

# TECHNICAL REPORT 2



## HFS WAREHOUSE AND BAKERY EXPANSION

University Park, PA

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CONSTRUCTION MANAGMENT

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## EXECUTIVE SUMMARY

Contained within this document is information concerning the renovation and addition of the Housing and Food Services Warehouse and Bakery Expansion for The Pennsylvania State University in University Park, Pennsylvania. This report entails topics such as system construction, schedule, cost estimates, and site logistics.

The schedule for the HFS Warehouse and Bakery Expansion is in line with the milestones. As of now, the project is one schedule to complete on time. The project is currently in phase 2, renovating the existing freezer and coolers and will soon continue to phase 3, renovation of existing ambient storage area. This is a moderately short project and schedule acceleration would be unnecessary given any unforeseen complications. As of today, the project is on schedule and owner occupancy should occur March 3<sup>rd</sup>, 2016.

The new mechanical system will consist of the installation of new freezer and refrigeration units, replacing the existing units, as well as installation of new air ducts. Within the mechanical estimate labor costs, material costs and equipment costs were calculated. The total cost for the mechanical system is approximately \$1,893,000. This corresponds directly to the square foot estimate, differing by only \$187,000. Overall, the mechanical system estimate is accurate and the assumptions were genuine.

Site logistics for this project are fairly straightforward. There is ample space on the site to allow for sufficient material laydown space and temporary facilities. The temporary fencing will be set up as the construction process moves along the schedule. Each phase will entail a new temporary fenced area and will remain there until the end of construction. There is only one small mobile crane and can be easily moved from one location to another as needed.

An overview of the interview with the superintendent, Robert Bair, is also encompassed in this report. Although the interview was short, some pertinent information was revealed. The greatest complication came when fresh exterior paint was applied to the façade and blown by the wind onto vehicles in the neighboring parking lot. This was a costly mistake that could have been easily avoided. The interview also entails complications within the insulation around the freezers, and time spent installing new racking in the dry storage area.

## PRODUCTION PLAN

### SYSTEM CONSTRUCTION MEANS AND METHODS

The HFS Warehouse and Bakery Expansion is undergoing major MEP renovations. The new mechanical system will consist of the installation of new freezer and refrigeration units, replacing the existing units. It will also entail replacing the ducts for the roof top units, new office and lobby rooftop units, and ventilation ducts. Two of the packaged rooftop units with energy recovery wheel will supply 50,000CFM to the the freezer and refrigerator. Three air handling units and three cooled condensing units, consisting of 1700CFM and 48000CFM respectfully, will supply the air needed for the warehouse and dry storage area. The kitchen, bakery, and office area will also have area specific rooftop units. Defining the design standards for performance and quality outcomes is simple in retrospect. The freezer needs to remain approximately -10°F at all times. The refrigerator is expected to remain about 28°F to 35°F. This is not a LEED project so the efficiency of these units is negligible, however, the new units will be more economically efficient. No cranes will be needed for this project; however, a small mobile crane was bought to erect the steel and hoist the HVAC units.

### PRODUCTION SCHEDULE

The existing HFS Warehouse and Bakery Expansion will undergo three phases from the construction start date, March 2<sup>nd</sup>, 2015, and will be completed for owner occupancy one year later, March 2016. The design phase started in November of 2013. Phase one starts with the excavation and foundation of the warehouse addition located on the north side. The freezer construction is also a part of phase one starting on March 16<sup>th</sup>, 2015 and continuing for 146 days until October 5<sup>th</sup>, 2015. New freezer and refrigeration units will be installed to replace the aging and inefficient system currently in place. The office and rear improvements will undergo MEP rough-in for ten days from June 6<sup>th</sup>, 2015 to June 23<sup>rd</sup>, 2015. The MEP trim-outs will take about 5 days starting July 27<sup>th</sup>, 2015. The MEP for the freezer and cooler in the bakery will take 28 days and will start on August 28<sup>th</sup>, 2015. Renovations of the existing ambient storage area will be included in the third phase starting on December 12<sup>th</sup>, 2015. The final MEP installation will be located in the new office and consulting room. This will start October 1<sup>st</sup>, 2015 and end in February 25<sup>th</sup>, 2016. A full construction schedule can be found in Appendix A.

## DETAILED COST

The overall cost for the mechanical system renovation and addition to the Housing and Food Services Warehouse and Bakery Expansion will cost approximately \$1,893,000. To install this system the labor will cost about \$425,000. This information was taken from RSMeans database. According to the previous square foot estimate, the \$1,893,000 cost for the mechanical system is relatively accurate. It is approximately 14.5% of the building cost, and the mechanical system estimate is actually 16% of the total cost. This only differs by roughly \$187,000. This difference could have occurred from different labor costs, small measuring differences, and material cost. The total material cost, total labor cost, and overall cost of the mechanical system can be seen in Figure 1. A full estimate can be found in Appendix B.

Total Material Cost	Total Labor Cost	Total Cost
\$1,042,823.74	\$425,086.04	\$1,892,909.18

Figure 1

## SITE PLAN AND LOGISTICS

Starting with phase 1A, the addition to the warehouse will be erected. The renovation of the south side will make the start of phase 1B. The material laydown is surrounded by a gate on the northern most parking lot. This is also where one of two construction entrances is located. This can be seen in Figure 2.

