Kaiser Permanente Largo Medical Office Building – Largo, MD

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Technical Assignment1

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Executive Summary

Technical Assignment 1 includes an investigation of the building construction, systems utilized, and scope of work required for the Kaiser Permanente Largo Medical Office Building. This report goes into detail about the project schedule, cost evaluation, existing conditions, project delivery and more. Results of this investigation are discussed in more detail throughout this report.

Kaiser Permanente's (KP) Largo project includes expansion of the existing medical office building with a combination of both minor and major renovations to the existing building which will remain occupied. The 106,700 square foot addition will consist of three-stories and include everything from a pharmacy, an MRI suite, orthopedics, medical pulmonary, a staff lounge, operating rooms, surgical center and several other departments.

The goal of this project is to implement requirements of the KP functional program to meet the current and future patient health care demand as well as create a healthier experience for patients and staff. The three-story addition footprint is replacing a large amount of parking space, so a four-level parking garage was built before the focus of this report could begin.

Since construction has started, the schedule has very little room for delay. DPR was awarded the construction contract on December 27, 2010. The Notice to Proceed was issued June 10, 2011 as design and preconstruction was underway; however, construction was actually delayed right away due to obtaining the owner provided building permit. Once obtained, site mobilization began followed by construction of utilities, foundations, superstructure, masonry façade, roofing, MEP rough ins and finishes. Each major construction activity presented its own unique challenges that will be discussed later in this report. First Patient for the addition is expected July 17, 2013.

The cost analysis has been dissected slightly for a more accurate analysis. The addition is the key focus of the cost comparison using RSMeans. The actual building cost of the addition is $230.79 per square foot. This was almost $100 per square foot more than the RSMeans square foot analysis. There are several reasons for this large difference. This Kaiser Permanente Largo Medical Office Building has everything that a hospital does, except for a full-time staff that permits overnight stay. All surgeries are same-day surgeries so patients never stay for extended durations. Being that this medical office building has most capabilities of a hospital, larger than average systems are in place or those that are more unique than typical medical office buildings. Further detail will be provided in the Project Cost Evaluation section.

Possible ideas for further research include comparing the chosen masonry façade to using precast panels instead to cut schedule time, how BIM was used with preconstruction planning and its affect throughout construction, and whether or not the building's structural steel system selected was the most cost effective choice for a medical office building.

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Project Schedule Summary

Kaiser Permanente has developed a well-planned execution of expanding its current facilities in Largo, MD. Because the new addition will take up critical parking areas, a new four-story parking garage was completed before the construction of the addition would start. Upon completion of the parking garage, DPR was awarded the construction contract to be the general contractor on December 27, 2010. Kaiser Permanente issued the Notice to Proceed on June 10, 2011. A more detailed schedule, the Project Summary Schedule, can be found in **Appendix A.** DPR is responsible for construction of the addition along with the renovation of the existing medical office building. The Project Summary Schedule does not include any renovation work as planning is still underway and construction is not to start until the addition is complete.

The schedule is broken in three main categories; Design & Procurement, Construction, and a Closeout & Occupancy phase; each includes major milestone dates throughout the duration of the project. One of the biggest challenges this project presents is dealing with an occupied building. Specific design requirements, such as matching existing site architectural features, had to be met due to the existing building and will be investigated more in depth in Technical Assignment 2. However, because of the site layout, it has been determined that major work would flow best from the area closest to the existing building and proceed south to the rest of the L-shaped addition, as seen in Figure 1 and starting in Area B proceeding to Area C. After completion of the addition, it has been determined the renovation will be phased while occupied night work will be required in four 10-hour shifts.

The Construction Phase was delayed from the start due to lateness of attaining the Owner provided permit. Site mobilization and utility work could begin, but foundations were not able to start until the end of August 2011. Construction included a fairly traditional route with a few variations discussed in further detail to come later in this analysis. A few variations from the original sequence include structural steel beginning before the slab on grade began, interior finishes going in place before the building was watertight, and the overall roof sequencing and temporary roofing needed. Unexpected delays and challenges that developed required these activities to be done out of their original sequence to allow work to continue.

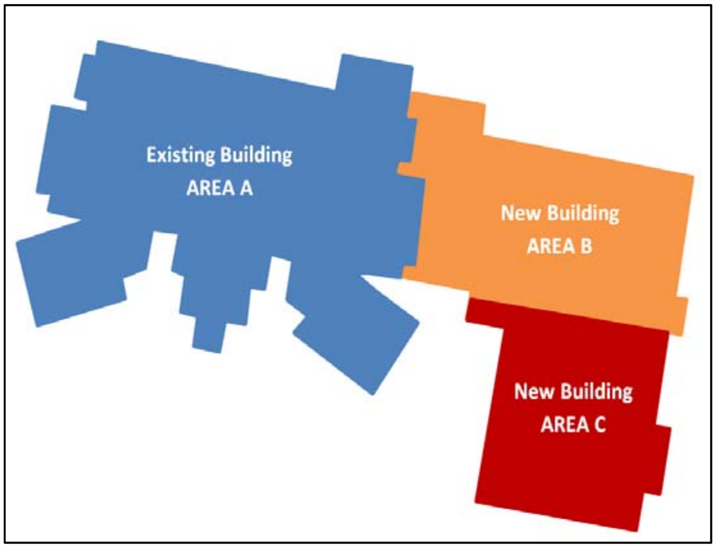


Figure 1 - Footprint of the existing building and addition, separated into different areas based off construction. These references will be used throughout the report. Image created by Chris Pozza.

The Closeout & Occupancy Phase has been broken into the Startup & Commissioning activity. Included are commissioning for each floor, a shared services activation and Kaiser's regional services activation. Along with Startup & Commissioning and Owner Furnish Contractor Install (OFCI) of medical equipment, three major milestones have been included. Substantial Completion is set for February 11, 2013. Final Completion follows on April 12, 2013. There is an activation period lasting a few months before the first patient can receive treatment on July 17, 2013. It is intended that the renovation will be complete in one year from time of the first patient of the addition.

Foundation

After necessary underground utilities are dealt with and completed, the foundation can start. Spread footings and perimeter walls were used. The sequence began with the framing, reinforcing and placement of the footings followed by perimeter foundations. The sequence began in Area B, quickly moving to Area C. Footings are normal weight, 3,000 PSI with a slump of 3-4" and extend to at least 2.5' below the final exterior grade, safely below the frost line.

The slab on grade actually began after structural steel, which will be discussed more in the next section. The slab on grade is 5" thick, 3,000 PSI normal weight concrete reinforced with W2.9xW2.9 welded wire fabric. The system rests on 15 mil vapor barrier over 4" of compacted stone aggregate. The slab was finished with a smooth, trowel finish. The only area of slab to differ is below the MRI room. Here the slab is required to be 16" thick, 3,000 PSI normal weight concrete and reinforced with 5/8" diameter fiberglass reinforcing. Dewatering systems were deemed unnecessary as the closest level groundwater was encountered was 12' below the surface. Wooden formwork was used where necessary and for all housekeeping pads required in the structure.

Structure

The new footprint is an L shape; steel began near the existing building, referred to as Area A. The structure itself is comprised of wide flange columns, girders and beams. Sequencing repeated the same direction as foundations; moving south to Area B and finishing steel erection with Area C. It should be noted that the steel sequence was changed near scheduled time of erection as described below.

Originally, the steel erection plan was to place all columns on the first level, which are two-story columns, followed by the entire top level; again moving from Area B to Area C. Opportunity to improve efficiency was noticed and quickly changed by the project team because if the original sequence were to take place, valuable time would have been lost. Slabs and floor deck would not have been able to begin in areas where crane lifts were going to be nearby or overhead, so the sequence was changed to do entire areas of the building instead of entire floors. Slab on grade construction was able to start roughly one week after steel erection began.

Figure 2 – Photograph of a Sideplate system (a moment frame that connects columns to beams and girders and can be single or double sided). Spray-on fireproofing has already been applied to the structural steel at this point of construction. Personal photograph taken by Chris Pozza.

A unique aspect of this project is the structural steel connections. A Sideplate Frame System, seen in Figure 2, has been selected. This is much more popular on the west coast, not traditionally being done on the east coast. This system will be discussed in more detail in the Structural Steel section to follow.

Metal deck placement began the day steel erection completed to be followed by installment of shear studs, working from the bottom up. A 60-ton crawler crane was used and laydown areas will be discussed more in this analysis. A more detailed schedule analysis and estimate for steel will be developed in the following Technical Report 2.

MEP Rough-Ins

Rough-ins for systems began March 5, 2012 and were completed on October 24, 2012. Rough-ins started on the first floor and proceeded through and up the building, following the same path as the foundation, with a large overlap between floors. After the first floor began, it would take about two and a half weeks the floor above to begin. Each area had overhead plumbing, electric, tele data, and mechanical rough-ins after walls were laid out. In-wall work followed for MEP systems and med gas with sprinklers being the last system to be roughed in.

Upper floors both took six and a half months to complete. The first floor took just over eight months, mostly due to the MRI room as extra work needed to be done in this area. For example, lead shielding was needed and extra space was needed above the ceiling to be a safe distance from the magnetic force. MRI equipment is usually one of the last things brought into the building due to new technology likely to be developed over the duration of construction; so precise rough-ins weren't able to take place.

Finishes

The building finishes sequence includes numerous activities; started with insulation and hanging of drywall. Other activities included are taping & finishing drywall; first coat paint; installing the ceiling grid, light fixtures, sprinkler heads and final paint. Once the final layer of paint is completed, a close-in inspection will take place.

There are a few things to point out regarding the sequencing of events during construction and how they affected finishes. The exterior enclosure was behind schedule from early on due to obtaining the owner provided building permit late and weather delays. Along with this, complicated details for the vapor barrier further hindered the façade construction about one month. Surprisingly, MEP & Fireproofing rough-ins started on the first floor the same day the exterior enclosure started. Along with this, the roof was constructed earlier than expected. Due to the sequencing, temporary roofing was required in some areas. Area A and Area C both have small portions of low roof that required the temporary roof. A Mason King scaffolding system was required for masonry work, so finished roof couldn't be installed in these areas until after all of the façade work was completed. This combination delayed the Building Watertight milestone and major elevator work.

Owner Furnished and Contractor Installed (OFCI) equipment will start arriving on site on October 30, 2012. Substantial Completion is expected to be February 11, 2013. Final Completion for the addition is scheduled for April 12, 2013 and First Patient will be July 17, 2013. Once construction ends in the addition, phased construction of the occupied existing medical office building will begin. The renovation is currently expected to take one year to complete.

Building Systems Summary

The building systems primarily focused on in this section are the structural steel frame, electrical system, masonry and glass curtain wall systems. The structural steel frame has unique connections and could provide an interesting comparison in later analyses whether or not the system selected was cost effective. The electrical system is critical for a medical office building where people's lives could depend on the building's power. System redundancy is required with backup power in case of emergency. Finally, the exterior façade is mostly covered in brick veneer and a prefabricated aluminum curtain wall. The brick veneer could possibly be studied closer with an alternate precast system instead.

Yes	No	Work Scope
X		Demolition
X		Structural Steel Frame
X		Cast-In-Place Concrete
X		Precast Concrete
X		Mechanical System
X		Electrical System
X		Masonry
X		Curtain Wall
	X	Support of Excavation

Table 1 - Building Systems Summary table created by Chris Pozza.

Demolition

Prior to start of construction, the existing surfaces, structures, paving and hardscape, making up what was once a parking lot, needed to be removed. A vestibule connected to the existing pharmacy needed to be demolished as well as a canopy at the loading dock. There are several locations where the addition connects to the existing building that will need to be opened in order to create corridors connecting the two structures. This will be done once the building is enclosed.

Once the renovation begins, there will be large amounts of demolition in the existing building as entire departments are being redone or moved. Zip walls will be required in areas during renovation work in order to limit the amount of dust and debris reaching neighboring areas. Being that this building was constructed in 1998, asbestos and lead are not a concern.

Excavation

There is no major excavation that required an additional form of support as this three-story addition's first floor is a slab on grade with no basement. Minor excavation is required for the footings and foundations, and underground utilities. Utility trenches have been dug four inches deeper than the required bottom-of-pipe elevation to allow for a layer of aggregate bedding. Because the water level was well below foundations with only shallow excavations being done, no dewatering systems were necessary.

Structural Steel Frame

The main superstructure consists of wide flange beams, columns and girders. The first floor is a 5" thick concrete slab on grade. The rest of the building's floor deck is 3" deep, 18 gage, composite metal deck with a 2.5" topping thickness. Typical floor beams range from W16x26 to W16x31 with girders ranging from W21x57 to W21x73.

Typical roof construction consists of 3" deep 20 gage steel roof deck. Decking has been specified based on a three span condition. Wide flange beams are used on the roof that primarily consists of W14x22, but W21x44 are required where supporting rooftop mechanical units. Roof girders mostly range from W21x44 to W21x62 with W18x40 and W18x50 spanning the perimeter. Hollow Structural Steel (HSS6x6x1/4) is used near the cobrahead roof. Steel is sloped toward roof drains.

This structure uses a unique moment connection, a Sideplate Frame System, which is shown to the left in Figure 3.

