Phoenixville Area Middle School

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Tech Report #1

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AE Senior Thesis

9/23/2011

Executive Summary

The Phoenixville Area Middle School (PAMS) is a large part of the program developed by the school district to upgrade the educational facilities of their town. The new middle school will provide the students in the area with a modern and engaging building that will serve as a place of learning for decades to come. Specific upgrades over the existing structures are the increased size of the auditorium, addition of a gymnasium and increased utilization of technology. Overall, the total program developed by the district will cost roughly $55 Million. The middle school is scheduled to be completed in May of 2012, and the rest of the campus upgrades will follow soon after.

Despite not obtaining an official LEED certification, the PAMS did have enough potential "green" credits to qualify. This was done by strictly following the program developed by LEED. Top among their efforts was the design of the mechanical system. Energy efficient technology on the cusp of popularity in the industry was integrated into the design. Thing such as heat recovery units, water-source heat pumps, and VAV boxed controlling airflow to nearly all rooms is a big step towards energy efficiency.

Another distinguishing characteristic of the building is the manner in which it is being constructed. By separating the building into four different areas, construction for different trades can occur simultaneous that usually would not be possible. This logistical approach helped to make a short project duration, which means that the school will be student-ready by fall of 2012.

The analysis of the report will focus strictly on the major building systems, schedule, cost, site, site logistics, and existing conditions for the Phoenixville Area Middle School. An in depth look at the project teams involved, the owner's concerns and priorties, and the local conditions of the Phoenixville Area will help clarify the reasoning for the design, construction methods, and overall project outcome. Other areas covered are the delivery method used for the project, and a look at the staffing plan incorporated by the construction manager, Reynolds Construction.

Main Entrance PAMS Rendering, Provided By Reynolds Construction

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Project Schedule Summary

The Phoenixville Area School District began the design of the new middle school in February of 2009. Working with Gilbert Architects, the design was part of a feasibility study to explore the options of upgrading the school district's facilities. After deciding that a new building was the more cost effective route rather than renovating the existing middle school, Reynolds Construction Management was brought on to the design team. Acting as an Agency CM, Reynolds assisted with the development of the program. After reaching the construction document phase, it went out for bid and commenced construction on May 21st, 2010.

The overall project is split up into three phases – the construction of the middle school and district administration office, demolition of the existing middle school, and the upgrades to the site and athletic facilities. The construction of the new Phoenixville Area Middle School is split into four areas:

Area A – Gymnasium and Locker Rooms

Area B – Classrooms, Kitchen, Cafeteria and Mechanical

Area C – Classrooms and Library

Area D – Auditorium and Music Rooms

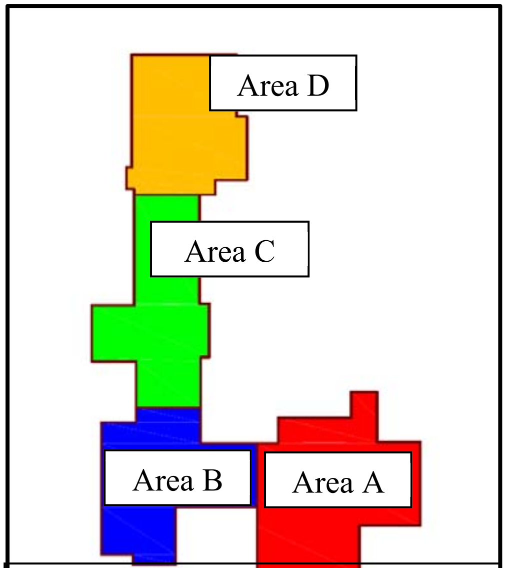


Figure 1.1 – Areas of PAMS

These areas were separated in the schedule due to the logistical approach taken for the construction of the middle school. The open site allows for multiple trades to be mobilized and working at any given time. By separating the construction into different areas, different trades can be working in different areas of the building at once, reducing overall schedule duration. For example, as the masonry is being put up in Area D, the finish trades can be working in Area A or B without interfering. Since trades such as MEP, finishes and casework represent such a large portion of the overall schedule, it is a big advantage to have this simultaneous construction. The summary schedule demonstrates the overlap between the areas. Since construction causes interference with normal school activities, this reduced duration is that much more important. As of right now, the construction completion is scheduled for May, 2012. The middle school will be occupied starting June, 2012.

Building Systems Summary

Work Scope	Yes	No
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		X

Demolition

The existing Phoenixville Area Middle School will require demolition upon the completion of the new school. This phase in not included in this report except for the total project cost. The site fence, tree protection and erosion control will be transferred to the existing middle school after the first phase of the project. The demolition will be done from the top of the building down in an effort to do it as safely as possible. Since the surrounding areas are residential, and school will be in session for some of the time this phase takes place, noise control is a priority. Loud, repetitive activities cannot occur before 8:00 a.m. or after 4:00 p.m. as stated in the contract.

Structural Steel Frame

The superstructure of the building consists exclusively of steel columns and beams. The structural steel wide flange beams conform to ASTM A992, and the remaining shapes are ASTM A36. The columns consist of HSS 8”x8”x3/8” and a variety of wide flange beams. These bear on concrete column footings in the shallow foundation. The floor framing is done with an assortment if wide flange beams. The gymnasium roof is supported by custom barrel trusses. For the most part connections are bolted shear connections, although some are deep penetrations welds.

Two cranes were used in the placement of the steel. The larger of the two was the Tadano ATF160G-5, and the smaller was the Kobelco CK-850-11. There statistics are as follows:

Tadano ATF160G-5	Kobelco CK-850-11
Boom Length: 196’	Boom Length: 196’
Jib Length: None	Jib Length: 60’
Tonage: 200 US Tons	Tonage: 85 US Tons
Spreader Beam Requirements: None	Spreader Beam Requirements: None

The floors are 2” – 20 GA composite metal deck with a 3 ½” concrete topping reinforced with 6 x 6 – W2.1 WWF, with a total thickness of 5 ½”. The decking is designed for 3 span condition un-shored construction. The decking is welded to a bent plate at columns. In general, the roof metal decking is 1 ½” 20 GA galvanized acoustic metal rood deck, the be finished with paint.

Cast-in-Place Concrete

The building has a shallow foundations consisting of wall and column footings. The footings are made of 3000 psi concrete. The dimensions are typically 2’ 8” wide by 1’ 0” deep, and are reinforced with 3 # 5 rebar continuously, and #4 rebar every 24’. The foundation slab on grade is 4” thick, and rests on 6” of stone drainage fill. A vapor retarder rests above the stone, and it is reinforced with 6 x6 – W2.9x2.9 WWF. The concrete piers and foundation walls are specified as 4000 psi concrete. Vertical crack and/or construction joints are specified at no more than 30’ apart.

The concrete slab on deck has a strength requirement of 3500 psi. It is a normal weight concrete reinforced with WWF. The contractors used pumping equipment to get the concrete to the upper levels of the building. There it was manually leveled off to the uniform thickness specified. Running electrical conduit through the slab on deck is not permitted.

Mechanical System

The mechanical system of the Phoenixville Area Middle School incorporates several green elements to provide an environmentally friendly HVAC design. These include the use of water source heat pumps, VAV boxes, and heat recovery units. On the roof, there are two water source heat pumps. They supply 4995 and 7545 cfm of air to the administration room and media center respectively. Nine different console water source heat pumps serve different rooms and stairwells of the building. Water source heat pumps of a smaller scale individually serve a total of 78 rooms, ranging from 456 to 1520 cfm. Four rooftop heat recovery units serve the entire system, each with a range of 4595 to 8665 cfm. 42 different VAV boxes help to bring air comfort to different areas based on the needs of the space, further reducing wasted energy.

Other portions of the HVAC system include 3 gas powered condensing heaters, electric cabinet heaters, electric wall heaters, and electric unit heaters. On the roof, two closed circuit cooling towers serve the entire building. 15 split system air conditioning units are used for smaller rooms. The ductwork on the roof is specified as McGill rectangular galvanized duct with 1 ½" fiberglass liner and perforated inner line. Elbows are mitered with double thickness vanes. They are insulated with 2" rigid insulation. They are weatherproofed with white EPDM roofing.

Electrical System

The PECO primary overhead electric line enters the middle school at the South-western corner of the building. Here it encounters four transformers serving different areas. The ratings of these transformers are 500 KVA, 300 KVA, 300 KVA, and 150 KVA. The primary voltages are 480 V, with a secondary voltage of 208/120 V, 3 phases and 4 wires. These transformers distribute power to the entire building.

A 230 KW diesel driven backup generator operates at at 480/ 277 V, with 3 phases and four wires. In the event of power failure, this begins operating and ensures the critical safety systems of the building stay online.

Masonry

Masonry units are used extensively throughout the Phoenixville Area Middle School. The exterior façade is composed of a combination of specially designed split faced CMU's and courses of ground faced, as well as face brick and limestone in some areas. Walls are either backed with CMU's or metal studs, and have a layer of rigid insulation and air space in between that vary depending on wall composition. The exterior reinforcing, masonry ties and anchors are specified as stainless steel conforming to ASTM A580 Type 304. Where there is vertical reinforcement in the walls, a truss type single wythe joint reinforcing is used with No. 9 rids and No. 9 cross ties. For multiple wythe cavity wall joint reinforcement, the specifications call for steel wire, No, 9 side rods with No. 9 cross ties sized for insulation and the indicated air space. The reinforcement type varies between ladder and truss here as well. The anchors are dovetail, 26 gage with 1" slots. Where split or ground-face CMU veneers are used, the anchors must have a seismic clip with 9 gage pencil rod reinforcing.