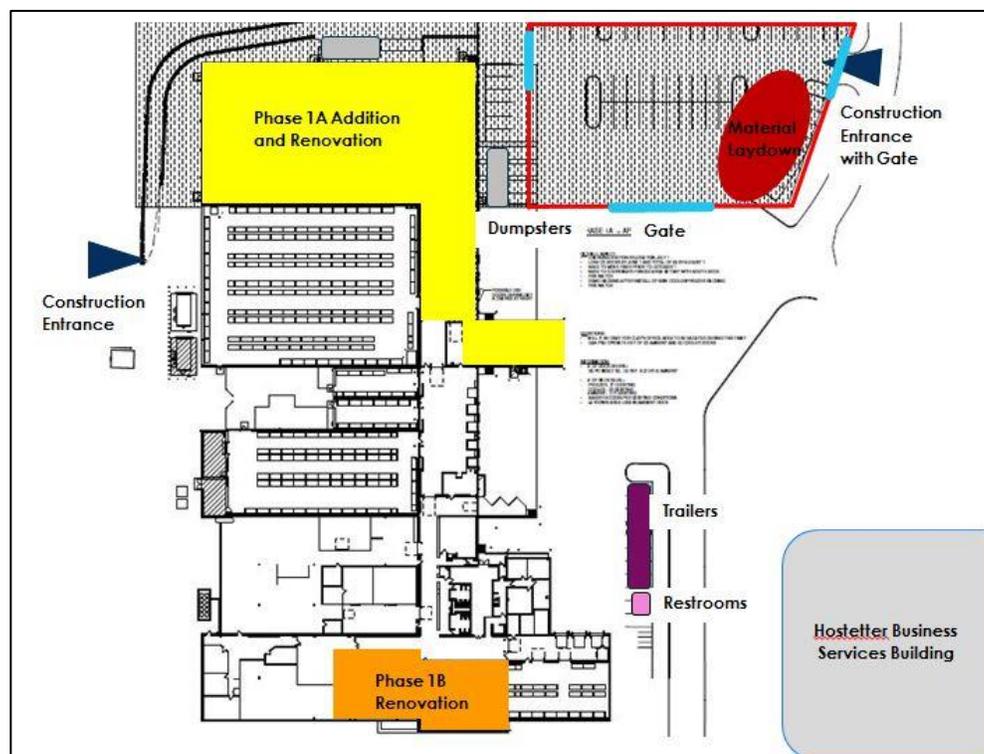


Figure 2

Phase 2 marks the start of the existing cooler and freezer renovation. A new fence is place around the west side of the building, along with dumpsters. The second of two construction entrances will need a gate to allow passage through the fencing as seen in Figure 3. This fence will be used later in phase 3.

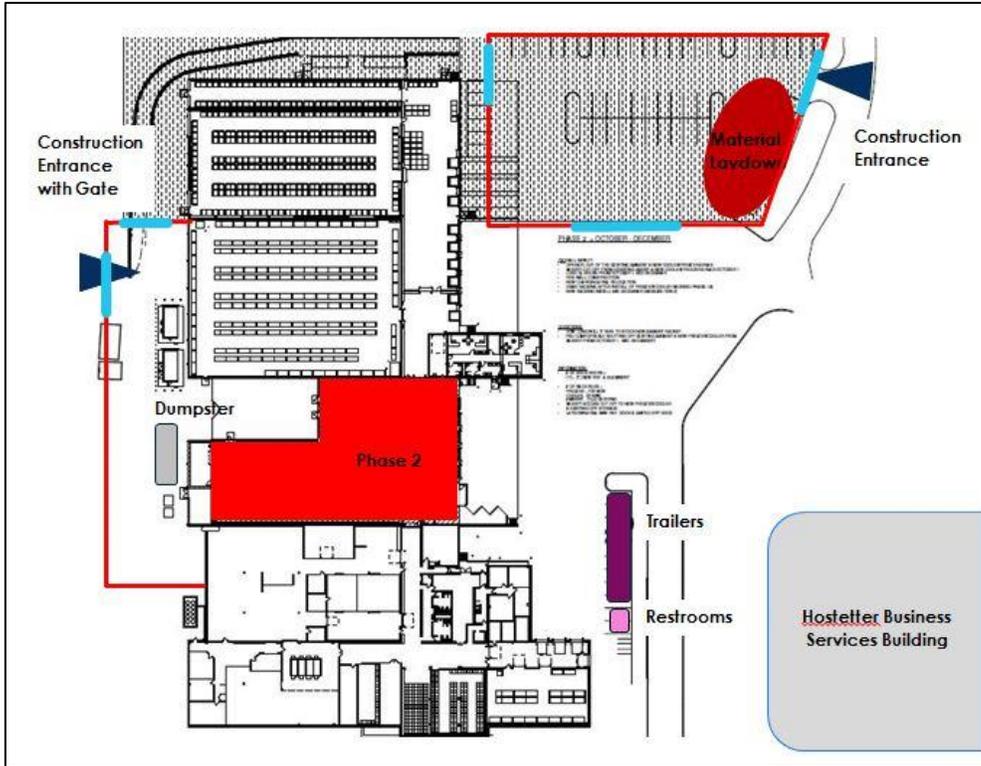


Figure 3

Phase 3 starts with the existing freezer. This will be renovated into more dry storage. The first part of phase 3 will start with the southern part of the dry storage area and the offices as seen in Figure 4. As the offices continue to be renovated, the northern part of the dry storage area will start renovations. This can be seen in Figure 5. Additional fencing will be set up around the trailers and south east side of the building.