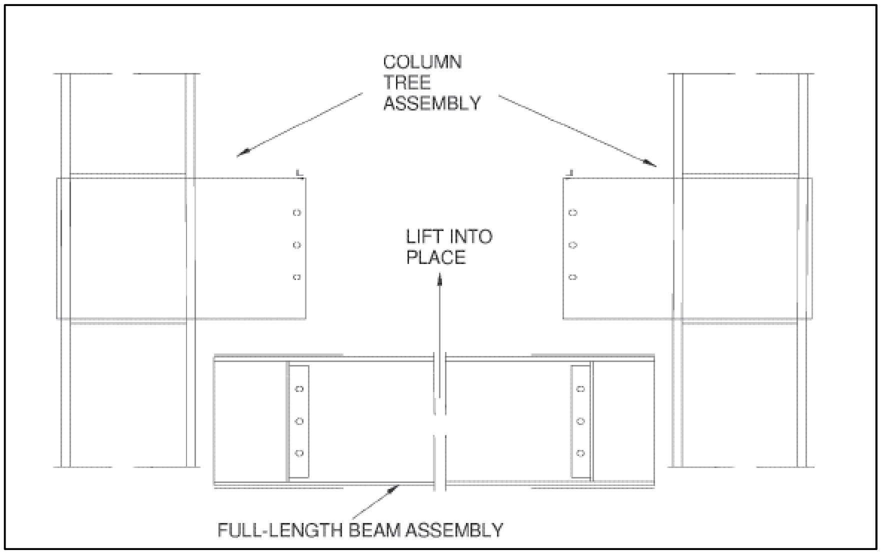


Figure 3 - Field erection method of a Sideplate Frame System. Image courtesy of Ellerbe Becket.

Sideplate connections were chosen over braced frames because they allow lateral framing to be located more conveniently and offer a greater cost economy. Smaller members are able to be used allowing for more space above ceilings and quicker steel erection. This system has previously been used on Kaiser Permanente facilities on the west coast.

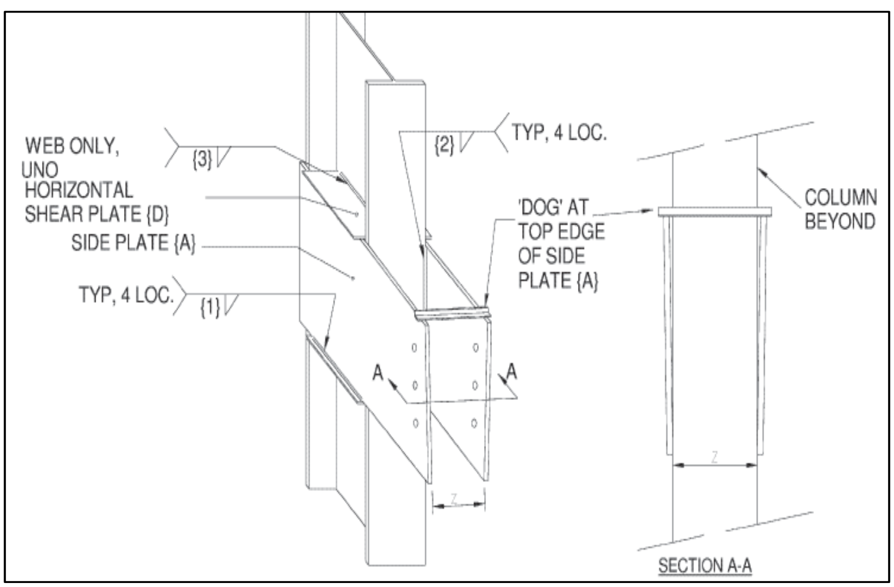


Figure 4 - 3D drawing of a Sideplate Frame System. Image courtesy of Ellerbe Becket.

Figure 4 shows a 3D view of a side plate. Connections are prefabricated and require minor field work to bolt and weld members. The system itself is a beam-to-column moment connection. This can be a one- or two-sided connection that saves space and construction time. A shear plate is welded to the web of the column above and below the physical side plate with one on each side. The side plate itself extends beyond the column where the beam is then placed and bolted. Seen below in Figure 5 is an elevation and plan view of the Sideplate Frame System.

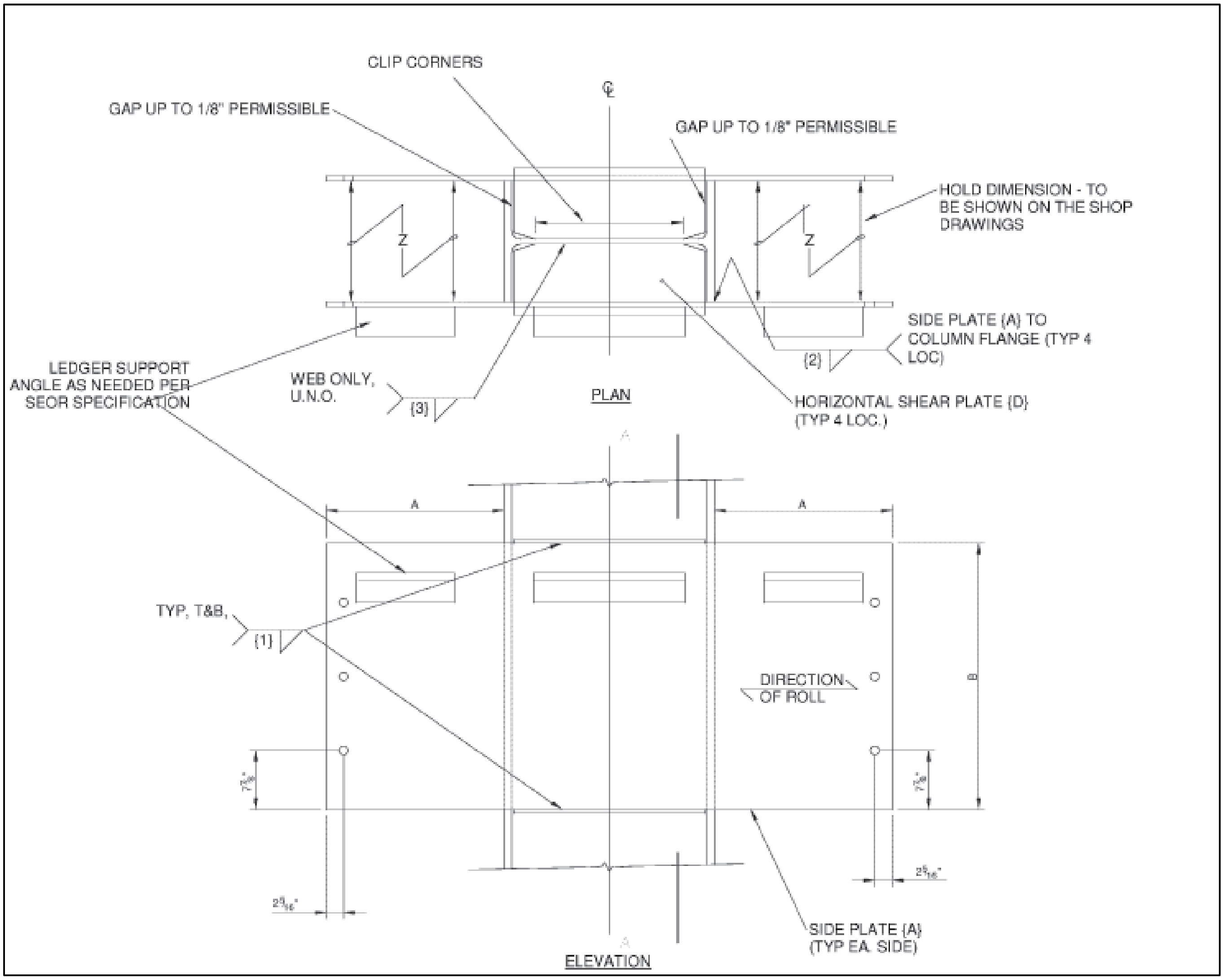


Figure 5 - Elevation and plan view of a Sideplate Frame System. Image courtesy of Ellerbe Becket.

Cast-In-Place Concrete

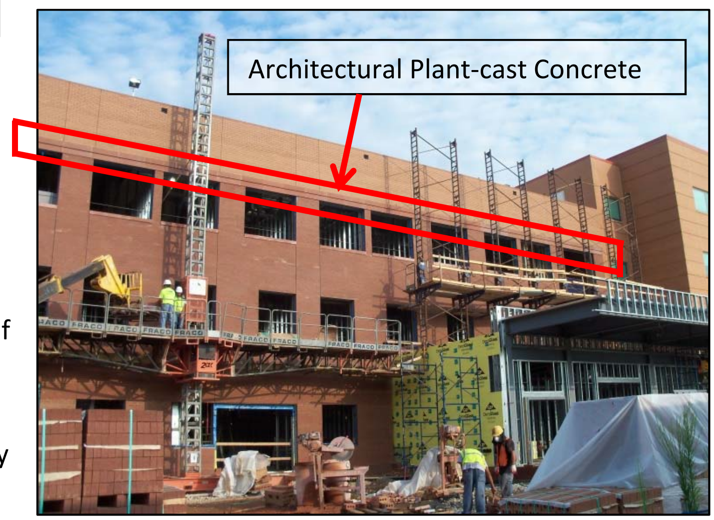
Cast-in-place concrete served several purposes for this structure. Shallow spread footings make up the foundation. The floor systems, including the 5” thick slab on grade, are all cast-in-place that are reinforced with welded wire fabric. Housekeeping pads are also required for all mechanical, electrical and plumbing equipment. The screen wall at the west loading dock was cast-in-place concrete as well. A concrete pump truck was utilized for the majority of concrete placement. Buggies were necessary for small placements such as housekeeping pads.

Precast Concrete

Although the neighboring parking deck is predominantly brick-clad architectural precast, the addition uses very little precast; however, precast concrete was used as an architectural feature to make a smooth transition from the existing to new structure. This accent band can be seen going in place in Figure 6, along with the vapor barrier, insulation and necessary steel tie-backs. The band itself is called out in red below in Figure 7. It can be seen that a color near that of the brick used blends nicely with the window sills and accent bands. An all-terrain forklift was used to lift precast to Fraco Lifts from which pieces were placed.

Figure 6 - Precast concrete can be seen above which make up the accent band along with east elevation. Personal photograph taken by Chris Pozza.

Figure 7, *Below* - Architectural precast concrete is seen under window sills and spanning the addition on the left above the third story windows. Personal Photograph taken by Chris Pozza.



Mechanical System

Four rooftop air conditioning units resting on 30" high roof curbs will be responsible for the building's air conditioning. Rooftop units one, two, and three (RTU-1, -2, -3) will serve spaces on each floor, with output capacity ranging from 26,000 to 34,000 cubic feet per minute (CFM). The fourth (RTU-4) is dedicated to the third floor operating rooms, with a capacity of 21,600 CFM. Each supply and return fan will be equipped with a variable frequency drive (VFD). Each unit includes a fan inlet airflow measuring station, two banks of filters, along with economizing dampers and controls to provide free cooling when outdoor conditions are suitable. A few other energy conservation measures will be taken for this system. Operating suites have setback controls for unoccupied periods and the mechanical system controls will provide and optimize energy efficiency. A direct digital Energy Management System (EMS) will optimize units operation.

Imaging and MRI suites will have smaller dedicated split air conditioning units. New terminal units with electric reheat coils will be included with variable air volume (VAV) and constant air volume (CAV) units, which will be the primary source of heating. The majority of the building's air terminal units are CAV units. Both operate through a direct digital control (DDC) system with an adjustable temperature set point. When VAV boxes are supplying occupied spaces, a space thermostat controls the damper to maintain temperature. When heating is required, the damper will close to a minimal position, while the reheat coil valve opens in raise room temperature. The opposite takes place for cooling. For occupied spaces controlled by CAV units, air dampers are fixed at modes defined for each specific space on plans. The big difference between the VAV and CAV units is that CAV's include humidity isolation valves to control and maintain humidity levels.

Chillers will be closed-loop systems that use non-CFC/HCFC R404a refrigerant. Each chiller has a cooling capacity of 118.8 thousand BTU per hour (MBH), 15 horsepower (HP) compressor, operating weight of 3,500 pounds, and run on 460 volts and are three-phase. Chillers are located on the rooftop of Area B, as seen below in Figure 8.

A unique feature is the cryogen vent which is required for the MRI equipment. This vent allows the superconducting liquid, used to keep magnets from overheating, to be dissipated from the building in the event of an unexpected shutdown, also known as a quench. The vent runs from the MRI suite through the building's partition walls until exiting the building on the roof.

