55	30	2	$ 5,454.60	$ 127.20	$ 106.20	$ 5,688.00
W	21X44	30	3	$ 6,518.70	$ 198.00	$ 165.60	$ 6,882.30
W	12X14	7.25	4	$ 767.63	$ 51.62	$ 60.32	$ 879.57
W	16X26	12	2	$ 1,031.04	$ 37.68	$ 43.68	$ 1,112.40
W	16X26	24	2	$ 2,062.08	$ 75.36	$ 87.36	$ 2,224.80
W	12X38	12	1	$ 695.28	$ 23.16	$ 27.00	$ 745.44
HSS	16X12X5/8	45	3	$ 235,665.45	$ 4,660.20	$ 5,425.65	$ 245,751.30
HSS	16X12X5/8	38	2	$ 132,670.92	$ 2,623.52	$ 3,054.44	$ 138,348.88
C	6X10.5	45	6	$ 54,621.00	$ 3,916.35	$ 4,527.90	$ 63,065.25
						Subtotal	$ 538,050.38
Columns							
Type	Size	Length[ft]	Quantity	Material Cost	Labor Cost	Eqpt. Cost	Total Cost
W	10X39	16.5	9	$ 11,052.86	$ 225.72	$ 262.85	$ 11,278.58
HSS	6X6X1/2	16.5	14	$ 93,462.60	$ 6,701.31	$ 7,747.74	$ 100,163.91
HSS	12X12X1/4	16.5	3	$ 80,357.31	$ 1,627.56	$ 1,893.38	$ 81,984.87
						Subtotal	$ 193,427.36
Cross Bracing							
Type	Size	Length[ft]	Quantity	Material Cost	Labor Cost	Eqpt. Cost	Total Cost
L	4x4x1/4	39.5	2	$ 9,786.13	$ 1,069.66	$ 1,241.88	$ 10,855.79
L	4x4x1/4	43	2	$ 10,653.25	$ 1,164.44	$ 1,351.92	$ 11,817.69
						Subtotal	$ 22,673.48
Decking							
Type	Size	Length[ft]	Quantity	Material Cost	Labor Cost	Eqpt. Cost	Total Cost
20G Galvanized	3"	106	76	$ 25,456.96	$ 2,416.80	$ 322.24	$ 28,196.00
						Subtotal	$ 28,196.00
						Total	$ 782,347.21

For the concrete estimate a major assumption was that all of the columns in the building were 24”x24”X12’ with 5000 psi concrete. The majority of the columns in the building are 24”x24”X12’ with 5000 psi concrete so this assumption is not far off. It was also assumed that each pile was driven a depth of 64.25 ft. This value was listed in the foundation drawings as the average

Overall the concrete estimate that was developed is off of the actual cost by less than 1%. The actual concrete cost was $8.2 Million. The difference is most likely due to the general conditions costs for the concrete subcontractor and the assumptions that were made in the estimate. A list of assumptions is listed below.

Concrete Estimate Assumptions:

1. The cost of each pile includes concrete being placed inside but does not include reinforcing
2. No reinforcing is epoxy coated
3. Each PT beam contains three (3) tendon bundles containing (4) tendons
4. Crane cost is included in equipment unit costs
5. Open-shop labor

The steel value also seems close to the actual construction cost. The exact percentage difference is unknown because the structural steel cost that has been reported is combined with the miscellaneous metal cost. The total misc. metal cost is $1.1 Million. It stands to reason that the majority of the misc. metal cost is for the structural steel making the estimate provided pretty accurate.

General Conditions Estimate

The general conditions costs for Thames St. Wharf Office Building were not available as a reference so this estimate is based on RS Means values and the general conditions costs listed in Justin Wingenfield's Tech II assignment. His assignment was chosen because the building he did his thesis on is similar to The Thames St. Wharf Office Building and located in Washington DC so it is relatively close geographically. Table 4.1 shows the results of the general conditions estimate.

The estimate is based on the ideal 26 month construction schedule. None of the delays are factored into the costs because their durations are unknown separate general. There is also no information available on who was responsible for the delays so it is unknown who is responsible for paying the extra general conditions costs. A separate estimate was compiled to show the general conditions costs per week to demonstrate the increased costs associated with any delay. Table 4.2 shows this estimate.

Each subcontractor is responsible for all of their own trailers, storage sheds and equipment. Additionally no cranes were provided by the construction managers. All on-site personnel are based on Armada Hoffler Construction's staffing. A list of additional assumptions is listed below.

Assumptions:

1. All months consist of four (4) weeks
2. Each subcontractor is responsible for their respective permits
3. Each subcontractor is responsible for their own safety equipment
4. Each subcontractor is responsible for clean up at the end of each work day
5. An average of four (4) dumpsters were pulled a week over the duration of the project
6. Each dumpster has the same cost associated per pull
7. All project staff are on-site for the entire project duration
8. Six (6) portable toilets are needed per month over the entire project duration.

General Conditions					
Project Management Personel					
Item	Quantity	Amount	Units	Unit Price	Total
PM	1	104	wk	$ 1,925.00	$ 200,200.00
APM	1	104	wk	$ 1,650.00	$ 171,600.00
PE	1	104	wk	$ 1,350.00	$ 140,400.00
Superintendent	1	104	wk	$ 2,025.00	$ 210,600.00
Assisstant Super	1	104	wk	$ 1,600.00	$ 166,400.00
PMA	1	104	wk	$ 1,200.00	$ 124,800.00
Safety Manager	1	104	wk	$ 1,350.00	$ 140,400.00
				Subtotal	$ 1,154,400.00
Administrative Facilities & Supplies					
Item	Quantity	Amount	Units	Unit Price	Total
50x10 Trailer rent/month	2	26	Mo	$ 275.94	$ 14,348.88
Office Eqpt Rental	1	26	Mo	$ 152.21	$ 3,957.46
Office Supplies Avg	1	26	Mo	$ 83.47	$ 2,170.22
Telephone	1	26	Mo	$ 78.56	$ 2,042.56
lights & HVAC	1	26	Mo	$ 147.30	$ 3,829.80
IT Expenses	1	26	Mo	$ 75.00	$ 1,950.00
Drawings & Specifications	1	1	LS	$ 5,000.00	$ 5,000.00
				Subtotal	$ 33,298.92
Jobsite Requirements					
Item	Quantity	Amount	Units	Unit Price	Total
Fencing 6' High Chain Link	1	600	LF	$ 8.73	$ 5,238.00
Dumpsters	4	26	Mo	$ 200.00	$ 20,800.00
Temp Power	1	34625	CSF/Flr	$ 2.65	$ 91,756.25
Temp Water	1	26	Mo	$ 60.88	$ 1,582.88
Portable Toilets	6	26	Ea/month	$ 179.21	$ 27,956.76
				Subtotal	$ 147,333.89
Safety					
Item	Quantity	Amount	Units	Unit Price	Total
Personal Protection Eqpt.	1	1	LS	$ 1,000.00	$ 1,000.00
				Subtotal	$ 1,000.00
Job Extras					
Item	Quantity	Amount	Units	Unit Price	Total
Commissioning	1	$ 50,000,000	Project	0.75%	$ 375,000.00
Concrete Testing	1	1	Project	$ 35,378.00	$ 35,378.00
				Subtotal	$ 410,378.00
				Total	$ 1,746,410.81