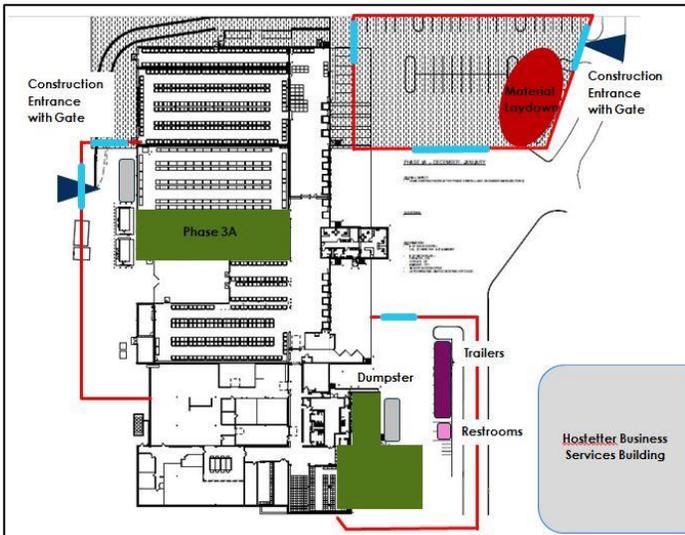


Figure 5

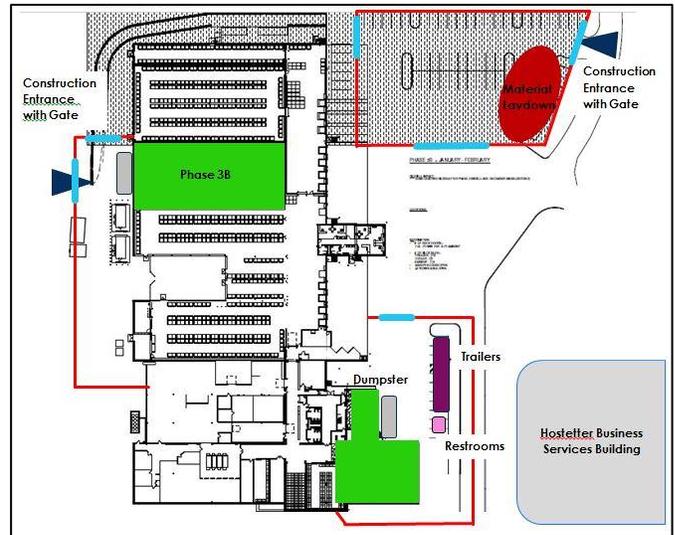


Figure 4

## PRODUCTION ANALYSIS

### PRODUCTION

The 94,000 square foot existing HFS building will undergo approximately 44,500 square feet of renovations during the three phases of construction. This allows for flexibility within the crews and site constraints. The schedule starts with the longest activity, warehouse addition, and ends with the renovation of the office space. This is extremely effective since other activities can occur if phase 1 gets delayed. The only overlap that may arise is with the use of the small mobile crane. Since there is only one, the use of this mobile crane will need to be planned in coordination with the phases.

### COST ANALYSIS

The mechanical estimate is relatively accurate to the RSMeans square foot estimate and the actual construction costs for this system. The square foot estimate and the mechanical estimate only differ by approximately \$187,000. This difference could have occurred from different labor costs, small measuring differences, and material cost. Labor rates may change from one subcontractor to another. When measuring the ducts the square footage could vary slightly depending on the accuracy of the lines drawn.