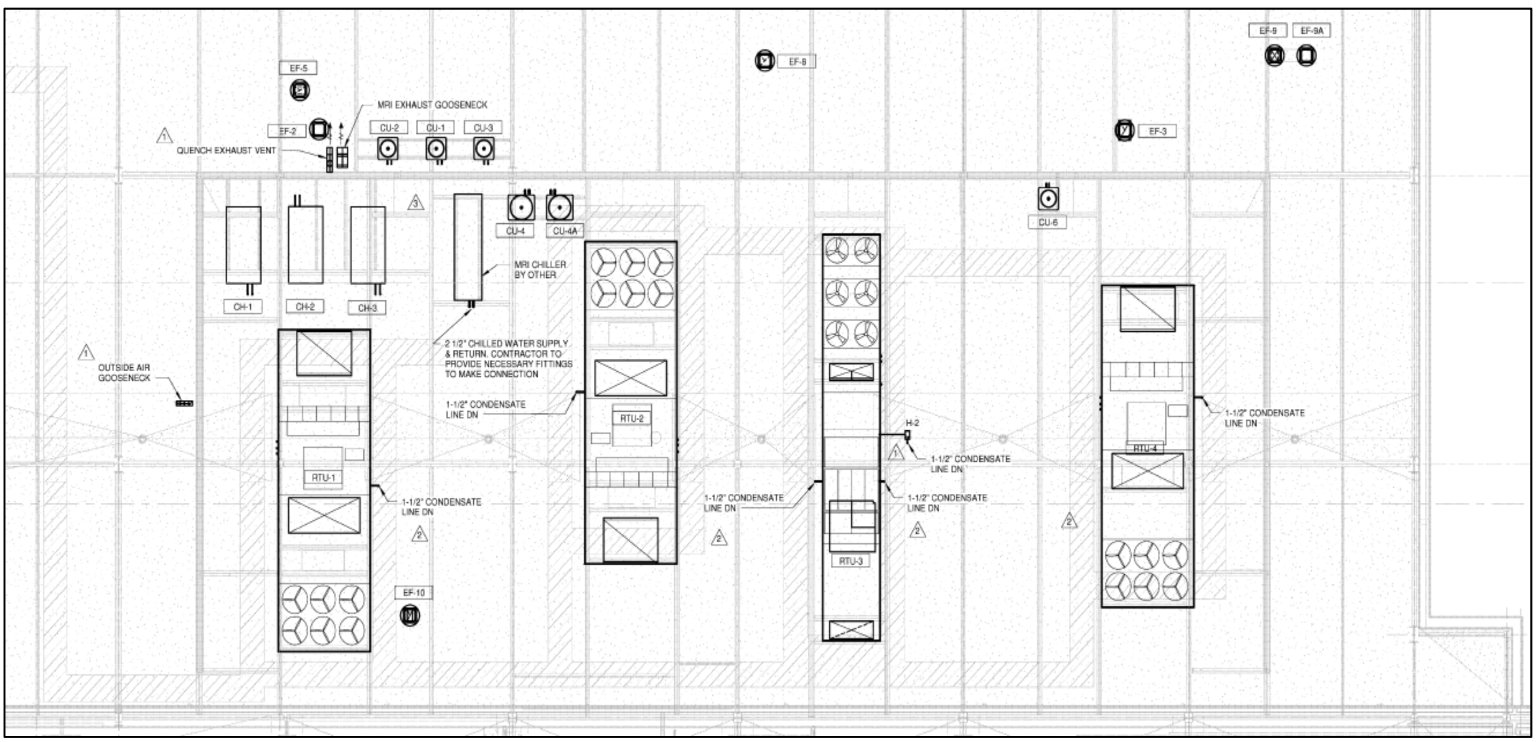


Figure 8 - Plan view of Area B's rooftop and the location of the building's major mechanical components. Rooftop units, chillers, exhaust fans, and even the cryogen vent exaust vent. Image courtesy of Ellerbe Becket.

A 6” fire and domestic water service lines will be split from the service provider to supply this building. A double check valve backflow preventer will be provided in the fire main supplying the 50 horsepower fire pump. The fire pump serves two standpipes in risers. Every floor will have a sprinkler branch, control valve, tamper switch and a flow switch that are connected to the fire alarm panel. Concealed sprinklers will be provided for public spaces and pendent type sprinklers will be located in ceilings of patient and administrative rooms. A dry-pipe sprinkler system will be provided for the main patient entrance canopies.

Main distribution piping for medical gas will be installed in the ceiling space of the first floor only. Medical gas wall outlets and piping will be color coded and labeled for easy identification during construction or future maintenance. From the first floor, piping will rise to serve outlets in second and third floors rooms, including operating suites, pre-operation areas, and procedure rooms. Piping will branch off of risers and directly connect to headwall units, equipment booms, and wall outlets. Medical gas includes oxygen, nitrous oxide, carbon dioxide, and nitrogen. The entire med gas system will be linked to the Building Automation System (BAS).

Electrical System

Pepco Power is the electric utility supplier to the existing building. The new service for the three-story addition is going to include a service yard on the southeast corner of the building. The electrical system’s service connects to a Pepco Power supply that consists of a 13.2 kV feeder serving a utility provided 480/277 Volt Pad mounted transformer, which will be fed from two sources in a three-way, concrete-encased ductbank. These two sources provide the necessary redundancy for the new building addition and do not affect the existing building’s systems. There will be a one-way and two-way concrete encased ductbank running to an existing Pepco Pole. From the service yard, a 15-way concrete-encased ductbank will run to the main switchboard.

Also in the service yard are two 1,250 KW Diesel generators which are connected to the addition’s paralleling gear. Between the paralleling gear and Switchboard MDS are eight main circuit breakers (MCB) and a fire pump; each of which have an automatic transfer switch to transfer the emergency distribution system loads from the Pepco Power source to the emergency generators. The main switch board and paralleling gear are both 4,000 Amp, 480/277V, and three-phase. Dry-type transformers are typically found throughout the building in electric rooms, ranging in size from 45 to 150 KVA, with the most common being 75 KVA. The main electric room is adjacent to the main mechanical room in the southwest corner of Area C. There are several smaller electric rooms on floors two and three.

The building uninterruptible power supply (UPS) for the addition will operate in union with the existing building’s electrical system. Its purpose is to provide back-up and distribution for critical electrical loads. The system is comprised of a single 60 KVA, 54 KW UPS module. Also included is multiple battery-powered system capable of a 15-minute run time at this load.

Lighting

A three-phase, 277V, 20 KVA UPS System with a 90 minute battery back-up will be specifically for emergency lighting applications. 277V, 3500/4100 Kelvin fluorescent fixtures dominate the new addition although there are some 120V incandescent fixtures used in areas for special use or decorative applications and include dimmers. The predominant luminaire in corridors, offices and patient rooms will be 2' by 4' recessed ceiling fixtures with either two or three 32 watt T8 lamps. Waiting areas and imaging rooms are generally comprised of round recessed LED fixtures. The MRI room will use 200 watt down lights actually running on DC power specifically rated for MRI suites. Exterior lighting is mainly comprised of 100 watt, HID lensed downlights that are recessed in the exterior canopies on the east and south ends of the addition.

Masonry

Non-load bearing brick veneer over steel studs will be the primary building façade. There are two colors of brick used that match the existing building's colors. Mortar color presented a challenge as it was difficult to produce the same color found on the existing building, but after several attempts, the desired color was eventually matched.

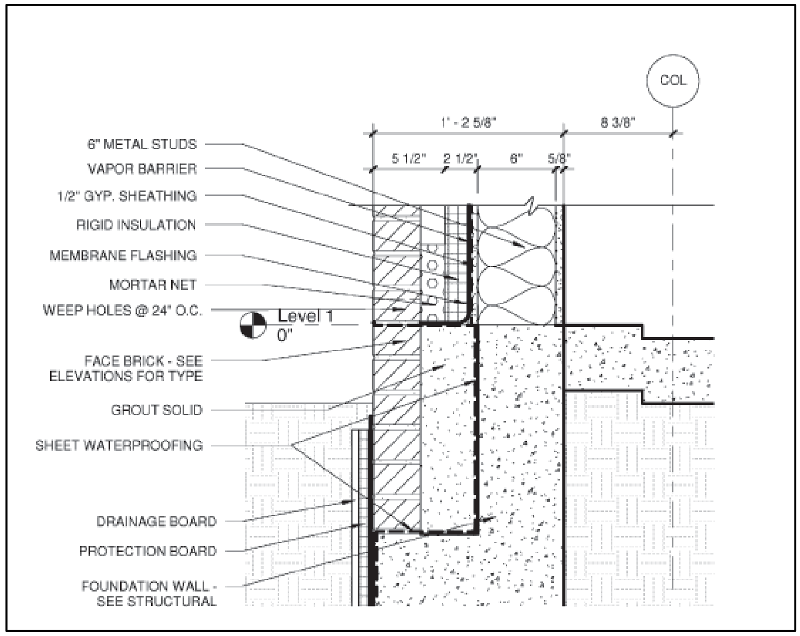


Figure 9 - Detail of exterior masonry wall at foundation. Image courtesy of Ellerbe Becket.

Fraco Lifts were set up around the perimeter of areas placing brick. MasonKing lifts were required in areas where veneer work was done above rooftops, which are shown and described below in Figures 10 and 11.

Figure 10 - View looking at southwest elevation. A MasonKing lift is required in areas where work is done above rooftops. These lifts have to be simultaneously cranked by hand to be lowered or raised. Personal photograph taken by Chris Pozza.

Figure 11 - View looking at east elevation. Fraco Lifts are used around exterior to provide efficient flow of construction along a large percentage of elevation at a time. Materials are lifted into place with a boom lift. Personal photograph taken by Chris Pozza.

Curtain Wall

Prefabricated aluminum curtain wall systems are used mostly on the west and south elevations. This wall system consists of 2.5” wide by 8” deep exposed mullions and caps at multistory locations. At low rise locations, 2.5” wide by 6” deep exposed mullions and caps are used. There are horizontal and vertical expressed caps along with the two main types of glass; 1” clear low E coated insulated glass and 1” spandrel glass. The system is thermally broken and designed to accommodate horizontal and vertical movement. Glass is lifted into place and sealed by two workers using a using JLG lift.

Figure 12 - View of west elevation curtain wall system under construction. The boom lift used during construction of the façade system can be seen at the bottom of the photo. Personal photograph taken by Chris Pozza.

An exterior view of glass curtain wall going in place is shown above in Figure 12. To the left is Figure 13, an interior view looking at the same area on the second floor is seen. Eventually, this area will be a corridor into the existing building (straight ahead) with waiting areas to the right, getting plenty of natural daylight.

Figure 13, *left* – Interior view of west elevation curtain wall system under construction. Personal photograph taken by Chris Pozza.

Exterior Insulation and Finish System (EIFS)

An EIF System over steel stud back-ups is used primarily on the underside of overhangs and screenwalls around rooftop units. Primarily, it’s used in areas where it actually cannot be seen. At non-insulated soffit locations, EIFS is applied directly over the water resistant sheathing. The EIFS will have an acrylic finish coat with a standard light-sand, troweled finish. The color has been chosen to match the EIFS in the existing building.

Metal Panel

There are three types of metal panels used on this project. Insulated Aluminum Panels (MP-1) are 2" thick insulated metal panels that are bonded to factory formed-in-place core with a tongue-and-groove joint. Composite Aluminum Panels (MP-2) are comprised of two sheets of aluminum sandwiching a core of extruded thermoplastic. This system is formed in a continuous process with no adhesives between unlike materials. Preformed Exposed Fastened Metal Panels (MP-3) are fabricated from zinc-coated steel. These will largely be used at the elevated roof of the clerestory window shown below in Figure 13.

Sustainability Features

Although this building is not going to be LEED certified, there are many sustainable features in this medical office building. Construction is guided by the Green Guide for Health Care, although contracts are not tied to it. Throughout construction, material is being separated and recycled. A major passive feature of this building is the large cobrahead roof on the third floor of the addition which spans over 200 feet in length, shown in Figure 14. A cobrahead roof refers to the shape of the roof. This will bring in large amounts of natural daylight without overheating the space. The top layer of roofing consists of a thermoplastic membrane. This is a durable material that, because of its white color, will help the roof reflect light and absorb as little heat as possible, preventing the heat island effect.

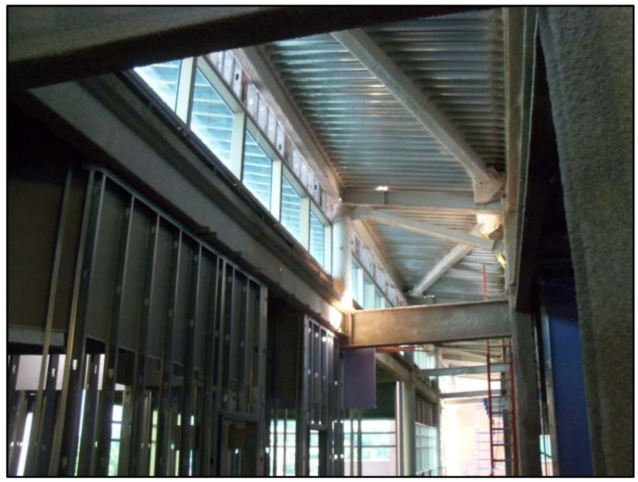


Figure 14 - Shown above is the clerestory that stretches over 200 feet long and bringing in natural light. Personal photograph taken by Chris Pozza

There will also be a drainage pond located between the Area C and the existing south wing. The pond will manage storm water runoff and help improve the water quality of nearby sources. Another sustainable feature incorporated into the landscape design is the natural vegetation that will be used surrounding the building. There is a lot less macadam and concrete around the perimeter of the building, allowing plenty of space for grass, shrubs and small trees native to the area. The area surrounding the building, once completed, will have entirely new pathways guided through a variety of vegetation. The plantings have specifically been chosen for their indigenous characteristics and do not require more water than the natural environment provides; therefore, an irrigation system is not required.

Project Cost

The following section focuses on the cost of the KP Largo Medical Office Building. The key focus of this section will be the cost of work in the addition. The renovation will not be focused on in great detail because it is still in a planning stage and it will not be a traditional sequence or full-building renovation with any comparison cases to compare to in the area that would be relevant. Information about the addition and renovation will be included to show relative cost information, but the square foot and assemblies estimates will only include addition work as this makes up over 80% of the total project cost.