Table 4.1

General Conditions Cost Per Week					
Project Management Personel					
Item	Quantity	Amount	Units	Unit Price	Total
PM	1	1	wk	$ 1,925.00	$ 1,925.00
APM	1	1	wk	$ 1,650.00	$ 1,650.00
PE	1	1	wk	$ 1,350.00	$ 1,350.00
Superintendent	1	1	wk	$ 2,025.00	$ 2,025.00
Assisstant Super	1	1	wk	$ 1,600.00	$ 1,600.00
PMA	1	1	wk	$ 1,200.00	$ 1,200.00
Safety Manager	1	1	wk	$ 1,350.00	$ 1,350.00
				Subtotal	$ 11,100.00
Administrative Facilities & Supplies					
Item	Quantity	Amount	Units	Unit Price	Total
50x10 Trailer rent/month	2	0.25	Mo	$ 275.94	$ 137.97
Office Eqpt Rental	1	0.25	Mo	$ 152.21	$ 38.05
Office Supplies Avg	1	0.25	Mo	$ 83.47	$ 20.87
Telephone	1	0.25	Mo	$ 78.56	$ 19.64
lights & HVAC	1	0.25	Mo	$ 147.30	$ 36.83
IT Expenses	1	0.25	Mo	$ 75.00	$ 18.75
				Subtotal	$ 272.11
Jobsite Requirements					
Item	Quantity	Amount	Units	Unit Price	Total
Dumpsters	4	0.25	Mo	$ 200.00	$ 200.00
Temp Water	1	0.25	Mo	$ 60.88	$ 15.22
Portable Toilets	6	0.25	Ea/month	$ 179.21	$ 268.82
				Subtotal	$ 484.04
				Total/ Week	$ 11,856.14

Table 4.2

Critical Industry Issues

The 2009 PACE Roundtable was a day dedicated to presenting critical industry issues and topics and bringing them up in a way where they could be openly discussed between students, faculty and industry professionals. The theme of the roundtable was "Creating Opportunities." It was dedicated to how the downturn in the economy has affected the construction industry, what industry members and their companies are doing to remain profitable and where they see the construction industry going in the near future due to the economy. An industry panel on the "state of construction", a student panel on the "communication patterns of the now generation" and three breakout sessions each on a specific technical topic were used to address the changes in the industry. The three breakout topics covered were "Energy and the Construction Industry", "Business and Networking" and "BIM Executive Planning."

During the industry panel it became very apparent that during these slow economic times companies find themselves needing to diversify their projects. Companies are no longer able to stay in just one or two niche markets and survive. They are finding that other companies that they don't normally compete with are breaking into their markets and "steeling" their jobs out from under them. All of the panel members said that their companies need to branch out into new areas of construction that they have either not been a part of before or have had very little experience in. If they don't successfully do that they will have a lot of trouble in the coming months getting work and keeping employees busy. They are also finding that projects that used to have three or four companies bidding them now have 20-30 companies bidding. This creates a more cut throat market and it also increases the need for quality relationships between the construction contractors and the building owners. Another effect of so many companies bidding is that some companies low ball their bid values just to get the work and then deliver an inferior product because they aren't making as much as is desired.

Companies also seem to be using the downturn, and the slowing in the amount of work they are doing, to better themselves. They see increased time available to hold employee training sessions and to improve their project staffs. They have been able to focus more energy on improving the basics of the company and figure out where exactly as a company they are strongest and in what areas they need improvement.

The industry panel also briefly addressed BIM and what affect it is having on the industry and where they see it going in the future. Currently BIM is slowly emerging as a viable cost and time saving technique. It is difficult to gage how much time and money is actually saved using BIM at this point but it is known that companies that have used BIM on a project before and know that is being implemented on the project they are pursuing will submit a lower bid price. The panel members saw BIM become more widely used in the future but noted that the economy has halted some growth because people aren't as willing to spend the extra upfront money necessary implement BIM when they aren't exactly sure what it's returns are and the construction industry is naturally a slow evolving one. As firms and the people in them become more technologically savvy and more familiar with the programs BIM will become a strong force in the construction industry.

I attended the Business and Marketing breakout session and it was mostly geared towards finding ways to enter into new markets, improving relationships with clients, subcontractors and designers and different types of project delivery systems and communication lines. A fair amount of the issues that have occurred on The Thames St. Wharf project have been due to communication issues between multiple different parties and I felt that finding a way to address that would be a good thesis topic for me to look into. One thing that surprised me most about the discussion that took place was how much the industry members shared ideas with each other and explained the pros and cons of different ideas. Each member was openly sharing information with people they consider their competitors. It seemed very unusual that everyone was as open as they were with each other but it was a mutually beneficial atmosphere. Every member appeared to walk out of the room with a bit of knowledge that they did not have before.

The biggest topic discussed in the breakout session, and something I may look into as a thesis research topic, was the Integrated Project Delivery method (IPD). On a project using the IPD the owner, architect and contractor sign a joint, incentives based contract. Both the contractor and architect are brought on in the very early stages of schematic design and work together in much the same way as they would with a Design-Build contract. The major difference with the IPD is that the owner is not cut off from the design and construction of the building. They are an integral member of the team and help direct the designers towards what they want. In a design-build relationship the owner is generally cut out from the design process once a designer is selected and told the basics of what the owner wants. I feel that if everyone was involved in the design process and had responsibilities through the end of construction that a lot of the coordination issues that occurred and something the expensive systems that needed to be installed in the building could have been avoided.