As part of the green effort of the school district, all CMU's are required to have at least a 10% recycled building materials content, or 40 % pre-consumer material content. The minimum compressive strength of concrete masonry walls is specified as 1,500 psi. The concrete masonry walls in the auxiliary gymnasium are required to have a compressive strength of 2,000 psi. Grout must conform to ASTM C476, and have a minimum slump of 8". Fine and coarse grained is required to use on differing void thicknesses. Mortar must conform to C270, type M or S. The CMU's are to be laid in running bonds and have a full mortar bed joint. Vertical crack control joints are to be at 30' on center maximum.

Project Cost Analysis

Construction Cost

The construction cost for the actual building was determined by reviewing the payment applications of the seven prime contractors for the project. The contracts are based on unit cost for quantities, therefore there is no contingency fee involved in a contractor's bid since any differing quantities result in an automatic contract adjustment. Things such as bonding, site work and general conditions are excluded. Finally, an estimated fee of 5% is excluded from the contractor's schedule of values to account for profit. This percentage is an estimate, and is not by any means based on any real fee charged by those holding contracts.

Construction Costs Phoenixville Area Middle School			
Prime Contract	**PAMS Cost**		**Adjusted Amount**
Electric	$2,595,090.00	0.95	$2,465,336
Fire Protection	$264,210.00	0.95	$251,000
Food Service	$539,008.00	0.95	$512,058
General Construction	$19,722,071.00	0.95	$18,735,967
HVAC	$5,521,734.00	0.95	$5,245,647
Plumbing	$1,985,391.00	0.95	$1,886,121
Roofing	$1,328,400.00	0.95	$1,261,980
Total Construction Cost	$31,955,904.00		$30,358,109
Total Construction Cost S.F.			$161.05

Total Project Cost

Total project cost is the current total project cost to date, including all line items and phases of construction.

***Total Project Cost* = $44,536,059.00**

***Project Cost per Square Foot* = $44,536,059.00/188,500 s.f. = $236.27**

*This cost was calculated by neglecting the SOV items for the District Administration Offices, landscaping and work to athletic facilities. It only reflects the line items for the PAMS.

Major Building Systems Costs

Building System	Total Cost	S.F. Cost
Mechanical	$5,778,734.00	$30.66
Electrical	$2,595,090.00	$13.77
Plumbing	$1,985,391.00	$10.53
Structural	$9,525,411.00	$50.53

The contracts bid jointly only contain costs associated with the Phoenixville Area Middle School.

Square Foot Estimate

RS Means Costworks was used to create this square foot estimate. The information used in arriving at the estimate can be found in appendix A:

Total Building Cost: $36,811,000.00

Cost per Square Foot: $195.28

Assemblies Estimate

The following costs were determined using data from the RS Means Construction Assemblies Cost 2011. The references are listed in detail in appendix B:

Building System	Total Cost	S.F. Cost
Mechanical	$5,350,515.00	$28.38
Electrical	$2,779,620.50	$14.75
Plumbing	$1,141,762.50	$6.06

When substituting these values into their respective square foot estimate divisions:

New S.F. Cost: $206.78 *New Total Cost*: $38,978,020.00

Fire Protection was included in this assembly estimate due to its general inclusion in mechanical systems contracts. It is listed separately because the contract for mechanical work was split between HVAC and Fire Protection.

Cost Comparison

Total Project Cost:	$44,536,059.00
Cost of Construction:	$30,358,109.00
Square Foot Estimate:	$36,811,000.00
SF with MEP Assemblies:	$38,978,020.00

The total project cost is significantly more than any of the estimates done. The square foot estimate is off by roughly $8 million, and the MEP Assembly adjusted estimate is off by $6 million. An estimating error such as this would mean a loss if these were to be the bids submitted for the job. These errors can be attributed to a few factors. First and most importantly, the error in doing square foot estimates is always high, and it is not used for more than early design cost analysis. Second, certain MEP items were not the exact matching item from the construction documents. This was due to line items that did not match in RS Means, but the closest was taken. Finally, the difference in the total project cost and cost of construction is extremely large. This means a lot of general conditions and site work costs. New utilities must be run from the existing all over the site. Site fencing and paving were not included in this estimate, yet each prime contractor is responsible for their own general condition items. This may be hard to estimate using the RS Means Data as the only resource. The differences in these estimates demonstrate the importance of an experienced estimating team.

Site Layout Planning

Existing Conditions

The Phoenixville Area Middle School building site is located on the campus grounds along with the existing high school, middle school, track and field, and tennis courts. Phoenixville Area High School is located in the Northern-central portion of campus, and the existing Phoenixville Area Middle School is in the South-eastern corner. The campus is bordered by roads on three different sides: Carlisle Ave to the East, City Line Ave to the North, and State Road to the West. To the South of Campus lies Meadow Brook Golf Club. The existing utilities are shown on the existing site plan found in Appendix D. The building footprint for the new middle school is in the South-western corner of campus. As shown in the image below, that area is currently a green space bordered by tennis courts and a baseball field. The construction of the middle school will require the relocation of the baseball field to the opposite side of campus. The single tennis court will have to be demolished, but the group of six will remain intact and accessible throughout construction. Pedestrian and vehicle paths are not a big issue for this project, since the building site does not disrupt roads or parking lots. A temporary road will be put in place to give teachers and students access to the parking lot behind the high school. New utilities will be run for trailers when establishing the site.

Figure 2.1 - Aerial Image of PASD grounds from Bing Maps

Excavation Site Layout

The excavation site layout shows changes to the school grounds established during the general conditions portion of the schedule. Trailers were set up along Carlisle Ave and connected to the necessary utilities. The main construction entrance is located by a crushed stone temporary road off of Beechwood Lane. This is the road buses take to drop students of, and there is no site access here for construction vehicles from 7:00 – 8:00 a.m. and 2:00 – 3:00 p.m. A site fence borders all construction activity to prevent students from entering the job site. Tree protection is included along the border of the job site, and erosion control is part of the fence in all areas. Construction parking for this phase is located right by the tennis court to provide easy access to the soil stockpile area. The excavation begins in the South-eastern part of the building footprint, and progress towards the opposite end. This allows the excavators to work backwards towards the stockpile area. A temporary road along the perimeter of the property allows vehicle movement from one end of the site to the other. The foundation wall did not require structural support. Since there was enough space, the walls were sloped back at a grade of 1: 1.5. This layout is an efficient use of space during this process. Since there is not much going on at this time except excavation, there is not much complexity to the logistical challenges posed here. The only possible criticism is the decision to make the main construction entrance from Beechwood Lane. Construction vehicles must travel across campus to reach the site entrance, and the hours that are reserved for bus traffic must be worked around. However, this could be due to regular vehicle traffic on City Line Ave where teachers arrive and parents drop of students.

Superstructure Site Layout

This portion of the construction process is where the structural steel is erected. In this plan the different areas of the middle school are shown to demonstrate the phasing of the project. Working from Area A and progressing towards Area D, while the steel members and decking are being erected other trades can begin mobilizing on site. Not much has changed from the excavation site layout, except that a crane has been brought on-site. The crane works from two main areas as shown in the plan. At this point, all of the dumpsters have arrived on site. Contractor parking has moved to the area near the trailers. The previous parking area is now used as a shake-out area for steel. This layout is effective in that the steel is erected in a manner that allows other trades to being work as certain areas are completed. The space is utilized in a way that allows simultaneous work between two trades that usually cannot operate at the same time. The roof of Area A, the gymnasium and locker rooms, is metal deck. By setting this and moving to the next area, other trades can begin work on the interior and building shell since the roof provides some shelter from the elements.

Finishes Site Layout

The finishes plan represents the busiest portion of the project. At this point, the majority of Area A work has been completed, structural steel is still going up in Area D. Area B and C have a nearly complete building shell and work has started on the interiors. The interiors of B and C take the longest since they contain the kitchen, classrooms and laboratories. The site layout is basically the same as the superstructure stage, except there are many more contractors on site. The crane is still on site to erect structural steel and lift large MEP system components to the mechanical area. Site access remains the same, as well as parking and staging areas. This layout is an effective way to manage all the different trades working at once. By starting the interior work of Area B and C before the rest of the structure is completed, a lot of time is saved on the schedule. The relatively short duration of the project can be attributed to this sequencing. The only problem with this layout is the potential for congestion on the road bordering the property line. While trades are working from all sides, site access and mobility are limited by the sheer number of workers. By expanding the site into the parking lot, and creating the temporary access road from the drop of circle, more space could be created. This limits the risks that come with a congested site.

Local Conditions

The building site for the new Phoenixville Area Middle School is located on a field in the Southwest corner of school grounds, with no structures immediately surrounding it. Surrounding the school grounds are residential areas on three sides, and a golf course on the fourth. Located in the Eastern edge of Pennsylvania, the area experiences a full four season throughout the year. These had to be accounted for when planning the construction of the new middle school.