Project Cost	Size (Square Feet)	Cost ($)	Cost per Square Foot ($)
Total Project Cost	236,200	$39,558,519	$167.47
Addition	106,700	$32,504,687	$304.64
Renovation	129,500	$7,053,833	$54.47

Table 2 - Total project cost and size information for the Kaiser Permanente Largo Medical Office Building.

As noted above in Table 2, the guaranteed maximum price is $39,558,519. The total cost per square foot is very low for such a project, but that is due to renovation work typically being lower and only certain areas in the existing building being renovated. The addition costs roughly $305 per square foot.

Actual Construction Cost	Size (Square Feet)	Cost ($)	Cost per Square Foot ($)
Total Actual Const. Cost	236,200	$30,018,866	$127.09
Addition	106,700	$24,625,461	$230.79
Renovation	129,500	$5,393,401	$41.64

Table 3 - Actual construction cost and size information for the Kaiser Permanente Largo Medical Office Building.

Table 3 summarizes the actual cost of construction, excluding the following:

- Contingency
- Bonds, Insurance, and Taxes
- Performance and Payment Bond
- Commercial General Liability
- Subcontractor Default Insurance
- Preconstruction Services
- Contractor's Fee and General Conditions Costs
- Project General Requirements Costs

The numbers provided in Table 4 show the actual construction cost for the project. The total construction cost per square foot is relatively low, but that is primarily due to the renovation cost bringing down the overall cost per square foot. Although renovations are typically associated with lower costs per square foot compared to new construction, the price of $41.64 per square foot is lower than expected. The biggest reason for this is the total existing building square foot has been used to calculate the cost per square foot. A large amount of the existing building is going to be renovated, but not the entire building. Total square footage was used because the exact area being renovated is unknown at this time. That would definitely bring this cost up and, therefore, the overall total cost per square foot.

Major building system costs are summarized in Table 4. Also included is a cost per square foot of each system. All of the following systems are based off of the construction cost and size of the addition which can be seen in Table 3. One thing to take note of is that all plumbing scope is included with HVAC. Also, the electrical system includes all communications, electrical safety and security.

Division	Building System	Total Cost ($)	Cost per Square Foot ($)	% of Building Cost
03	Concrete	870,118	8.15	3.5
04	Masonry	1,131,376	10.60	4.6
05	Metals	2,252,965	21.11	9.1
06	Woods and Plastics	726,303	6.81	2.9
07	Thermal Moisture Protection	1,289,192	12.08	5.2
08	Doors and Windows	1,882,838	17.65	7.6
09	Finishes	4,041,341	37.88	16.4
10	Specialties	328,331	3.08	1.3
11	Equipment	133,992	1.26	0.5
12	Furnishings	76,450	0.72	0.3
13	Special Construction	74,665	0.70	0.3
14	Conveying System	350,654	3.29	1.4
21	Water Suppression	299,670	2.81	1.2
23	HVAC	5,158,880	48.35	20.9
26	Electrical	6,008,686	56.31	24.4

Table 4 - Major building systems and cost per square foot for the addition.

Square Foot Estimate

RSMeans CostWorks was used in order to produce a square foot estimate using RSMeans data.

Key assumptions used in estimate:

- Building Type – Medical Office, 2 story (best match)
- Data Release – Year 2011 Quarter 2 (Final GMP Release date)
- Wall/Framing Type – Face Brick with Concrete Block Back-up/Steel Joists
- Perimeter - measured to be 1,010 feet
- Story Height – 13.33 feet (average taken of all three)
- Contractor's Fee – 1.95% in GMP Contract
- Location Adjustment – Silver Spring, MD

Cost Comparison	Cost ($)	Cost per Square Foot ($)
KP Largo MOB Addition	24,625,461	230.79
RSMeans CostWorks Estimate	14,174,500	132.84

Table 5 - Cost Comparison between RSMeans CostWorks estimate and the actual cost of this project.

There were several factors that led to this building's RSMeans comparison being much less than the actual price. To start, the closest match was a 2-story medical office building. Although the story count and height were adjusted and increased, the estimates were still very low. The most obvious reason for the large difference, as seen in the Square Foot Estimate found in **Appendix B,** was the assumption of the shell. CostWorks provided $1,747,500 for the Shell. This included floor and roof construction;

exterior walls, windows and doors; and roof coverings and openings. This building was largely a masonry façade. The actual masonry cost itself was $1,131,376. A very large portion of actual building cost was finishes, at over $4 million. RSMeans estimates wall, floor, and ceiling finishes to be under $1.5 million. The major difference between estimates is the HVAC and Electrical systems can be seen below in Table 6.

CostWorks groups elevators and lifts; plumbing fixtures; terminal & package units; electrical and lighting systems; and communication systems together to total $7,546,000. Electrical systems alone in the Largo Medical Office Building cost $6,008,686. Uninterruptible power systems and system redundancy contributes to very high electrical costs, but there are definitely more major scope busts in the RSMeans estimate. One thing to take note of is the fact that RSMeans did include a contractor's fee (1.95%). The actual construction cost calculated above in Table 3 does not include this fee, making the difference between estimates even larger.

Assemblies Cost Estimate

An assemblies estimate was conducted to compare the building's MEP system to the actual costs were. As noted in Table 4, mechanical and plumbing systems were grouped together the same as the actual construction estimate that was done. There are several reasons for the large variance between estimates. Many of the systems were tough to match due to the exact systems not being provided by RSMeans, so the closest to actual component was chosen, as seen in **Appendix C**. Below in Table 6, the estimate comparison along with the total difference can be seen.

Assemblies Cost Comparison	Electrical ($)	Mechanical and Plumbing ($)
KP Largo MOB Addition	$6,008,686	$5,158,880
RSMeans CostWorks Estimate	$4,488,442	$3,652,492
Difference between estimates	**$1,520,244**	**$1,506,388**

Table 6 - Assemblies cost estimate compared to the actual estimate.

Because of the complexity of the electrical system, system redundancy and oversizing in case of emergency account for the addition's higher actual systems price. Also, systems including headwall units, nurse stations, elevators, MRI and imaging equipment were not included in the RSMeans estimate. At the same time, some things like branch wires were only partially included in estimates where realistically the lengths and quantities are much larger. The mechanical and plumbing systems estimate also had a large difference. Some contributing factors to the lower amount are the absence of medical gas and equipment, ductwork and diffusers. A few key assumptions made included all lighting fixtures as being fluorescent tubes, all variable-air volume boxes are the same size and each floor has 14,000 linear feet of 20 A wire. More information can be found in **Appendix C.**

After looking further into the estimate, the cost of the systems makes sense for the reasons mentioned above. Estimates created using RSMeans are justifiably lower than the actual costs due to complexity of redundant systems, medical equipment and absence of major contributing factors like nurse stations and elevators. Actual costs of the different systems are higher than typical medical office buildings, but that is because there are a wider range of features provided, near equivalent to a hospital, in this building.

Existing Conditions

The Kaiser Permanente Largo Medical Office Building is found in Largo, Prince George's County, Maryland. This building is less than two miles away from FedEx Field, home of the Washington Redskins. Between the football stadium and site is Interstate 495. Directly to the west of the site is Landover Road, Route 202. These major roadways allow for several means of access to the site in a relatively short distance.

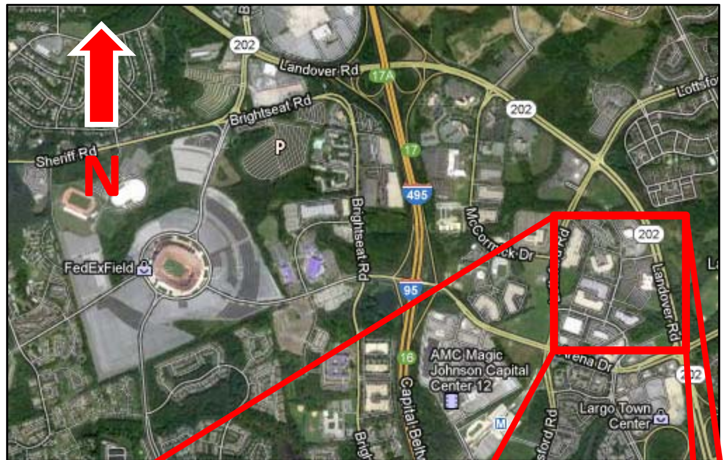


Figure 15, *above right* – Zoomed out site view highlighted in red showing major nearby access routes such as Interstate 495 and Route 202. Image taken from maps.google.com.

The site is surrounded almost entirely by roads. Technology Way is to the north, Mercantile Lane to the west and Landover Road to the east. Directly to the south is the only area where commercial property can be accessed directly. The terrain is flat and relatively level as the majority of the space was previously a parking lot for the existing building.

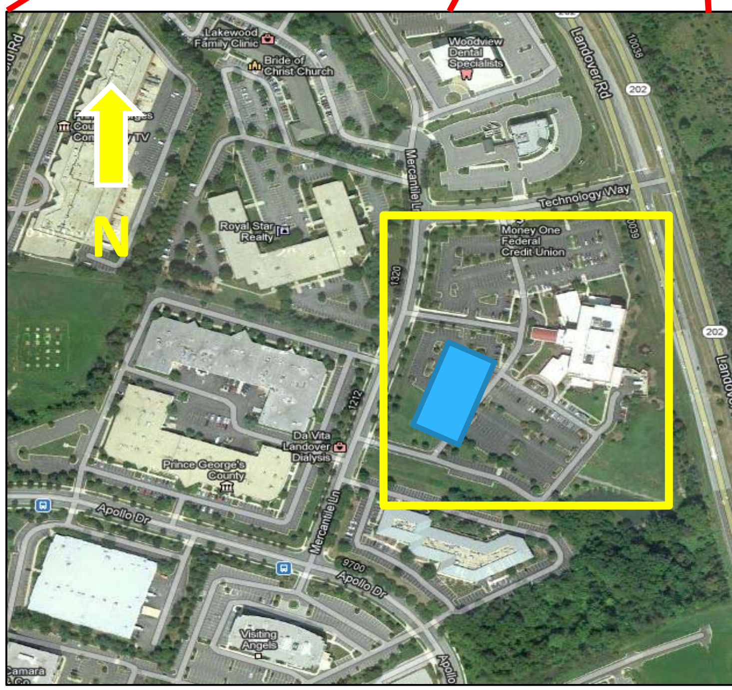


Figure 16, *right* – Zoomed in site view of the existing medical office building highlighted in yellow. The majority of the site surface is hardscape for vehicle and pedestrian traffic. Due to the outdated image, the existing parking garage was drawn in blue. Neighboring low-rise buildings can be seen a large distance away, thus construction will have minimal impact on neighboring buildings. Image taken from maps.google.com.

It can be seen that buildings in this area typically have a large footprint and are relatively low, ranging from two to four stories. KP's medical office building is no different, actually being one of the tallest at four stories and 51' 4". It can be seen in Figure 16 that the majority of the site is parking lot, even though the image is outdated due to the current parking garage which has been added, highlighted in blue.

A more detailed site plan showing the existing conditions has been created. Please refer to **Appendix D**. Underground electric below the existing parking lot to be removed is included. One unique thing is that many of the existing utilities near the new building footprint have been added during the construction of the parking garage in preparation for this project. Once excavation begins for the addition, trenches and utilities will have much less of an impact on the overall site.

Site Layout Planning

Excavation & Site Mobilization

A temporary bypass road has been placed adjacent to the south entrance of the existing parking garage. The majority of the existing parking lot has been demolished for the new building footprint. This, with a legend and detailed plan can be seen on the Excavation & Site Mobilization plan found in **Appendix E**.

Deliveries will still be made to the east loading dock of the existing building for occupants. A temporary water runoff trap is located south of the bypass road to catch excess muddy water from the large building footprint. Parking is available for the project team, roughly 24 spaces near the site trailers, throughout excavation and mobilization activities. Temporary power will enter the site from a Pepco utility pole connecting to a power shed near the trailers. This will remain in place the duration of construction. Permanent power will be placed later during construction, although underground utilities will already have been placed, the connection will be established near the existing loading dock farther north from the temporary power location. Other utilities can be seen in their respective trench areas.

The recent construction of the parking garage included placing utilities where necessary for the new addition. This helped limit the amount of utility time and space needed. Excavation began near the existing building and moved towards the southwest end of the site. A mock-up area has been designated between the bypass road and parking garage. Here, a mock-up of brick veneer including a window to show joints and connections will be fabricated. Dumpsters are placed near the southwest corner of site as well. Access to the new parking garage is still available near the mock-up area; however, this area is not barricaded so pedestrians are able to walk around the parking garage between the site fence and garage.

Structure

There are three major entrances to site, along with two pedestrian gates for workers. Additional parking is provided for construction workers in the neighboring parking garage. The third level ramp continuing to the fourth level can be utilized by the workforce, which requires about 55 spaces maximum. Large laydown areas are utilized between site entrances on the site and the northwest corner. A 60-ton crawler crane was used for steel erection. The laydown area for steel sequence #1 was between Area A and the site trailers. Steel was taken from the truck and placed in the laydown area where material could then be picked by the crane. Sequence #2's laydown area was in the southwest corner of Area C.

Overhead protection was also required near the existing building exit on the east elevation due to crane picks. Night work actually had to be done for about a week in Area B, near the existing MRI room. This area is labeled on the Structure Plan in **Appendix E.** Crane picks could not be done overhead during the day while the MRI was in use. The site trailers with appropriate parties involved are also labeled in more detail.