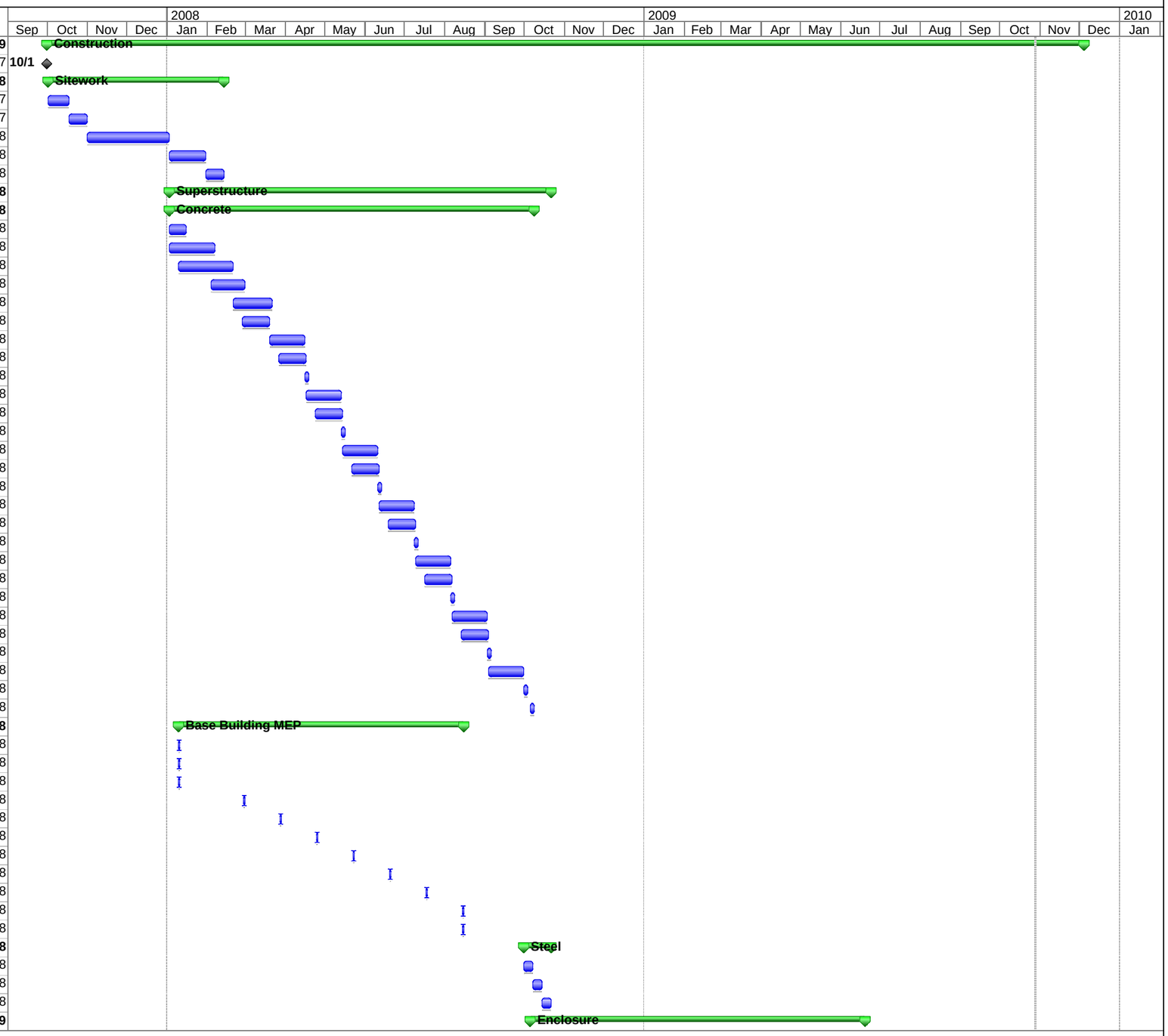
Another topic that was discussed during the breakout session that I may look into as a research topic instead of an IPD was using two CM or GC firms together as joint venture to deliver a project. If the Thames St. Wharf project was pursued as a joint venture between Struever Bros. and another firm it is possible that SBER may not have defaulted on their responsibilities preventing all of the issues that came along with that. Additionally the expertise of both parties could have possibly combined to prevent some of the other issues that have occurred.

All of the industry members I met and talked to were more than willing to help with anything that I may need in the future on my thesis but three really stood out as people that could be a great help. The first is Ray Sowers of ONCORE Construction. ONCORE was the concrete subcontractor on the Thames St. Wharf Office Building and he knows a lot of details about the project during the time that ONCORE was on-site. The second contact is Rob Leicht from DPR construction. DPR does a lot of IPD projects around the country and he may have some valuable insight into the delivery method or be able to put me in the direction of someone else who does. And the third contact is Mike Abbondante from Barton Malow. He has worked on at least two joint venture projects for Barton Malow and will be able to explain their benefits and inner workings in more detail.