The school grounds are split by a boundary line seperating the Schuykill Township from the Borough of Phoenixville.The Borough of Phoenixville is a public facilities zone, and the Schuykill Township is a medium residential zone. The design of the overall Phoenixville School project had to be approved by the boards of both councils. Part of the season for this is that the schools are open to use of non-student groups to hold meetings. Along with the design of the actual buildings, areas of concern to the council were the erosion and sediment control during construction. Also, the water runoff down the hills from the landscaping and work to athletic facilities after the completion of the middle school needed to be addressed. The project team had to manage the concerns of both councils in the design and logistics of the project. Since the school grounds are surrounded by residential areas, noice pollution had to be restricted. Repetitve, high level impact noice is only permitted between the hours 8:00 a.m. to 6:00 p.m. These activities can not reach certain decibal levels for more than 12 minutes per any hour, and any added costs to stay within these limits can not be charged to the owner by contract. All employed workers through out the project are required to go through the following background checks:

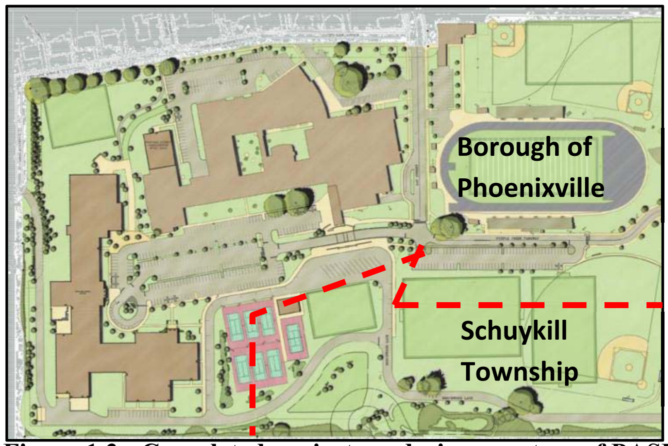


Figure 1.3 - Completed project rendering courtesy of PASD

1. Pennsylvania State Police Request for Criminal Records Check (Act 34).

2. Department of Public Welfare Child Abuse History Clearance (Act 151).

3. Federal Criminal History Record Information (CHRI) (Act 114) in manner prescribed by Department of Education.

It is the responsibility of all contractors to submit their employees for review. The school district is then responsible to review the employees and verfiy they are fit to work on school grounds. These background checks are typical for any construction project involving schools.

The site conditions and construction methods are typical of the area, and the materials used in design are common for high schools. Steel framing allows for a relatively quick duration for erecting the superstructure. Brick with CMU backing is a cost effective way to create an attractive façade that will last a long time. The area is not very densely populated relative to places closer to Philadelphia. This makes transporting things such as material and heavy duty equipment much simpler, as there is not as much traffic in the region. The school grounds itself provide access from three different points. Two of the entrances are very close to the site, and the open field space surrounding the building footprint provides options for construction logistics. Construction parking on-site is located by the trailers set up by for the different contractors at the Northwest area of the school grounds, as well as the Eastern portion of the construction site. The parking by the trailers can be accessed by the gate entrance off of Carlisle Ave, or by the entrance off of City Line Ave. A temporary road provides access to the other area, which is a sectioned off portion of the existing high school parking lot. During the summer months of construction, there is an abundance of parking areas since school is out of session. Large construction vehicles can use any of the three entrances. However, the entrance from Carlisle Ave is discouraged due to the proximity of houses, and is only used when absolutely needed. The entrance at the Southeast corner off of State Road is closed to construction vehicles during bus hours, meaning the hours right before and after a school day.

The use of recycled building materials and recycling of disposed materials is required by the contract held between contractors and the Phoenixville Area School District. While not a LEED certified building, green initiatives are a focus in the design of the middle school. The building materials are required to be separated into thirteen different categories based on the local and regional recycling facilities. Contractors must also make use of such organizations as the National materials exchange network and Habitat for Humanity. All rebates, tax credits or other savings obtained through the use of recycled materials or recycling of building materials is credited to the contractor. However, the decision on where to bring the materials was left to the contractors, and any monetary value of compensation for recycling is unknown. Dumpsters on site are located North of the building footprint near the stockpile of soil. The cost of dumpsters is contained in the contract of the general construction contractor, IMC Construction. While tipping fees are not known, the total contractual value for dumpsters and hauling for the duration of the project is $105,000.

Soil records indicate the site soils to be of the Bucks, Penn and Readington Series as identified in the Soil Survey for Chester and Delaware Counties, Pennsylvania. The Bucks Series is a deep, well-drained soil underlain by Triassic red shale and sandstone. These soils typically have a reddish brown silt loam surface layer with reddish-brown silty clay loam subsoil. The on-site variation is the Bucks silt loam, 3-8 percent slopes, moderately eroded. This type represents most of the soils on site. The geotechnical drilling program performed by SVEI for the subsurface evaluation included 20 test borings. These occurred at locations all over the school grounds to get an idea of subsurface conditions. The soils were found to be a mix of silty sands with gravel, sandy silts with gravel, and silty gravel with sand. The topsoil is 6 to 13 inches thick. The fill material of Stratum IMF was encountered at all the boring locations. This is the remnant of passed construction, and was recommended to be removed by the geotechnical engineer. The presence of this material led the site to be categorized as "disturbed". Groundwater was encountered at eleven of the twelve borings. While it was not expected to be an issue when digging foundations, there was a chance of some flowing into the site. However, the small amount has a minor impact on the construction process, since it can easily be pumped out.

Client Information

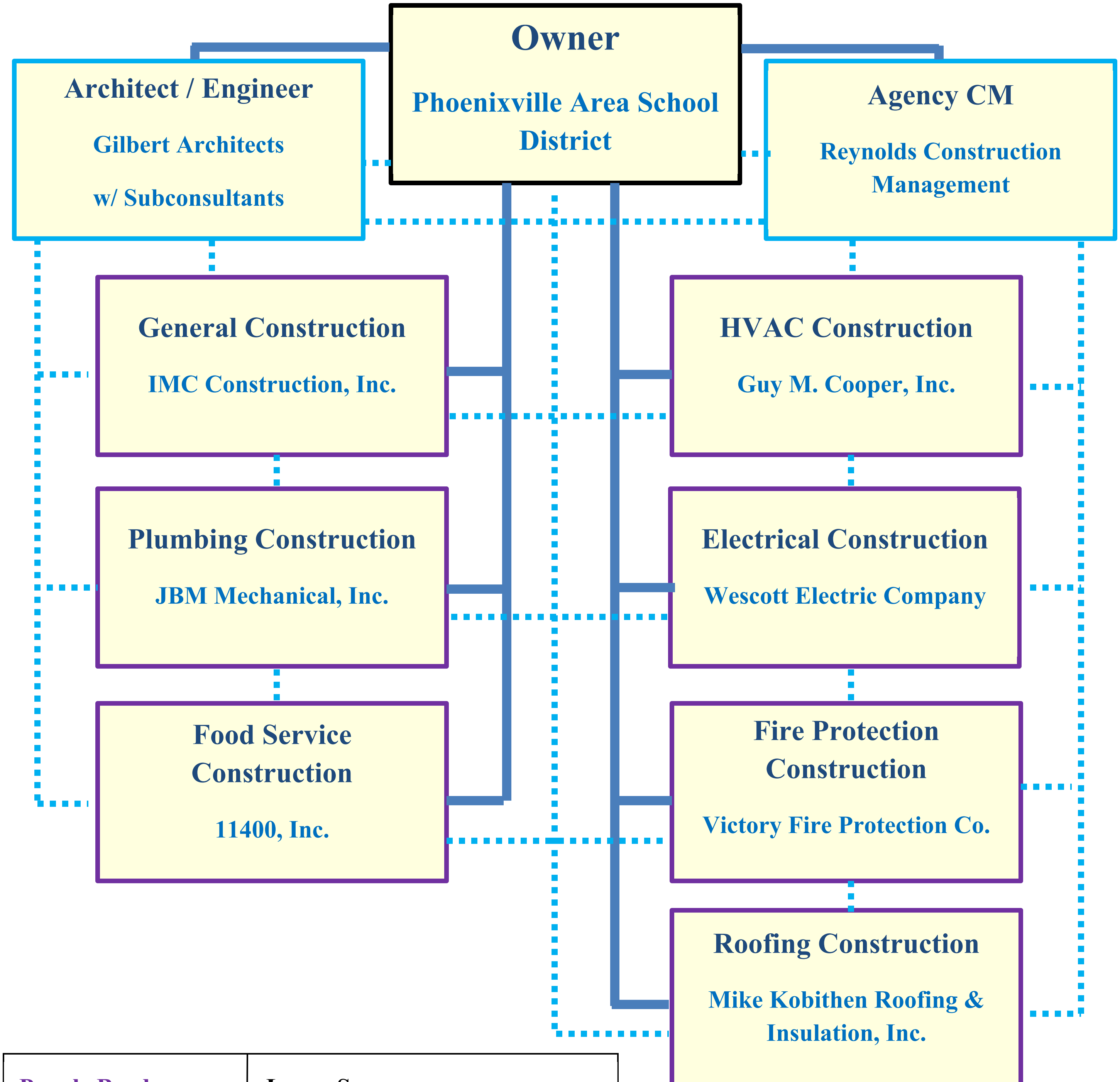
The Phoenixville Area School District is the acting owner of this project. It consists of elected project executives and the school board. However, since it is a project paid for by public funds serving a community, taxpayers of the community can voice their opinions as well. The purpose of the new middle school is to serve as a competent facility for children to learn. The program is driven by the needs to give them the best education possible. This goes beyond the typical subjects taught in school. The program needs to provide facilities for recreational activities such as theatre and athletics which are so critical to the development of young students.

The school district was driven to upgrade the campus facilities by the inability of the existing to meet the needs of the program. The existing middle school did not contain a gymnasium. The high school gymnasium had to be used for athletics and gym classes. The auditorium did not meet the desires of the district either. It was decided that some sort of change was needed. Initially, with the aid of Gilbert Architects, a feasibility study was done by the board to determine the options for an upgrade. Renovating the existing middle school was considered as opposed to building an entire new facility. However, the construction required to add the extra space and features deemed necessary by the district would end up costing more than building an entire new building. It was finally decided to go ahead and construct a new middle school, and demolish the existing. Along with the new school, upgrades to athletic facilities, utilities, storm water drainage and a new district administration office were added to the scope.