Finishes

Masonry has been included on the Finishes Plan due to the major masonry façade work happening simultaneously with interior work. Fraco Lifts are shown along almost the entire east and south facades to provide the most efficient brick placement possible. The interior follows the same area sequencing as the foundations and structure, from north near the existing building to the southwest. Two façade locations have been left open intentionally to allow materials to be lifted into and removed from the building. The opening at the south is also a pedestrian access entrance on the first level. Here, overhead protection is required. All-terrain forklifts were used on site to lift masonry material to scaffolding and deliver MEP material to the upper floors. The loading dock has been moved as shown in the last site plan, the Finishes Plan in **Appendix E.** This decision was due to the site being very active during this phase and the existing medical office building gets several deliveries daily.

Local Conditions

Geotechnical Report

The geotechnical analysis and study was conducted by Hills-Carnes Engineering Associates, Inc. Their work was reported on August 27, 2010. This date was prior to even the new parking garage on site which was complete before the addition started, so the soil analysis was done on a much larger area than just the surrounding footprint of the addition. In total, 28 Standard Penetration Test soil borings were drilled throughout this area. 15 borings were drilled at depths ranging between 20 and 40 feet below the existing site grades in the addition and parking garage footprints. Eight were drilled to 6.5 foot depths in future paved areas. The rest were taken below existing grades in proposed storm water management areas and in-situ infiltration testing was performed where specified by the civil engineer.

As requested by the Owner, borings were located in grass areas away from pavement where possible to have as little impact on parking as possible. Two other locations specifically needed to move away from the existing building due to being within close proximity to the MRI equipment. Soil samples were classified in accordance with the Unified Soil Classification System (USCS). This project is located in the Atlantic Coastal Plain Region; where near surface natural soils consist of sedimentary materials typically with layers of granular and semi-cohesive to cohesive soils.

Several borings were drilled through existing pavement areas generally 3 to 4 inches thick with another same-size layer of stone. Where encountered, topsoil at tested locations ranged from 2 to 5 inches. Findings included combinations of man-placed fill and natural soils; both of which were found in the majority of borings taken from this site. The man-made fill materials appeared to be materials placed during the construction of the existing building in 1998. This fill ranged from depths of 2 to 7.5 feet. It was not determined to have an effect on construction because the fill is similar to the on-site natural soils. The natural soils found were classified as silty sand (SM), clayey sand (SC), sandy silt (ML) and combinations of the three. The maximum column loads expected were calculated to be near 400 kips for the proposed addition. A 1" settlement has been assumed to be tolerable for this structure.

Groundwater in the site was encountered at its highest level was well below grade, roughly 12' below the lowest finished floor elevation. It was determined that dewatering systems for excavation were not necessary but monitoring was required throughout the season to make sure of no major level fluctuations that could impact construction.

Building Methods

Structural steel frame buildings with masonry façades are common in Prince George's County. Alternatives were basically ruled out due to the existing building already limiting site access along with the effort taken to match the existing building type as previously discussed. Medical office buildings are not as common in the area, but there are many commercial buildings that have used similar construction methods. Because of this construction being an addition of purely medical office building uses, a basement was not necessary. The methods that were exploited reflect the current healthcare construction requirements and Kaiser Permanente's demands as they are a very large and successful national organization.

Parking
Even though there is a limited number of parking due to current construction, there is still plenty of parking available for people working construction and working or visiting the medical office building. DPR, Jacobs and members from Kaiser Permanente on site are able to park near the office trailers. There is also enough room for foremen of key trades on site to park in the same area near their site trailers as well. The rest of the construction team is able to park on the third for fourth level of the parking deck, directly west to the site. There are about 55 parking spots for craftsmen, which means about half of the craftsmen drive while half are dropped off or carpool. Parking has not been an issue mainly due to workers being able to use the new parking garage. This site has enough room for all employees and there are also two visitor spots directly beside the trailers for guest's convenience on site.

Recycling
The overall goal for this project is to have at least 50% of discarded material to be recycled or reused. Monthly reports are provided summarizing the exact amounts of material being taken from site, recycled or sent to the landfill. Comingled dumpsters are used, which means any material can go in any dumpster. Once dumpsters are filled, they are removed and separated into trash or recyclables off site. A service call is placed to Lawrence Street Industry (LSI) to empty them by 5 PM the next business day. The roll-off containers allow for easy removal of material and help keep the site clean and organized.

Total monthly waste varies due to various trades on site throughout construction, but more recently months have had over 25 tons removed as construction is in some of its busiest times. Even though this project isn't striving to become LEED certified, the rights steps are certainly being taken in order to be environmentally friendly and sustainable. As of July 2012, after a year of construction, over 145 cubic yards of materials have been removed from site; with over 130 yards have been diverted. To date, less than 10% of materials have been sent to a landfill. Tipping fees are charged to the waste haulers when material is taken to a landfill. After LSI separates the trash and loads it on a truck headed for a landfill, each truck is then charged a tipping fee for the load dumped.

Local Bylaws & Permits
The recently built parking garage was necessary to support the increased square footage of the building as required by the Prince George's County Zoning Ordinance. With construction of the new KP Largo Medical Office Building directly following construction of the parking garage, an interesting situation arose. The Washington Suburban Sanitary Commission (WSSC) deals with grading permits for construction projects. Donohoe Construction, the general contractor responsible for the garage, was closing out their respective work when DPR was beginning site grading for the new addition.

This presented a unique situation. Typically a construction site requires one grading permit under one general contractor. The projects overlapping placed two general contractors on a single permit. In order to close out the garage and obtain the Certificate of Occupancy, a temporary permit was necessary. Fortunately, the WSSC was willing to work closely with Donohoe Construction to help get the necessary temporary signoff for the garage with no delays.

Client Information

Kaiser Permanente was founded in 1945 and has become one of the largest national healthcare organizations in the country with almost nine million customers. Today, the organization continues to grow, providing both for-profit and not-for-profit health plans. Kaiser has hospitals and medical office buildings providing outpatient services at many locations, like the one which is the focus of this project. Outpatient services include everything a hospital does but without overnight stay.

The purpose of this project is to expand and improve existing facilities to meet future healthcare demands and create an environment that improves the overall experience for the people in this facility. With a growing population in the region, the demand for healthcare facilities is on the rise and this additional space has been determined essential. The real drivers on this project are schedule and cost. The schedule has been tight from the very beginning of construction. First Patient is the most critical milestone, scheduled for July 17, 2013, and cannot be missed. Planning for the renovation is currently underway and expected to begin upon completion of the addition.

DPR has worked with Kaiser Permanente in the past and projects have been very successful. Due to DPR's past successes, it can be said that quality and safety must never be compromised throughout construction, regardless of how challenging a project may be. Kaiser Permanente has their own set of standards that clearly define goals and expectations, making it evident that KP has very high anticipations for their facilities.

Cost is closely monitored, as evident by the weekly change order meeting that take place. Also, several bulletins and construction change directives (CCD's) have been issued since the start of construction. It's understood by all parties involved that construction needs to keep moving in order to reach the First Patient milestone. Kaiser works closely with DPR to track work being put in place and to make sure appropriate payments are made for that work.

Having minimal impact on the current functions of the existing building is expected to make the renovation very challenging. KP wants the building to remain occupied throughout construction; therefore, a phased renovation will be required. Work is being planned to place on multiple floors at a time in small areas. Because the whole building is to remain occupied, night work is going to be required. Shifts will have to set up and tear down equipment daily; therefore, four 10-hour shifts are going to be utilized instead of five 8-hour shifts weekly. Efficiency was the key driver for this decision as there will be less time preparing to work or cleaning up. KP expects their employees to be able to continue their work without having to avoid construction areas (except for those departments closed down for full renovation). Zip walls will be used to contain dust and debris while making for easy cleanup.

Project Delivery System

Kaiser Permanente has chosen a CM at Risk project delivery for the construction of this 3-story addition and renovation work. Although DPR would have liked to be even more involved in preconstruction activities, there is a clear overlap between design and construction, eliminating the possibility of a design-bid-build delivery. Having a strong vision in mind what a successful end product should be, this delivery method made the most sense as design function and layout were basically predetermined once demand for expansion was discovered. An organizational chart including contract types listed with appropriate project team members has been created. It can be found in **Appendix E.**

DPR has been awarded a guaranteed maximum price (GMP) contract as the general contractor. With that, DPR takes on risk for all of the subcontractors on site. All of the contracts DPR holds with subcontractors are lump sum contracts. Drywall and framing is the only activity that DPR self-performs. DPR is not contractually tied to the construction manager, Jacobs, or the architect. Essex Construction has a lump sum contract agreement with DPR. Essex is a minority business (MBE) and team members help with project management; including directly managing the electric/fire alarm sub. Pro-Air is the only subcontractor to hold another contract, as sheet metal work has been awarded to CMC.

Ellerbe Becket has an interesting contract with KP, a term contract. Qualified firms were able to apply when Kaiser announced the opportunity. Upon being awarded the contract, Ellerbe Becket is now contractually tied with Kaiser for a fixed period of time. Duration and cost of this contract were not deemed necessary. What's also interesting is Ellerbe Becket performs more than just the aesthetic design. Structural, mechanical, electrical, plumbing, and interiors are all engineered and designed in house. The only outside assistance is required from a civil engineering firm and a landscape architect, both of which are lump sum contracts. Jacobs, the construction manager has a professional services agreement with a fixed fee.

Jacobs is the Construction Manager for the project. Jacobs Project Management Company has been brought on early as a program manager consultant. Other early involvement activities performed by Jacobs include a schematic design cost estimate based on the overall project scope. Kaiser Permanente holds a GMP contract with Jacobs as well as DPR.

Bonds and insurances are required by KP. A performance and payment bond, commercial general liability and subcontractor default insurance are all included in the project budget. Builder's risk insurance has been provided by the owner. A 3% construction contingency has been included in the GMP.

Kaiser Permanente has three major projects taking place around the Virginia / Washington DC Metro Area. KP intended to have a different contractor for each project, so three separate contractors were to be chosen. Originally, there was a Request for Proposal (RFP) inviting 12 contractors to bid on one or multiple desired projects. Contractors were required to be prequalified, having healthcare experience and be financially qualified as well. Further details specifying qualifications were not available. Contracts were to be selected based off best value.

Major trades were selected similarly to DPR and contractors for other KP projects. Subcontractors need to prequalify. Once it was proven a subcontractor is financially qualified, the subcontractor could proceed with bidding. The lowest two or three were selected and interviewed to make sure that all major scope is taken care of and there are no busts. After the interview, the subcontractors were allowed to resubmit their bids, without knowing what the competition has previously submitted, and the lowest was selected.

Staffing Plan

A staffing chart making up DPR's project team can be found in **Appendix E.** The staffing chart is actually shown as a plan view of the office trailer showing members' areas to emphasize the encouragement of collaboration as opposed to a project team hierarchy. Showing the layout of the office shows the intent for full collaboration as it is entirely open, promoting team member discussions and overlap of responsibilities.

The field office staff includes the coordinator (FOC), two superintendents, Jeff Busch and Tim Miner, and the project managers, John Stull and Michael Hudak. Blake Haldeman and Emily Price were project engineers. Matt Hedrick was the BIM Champion and took over as a Project Engineer when Emily Price left on maternity leave. A safety person for the region, Stephen Cloutier, is on site a few times a week.

The project executive, John Anania, is on site as required. Two members from Essex Construction are also in the trailer; Joe Brito is responsible for quality control and Anthony Moore manages the electric subcontractor and assisted DPR's management staff.

Table 7 shows the major responsibilities of each person and their contributions to the project team. This goes more in detail of individual team responsibility compared to the staffing plan laid out in **Appendix E** to keep information as organized and concise as possible**.**