Appendix A

Detailed Project Schedule

ID	Task Name	Duration	Start	Finish
1	**Construction**	**570 days**	**Mon 10/1/07**	**Fri 12/4/09**
2	NTP	0 days	Mon 10/1/07	Mon 10/1/07
3	**Sitework**	**97 days**	**Tue 10/2/07**	**Wed 2/13/08**
4	Demo Existing Parking Lot	12 days	Tue 10/2/07	Wed 10/17/07
5	Excavation	10 days	Thu 10/18/07	Wed 10/31/07
6	Pile Driving	45 days	Thu 11/1/07	Wed 1/2/08
7	Underground Utilities	20 days	Thu 1/3/08	Wed 1/30/08
8	Back Fill	10 days	Thu 1/31/08	Wed 2/13/08
9	**Superstructure**	**209 days**	**Thu 1/3/08**	**Tue 10/21/08**
10	**Concrete**	**200 days**	**Thu 1/3/08**	**Wed 10/8/08**
11	Erect Tower Crane	9 days	Thu 1/3/08	Tue 1/15/08
12	Pile Caps	25 days	Thu 1/3/08	Wed 2/6/08
14	Ground Floor Columns & Walls	30 days	Thu 1/10/08	Wed 2/20/08
13	SOG	20 days	Mon 2/4/08	Fri 2/29/08
15	1st Floor Beams & Slab	22 days	Thu 2/21/08	Fri 3/21/08
16	1st Floor Columns & Walls	15 days	Thu 2/28/08	Wed 3/19/08
17	2nd Floor Beams & Slab	19 days	Thu 3/20/08	Tue 4/15/08
18	2nd Floor Columns & Walls	15 days	Thu 3/27/08	Wed 4/16/08
30	1st Floor Curbs	3 days	Wed 4/16/08	Fri 4/18/08
19	3rd Floor Beams & Slab	19 days	Thu 4/17/08	Tue 5/13/08
20	3rd Floor Columns and Walls	15 days	Thu 4/24/08	Wed 5/14/08
31	2nd Floor Curbs	3 days	Wed 5/14/08	Fri 5/16/08
21	4th Floor Beams & Slab	19 days	Thu 5/15/08	Tue 6/10/08
22	4th Floor Columns & Walls	15 days	Thu 5/22/08	Wed 6/11/08
32	3rd Floor Curbs	3 days	Wed 6/11/08	Fri 6/13/08
23	5th Floor Beams & Slab	19 days	Thu 6/12/08	Tue 7/8/08
24	5th Floor Columns & Walls	15 days	Thu 6/19/08	Wed 7/9/08
33	4th Floor Curbs	3 days	Wed 7/9/08	Fri 7/11/08
25	6th Floor Beams & Slab	19 days	Thu 7/10/08	Tue 8/5/08
26	6th Floor Columns & Walls	15 days	Thu 7/17/08	Wed 8/6/08
34	5th Floor Curbs	3 days	Wed 8/6/08	Fri 8/8/08
27	7th Floor Beams & Slab	19 days	Thu 8/7/08	Tue 9/2/08
28	7th Floor Columns & Walls	15 days	Thu 8/14/08	Wed 9/3/08
35	6th Floor Curbs	3 days	Wed 9/3/08	Fri 9/5/08
29	Penthouse Beams & Slab	19 days	Thu 9/4/08	Tue 9/30/08
36	7th Floor Curbs	3 days	Wed 10/1/08	Fri 10/3/08
37	Dismantle Tower Crane	3 days	Mon 10/6/08	Wed 10/8/08
38	**Base Building MEP**	**157 days**	**Thu 1/10/08**	**Fri 8/15/08**
39	Ground Floor Electrical Sleeves	1 day	Thu 1/10/08	Thu 1/10/08
40	Ground Floor Plumbing Sleeves	1 day	Thu 1/10/08	Thu 1/10/08
41	Ground Floor Sprinkler Sleeves	1 day	Thu 1/10/08	Thu 1/10/08
42	1st Floor Sleeves	1 day	Fri 2/29/08	Fri 2/29/08
43	2nd Floor Sleeves	1 day	Fri 3/28/08	Fri 3/28/08
44	3rd Floor Sleeves	1 day	Fri 4/25/08	Fri 4/25/08
45	4th Floor Sleeves	1 day	Fri 5/23/08	Fri 5/23/08
46	5th Floor Sleeves	1 day	Fri 6/20/08	Fri 6/20/08
47	6th Floor Sleeves	1 day	Fri 7/18/08	Fri 7/18/08
48	7th Floor Sleeves	1 day	Fri 8/15/08	Fri 8/15/08
49	PH Sleeves	1 day	Fri 8/15/08	Fri 8/15/08
50	**Steel**	**15 days**	**Wed 10/1/08**	**Tue 10/21/08**
51	Penthouse Columns	5 days	Wed 10/1/08	Tue 10/7/08
52	Penthouse Beams	5 days	Wed 10/8/08	Tue 10/14/08
53	Penthouse Decking	5 days	Wed 10/15/08	Tue 10/21/08
54	**Enclosure**	**185 days**	**Mon 10/6/08**	**Fri 6/19/09**



Project: Detailed Schedule
Date: Wed 10/28/09

Task | Milestone | Rolled Up Task | Rolled Up Progress | External Tasks | Group By Summary
Progress | Summary | Rolled Up Milestone | Split | Project Summary | Deadline