### LOGISTICAL ANALYSIS

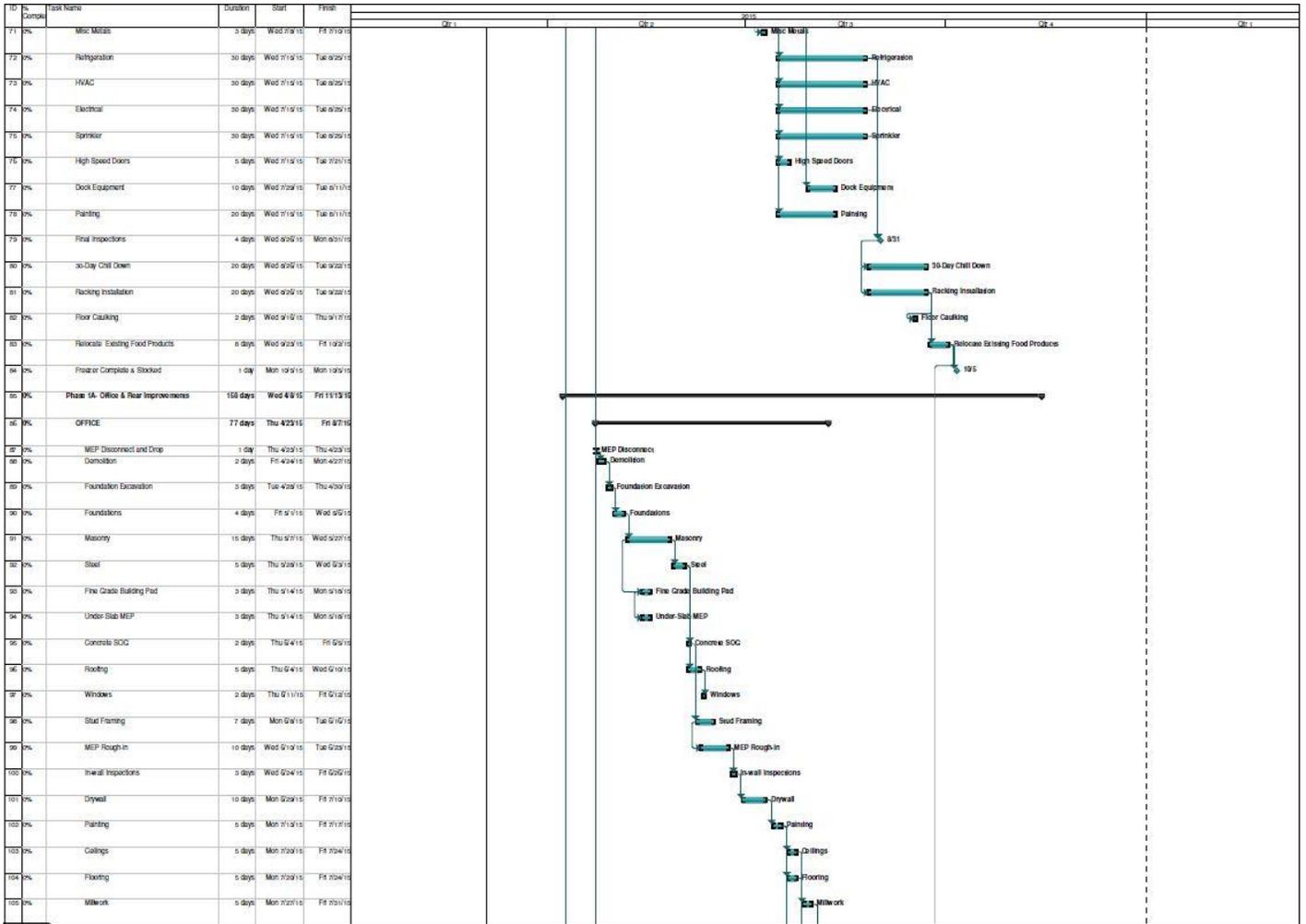
The space for this project is ample since the site is surrounded by grass and gardens. There is only one adjacent building, Hostetter Business Services, but it does not limit the laydown area or construction entrances. However, parking for construction employees and the occupants of the building is reduced. Alternative locations for the job trailers, restrooms and material laydown could be used, but would not change the overall flow of construction. If the material laydown area was moved to the south east side of the building, it may retard the flow of traffic into the building. Improving the fencing around the north side of the building during phase one could benefit the movement of material. If the fence was extended around the warehouse addition, materials could be transported directly to the addition instead of going around the fencing.