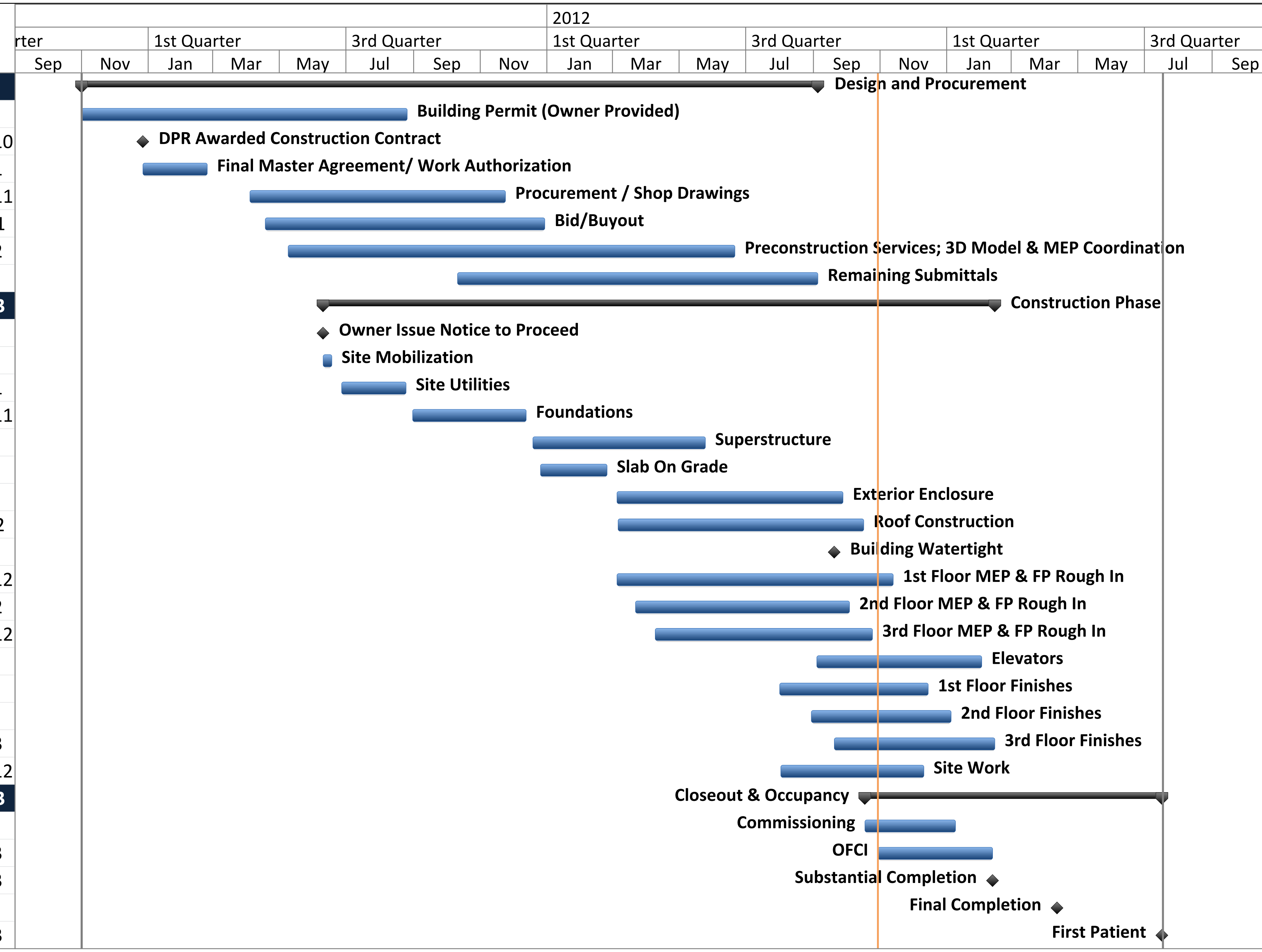
Name	Position	Responsibilities
John Stull	Project Manager	Track project budget throughout duration of project Work with KP to negotiate change orders Monthly cost reports logging overall project financials Work with Superintendents to track subcontractors percentage of work complete
Michael Hudak	Assistant Project Manager	Brought on to help manage changes Help track change orders and construction change directive Verify cost of changes by working with subcontractors to understand scope impact
Jeff Bush	Superintendent	Responsible for site logistics and building exterior construction
Tim Miner	Superintendent	Responsible for interiors and MEP construction
Emily Price	Project Engineer	Manages doors and hardware, miscellaneous metals, and steel subcontractors
Blake Haldeman	Project Engineer	Manages electrical, mechanical, and plumbing subcontractors
Matt Hedrick	BIM Champion Project Engineer	Responsible for all trades BIM Coordination Manages FFE and responsible for Emily Price's subcontractors upon her departure
Karen Washington	Field Office Coordinator	Handles day to day activities, tracks toxic chemicals on site, keeps office in line
Anthony Moore	Essex Project Manager	Manages electrical subcontractor and design team, responsible for site recycling
Joe Brito	Quality Control Inspector	Essex Representative responsible for overall project quality control
Steve Cloutier	Regional Safety Leader	Responsible for site safety on several project, comes on site 2-3 times per week
John Anania	Project Executive	Responsible for overall project and financials, on site 1-2 times per week
Chris Pozza	Intern	Responsible for RFI linking, renovation documentation, rolling completion lists and where team determined necessary

Table 7 - Summary of the project team's roles and responsibilities. Although there is constant overlap of responsibility, the responsibilities listed are those that each team member lead.

Appendix A – Project Summary Schedule

Project Summary Schedule

ID	Task Name	Duration	Start	Finish
1	**Design and Procurement**	**482 days**	**Mon 11/1/10**	**Tue 9/4/12**
2	Building Permit (Owner Provided)	214 days	Mon 11/1/10	Thu 8/25/11
3	DPR Awarded Construction Contract	0 days	Mon 12/27/10	Mon 12/27/10
4	Final Master Agreement/ Work Authorization	43 days	Mon 12/27/10	Wed 2/23/11
5	Procurement / Shop Drawings	168 days	Mon 4/4/11	Wed 11/23/11
6	Bid/Buyout	184 days	Mon 4/18/11	Thu 12/29/11
7	Preconstruction Services; 3D Model & MEP Coordination	293 days	Mon 5/9/11	Wed 6/20/12
8	Remaining Submittals	236 days	Tue 10/11/11	Tue 9/4/12
9	**Construction Phase**	**439 days**	**Fri 6/10/11**	**Wed 2/13/13**
10	Owner Issue Notice to Proceed	0 days	Fri 6/10/11	Fri 6/10/11
11	Site Mobilization	6 days	Fri 6/10/11	Fri 6/17/11
12	Site Utilities	43 days	Mon 6/27/11	Wed 8/24/11
13	Foundations	74 days	Wed 8/31/11	Mon 12/12/11
14	Superstructure	114 days	Mon 12/19/11	Thu 5/24/12
15	Slab On Grade	45 days	Mon 12/26/11	Fri 2/24/12
16	Exterior Enclosure	149 days	Mon 3/5/12	Thu 9/27/12
17	Roof Construction	161 days	Tue 3/6/12	Tue 10/16/12
18	Building Watertight	0 days	Thu 9/20/12	Thu 9/20/12
19	1st Floor MEP & FP Rough In	181 days	Mon 3/5/12	Mon 11/12/12
20	2nd Floor MEP & FP Rough In	140 days	Thu 3/22/12	Wed 10/3/12
21	3rd Floor MEP & FP Rough In	143 days	Mon 4/9/12	Wed 10/24/12
22	Elevators	109 days	Tue 9/4/12	Fri 2/1/13
23	1st Floor Finishes	98 days	Wed 8/1/12	Fri 12/14/12
24	2nd Floor Finishes	92 days	Thu 8/30/12	Fri 1/4/13
25	3rd Floor Finishes	105 days	Thu 9/20/12	Wed 2/13/13
26	Site Work	93 days	Thu 8/2/12	Mon 12/10/12
27	**Closeout & Occupancy**	**194 days**	**Thu 10/18/12**	**Wed 7/17/13**
28	Commissioning	59 days	Thu 10/18/12	Tue 1/8/13
29	OFCI	75 days	Tue 10/30/12	Mon 2/11/13
30	Substantial Completion	0 days	Mon 2/11/13	Mon 2/11/13
31	Final Completion	0 days	Fri 4/12/13	Fri 4/12/13
32	First Patient	0 days	Wed 7/17/13	Wed 7/17/13



Project: Kaiser Permanente Largo
Date: Tue 10/30/12

Task — Milestone ◆ — Summary

Appendix B – Square Foot Cost Estimate

Square Foot Cost Estimate

Square Foot Cost Estimate Report

Estimate Name:	**Untitled**
Building Type:	**Medical Office, 2 Story with Face Brick with Concrete Block Back-up / Steel Joists**
Location:	**SILVER SPRING, MD**
Story Count:	**3**
Story Height (L.F.):	**13.33**
Floor Area (S.F.):	**106700**
Labor Type:	**Union**
Basement Included:	**No**
Data Release:	**Year 2011 Quarter 2**
Cost Per Square Foot:	**$132.84**
Building Cost:	**$14,174,500**

Costs are derived from a building model with basic components.

Scope differences and market conditions can cause costs to vary significantly.

Parameters are not within the ranges recommended by RSMeans.

		% of Total	Cost Per S.F.	Cost
A Substructure		**1.70%**	**$2.22**	**$237,000**
A1010	**Standard Foundations**		**$0.22**	**$24,000**
	Strip footing, concrete, reinforced, load 11.1 KLF, soil bearing capacity 6 KSF,			
	Spread footings, 3000 PSI concrete, load 75K, soil bearing capacity 6 KSF, 4' -			
A1030	**Slab on Grade**		**$1.61**	**$172,000**
	Slab on grade, 4" thick, non industrial, reinforced			
A2010	**Basement Excavation**		**$0.13**	**$13,500**
	Excavate and fill, 4000 SF, 4' deep, sand, gravel, or common earth, on site stc			
A2020	**Basement Walls**		**$0.26**	**$27,500**
	Foundation wall, CIP, 4' wall height, direct chute, .148 CY/LF, 7.2 PLF, 12" thic			
B Shell		**12.60%**	**$16.38**	**$1,747,500**
B1010	**Floor Construction**		**$7.92**	**$845,500**
	Floor, concrete, slab form, open web bar joist @ 2' OC, on W beam and wall,			
	Floor, concrete, slab form, open web bar joist @ 2' OC, on W beam and wall,			
B1020	**Roof Construction**		**$1.62**	**$173,000**
	Floor, steel joists, beams, 1.5" 22 ga metal deck, on columns and bearing wal			
	Floor, steel joists, beams, 1.5" 22 ga metal deck, on columns and bearing wal			
B2010	**Exterior Walls**		**$2.54**	**$270,500**
	Brick wall, composite double wythe, standard face/CMU back-up, 8" thick, pe			
B2020	**Exterior Windows**		**$1.36**	**$145,500**
	Windows, aluminum, sliding, standard glass, 5' x 3'			
B2030	**Exterior Doors**		**$1.44**	**$153,500**
	Door, aluminum & glass, with transom, narrow stile, double door, hardware,			
B3010	**Roof Coverings**		**$1.49**	**$158,500**
	Roofing, asphalt flood coat, gravel, base sheet, 3 plies 15# asphalt felt, mopp			
	Insulation, rigid, roof deck, composite with 2" EPS, 1" perlite			
	Roof edges, aluminum, duranodic, .050" thick, 6" face			
	Gravel stop, aluminum, extruded, 4", mill finish, .050" thick			
B3020	**Roof Openings**		**$0.01**	**$1,000**
	Roof hatch, with curb, 1" fiberglass insulation, 2'-6" x 3'-0", galvanized steel,			
C Interiors		**24.90%**	**$32.40**	**$3,457,000**
C1010	**Partitions**		**$6.42**	**$685,000**
	Metal partition, 5/8"fire rated gypsum board face, 5/8"fire rated gypsum boa			

	1/2" fire ratedgypsum board, taped & finished, painted on metal furring			
C1020	**Interior Doors**		$8.80	$939,000
	Door, single leaf, wood frame, 3'-0" x 7'-0" x 1-3/8", birch, solid core			
C2010	**Stair Construction**		$3.33	$355,500
	Stairs, steel, cement filled metal pan & picket rail, 16 risers, with landing			
C3010	**Wall Finishes**		$2.88	$307,500
	Painting, interior on plaster and drywall, walls & ceilings, roller work, primer			
	Vinyl wall covering, fabric back, medium weight			
C3020	**Floor Finishes**		$6.28	$670,500
	Carpet, tufted, nylon, roll goods, 12' wide, 36 oz			
	Carpet, padding, add to above, maximum			
	Vinyl, composition tile, maximum			
C3030	**Ceiling Finishes**		$4.68	$499,500
	Acoustic ceilings, 5/8" mineral fiber, 12" x 12" tile, 1" x 3" wood, 12" OC grid,			
D Services		**54.30%**	**$70.72**	**$7,546,000**
D1010	**Elevators and Lifts**		$14.45	$1,542,000
	Hydraulic hospital elevator, 4000 lb., 125 FPM			
D2010	**Plumbing Fixtures**		$20.95	$2,235,000
	Water closet, vitreous china, bowl only with flush valve, wall hung			
	Lavatory w/trim, vanity top, vitreous china, 20" x 16"			
	Kitchen sink w/trim, countertop, stainless steel, 19" x 18" single bowl			
	Service sink w/trim, PE on CI,wall hung w/rim guard, 22" x 18"			
	Water cooler, electric, wall hung, wheelchair type, 7.5 GPH			
D2020	**Domestic Water Distribution**		$0.19	$20,500
	Gas fired water heater, commercial, 100< F rise, 200 MBH input, 192 GPH			
D2040	**Rain Water Drainage**		$0.92	$98,000
	Roof drain, CI, soil,single hub, 4" diam, 10' high			
	Roof drain, CI, soil,single hub, 4" diam, for each additional foot add			
D3050	**Terminal & Package Units**		$13.39	$1,429,000
	Rooftop, multizone, air conditioner, medical centers, 10,000 SF, 23.33 ton			
D4010	**Sprinklers**		$3.29	$351,500
	Wet pipe sprinkler systems, steel, light hazard, 1 floor, 5000 SF			
	Wet pipe sprinkler systems, steel, light hazard, each additional floor, 5000 SF			
D4020	**Standpipes**		$1.49	$159,500
	Wet standpipe risers, class III, steel, black, sch 40, 4" diam pipe, 1 floor			
	Wet standpipe risers, class III, steel, black, sch 40, 4" diam pipe, additional flc			
	Cabinet assembly, includes. adapter, rack, hose, and nozzle			
D5010	**Electrical Service/Distribution**		$0.16	$17,000
	Service installation, includes breakers, metering, 20' conduit & wire, 3 phase,			
	Feeder installation 600 V, including RGS conduit and XHHW wire, 400 A			
	Switchgear installation, incl switchboard, panels & circuit breaker, 400 A			
D5020	**Lighting and Branch Wiring**		$7.33	$782,000
	Receptacles incl plate, box, conduit, wire, 10 per 1000 SF, 1.2 watts per SF			
	Wall switches, 5.0 per 1000 SF			
	Miscellaneous power, 1 watt			
	Central air conditioning power, 3 watts			
	Fluorescent fixtures recess mounted in ceiling, 0.8 watt per SF, 20 FC, 5 fixtur			
D5030	**Communications and Security**		$7.66	$817,000
	Telephone wiring for offices & laboratories, 8 jacks/MSF			