ID	Task Name	Duration	Start	Finish
55	**Masonry**	**116 days**	**Mon 10/6/08**	**Mon 3/16/09**
56	Brick & Sills East	55 days	Mon 10/6/08	Fri 12/19/08
57	Brick & Sills North	51 days	Mon 11/10/08	Mon 1/19/09
58	Brick & Sills West	61 days	Mon 12/22/08	Mon 3/16/09
63	**Curtain Wall**	**140 days**	**Mon 12/8/08**	**Fri 6/19/09**
64	Curtain Wall South	35 days	Mon 12/8/08	Fri 1/23/09
66	Curtain Wall East	15 days	Mon 1/26/09	Fri 2/13/09
65	Curtain Wall West	50 days	Mon 3/9/09	Fri 5/15/09
67	Curtain Wall North	25 days	Mon 5/18/09	Fri 6/19/09
59	**Windows**	**96 days**	**Mon 12/22/08**	**Mon 5/4/09**
60	Windows East	35 days	Mon 12/22/08	Fri 2/6/09
62	Windows North	35 days	Tue 1/20/09	Mon 3/9/09
61	Windows West	35 days	Tue 3/17/09	Mon 5/4/09
68	**Interior Finishes**	**235 days**	**Mon 1/12/09**	**Fri 12/4/09**
69	**Ground Floor**	**155 days**	**Mon 1/12/09**	**Fri 8/14/09**
70	MEP Riser	10 days	Mon 1/12/09	Fri 1/23/09
71	Plumbing Rough In	10 days	Mon 1/26/09	Fri 2/6/09
72	Sprinkler Rough In	10 days	Mon 2/2/09	Fri 2/13/09
73	Electrical Rough In	10 days	Mon 2/9/09	Fri 2/20/09
78	Frame, Finish & Paint - Core	45 days	Mon 3/23/09	Fri 5/22/09
74	Duct Layout	10 days	Mon 5/4/09	Fri 5/15/09
75	Install Access Floor	10 days	Mon 5/18/09	Fri 5/29/09
79	Plumbing Trim Out - Core	10 days	Mon 5/25/09	Fri 6/5/09
76	Duct Installation	10 days	Mon 6/1/09	Fri 6/12/09
80	Electrical Trim - Core	5 days	Mon 6/8/09	Fri 6/12/09
77	Set Mechanical Eqpt.	10 days	Mon 6/15/09	Fri 6/26/09
81	HVAC Trim - Core	5 days	Mon 6/15/09	Fri 6/19/09
82	MEP Connections to Eqpt	20 days	Mon 6/22/09	Fri 7/17/09
83	Testing & Commissioning	20 days	Mon 7/20/09	Fri 8/14/09
84	**Level 1**	**145 days**	**Mon 1/26/09**	**Fri 8/14/09**
85	MEP Riser	5 days	Mon 1/26/09	Fri 1/30/09
86	Plumbing, Sprinkler, Electrical Rough In	20 days	Mon 2/2/09	Fri 2/27/09
91	Frame, Finish & Paint - Core	40 days	Mon 2/2/09	Fri 3/27/09
92	Trim Out - Core	20 days	Mon 3/30/09	Fri 4/24/09
87	Duct Layout & Install	20 days	Mon 5/18/09	Fri 6/12/09
88	Install Access Floor	10 days	Mon 6/15/09	Fri 6/26/09
89	MEP Connections to Eqpt	20 days	Mon 6/29/09	Fri 7/24/09
90	Testing & Commissioning	15 days	Mon 7/27/09	Fri 8/14/09
93	**Level 2**	**145 days**	**Mon 2/2/09**	**Fri 8/21/09**
94	MEP Riser	5 days	Mon 2/2/09	Fri 2/6/09
95	Plumbing, Sprinkler, Electrical Rough In	15 days	Mon 2/9/09	Fri 2/27/09
98	Frame, Finish & Paint - Core	40 days	Mon 2/9/09	Fri 4/3/09
99	Trim Out - Core	10 days	Mon 4/6/09	Fri 4/17/09
96	Duct Layout & Install	15 days	Mon 6/1/09	Fri 6/19/09
97	Install Access Floor	10 days	Mon 6/22/09	Fri 7/3/09
100	MEP Connections to Eqpt	20 days	Mon 7/6/09	Fri 7/31/09
101	Testing & Commissioning	15 days	Mon 8/3/09	Fri 8/21/09
102	**Level 3**	**150 days**	**Mon 2/9/09**	**Fri 9/4/09**
103	MEP Riser	5 days	Mon 2/9/09	Fri 2/13/09
104	Plumbing, Sprinkler, Electrical Rough In	15 days	Mon 2/16/09	Fri 3/6/09
107	Frame, Finish & Paint - Core	40 days	Mon 2/16/09	Fri 4/10/09
108	Trim Out - Core	10 days	Mon 4/13/09	Fri 4/24/09
105	Duct Layout & Install	15 days	Mon 6/15/09	Fri 7/3/09
106	Install Access Floor	10 days	Mon 7/6/09	Fri 7/17/09

Project: Detailed Schedule
Date: Wed 10/28/09

Task | Progress | Milestone | Summary | Rolled Up Task | Rolled Up Milestone | Rolled Up Progress | Split | External Tasks | Project Summary | Group By Summary | Deadline

ID	Task Name	Duration	Start	Finish
109	MEP Connections to Eqpt	20 days	Mon 7/20/09	Fri 8/14/09
110	Testing & Commissioning	15 days	Mon 8/17/09	Fri 9/4/09
111	**Level 4**	**174 days**	**Mon 2/16/09**	**Thu 10/15/09**
112	**Floor Wide**	**150 days**	**Mon 2/16/09**	**Fri 9/11/09**
113	MEP Riser	5 days	Mon 2/16/09	Fri 2/20/09
114	Plumbing, Sprinkler, Electrical Rough In	15 days	Mon 2/23/09	Fri 3/13/09
117	Frame, Finish & Paint - Core	40 days	Mon 2/23/09	Fri 4/17/09
118	Trim Out - Core	10 days	Mon 4/20/09	Fri 5/1/09
115	Duct Layout & Install	15 days	Mon 6/29/09	Fri 7/17/09
116	Install Access Floor	10 days	Mon 7/20/09	Fri 7/31/09
119	MEP Connections to Eqpt	20 days	Mon 8/3/09	Fri 8/28/09
120	Testing & Commissioning	10 days	Mon 8/31/09	Fri 9/11/09
121	**Tenant Fit Out**	**129 days**	**Mon 4/20/09**	**Thu 10/15/09**
122	Frame Type G Walls	12 days	Mon 4/20/09	Tue 5/5/09
123	Install Underfloor Electrical	10 days	Wed 5/6/09	Tue 5/19/09
124	Frame Ceilings	11 days	Wed 5/6/09	Wed 5/20/09
126	Rough In Ceiling MEP - E Lobby	5 days	Wed 5/20/09	Tue 5/26/09
125	Frame Type R Walls	12 days	Thu 5/21/09	Fri 6/5/09
127	Prep & Install Terrazzo Floor	14 days	Mon 6/8/09	Thu 6/25/09
128	Hang & Finish Drywall	16 days	Mon 6/8/09	Mon 6/29/09
129	Hang Ceiling Grid	7 days	Tue 6/30/09	Wed 7/8/09
131	Install Linear Diffusers	6 days	Tue 6/30/09	Tue 7/7/09
132	Install Base & Trim	6 days	Tue 6/30/09	Tue 7/7/09
134	Install Millwork	21 days	Tue 6/30/09	Tue 7/28/09
135	Install Frames	10 days	Tue 6/30/09	Mon 7/13/09
130	Install Sprinkler Piping	10 days	Thu 7/9/09	Wed 7/22/09
133	Install Light Fixtures	5 days	Thu 7/9/09	Wed 7/15/09
136	Install Doors & Hardware	12 days	Tue 7/14/09	Wed 7/29/09
137	Prime & Paint	15 days	Thu 7/30/09	Wed 8/19/09
138	Drop Ceiling Tiles	6 days	Thu 8/20/09	Thu 8/27/09
139	Install Carpet	10 days	Fri 8/28/09	Thu 9/10/09
140	Punchlist & Walkthrough	20 days	Fri 9/11/09	Thu 10/8/09
141	Tenant FF&E	5 days	Fri 10/9/09	Thu 10/15/09
142	**Central Command/IDF Rooms**	**90 days**	**Mon 4/20/09**	**Fri 8/21/09**
143	Frame Walls	5 days	Mon 4/20/09	Fri 4/24/09
144	Rough In MEP	5 days	Mon 4/27/09	Fri 5/1/09
145	Hang & Finish Drywall	10 days	Mon 5/4/09	Fri 5/15/09
146	Paint Walls	5 days	Mon 5/18/09	Fri 5/22/09
147	Waterproof	5 days	Mon 5/25/09	Fri 5/29/09
148	Install Access Floor	5 days	Mon 6/1/09	Fri 6/5/09
149	Underfloor Duct Work	5 days	Mon 6/8/09	Fri 6/12/09
150	Set Eqpt & Fit Out	40 days	Mon 6/15/09	Fri 8/7/09
151	Install Cable	10 days	Mon 8/10/09	Fri 8/21/09
152	**Level 5**	**181 days**	**Mon 2/23/09**	**Mon 11/2/09**
153	**Floor Wide**	**150 days**	**Mon 2/23/09**	**Fri 9/18/09**
154	MEP Riser	5 days	Mon 2/23/09	Fri 2/27/09
155	Plumbing, Sprinkler, Electrical Rough In	15 days	Mon 3/2/09	Fri 3/20/09
160	Frame, Finish & Paint - Core	40 days	Mon 3/2/09	Fri 4/24/09
161	Trim Out - Core	20 days	Mon 4/27/09	Fri 5/22/09
156	Duct Layout & Install	15 days	Mon 7/13/09	Fri 7/31/09
159	Install Access Floor	10 days	Mon 7/27/09	Fri 8/7/09
157	MEP Connections to Eqpt	20 days	Mon 8/10/09	Fri 9/4/09
158	Testing & Commissioning	10 days	Mon 9/7/09	Fri 9/18/09
173	**Central Command/IDF Room**	**70 days**	**Mon 4/27/09**	**Fri 7/31/09**