Safety was the number one concern of the school board throughout the project. Protecting the wellbeing of students was an obvious top concern. However, other critical issues to the owner come from the source of funding and preserving the quality of education throughout construction. The budget for the project comes from tax dollars, so cost was a major concern in the design phase. The district had a certain amount to spend to bring facilities up to a level that could meet the demands of a quality educational program. This is best demonstrated in their pursuit of a green building design. The school district felt a responsibility to create an environmentally friendly building, and hoped to achieve LEED certification. However, the rebate for gaining an actual LEED certification would only grant them half a penny on the dollar. Despite having enough credits to potentially get certified, the cost to do so was more than the rebate and was not pursued. Schedule was also a main factor. Construction disrupts traffic flow, is distracting to students, and can be potentially dangerous to pedestrians. The project had to move quickly, and the facilities had to be ready for the school year beginning in the fall of 2012. Despite a focus on cost and schedule, quality was still a concern to the district. By hiring Reynolds Construction Management as a CM Agency, the district ensured it would develop the program it wanted.

The overall project for the Phoenixville Area School District contains three phases. Phase I is the construction of the new middle school and district administration office. Phase II is the demolition of the existing middle school and Phase III is the renovations to athletic facilities. The schedule of the project was designed to have the new middle school ready by the summer of 2012. This would allow for occupancy before the beginning of the school year. Move in to the new building was the chief sequencing concern, and the deadline had to be met by the project team. In order to satisfy the owner, the building had to be delivered on time without any safety issues.

Project Delivery System



Purple Border	Lump Sum
Light Blue Border	Fee
Solid Line	Contract Held Between Parties
Dashed Line	Line of Communication

The delivery method for the Phoenixville Area School District is Design-Bid-Build. This publicly bid type of project delivery is required for any project funded by the State of Pennsylvania. Reynolds Construction Management is acting as an Agency CM for the project, and is paid a fee in return for advising the owner, managing the program and planning the construction process. Reynolds Construction received the contract based on their ability to save money, reduce project costs, and bring the project in on schedule at a cost that was within the school district's budget.

Once awarded the contract, Reynolds worked with Gilbert Architects and the Phoenixville Area School District to develop the design of the project. Upon the completion of construction documents, the owner sent out a request for bids. Another requirement of State funded projects in Pennsylvania is the minimum requirement of Prime Contracts held between contractors and the owner. The minimum is four – General Construction, Electrical, HVAC and Plumbing. However, for this project a total of seven prime contracts were issued. Along with the previous four, these include Food Services Equipment, Roofing, and Fire Protection. Along with the new Middle School, the school district is building a new District Administration Office building. Potential bidders were given the option to bid on just the middle school or administration office, or to combine their bids for both. One reason for this was to give smaller companies the opportunity to bid on one or the other to increase the number of contractors applying. The other is for the potential of cost savings when bidders reduce their fee when bidding on the two buildings combined. Of all the Prime Contracts, the General Construction, Roofing, Fire Protection and Electrical are for both buildings. This method provided reduced project costs by increasing competition an allowing economy of scale to be used between the two buildings.

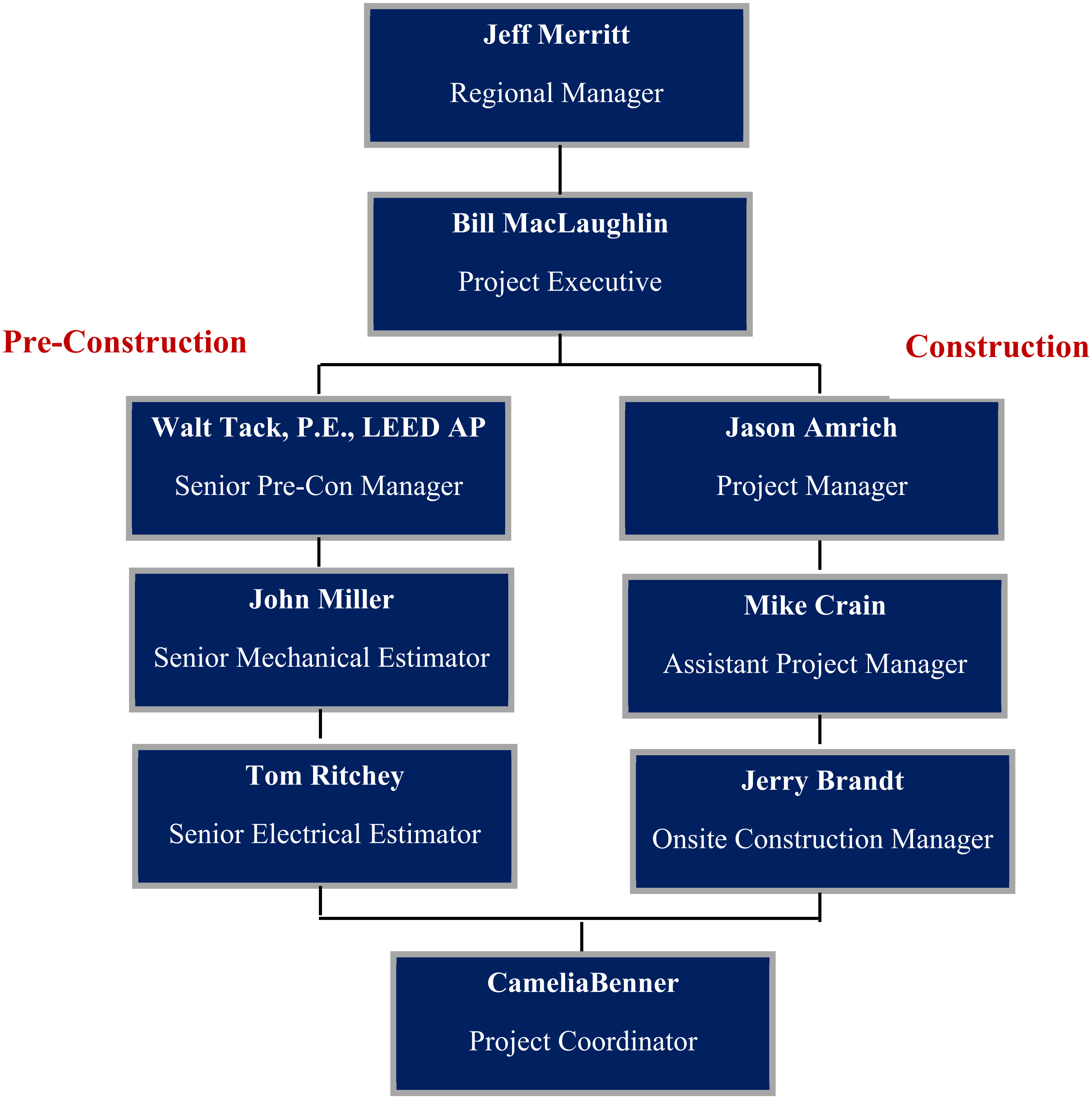
The lump sum contracts were bid based on drawings and specifications, and included select bid allowances and unit prices as determined by the project team. The bid states that the contractor is responsible to visit the site prior to issuing a bid. Along with submitting the bid form, each bid was required to contain a bid bond or a certified good faith check worth 10% of the total contract value (as bid). This is reserved by the school district in the event the contractor fails to execute the contract. The performance bond and payment bond are required to be from carriers listed in the most recent U.S. Treasury Department Circular.

Since there is no general contractor on the job, the Prime Contractors are responsible for communication between the different trades, with coordination assistance from the Agency CM. This requirement is specified, and is represented on the organizational chart by the dotted lines. The Agency CM certainly helps in this regard, but liability ultimately lies with the contractors.

The contract types and delivery method are appropriate for this project, and not only because it is required by law. The Phoenixville Area School District had many options to upgrade their facilities. The total project includes renovations to athletic facilities and utilities as well. By developing a complete scope early on, the program was controlled to avoid scope and program increase (creep). This approach allowed the district to remain on budget (and in fact reduce its budget), while accomplishing the goals identified early on.