	Communication and alarm systems, fire detection, addressable, 25 detectors			
	Fire alarm command center, addressable without voice, excl. wire & conduit			
	Communication and alarm systems, includes outlets, boxes, conduit and wire			
	Internet wiring, 8 data/voice outlets per 1000 S.F.			
D5090	**Other Electrical Systems**		**$0.89**	**$94,500**
	Generator sets, w/battery, charger, muffler and transfer switch, gas/gasoline			
E Equipment & Furnishings		**6.60%**	**$8.58**	**$916,000**
E1020	**Institutional Equipment**		**$8.58**	**$916,000**
	Architectural equipment, laboratory equipment, counter tops, acid proof, eco			
	Architectural equipment, laboratory equipment, cabinets, base, drawer units			
E1090	**Other Equipment**		**$0.00**	**$0**
F Special Construction		**0.00%**	**$0.00**	**$0**
G Building Sitework		**0.00%**	**$0.00**	**$0**
SubTotal		**100%**	**$130.30**	**$13,903,500**
Contractor Fees (General Conditions,Overhead,Profit)		**2.00%**	**$2.54**	**$271,000**
Architectural Fees		**0.00%**	**$0.00**	**$0**
User Fees		**0.00%**	**$0.00**	**$0**
Total Building Cost			**$132.84**	**$14,174,500**

Appendix C – Assembly Detail Report

Assembly Detail Report

Assembly Detail Report

Cost Estimate Report CostWorks RSMeans

Year 2011 Quarter 2

Date: 20-Sep-12

KP Largo MOB

Prepared By:
Chris Pozza
penn state

Assembly Number			Description	Quantity	Unit	Total Incl. O&P	Ext. Total Incl. O&P
D Services							
D50101200280			Service installation, includes breakers, metering, 20' conduit & wire, 3 phase, 4 wire, 120/208 V, 200 A	42.00	Ea.	$3,575.00	$150,150.00
D50101200320			Service installation, includes breakers, metering, 20' conduit & wire, 3 phase, 4 wire, 120/208 V, 400 A	6.00	Ea.	$7,550.00	$45,300.00
D50101200360			Service installation, includes breakers, metering, 20' conduit & wire, 3 phase, 4 wire, 120/208 V, 600 A	4.00	Ea.	$12,500.00	$50,000.00
D50101200400			Service installation, includes breakers, metering, 20' conduit & wire, 3 phase, 4 wire, 120/208 V, 800 A	2.00	Ea.	$15,300.00	$30,600.00
D50101200440			Service installation, includes breakers, metering, 20' conduit & wire, 3 phase, 4 wire, 120/208 V, 1000 A	6.00	Ea.	$18,250.00	$109,500.00
D50102301240			Branch installation 600 V, including EMT conduit and THW wire, 20 A	42,000.00	L.F.	$6.92	$290,640.00
D50102301560			Branch installation 600 V, including EMT conduit and THW wire, 200 A	42,000.00	L.F.	$32.55	$1,367,100.00
D50102400400			Switchgear installation, incl switchboard, panels & circuit breaker, 2000 A	2.00	Ea.	$55,500.00	$111,000.00
D50201100720			Receptacles incl plate, box, conduit, wire, 20 per 1000 SF,2.4 W per SF, with transformer	106,700.00	S.F.	$4.93	$526,031.00
D50201200560			Receptacles and wall switches, 400 SF, 6 receptacles	267.00	S.F.	$3.20	$854.40
D50201250760			3 way switch, 15 A with box, plate, 3/4" EMT & wire	180.00	Ea.	$256.00	$46,080.00
D50201300400			Wall switches, 10.0 per 1000 SF	106,700.00	S.F.	$2.38	$253,946.00
D50201400320			Central air conditioning power, 6 watts	106,700.00	S.F.	$0.83	$88,561.00
D50201450920			Motor installation, three phase, 200 V, 50 HP motor size	5.00	Ea.	$11,650.00	$58,250.00
D50201551080			Motor feeder systems, three phase, feed to 230 V 50 HP, 460 V 100 HP, 575 V 125 HP	200.00	L.F.	$30.00	$6,000.00
D50201700520			Motor connections, three phase, 200/230/460/575 V, up to 50 HP	5.00	Ea.	$362.50	$1,812.50
D50202080720			Fluorescent fixtures, type A, 41 fixtures per 3000 SF	106,700.00	S.F.	$7.15	$762,905.00
D50309100240			Communication and alarm systems, includes outlets, boxes, conduit and wire, sound systems, 30 outlets	6.00	Ea.	$37,100.00	$222,600.00
D50309100600			Communication and alarm systems, includes outlets, boxes, conduit and wire, intercom systems, 50 stations	6.00	Ea.	$61,100.00	$366,600.00
D50902101400			Generator sets, w/battery, charger, muffler and transfer switch, diesel engine with fuel tank, 1000 kW	2.00	kW	$255.98	$511.96
D Services Subtotal							**$4,488,441.86**

Assembly Detail Report

Cost Estimate Report CostWorks RSMeans

Year 2011 Quarter 2

Date: 20-Sep-12

KP Largo MOB

Prepared By:
Chris Pozza
penn state

Assembly Number			Description	Quantity	Unit	Total Incl. O&P	Ext. Total Incl. O&P
D Services							
D50101200280			Service installation, includes breakers, metering, 20' conduit & wire, 3 phase, 4 wire, 120/208 V, 200 A	42.00	Ea.	$3,575.00	$150,150.00
D50101200320			Service installation, includes breakers, metering, 20' conduit & wire, 3 phase, 4 wire, 120/208 V, 400 A	6.00	Ea.	$7,550.00	$45,300.00
D50101200360			Service installation, includes breakers, metering, 20' conduit & wire, 3 phase, 4 wire, 120/208 V, 600 A	4.00	Ea.	$12,500.00	$50,000.00
D50101200400			Service installation, includes breakers, metering, 20' conduit & wire, 3 phase, 4 wire, 120/208 V, 800 A	2.00	Ea.	$15,300.00	$30,600.00
D50101200440			Service installation, includes breakers, metering, 20' conduit & wire, 3 phase, 4 wire, 120/208 V, 1000 A	6.00	Ea.	$18,250.00	$109,500.00
D50102301240			Branch installation 600 V, including EMT conduit and THW wire, 20 A	42,000.00	L.F.	$6.92	$290,640.00
D50102301560			Branch installation 600 V, including EMT conduit and THW wire, 200 A	42,000.00	L.F.	$32.55	$1,367,100.00
D50102400400			Switchgear installation, incl switchboard, panels & circuit breaker, 2000 A	2.00	Ea.	$55,500.00	$111,000.00
D50201100720			Receptacles incl plate, box, conduit, wire, 20 per 1000 SF,2.4 W per SF, with transformer	106,700.00	S.F.	$4.93	$526,031.00
D50201200560			Receptacles and wall switches, 400 SF, 6 receptacles	267.00	S.F.	$3.20	$854.40
D50201250760			3 way switch, 15 A with box, plate, 3/4" EMT & wire	180.00	Ea.	$256.00	$46,080.00
D50201300400			Wall switches, 10.0 per 1000 SF	106,700.00	S.F.	$2.38	$253,946.00
D50201400320			Central air conditioning power, 6 watts	106,700.00	S.F.	$0.83	$88,561.00
D50201450920			Motor installation, three phase, 200 V, 50 HP motor size	5.00	Ea.	$11,650.00	$58,250.00
D50201551080			Motor feeder systems, three phase, feed to 230 V 50 HP, 460 V 100 HP, 575 V 125 HP	200.00	L.F.	$30.00	$6,000.00
D50201700520			Motor connections, three phase, 200/230/460/575 V, up to 50 HP	5.00	Ea.	$362.50	$1,812.50
D50202080720			Fluorescent fixtures, type A, 41 fixtures per 3000 SF	106,700.00	S.F.	$7.15	$762,905.00
D50309100240			Communication and alarm systems, includes outlets, boxes, conduit and wire, sound systems, 30 outlets	6.00	Ea.	$37,100.00	$222,600.00
D50309100600			Communication and alarm systems, includes outlets, boxes, conduit and wire, intercom systems, 50 stations	6.00	Ea.	$61,100.00	$366,600.00
D50902101400			Generator sets, w/battery, charger, muffler and transfer switch, diesel engine with fuel tank, 1000 kW	2.00	kW	$255.98	$511.96
D Services Subtotal							**$4,488,441.86**

Assembly Detail Report

Cost Estimate Report CostWorks RSMeans

Year 2011 Quarter 2

Date: 20-Sep-12

KP Mechanical and Plumbing

Prepared By:
Chris Pozza
penn state

Assembly Number			Description	Quantity	Unit	Total Incl. O&P	Ext. Total Incl. O&P
D Services							
D20101102120			Water closet, vitreous china, bowl only with flush valve, floor mount	52.00	Ea.	$1,520.00	$79,040.00
D20102102000			Urinal, vitreous china, wall hung	12.00	Ea.	$1,355.00	$16,260.00
D20103101640			Lavatory w/trim, vanity top, PE on CI, 18" round	52.00	Ea.	$1,285.00	$66,820.00
D20109262180			Bathroom, three fixture, 2 wall plumbing, lavatory, water closet & bathtub, long plumbing wall common *	3.00	Ea.	$4,425.00	$13,275.00
D20402104440			Roof drain, CI, soil,single hub, 8" diam, 10' high	9.00	Ea.	$4,725.00	$42,525.00
D30105301960			Commercial building heating systems, terminal unit heaters, forced hot water, 100,000 SF bldg, 1mil CF, total, 3 floors	106,700.00	S.F.	$3.84	$409,728.00
D30203301010			Pump, base mounted with motor, end-suction, 2-1/2" size, 3 HP, to 150 GPM	2.00	Ea.	$14,838.00	$29,676.00
D30401141050			AHU, rooftop, cool/heat coils, constant volume, filters, 20,000 CFM	4.00	Ea.	$147,049.00	$588,196.00
D30401341040			VAV terminal, cooling, hot water reheat, with actuator / controls, 800 CFM	132.00	Ea.	$7,025.00	$927,300.00
D30402401020			Roof vent. system, power, centrifugal, aluminum, galvanized curb, back draft damper, 800 CFM	8.00	Ea.	$5,750.00	$46,000.00
D30402401030			Roof vent. system, power, centrifugal, aluminum, galvanized curb, back draft damper, 1500 CFM	6.00	Ea.	$8,425.00	$50,550.00
D30402401060			Roof vent. system, power, centrifugal, aluminum, galvanized curb, back draft damper, 5000 CFM	3.00	Ea.	$36,250.00	$108,750.00
D30501201010			Space heater, suspended, gas fired, propeller fan, 20 MBH	6.00	Ea.	$2,875.00	$17,250.00
D30501201030			Space heater, suspended, gas fired, propeller fan, 100 MBH	14.00	Ea.	$3,500.00	$49,000.00
D30501701320			Split system, air cooled condensing unit, apartment corridors, 2,000 SF, 3.66 ton	106,700.00	S.F.	$4.34	$463,078.00
D30502031010			A/C packaged, DX, air cooled, hot water heat, constant volume, 5 ton	3.00	Ea.	$13,025.00	$39,075.00
D40104101000			Wet pipe sprinkler systems, steel, ordinary hazard, 1 floor, 500 SF	106,700.00	S.F.	$5.94	$633,798.00
D40203100600			Wet standpipe risers, class I, steel, black, sch 40, 6" diam pipe, 1 floor	6.00	Floor	$12,028.50	$72,171.00
D Services Subtotal							**$3,652,492.00**

Appendix D – Existing Conditions

Existing Conditions

Legend & Symbols

- Property Line
- Silt Fence
- Fire Hydrant
- Vehicular Traffic
- Existing Building
- Proposed Addition
- Pedestrian Traffic
- Existing Loading Dock
- Existing Parking Lot to be Demolished
- Electric
- Natural Gas
- Communications
- Water
- Existing Electric to be demolished