Project: Detailed Schedule
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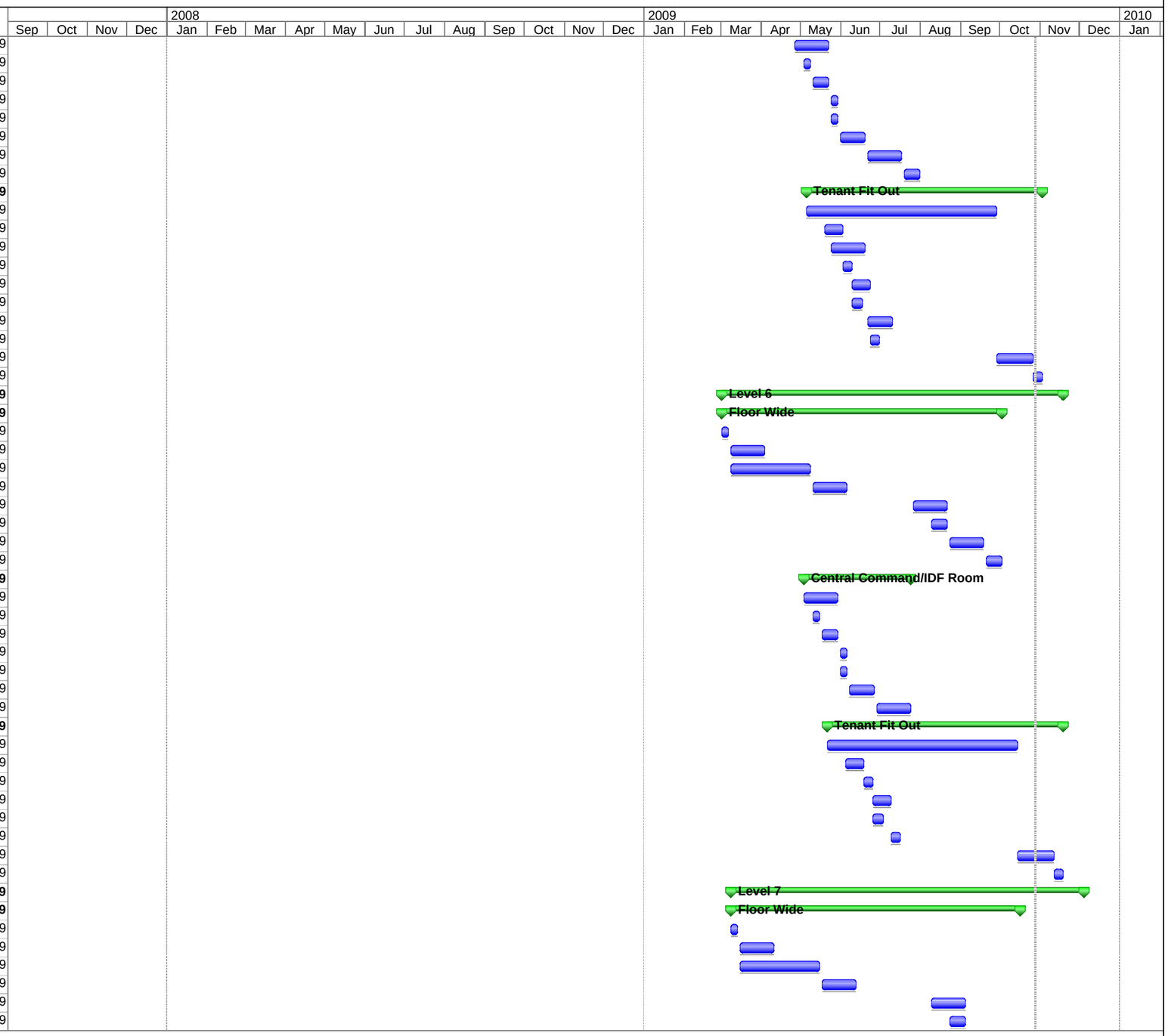
Task | Progress | Milestone | Summary | Rolled Up Task | Rolled Up Milestone | Rolled Up Progress | Split | External Tasks | Project Summary | Group By Summary | Deadline