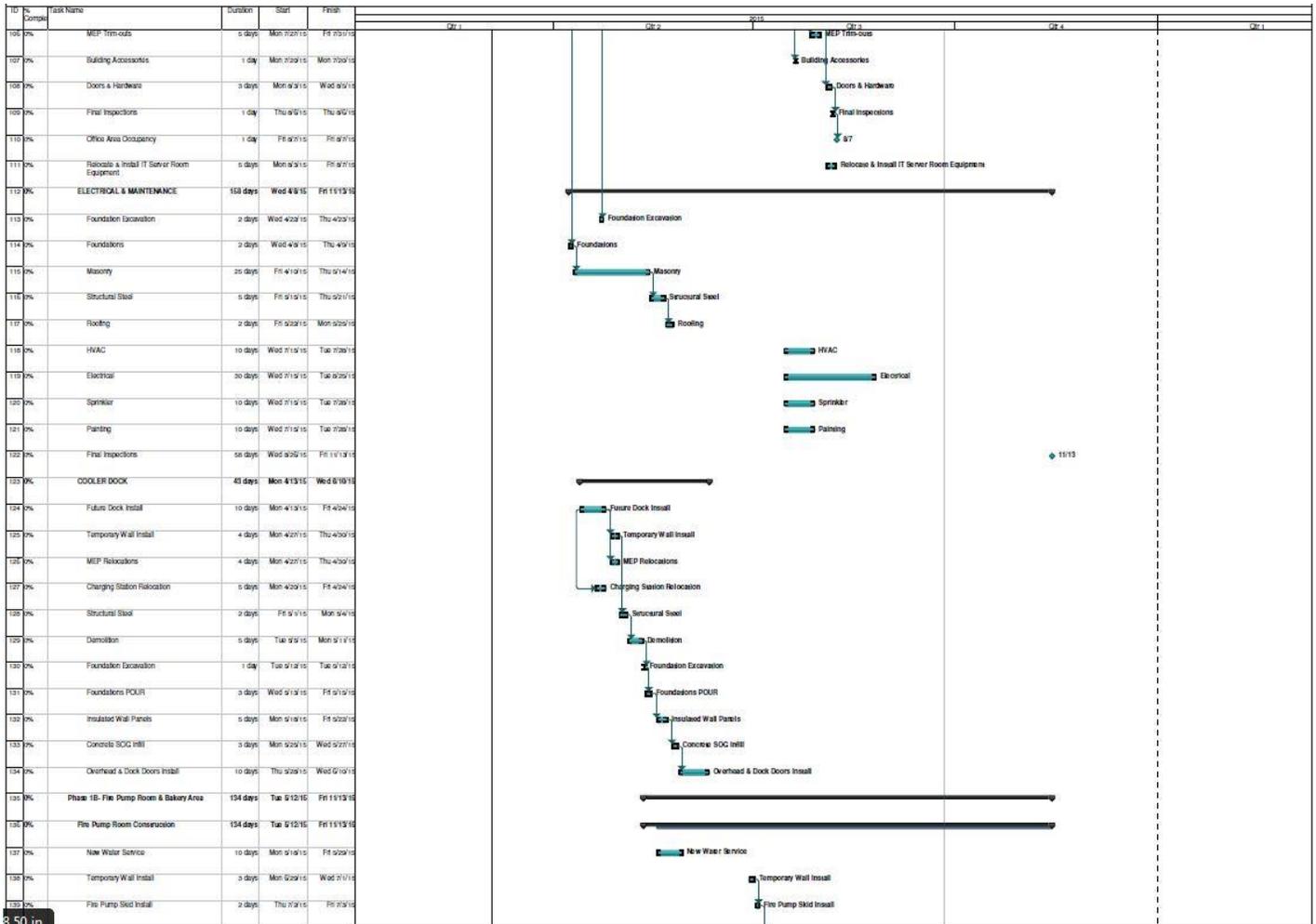
## FIELD SUPERVISOR INTERVIEW

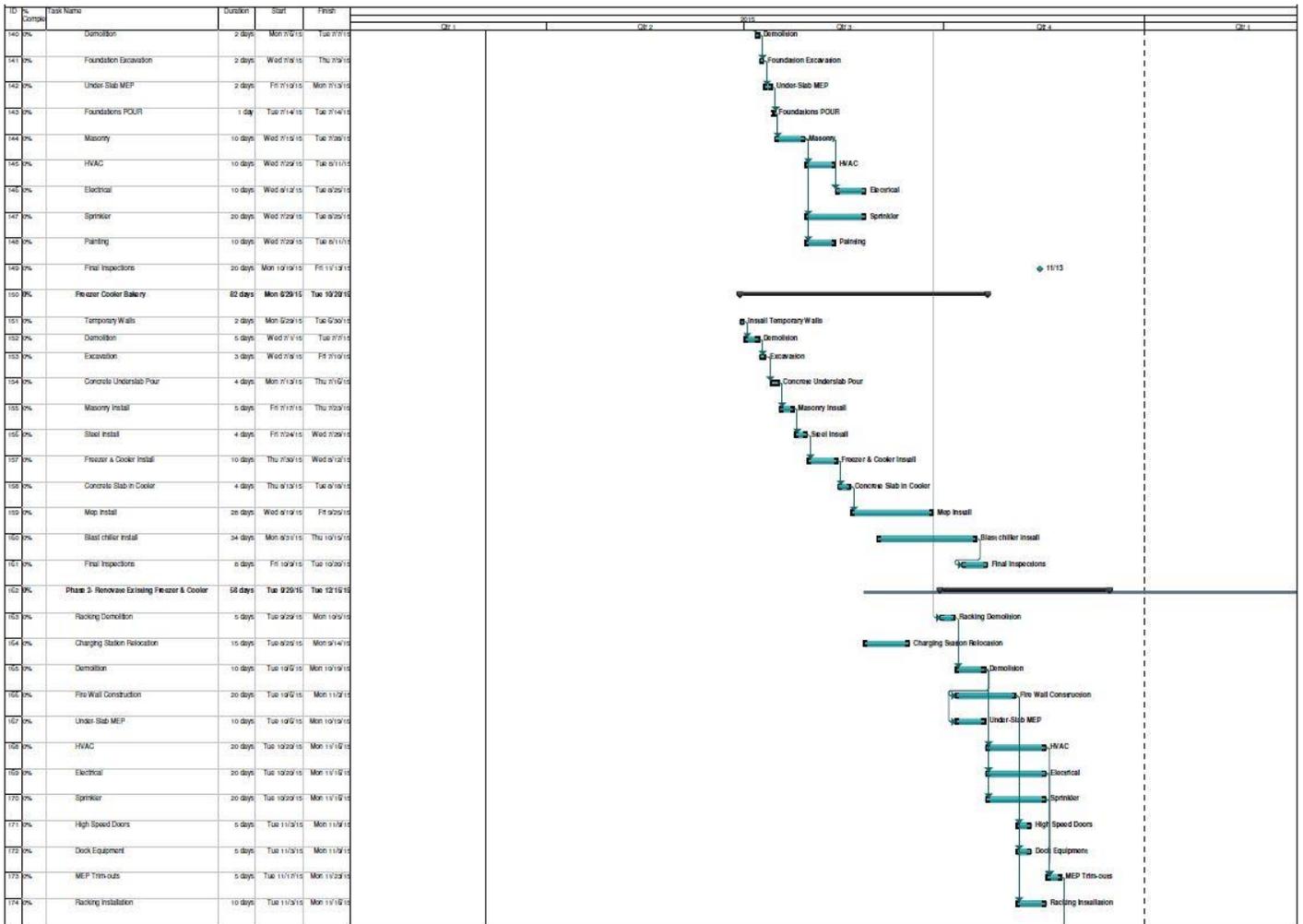
On October 9<sup>th</sup> the superintendent, Robert Bair, was contacted over the phone and was asked to respond to a few questions. This phone call lasted about ten minutes. Only a few suggestions were made and the project is going very smoothly. One of the biggest risks for the project schedule is the dry storage area renovation. The freezer space is to be renovated and made into a dry storage area with a mass quantity of racking. Bair said it was very hard to remove the freezer insulation and create ventilation for this large area. In addition, the racking is normally mounted into the concrete, but since this is a renovation anchors were mounted into the concrete and attached to the racks. Bair also stated that increasing manpower or accelerating the project would be unreasonable considering it is only a one year project. The project is on schedule to complete on time and unless a major unforeseen incident occurs, acceleration is unnecessary. One constructability concern Bair had was installing sufficient insulation below the floor in the freezer. If there is not enough insulation between the ground and the slab on grade in the freezer, it may freeze the ground and push up on the concrete. This creates cracks, and even large displacement within the area. To ensure this will not occur, six inches of insulation was installed under the six inch concrete slab along with a vapor barrier and two inch perimeter insulation. Bair also noted that one major incident arose when the building façade was being painted. A large storm was coming in while the façade was being painted and the wind blew paint across the parking lot. The paint was speckled onto many cars that were parked there. Reparations were made to the owners of the vehicles.