Staffing Plan

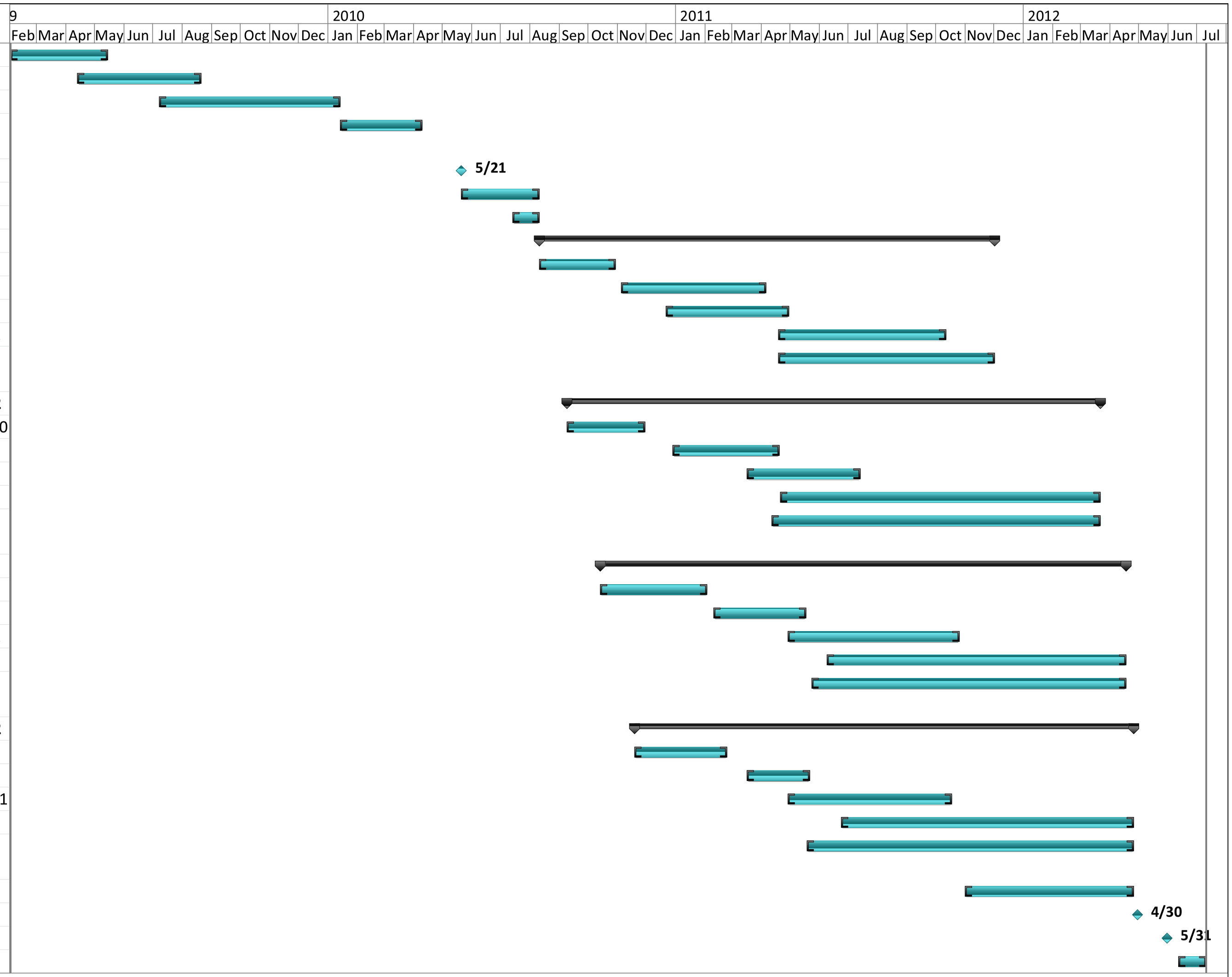
Reynolds Construction Management



This staffing plan reflects the different contributors to Reynolds' efforts in managing the project. The pre-construction team was used to make the preliminary estimate of costs based on existing documents and the school boards program. This allowed them to give a price within the school district's budget, and get them the contract. The team then worked with the district to develop the program scope. The role of the project executive is to provide a representative for Reynolds at meetings with the school board or various councils. The project manager and assistant manager work out of Reynolds' offices, and coordinate the various stages of construction. The on-site construction manager verifies that work is going according the schedule, and is being done as in the documents.

Appendix A – Summary Schedule

ID		Task Name	Duration	Start	Finish
1		Schematic Design	74 days	Mon 2/2/09	Thu 5/14/09
2		Design Development	94 days	Mon 4/13/09	Thu 8/20/09
3		Construction Documents	136 days	Wed 7/8/09	Wed 1/13/10
4		Bidding and Award Contracts	62 days	Thu 1/14/10	Fri 4/9/10
5		NTP	0 days	Fri 5/21/10	Fri 5/21/10
6		General Conditions	58 days	Fri 5/21/10	Tue 8/10/10
7		Bulk Excavation and Fill	20 days	Wed 7/14/10	Tue 8/10/10
8		**Area A Construction**	**342 days**	**Wed 8/11/10**	**Thu 12/1/11**
9		Foundation	58 days	Wed 8/11/10	Fri 10/29/10
10		Superstructure	108 days	Fri 11/5/10	Tue 4/5/11
11		Building Shell	93 days	Wed 12/22/10	Fri 4/29/11
12		MEP	126 days	Tue 4/19/11	Tue 10/11/11
13		Interior Fit-Out and Finishes	163 days	Tue 4/19/11	Thu 12/1/11
14		**Area B Construction**	**400 days**	**Thu 9/9/10**	**Wed 3/21/12**
15		Foundation	58 days	Thu 9/9/10	Mon 11/29/10
16		Superstructure	80 days	Wed 12/29/10	Tue 4/19/11
17		Building Shell	85 days	Thu 3/17/11	Wed 7/13/11
18		MEP	240 days	Thu 4/21/11	Wed 3/21/12
19		Interior Fit-Out and Finishes	247 days	Tue 4/12/11	Wed 3/21/12
20		**Area C Construction**	**394 days**	**Thu 10/14/10**	**Tue 4/17/12**
21		Foundation	80 days	Thu 10/14/10	Wed 2/2/11
22		Superstructure	69 days	Thu 2/10/11	Tue 5/17/11
23		Building Shell	128 days	Fri 4/29/11	Tue 10/25/11
24		MEP	224 days	Thu 6/9/11	Tue 4/17/12
25		Interior Fit-Out and Finishes	236 days	Tue 5/24/11	Tue 4/17/12
26		**Area D Construction**	**374 days**	**Fri 11/19/10**	**Wed 4/25/12**
27		Foundation	69 days	Fri 11/19/10	Wed 2/23/11
28		Superstructure	48 days	Thu 3/17/11	Sat 5/21/11
29		Building Shell	122 days	Fri 4/29/11	Mon 10/17/11
30		MEP	219 days	Fri 6/24/11	Wed 4/25/12
31		Interior Fit-Out and Finishes	245 days	Thu 5/19/11	Wed 4/25/12
32		Start-up and Testing	127 days	Tue 11/1/11	Wed 4/25/12
33		Substantial Completion	0 days	Mon 4/30/12	Mon 4/30/12
34		Complete Construction	0 days	Thu 5/31/12	Thu 5/31/12
35		Occupy Middle School	21 days	Tue 6/12/12	Tue 7/10/12



Project: Summary Schedule
Date: Mon 10/31/11

Task	Project Summary	Inactive Milestone	Manual Summary Rollup	Deadline
Split	External Tasks	Inactive Summary	Manual Summary	Progress
Milestone	External Milestone	Manual Task	Start-only	
Summary	Inactive Task	Duration-only	Finish-only	

Appendix B – Square Foot Estimate

Square Foot Cost Estimate Report

Estimate Name:	**Phoenixville Area School District**
	Phoenixville, PA
	Pennsylvania
Building Type:	**School, Jr High, 2-3 Story with Face Brick with Concrete Block Back-up / Steel Frame**
Location:	POTTSVILLE, PA
Stories Count (L.F.):	**3.00**
Stories Height	**14.60**
Floor Area (S.F.):	**188,500.00**
LaborType	**Union**
Basement Included:	Yes
Data Release:	**Year 2011 Quarter 3**
Cost Per Square Foot	**$195.28**
Total Building Cost	**$36,811,000**

Costs are derived from a building model with basic components. Scope differences and market conditions can cause costs to vary significantly.

		% of Total	Cost Per SF	Cost
A Substructure		8.6%	12.49	$2,353,500
A1010	**Standard Foundations**		7.06	$1,331,500
	Strip footing, concrete, reinforced, load 11.1 KLF, soil bearing capacity 6 KSF, 12" deep x 24" wide			
	Spread footings, 3000 PSI concrete, load 200K, soil bearing capacity 6 KSF, 6' - 0" square x 20" deep			
A1030	**Slab on Grade**		1.49	$281,000
	Slab on grade, 4" thick, non industrial, reinforced			
A2010	**Basement Excavation**		1.01	$190,000
	Excavate and fill, 10,000 SF, 8' deep, sand, gravel, or common earth, on site storage			
A2020	**Basement Walls**		2.92	$551,000
	Foundation wall, CIP, 12' wall height, pumped, .444 CY/LF, 21.59 PLF, 12" thick			
B Shell		40.9%	59.64	$11,243,000
B1010	**Floor Construction**		30.40	$5,731,000
	Cast-in-place concrete column, 12" square, tied, 200K load, 12' story height, 142 lbs/LF, 4000PSI			
	Flat slab, concrete, with drop panels, 6" slab/2.5" panel, 12" column, 15'x15' bay, 75 PSF superimposed load, 153 P			
	Floor, concrete, slab form, open web bar joist @ 2' OC, on W beam and column, 35'x35' bay, 38" deep, 100 PSF su			
	Floor, concrete, slab form, open web bar joist @ 2' OC, on W beam and column, 35'x35' bay, 38" deep, 100 PSF su			
	Fireproofing, gypsum board, fire rated, 2 layer, 1" thick, 10" steel column, 3 hour rating, 17 PLF			
B1020	**Roof Construction**		3.47	$654,500
	Floor, steel joists, beams, 1.5" 22 ga metal deck, on columns, 35'x35' bay, 28" deep, 40 PSF superimposed load, 62			
	Floor, steel joists, beams, 1.5" 22 ga metal deck, on columns, 35'x35' bay, 28" deep, 40 PSF superimposed load, 62			
B2010	**Exterior Walls**		13.32	$2,510,500
	Brick wall, composite double wythe, standard face/CMU back-up, 8" thick, perlite core fill			
B2020	**Exterior Windows**		7.69	$1,449,500
	Aluminum flush tube frame, for insulating glass, 2" x 4-1/2", 5'x6' opening, no intermediate horizontals			
	Glazing panel, insulating, 1/2" thick, 2 lites 1/8" float glass, tinted			
B2030	**Exterior Doors**		0.59	$112,000
	Door, aluminum & glass, without transom, wide stile, double door, hardware, 6'-0" x 7'-0" opening			
	Door, steel 18 gauge, hollow metal, 1 door with frame, no label, 3'-0" x 7'-0" opening			