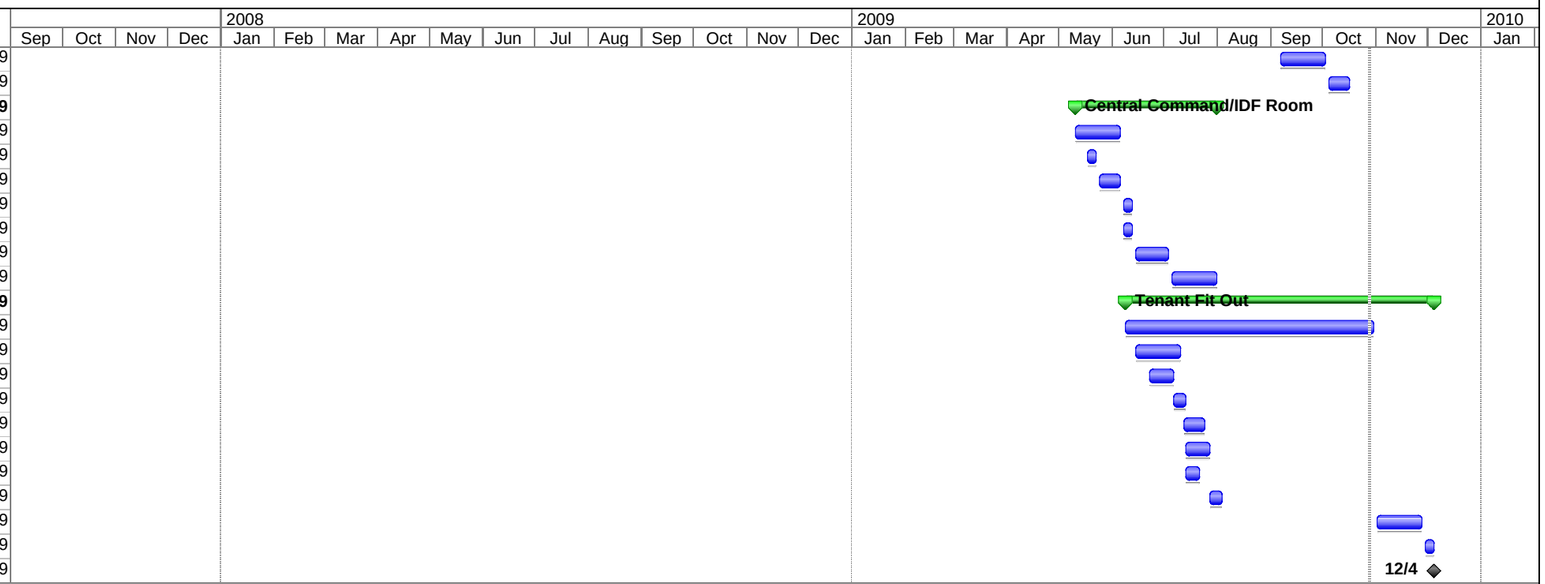
ID	Task Name	Duration	Start	Finish
174	Frame, Finish & Paint Walls	20 days	Mon 4/27/09	Fri 5/22/09
175	Rough In MEP	5 days	Mon 5/4/09	Fri 5/8/09
176	Cable Risers	10 days	Mon 5/11/09	Fri 5/22/09
177	Install Access Floor	5 days	Mon 5/25/09	Fri 5/29/09
178	Under Floor Ductwork	5 days	Mon 5/25/09	Fri 5/29/09
179	Rough In & Install Cable	15 days	Mon 6/1/09	Fri 6/19/09
180	Set Eqpt. And Fit Out	20 days	Mon 6/22/09	Fri 7/17/09
181	Commission	10 days	Mon 7/20/09	Fri 7/31/09
162	**Tenant Fit Out**	**129 days**	**Wed 5/6/09**	**Mon 11/2/09**
163	Frame & Finish Floors/Ceiling/Walls	104 days	Wed 5/6/09	Mon 9/28/09
164	Install Underfloor Electric	10 days	Wed 5/20/09	Tue 6/2/09
171	MEP Connections to Eqpt	20 days	Mon 5/25/09	Fri 6/19/09
165	Rough In MEP - E Lobby	5 days	Wed 6/3/09	Tue 6/9/09
166	Run Sprinker Pipe	10 days	Wed 6/10/09	Tue 6/23/09
167	Install Diffusers	6 days	Wed 6/10/09	Wed 6/17/09
172	Testing & Commissioning	15 days	Mon 6/22/09	Fri 7/10/09
168	Install Light Fixtures	5 days	Wed 6/24/09	Tue 6/30/09
169	Punchlist & Walkthrough	20 days	Tue 9/29/09	Mon 10/26/09
170	Tenant FF&E	5 days	Tue 10/27/09	Mon 11/2/09
182	**Level 6**	**188 days**	**Mon 3/2/09**	**Wed 11/18/09**
183	**Floor Wide**	**155 days**	**Mon 3/2/09**	**Fri 10/2/09**
184	MEP Riser	5 days	Mon 3/2/09	Fri 3/6/09
185	Plumbing, Sprinkler, Electrical Rough In	20 days	Mon 3/9/09	Fri 4/3/09
190	Frame, Finish & Paint - Core	45 days	Mon 3/9/09	Fri 5/8/09
191	Trim Out - Core	20 days	Mon 5/11/09	Fri 6/5/09
186	Duct Layout & Install	20 days	Mon 7/27/09	Fri 8/21/09
189	Install Access Floor	10 days	Mon 8/10/09	Fri 8/21/09
187	MEP Connections to Eqpt	20 days	Mon 8/24/09	Fri 9/18/09
188	Testing & Commissioning	10 days	Mon 9/21/09	Fri 10/2/09
201	**Central Command/IDF Room**	**60 days**	**Mon 5/4/09**	**Fri 7/24/09**
202	Frame, Finish & Paint Walls	20 days	Mon 5/4/09	Fri 5/29/09
203	Rough In MEP	5 days	Mon 5/11/09	Fri 5/15/09
204	Cable Risers	10 days	Mon 5/18/09	Fri 5/29/09
205	Install Access Floor	5 days	Mon 6/1/09	Fri 6/5/09
206	Under Floor Ductwork	5 days	Mon 6/1/09	Fri 6/5/09
207	Rough In & Install Cable	15 days	Mon 6/8/09	Fri 6/26/09
208	Set Eqpt. And Fit Out	20 days	Mon 6/29/09	Fri 7/24/09
192	**Tenant Fit Out**	**129 days**	**Fri 5/22/09**	**Wed 11/18/09**
193	Frame & Finish Floors/Ceiling/Walls	104 days	Fri 5/22/09	Wed 10/14/09
194	Install Underfloor Electric	10 days	Fri 6/5/09	Thu 6/18/09
195	Rough In MEP - E Lobby	5 days	Fri 6/19/09	Thu 6/25/09
196	Run Sprinker Pipe	10 days	Fri 6/26/09	Thu 7/9/09
197	Install Diffusers	6 days	Fri 6/26/09	Fri 7/3/09
200	Install Light Fixtures	5 days	Fri 7/10/09	Thu 7/16/09
198	Punchlist & Walkthrough	20 days	Thu 10/15/09	Wed 11/11/09
199	Tenant FF&E	5 days	Thu 11/12/09	Wed 11/18/09
209	**Level 7**	**195 days**	**Mon 3/9/09**	**Fri 12/4/09**
210	**Floor Wide**	**160 days**	**Mon 3/9/09**	**Fri 10/16/09**
211	MEP Riser	5 days	Mon 3/9/09	Fri 3/13/09
212	Plumbing, Sprinkler, Electrical Rough In	20 days	Mon 3/16/09	Fri 4/10/09
217	Frame, Finish & Paint - Core	45 days	Mon 3/16/09	Fri 5/15/09
218	Trim Out - Core	20 days	Mon 5/18/09	Fri 6/12/09
213	Duct Layout & Install	20 days	Mon 8/10/09	Fri 9/4/09
216	Install Access Floor	10 days	Mon 8/24/09	Fri 9/4/09