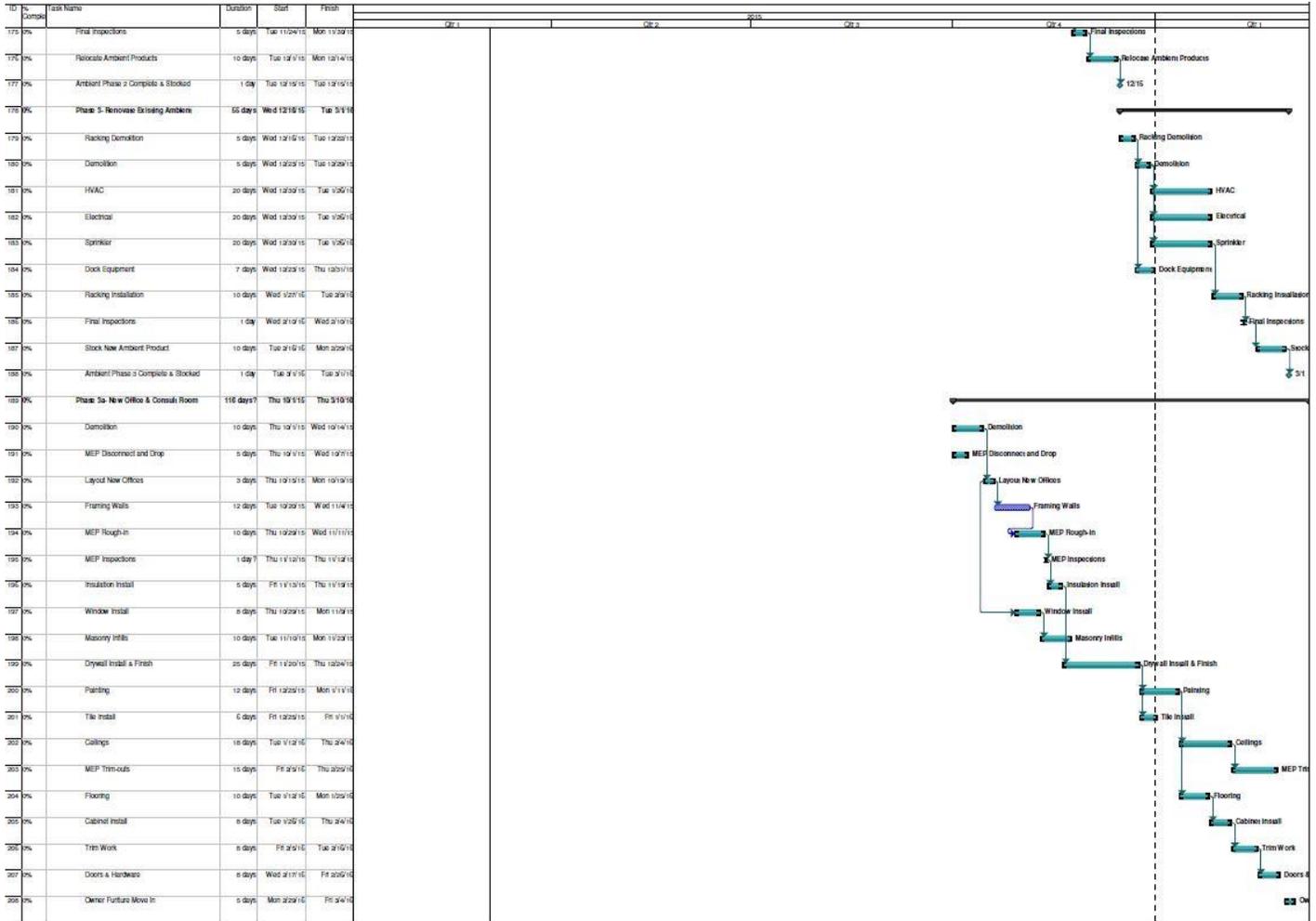
# APPENDIX A: SCHEDULE









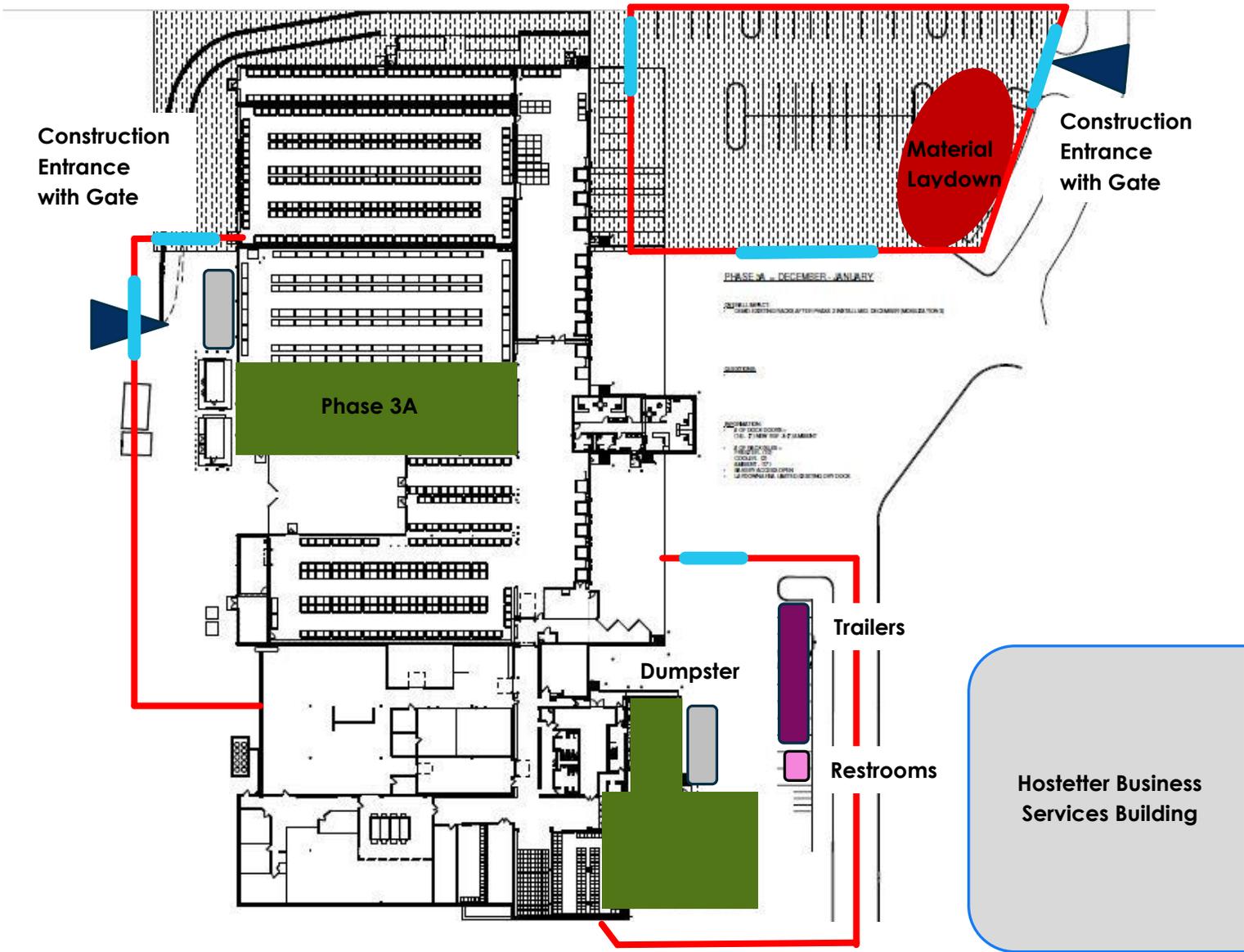


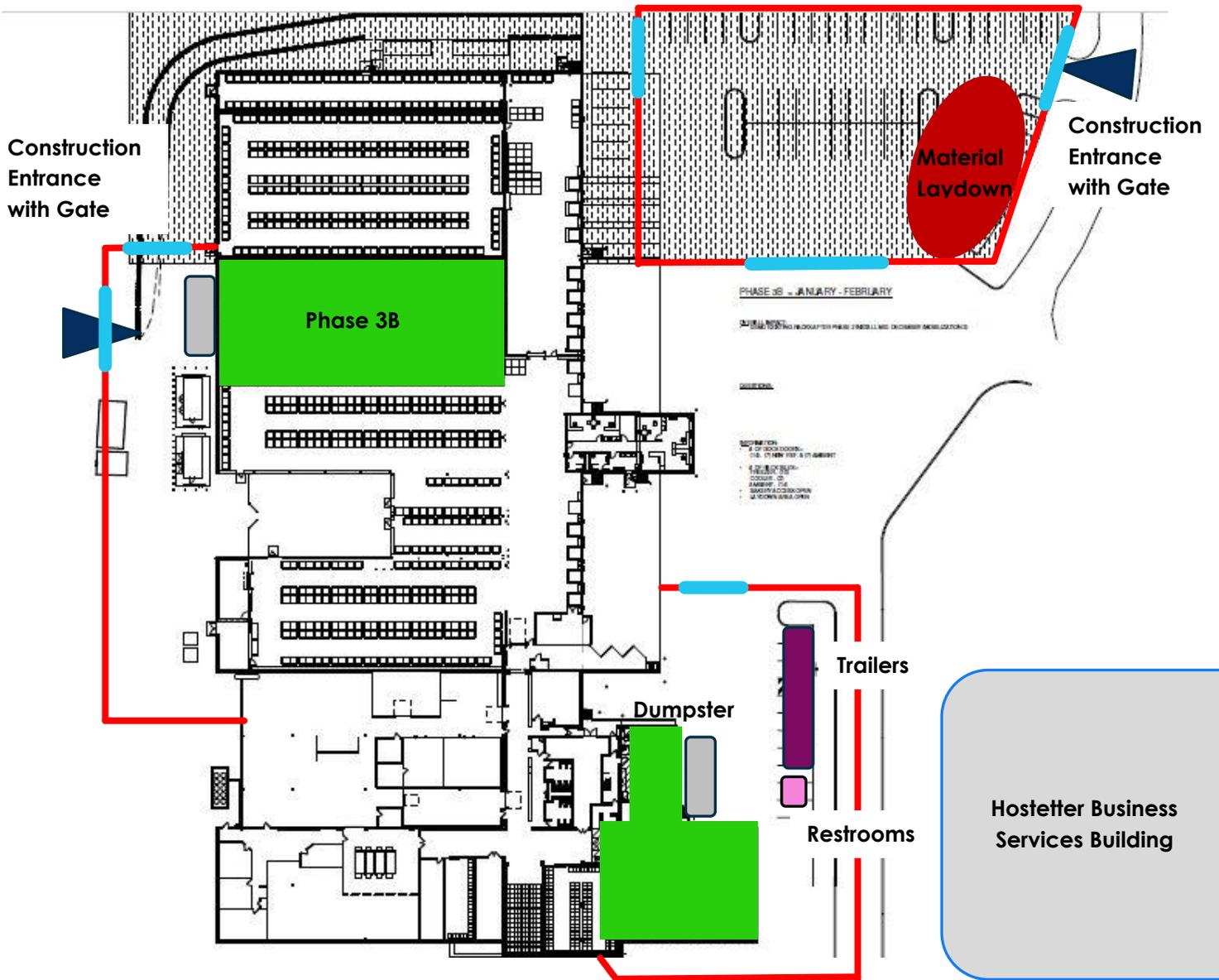
## APPENDIX B: MECHANICAL ESTIMATE

Description	Tons/CFM	Quantity	Unit	Material Unit Cost	Material Cost	Labor Unit Cost	Labor Cost	Equipment Unit Cost	Equipment Cost	Total Cost
Bakery RTU	30/12000	9040	/SF	3.94	35617.6	4.57	41312.8	0	0	\$76,930.40
Kitchen RTU	10./4000	1200	/SF	30	36000	13.75	16500	0	0	\$52,500.00
Office Lobby RTU	4/1600	450	/SF	9.6	4320	11.85	5332.5	0	0	\$9,652.50
Split Air System	1/24000	200	/SF	2.75	550	2.58	516	0	0	\$1,066.00
Cook Downblast Centrifugal Exhaust Ventilator	NA/3500	28	Ea	1300	36400	87	2436	0	0	\$38,836.00
Electrical Wall Heater	NA/100	3	Ea	1400	4200	95	285	0	0	\$4,485.00
Packaged Rooftop Unit with Energy Recovery Wheel	125/50000	2	Ea	248500	497000	24800	49600	212500	425000	\$971,600.00
Ducts for RTU	NA	21120	SF	2.65	55968	1.83	38649.6	0	0	\$94,617.00
Kitchen Hood	5-10000	1	Ea	5750	5750	1324	1324	0	0	\$7,074.00
Air Handling Units	1600-1700	3	Ea	1400	4200	687	2061	0	0	\$6,261.00
Air Cooled Condensing Units	48000	3	Ea	1137	3411	534	1602	0	0	\$5,013.00
Electric Unit Heater and Cabinet	350	16	Ea	5032.5	80520	1760	28160	0	0	\$108,680.00
Dry Pipe Sprinkler	NA	12222	/SF	2.87	35077.14	2.87	35077.14	0	0	\$70,154.28