1

		% of Total	Cost Per SF	Cost
	Door, steel 24 gauge, overhead, sectional, electric operator, 8'-0" x 8'-0" opening			
B3010	**Roof Coverings**		4.14	$780,500
	Roofing, single ply membrane, EPDM, 60 mils, fully adhered			
	Formed roofing, zinc-copper alloy, standing seam, 2-1/2" min slope, .020" thick, 0.87 PSF			
	Insulation, rigid, roof deck, polyisocyanurate, 2#/CF, 2" thick			
	Insulation, rigid, roof deck, polyisocyanurate, tapered for drainage			
	Base flashing, aluminum, .016" thick, fabric 2 sides, .025" aluminum reglet, .032" counter flashing			
	Roof edges, aluminum, duranodic, .050" thick, 6" face			
	Flashing, aluminum, no backing sides, .019"			
B3020	**Roof Openings**		0.03	$5,000
	Roof hatch, with curb, 1" fiberglass insulation, 2'-6" x 3'-0", galvanized steel, 165 lbs			
	Smoke hatch, unlabeled, galvanized, 2'-6" x 3', not incl hand winch operator			
C Interiors		18.7%	27.31	$5,147,500
C1010	**Partitions**		4.92	$927,500
	Concrere block (CMU) partition, light weight, hollow, 6" thick, no finish			
C1020	**Interior Doors**		1.29	$243,500
	Door, single leaf, kd steel frame, hollow metal, commercial quality, flush, 3'-0" x 7'-0" x 1-3/8"			
C1030	**Fittings**		1.06	$199,500
	Toilet partitions, cubicles, ceiling hung, stainless steel			
	Chalkboards, liquid chalk type, aluminum frame & chalktrough			
C2010	**Stair Construction**		0.63	$118,500
	Stairs, steel, cement filled metal pan & picket rail, 16 risers, with landing			
C3010	**Wall Finishes**		4.60	$866,500
	2 coats paint on masonry with block filler			
	Painting, masonry or concrete, latex, brushwork, primer & 2 coats			
	Painting, masonry or concrete, latex, brushwork, addition for block filler			
	Wall coatings, acrylic glazed coatings, maximum			
	Ceramic tile, thin set, 4-1/4" x 4-1/4"			
C3020	**Floor Finishes**		8.72	$1,644,500
	Carpet, tufted, nylon, roll goods, 12' wide, 36 oz			
	Carpet, padding, add to above, minimum			
	Terrazzo, maximum			
	Vinyl, composition tile, maximum			
C3030	**Ceiling Finishes**		6.09	$1,147,500
	Acoustic ceilings, 3/4"mineral fiber, 12" x 12" tile, concealed 2" bar & channel grid, suspended support			
D Services		29.7%	43.29	$8,160,000
D1010	**Elevators and Lifts**		0.76	$143,500
	Hydraulic passenger elevator, 2500 lb., 2 floor, 125 FPM			
D2010	**Plumbing Fixtures**		5.21	$981,500
	Water closet, vitreous china, bowl only with flush valve, floor mount			
	Urinal, vitreous china, wall hung			
	Lavatory w/trim, wall hung, PE on CI, 20" x 18"			
	Kitchen sink w/trim, countertop, stainless steel, 44" x 22" triple bowl			
	Lab sink w/trim, polyethylene, single bowl, flanged, 23-1/2" x 20-1/2" OD			
	Service sink w/trim, PE on CI, corner floor, 28" x 28", w/rim guard			
	Service sink w/trim, PE on CI,wall hung w/rim guard, 24" x 20"			
	Group wash fountain, stainless steel, circular, 54" diam			
	Shower, stall, baked enamel, terrazzo receptor, 36" square			
	Water cooler, electric, wall hung, wheelchair type, 7.5 GPH			
D2020	**Domestic Water Distribution**		0.34	$64,000

		% of Total	Cost Per SF	Cost
	Gas fired water heater, commercial, 100< F rise, 300 MBH input, 278 GPH			
D2040	**Rain Water Drainage**		0.40	$75,000
	Roof drain, CI, soil,single hub, 5" diam, 10' high			
	Roof drain, CI, soil,single hub, 5" diam, for each additional foot add			
D3050	**Terminal & Package Units**		19.28	$3,635,000
	Rooftop, multizone, air conditioner, schools and colleges, 25,000 SF, 95.83 ton			
D4010	**Sprinklers**		2.47	$465,500
	Wet pipe sprinkler systems, steel, light hazard, 1 floor, 50,000 SF			
	Wet pipe sprinkler systems, steel, light hazard, each additional floor, 50,000 SF			
D4020	**Standpipes**		0.34	$64,000
	Wet standpipe risers, class III, steel, black, sch 40, 6" diam pipe, 1 floor			
	Wet standpipe risers, class III, steel, black, sch 40, 6" diam pipe, additional floors			
D5010	**Electrical Service/Distribution**		1.29	$243,000
	Service installation, includes breakers, metering, 20' conduit & wire, 3 phase, 4 wire, 120/208 V, 1600 A			
	Feeder installation 600 V, including RGS conduit and XHHW wire, 1600 A			
	Switchgear installation, incl switchboard, panels & circuit breaker, 1600 A			
D5020	**Lighting and Branch Wiring**		8.89	$1,676,500
	Receptacles incl plate, box, conduit, wire, 8 per 1000 SF, .9 W per SF, with transformer			
	Wall switches, 2.0 per 1000 SF			
	Miscellaneous power, 1.2 watts			
	Central air conditioning power, 4 watts			
	Motor installation, three phase, 460 V, 15 HP motor size			
	Motor feeder systems, three phase, feed to 200 V 5 HP, 230 V 7.5 HP, 460 V 15 HP, 575 V 20 HP			
	Fluorescent fixtures recess mounted in ceiling, 1.6 watt per SF, 40 FC, 10 fixtures @32watt per 1000 SF			
D5030	**Communications and Security**		3.90	$736,000
	Communication and alarm systems, includes outlets, boxes, conduit and wire, sound systems, 100 outlets			
	Communication and alarm systems, fire detection, addressable, 100 detectors, includes outlets, boxes, conduit and			
	Fire alarm command center, addressable with voice, excl. wire & conduit			
	Communication and alarm systems, includes outlets, boxes, conduit and wire, intercom systems, 100 stations			
	Communication and alarm systems, includes outlets, boxes, conduit and wire, master clock systems, 30 rooms			
	Internet wiring, 2 data/voice outlets per 1000 S.F.			
D5090	**Other Electrical Systems**		0.40	$76,000
	Generator sets, w/battery, charger, muffler and transfer switch, diesel engine with fuel tank, 100 kW			
E Equipment & Furnishings		2.3%	3.28	$618,500
E1020	**Institutional Equipment**		2.17	$409,000
	Architectural equipment, laboratory equipment, counter tops, acid proof, economy			
	Architectural equipment, laboratory equipment, counter tops, stainless steel			
	Architectural equipment, laboratory equipment, cabinets, wall, open			
	Architectural equipment, laboratory equipment, cabinets, base, drawer units			
E1090	**Other Equipment**		1.11	$209,500
	Architectural equipment, school equipment basketball backstops, suspended type, electrically operated			
	Architectural equipment, school equipment bleachers-telescoping, manual operation, 15 tier, economy (per seat)			
	Architectural equipment, school equipment, weight lifting gym, universal, economy			
	Architectural equipment, school equipment, scoreboards, basketball, 1 side, economy			
F Special Construction		0.0%	0.00	$0
G Building Sitework		0.0%	0.00	$0

	% of Total	Cost Per SF	Cost
Sub Total	100%	$146.01	$27,522,500
Contractor's Overhead & Profit	25.0%	$36.50	$6,880,500
Architectural Fees	7.0%	$12.77	$2,408,000
User Fees	0.0%	$0.00	$0
Total Building Cost		**$195.28**	**$36,811,000**

Appendix C – Assembly Estimates

Assemblies Estimate

HVAC Assembly

	Unit	Amount	Material	Labor	Unit Cost	Total Cost	Source
Roof WS Unit Heat Pump	ea.	2	$63,500.00	$3,500.00	$67,000.00	$134,000.00	Consulted contractor
Rooftop Energy Recovery	ea.	4	$86,000.00	$3,750.00	$89,750.00	$359,000.00	Consulted contractor
Water Source Heat Pump	ea.	78	$2,500.00	$1,500.00	$2,750.00	$214,500.00	Consulted contractor
Heating and Recovery Unit	ea.	11	$91,000.00	$7,500.00	$98,500.00	$1,083,500.00	Consulted contractor
Console WS Heat Pump	ea.	9	$1,750.00	$1,000.00	$2,750.00	$24,750.00	Consulted contractor
Split System AC Unit	ea.	15	$2,025.00	$2,525.00	$4,550.00	$68,250.00	pg. 330 D3050 170 Split Systems With Air Cooled Condensing Units
Cooling Tower	s.f.	188,500	$7.35	$4.81	$12.16	$2,292,160.00	pg. 323 D3030 110 Chilled Water, Air Cooled Conderser Systems
Condensing Boiler System	s.f.	188,500	$2.99	$3.24	$6.23	$1,174,355.00	pg. 318 D3020 108 Heating Systems, Unit Heaters