Project: Detailed Schedule
Date: Wed 10/28/09

Task | Milestone | Rolled Up Task | Rolled Up Progress | External Tasks | Group By Summary
Progress | Summary | Rolled Up Milestone | Split | Project Summary | Deadline

ID	Task Name	Duration	Start	Finish
214	MEP Connections to Eqpt	20 days	Mon 9/7/09	Fri 10/2/09
215	Testing & Commissioning	10 days	Mon 10/5/09	Fri 10/16/09
230	**Central Command/IDF Room**	**60 days**	**Mon 5/11/09**	**Fri 7/31/09**
231	Frame, Finish & Paint Walls	20 days	Mon 5/11/09	Fri 6/5/09
232	Rough In MEP	5 days	Mon 5/18/09	Fri 5/22/09
233	Cable Risers	10 days	Mon 5/25/09	Fri 6/5/09
234	Install Access Floor	5 days	Mon 6/8/09	Fri 6/12/09
235	Under Floor Ductwork	5 days	Mon 6/8/09	Fri 6/12/09
236	Rough In & Install Cable	15 days	Mon 6/15/09	Fri 7/3/09
237	Set Eqpt. And Fit Out	20 days	Mon 7/6/09	Fri 7/31/09
219	**Tenant Fit Out**	**129 days**	**Tue 6/9/09**	**Fri 12/4/09**
220	Frame & Finish Floors/Ceiling/Walls	104 days	Tue 6/9/09	Fri 10/30/09
228	MEP Connections to Eqpt	20 days	Mon 6/15/09	Fri 7/10/09
221	Install Underfloor Electric	10 days	Tue 6/23/09	Mon 7/6/09
222	Rough In MEP - E Lobby	5 days	Tue 7/7/09	Mon 7/13/09
229	Testing & Commissioning	10 days	Mon 7/13/09	Fri 7/24/09
223	Run Sprinker Pipe	10 days	Tue 7/14/09	Mon 7/27/09
224	Install Diffusers	6 days	Tue 7/14/09	Tue 7/21/09
227	Install Light Fixtures	5 days	Tue 7/28/09	Mon 8/3/09
225	Punchlist & Walkthrough	20 days	Mon 11/2/09	Fri 11/27/09
226	Tenant FF&E	5 days	Mon 11/30/09	Fri 12/4/09
238	Substantial Completion	0 days	Fri 12/4/09	Fri 12/4/09



Project: Detailed Schedule
Date: Wed 10/28/09

Task | Milestone | Rolled Up Task | Rolled Up Progress | External Tasks | Group By Summary
Progress | Summary | Rolled Up Milestone | Split | Project Summary | Deadline

Appendix B

Detailed Structural Estimate Overview

Piles				
Type	Length[ft]	Diam[in]	Quantity	Total Length[ft]
Standard Piles	60.46	14.00	262.00	15839.21
Marine Piles	60.46	16.00	65.00	3929.58

Concrete		
Superstructure		
Area	CY Per Floor	CY Total
Elevated	575	4600
Beams	537	4294
Columns	75	597
Shear Walls	98	780
Curbs	25	203
Total/Floor	1309	
Superstructure Total		10474
Area		CY
SOG		1342
Pile Caps		456
Shear wall Foundations		758
Grade/Edge Beams		113
4000 psi piles		627
5000 psi piles		203
Foundation Total		3500
Building Total		13974

Reinforcing		
Mild		
Superstructure		
Area	Tons Per Floor	Total Tons
Elevated	6.81	54.44
Beams	102.89	823.09
Columns	7.75	62.03
Shear Walls	6.62	53.00
Curbs	1.79	14.31
Total/Floor	125.86	
Superstructure Total		1007.36

Foundation		
Area		Tons
SOG		148.15
Pile Caps & S.W.		
Foundations		99.21
Grade/Edge Beams		5.26
Piles		68.04
Foundation Total		320.66
Total Mild Reinforcing		1328.02

Post Tension				
Area	Ft/ Floor	Ft Total	lbs/Ft	lbs
Elevated	1450.00	11600.00	0.67	7772.00
Beams	5663.74	45309.90	0.67	30357.63
Total PT Cable				38129.63