Kaiser Permanente Largo Medical Office Building

Largo, Maryland

Chris Pozza

Existing Conditions

September 21, 2012

Tech Assignment 1

Appendix E – Site Plans

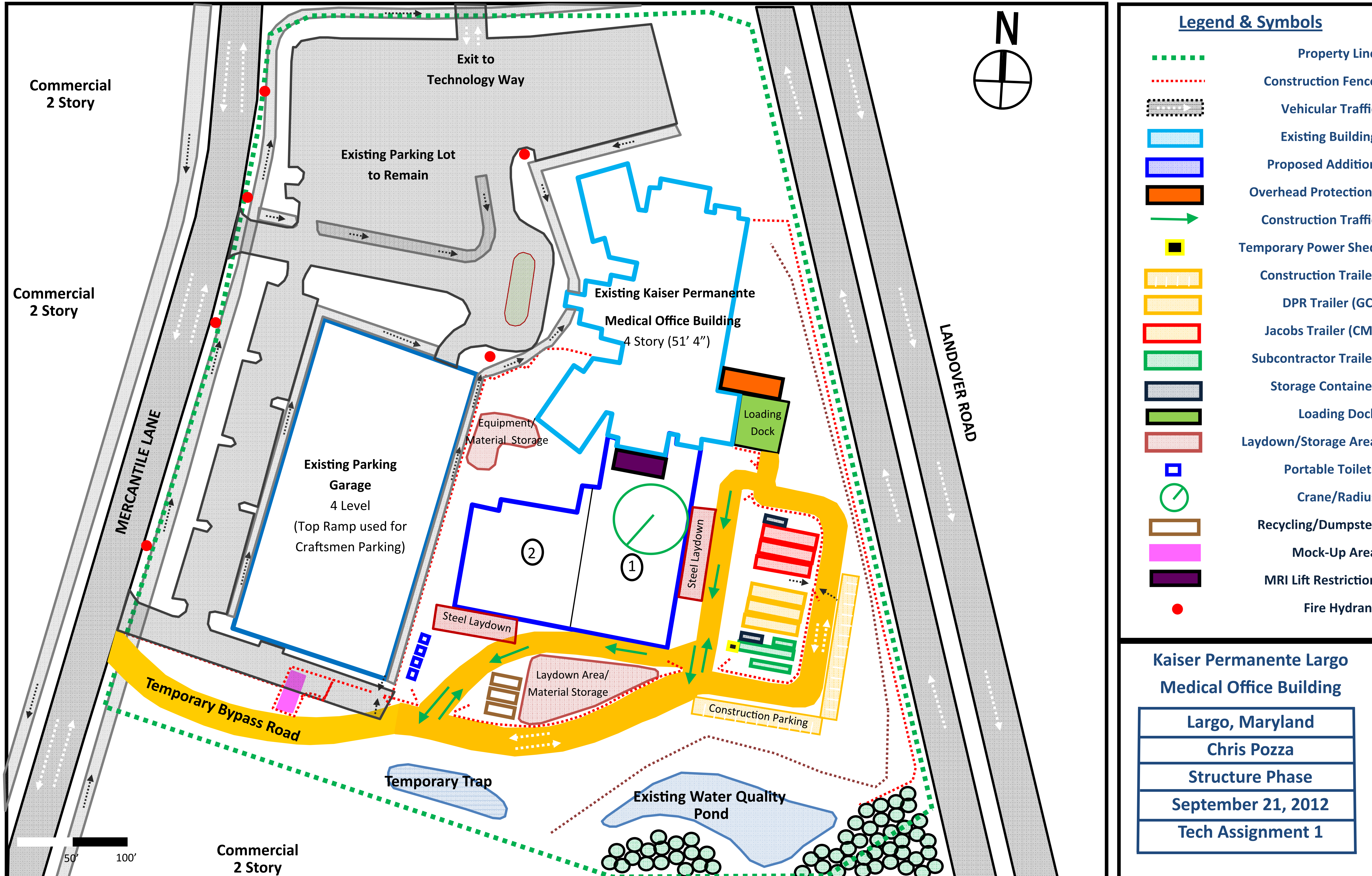
Site Plans

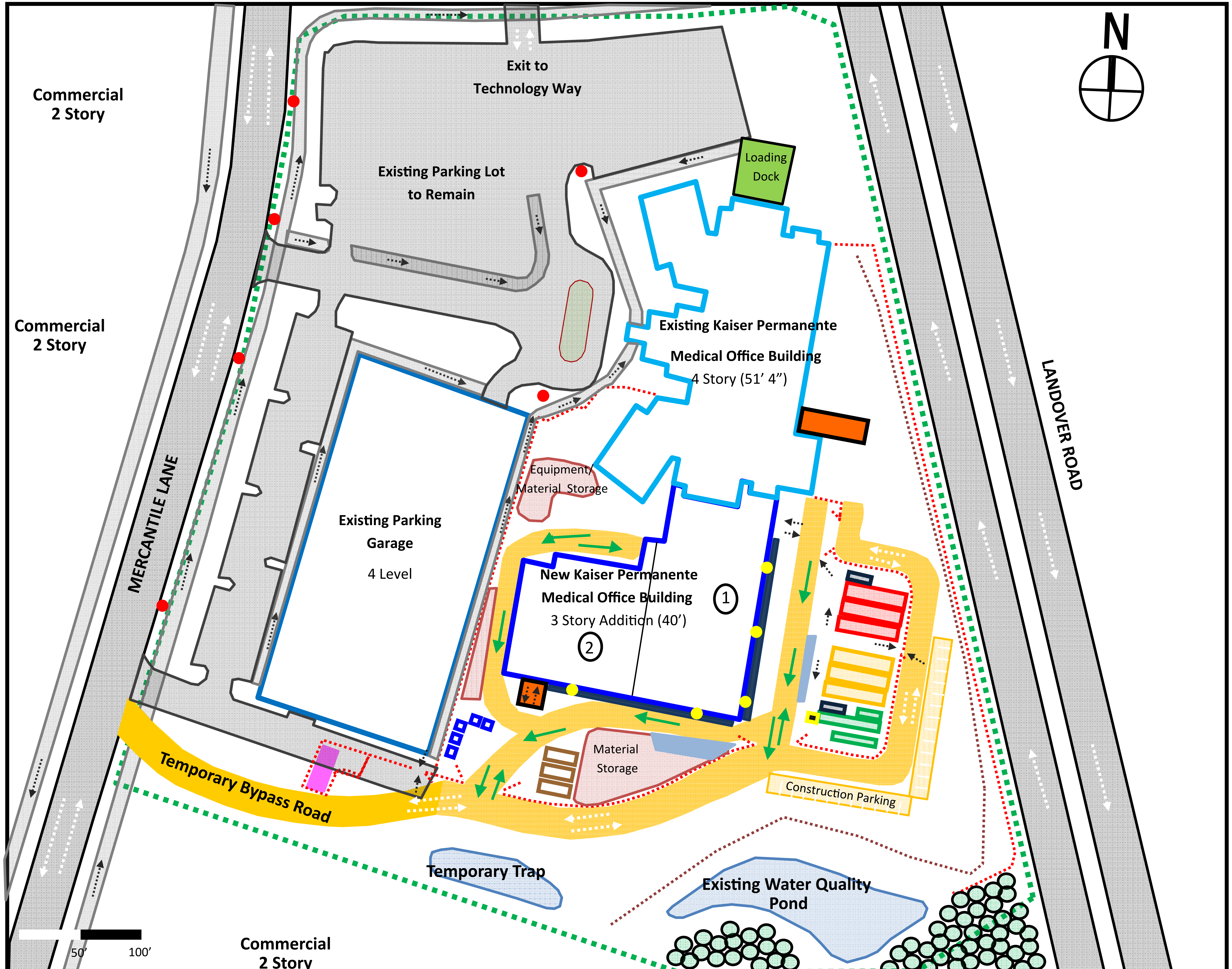
Legend & Symbols

- Property Line
- Construction Fence
- Excavated Utility Trench
- Construction Roadway
- Vehicular Traffic
- Existing Building
- Proposed Addition
- Pedestrian Traffic
- Loading Dock
- Temporary Parking
- Construction Trailer
- Sequence of Construction
- Construction Traffic
- Temporary Power Shed
- Dumpster/Recycling
- Equipment Storage
- Portable Toilets
- Mock-Up Area
- Fire Hydrant

Kaiser Permanente Largo Medical Office Building

Largo, Maryland
Chris Pozza
Excavation & Mobilization
September 21, 2012
Tech Assignment 1


N
Commercial
2 Story
Commercial
2 Story
Commercial
2 Story
MERCANTILE LANE
LANDOVER ROAD
Exit to
Technology Way
Existing Parking Lot
to Remain
Existing Kaiser Permanente
Medical Office Building
4 Story (51' 4")
Existing Parking
Garage
4 Level
(Top Ramp used for
Craftsmen Parking)
Equipment/
Material Storage
Loading
Dock
Steel Laydown
Steel Laydown
2
1
Laydown Area/
Material Storage
Construction Parking
Temporary Bypass Road
Temporary Trap
Existing Water Quality
Pond
50'
100'
Legend & Symbols
Property Line
Construction Fence
Vehicular Traffic
Existing Building
Proposed Addition
Overhead Protection
Construction Traffic
Temporary Power Shed
Construction Trailer
DPR Trailer (GC)
Jacobs Trailer (CM)
Subcontractor Trailer
Storage Container
Loading Dock
Laydown/Storage Area
Portable Toilets
Crane/Radius
Recycling/Dumpster
Mock-Up Area
MRI Lift Restriction
Fire Hydrant
Kaiser Permanente Largo
Medical Office Building
Largo, Maryland
Chris Pozza
Structure Phase
September 21, 2012
Tech Assignment 1



Legend & Symbols

- Property Line
- Construction Fence
- Vehicular Traffic
- Existing Building
- Proposed Addition
- Pedestrian Traffic
- Construction Traffic
- Mason's Fraco Lift
- Temporary Power Shed
- Construction Trailer
- DPR Trailer (GC)
- Jacobs Trailer (CM)
- Subcontractor Trailer
- Storage Container
- Loading Dock
- Laydown/Storage Area
- Portable Toilets
- Recycling/Dumpster
- Mock-Up Area
- Brick/Insulation Storage
- Fire Hydrant
- Temporary Lights

Kaiser Permanente Largo Medical Office Building

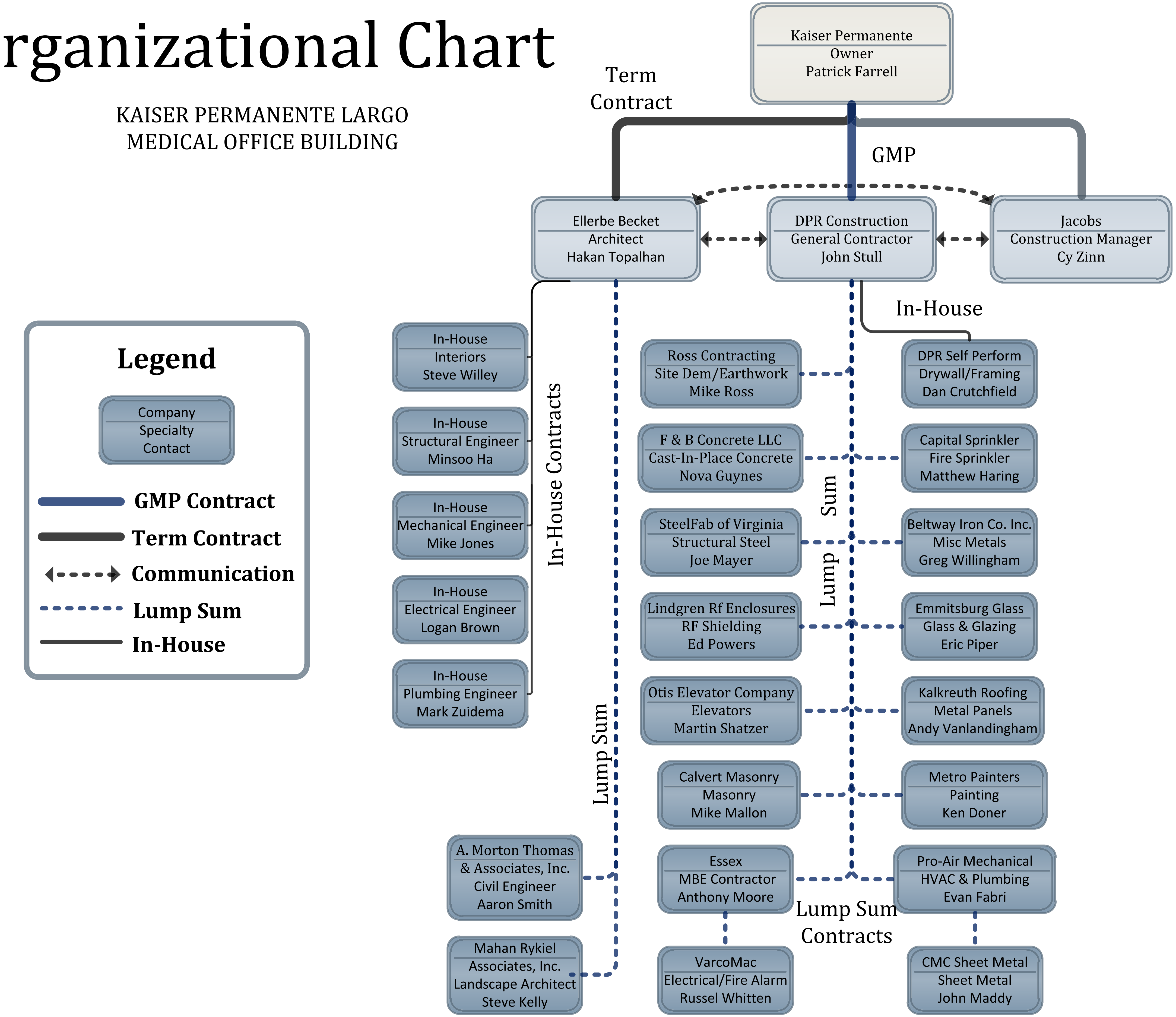
Largo, Maryland
Chris Pozza
Finishes Phase
September 21, 2012
Tech Assignment 1

Appendix F – Organizational Chart

Organizational Chart

Organizational Chart

KAISER PERMANENTE LARGO
MEDICAL OFFICE BUILDING



Appendix G – Staffing Plan

Staffing Plan

DPR Staffing Plan

KAISER PERMANENTE LARGO
MEDICAL OFFICE BUILDING

DPR FIELD OFFICE TRAILER PLAN