Total Cost	$5,350,515.00	**Actual Contract (adjusted)** $5,778,734.00
Total S.F. Cost	$28.38	**S.F. Cost Actual Contract** $30.66

Electric Assembly

	Unit	Amount	Material	Labor	Unit Cost	Total Cost	
Lighting System	s.f.	188500	$2.18	$4.97	$7.15	$1,347,775.00	pg. 372 D5020 208 Flourescent Fixtures
Fire Detection	s.f.	188500	$0.12	$0.20	$0.32	$60,900.00	pg. 390 D5030 910 Communication & Alarm Systems
Fire Alarm (100)	ea.	1	$2,525.00	$1,775.00	$4,300.00	$4,300.00	pg. 390 D5030 910 Communication & Alarm Systems
Data Communication	s.f.	188.5	$183.00	$440.00	$623.00	$117,435.50	pg. 391 D5030 920 Data Communication
Receptacles	s.f.	188500	$0.57	$2.18	$2.75	$518,375.00	pg. 357 D5020 110 Receptacle (by wattage)
Wall Switches	s.f.	188500	$0.25	$1.86	$2.11	$397,735.00	pg. 360 D5020 130 Wall Switch by s.f.
Switch Gear	ea.	6	$20,900.00	$11,000.00	$31,900.00	$191,400.00	pg. 356 D5010 240 Switchgear
Service Installation, 1200A, 108/220V	ea.	4	15800	6000	21800	$87,200.00	pg. 354 D5010 120 Electric Service
Service Installation, 1200A, 277/480V	ea.	2	19750	7500	27250	$54,500.00	pg. 354 D5010 120 Electric Service

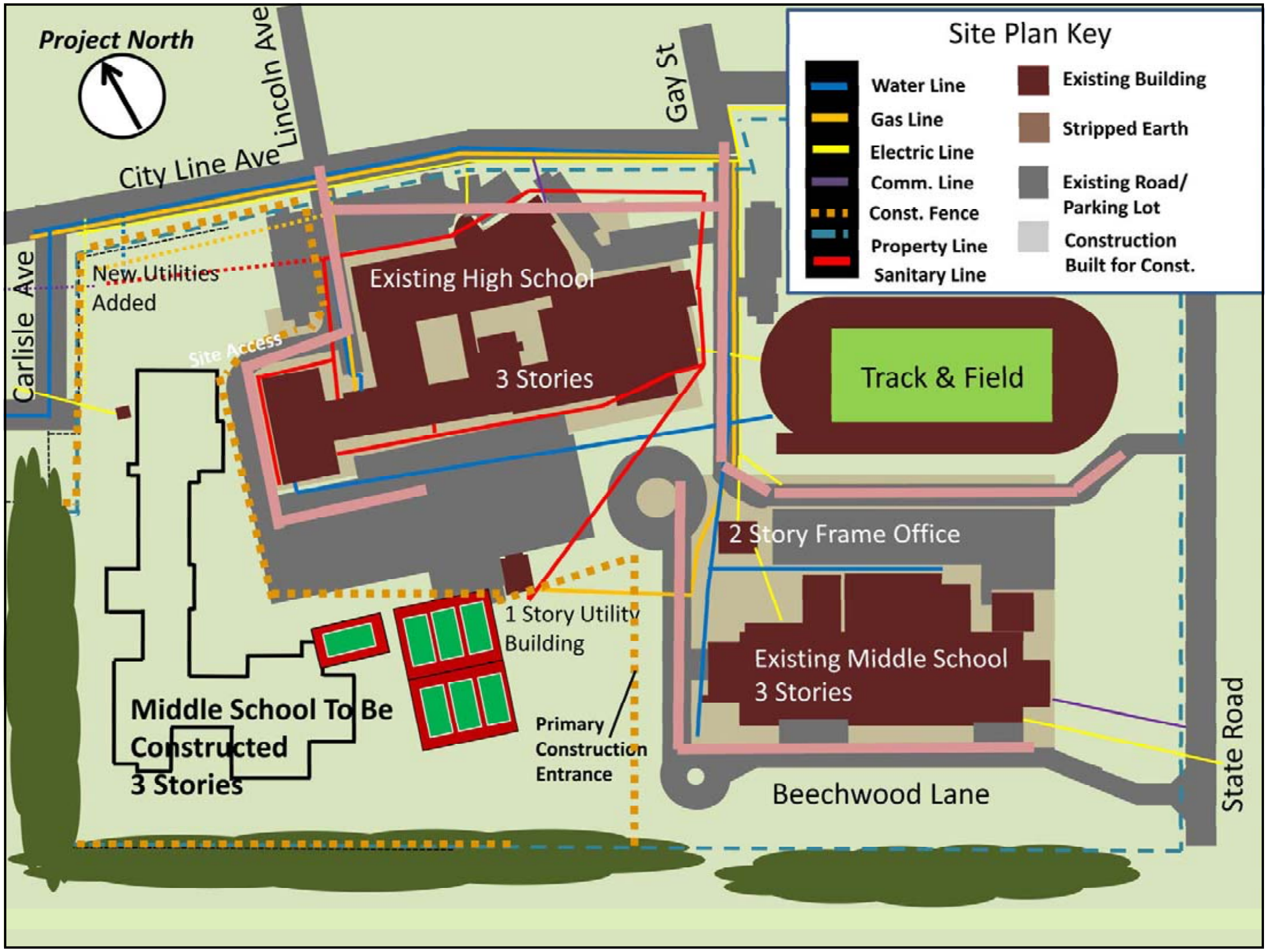
Total Cost	$2,779,620.50	**Actual Contract (adjusted)** $2,748,714.00
Total S.F. Cost	$14.75	**S.F. Cost Actual Contract** $14.58

Plumbing Assembly

	Unit	Amount	Material	Labor	Unit Cost	Total Cost
Urinal	ea.	25	590	765	$1,355.00	$33,875.00
Toilet	ea.	20	785	735	$1,520.00	$30,400.00
Drinking Fountain	ea.	20	1300	450	$1,750.00	$35,000.00
Lavatorty System	ea.	15	870	750	$1,620.00	$24,300.00
Drain Pipe	ea.	50	653.75	1525	$2,178.75	$108,937.50
Water Heater	ea.	10	11800	3125	$14,925.00	$149,250.00
Piping	L.F.	10,000	52.5	23.5	$76.00	$760,000.00

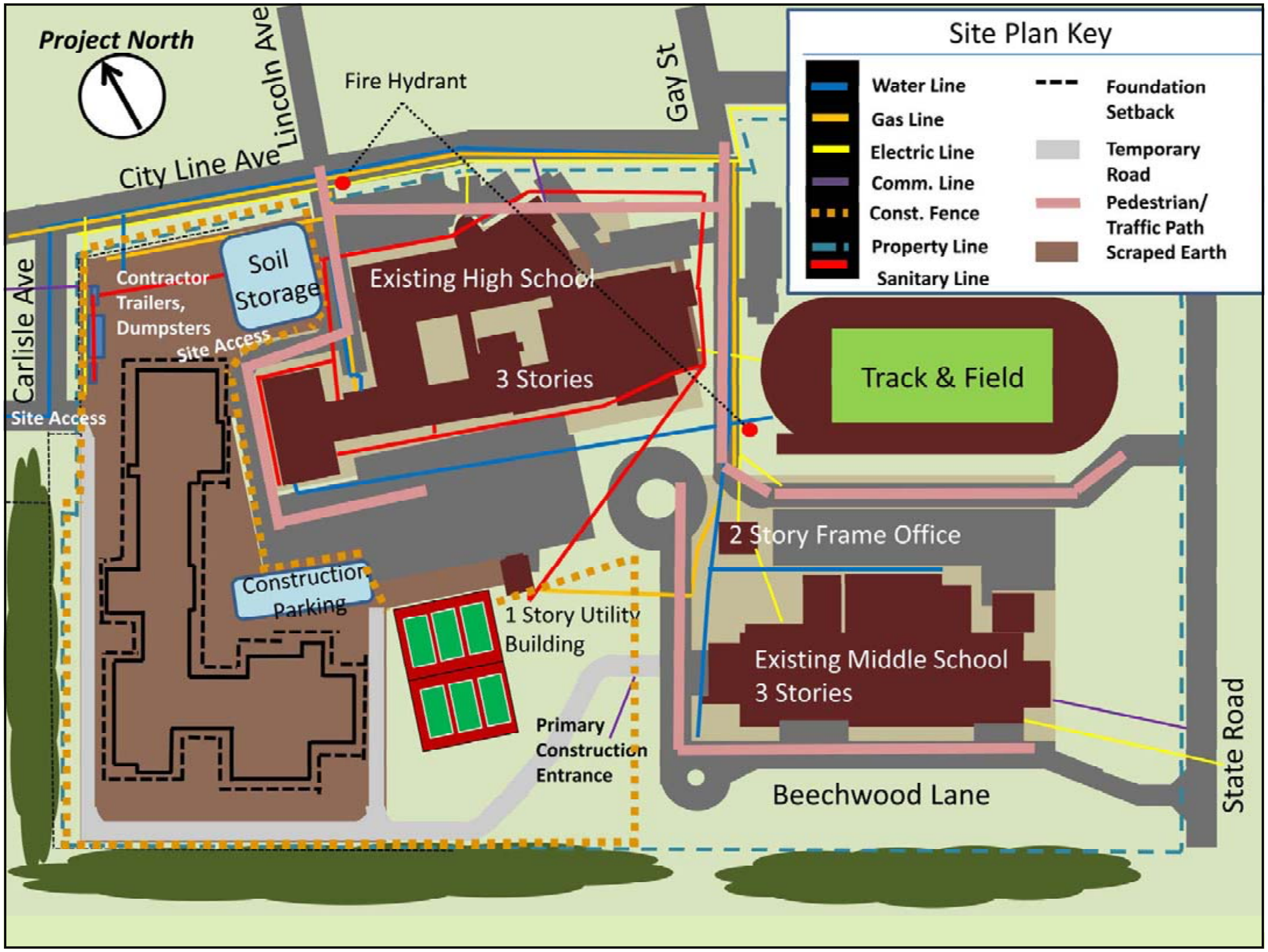
Total Cost	$1,141,762.50	**Actual Contract (adjusted)** $1,886,121.00
Total S.F. Cost	$6.06	**S.F. Cost Actual Contract** $10.01

Appendix D – Site Layouts

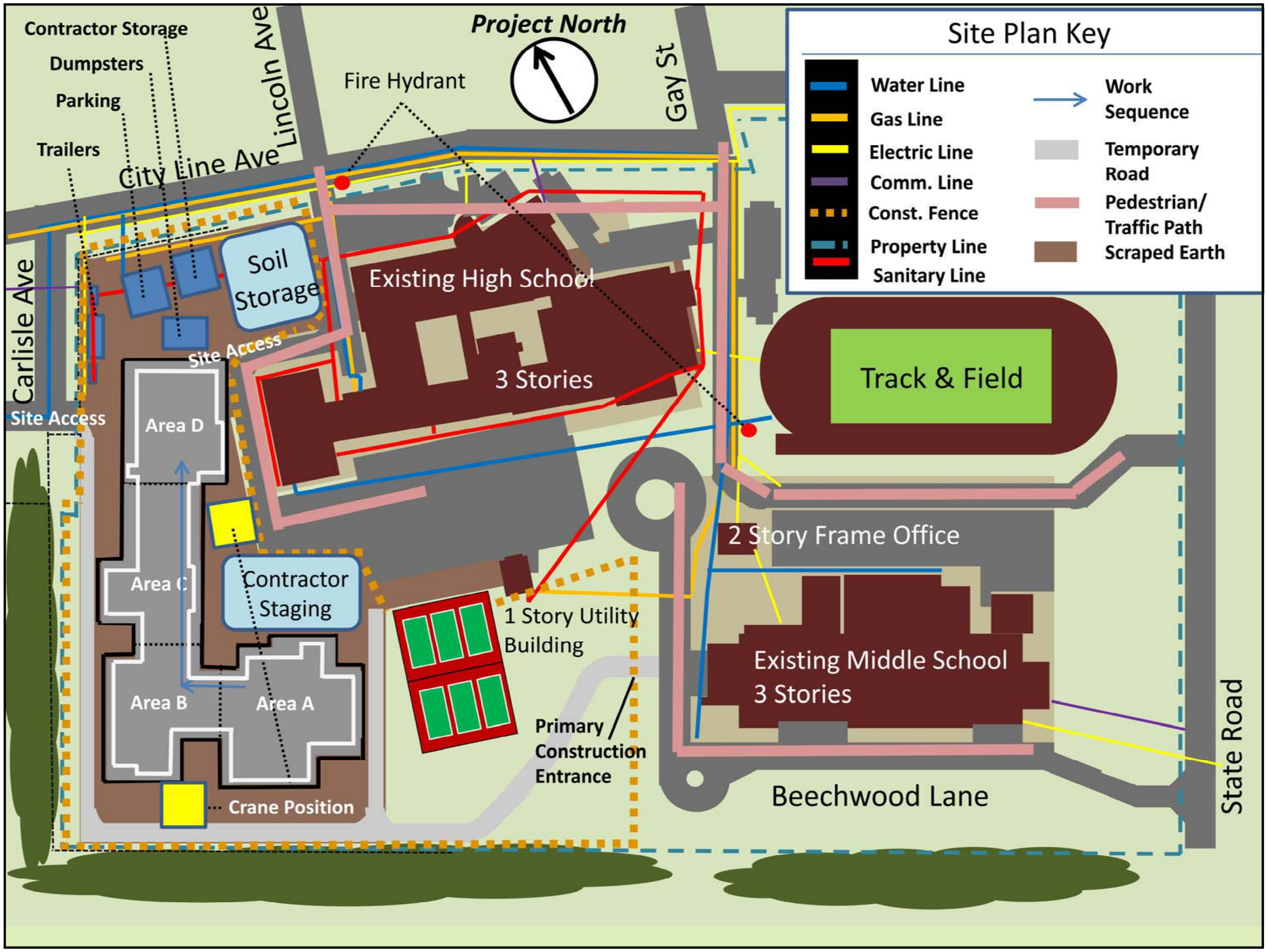


Project: Phoenixville Area Middle School	Location: Phoenixville, PA	Richard Schimpf
Drawing Title: Existing Site Plan	Date: 9/23/2011	Scale: NTS

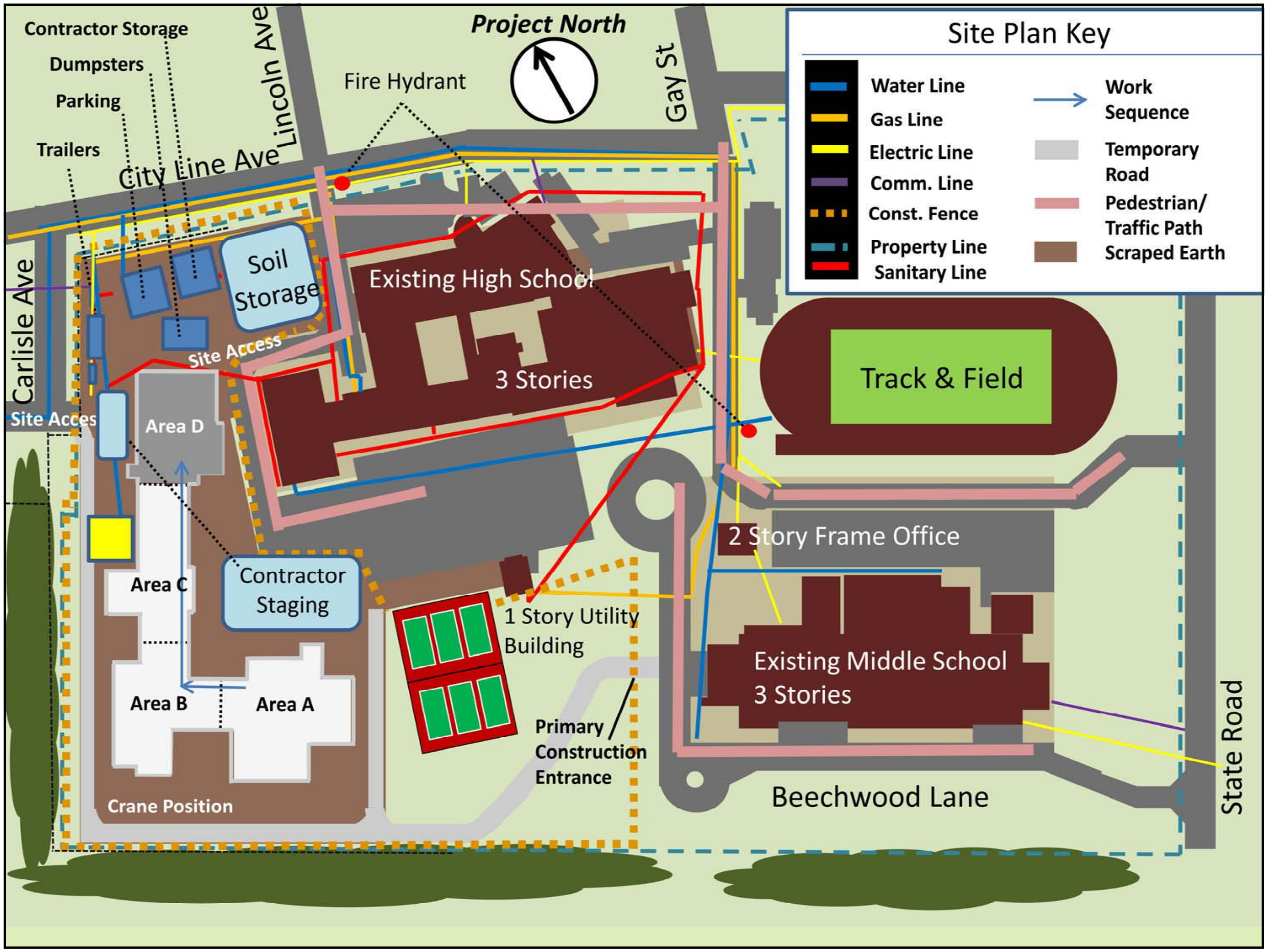
Appendix E – Site Logistics Plan



Project: Phoenixville Area Middle School	Location: Phoenixville, PA	Richard Schimpf
Drawing Title: Excavation Plan	Date: 9/23/2011	Scale: NTS



Project: Phoenixville Area Middle School	Location: Phoenixville, PA	Richard Schimpf
Drawing Title: Superstructure Plan	Date: 9/23/2011	Scale: NTS



Project: Phoenixville Area Middle School	Location: Phoenixville, PA	Richard Schimpf
Drawing Title: Finishes Plan	Date: 9/23/2011	Scale: NTS