Wet Standpipe Risers 2 1/2"	NA	18	/FL	13545	243810	11235	202230	0	0	\$446,040.00
										<b>\$1,892,909.18</b>









## APPENDIX D: INTERVIEW TRANSCRIPT

Rutt: Hello Robert Bair, this is Joseph Rutt calling. May I ask you a few questions regarding the HFS Warehouse and Bakery Expansion?

Bair: Sure I'd be happy to help.

Rutt: What is one of the biggest risks to completing this project on time?

Bair: I'd have to say the dry storage area renovation. This area has given us a bit of trouble. Ripping out the old freezer insulation has been quite time consuming and is making it difficult to create the right amount of ventilation for this large area.

Rutt: What about the racking in this renovation. I saw in the drawings that there is a large amount of storage racks. Is installing these racks just as time consuming?

Bair: Yes, there is a lot of storage in this area. The racks are normally mounted into the concrete. This means we will have to drill holes into the concrete and attach the racks with anchors. This isn't a big problem and can be done with a small crew size of about 2-3 men.

Rutt: Is the project on schedule? Could the project be accelerated?

Bair: This is such a short project that it would be irrational to accelerate the project. We are moving as fast as we can. Adding more manpower would only increase labor and would not accelerate the project enough to make up the difference.

Rutt: Are there any unique constructability issues in this project?

Bair: Well it's not so much a constructability issue, but installing the correct insulation below the new freezer is very important. If there is insufficient insulation between the ground and slab on grade, the ground will freeze.

Rutt: Why would it matter if the ground froze?

Bair: If the ground freezes under the slab, it will expand and push the concrete slab up. This could cause cracks and even holes in the concrete. The displacement would destroy the floor and new concrete would have to be poured to replace it.

Rutt: Are there any concerns or design changes for the site logistics plan? Could additional fencing be set up to ensure safety?

Bair: There isn't much traffic on that road as far as students are concerned. However, a costly mistake was made by the painter when he was spraying paint on the façade.

He was trying to finish quickly before the storm hit. The wind was strong and it blew the wet paint onto some of the cars in the parking lot. There wasn't too much paint on the cars but enough to notice small specks scattered along the cars. We ended up paying for any damages to the vehicles.

Rutt: Wow! I wouldn't have thought the paint could travel that far. Well I'm sorry to cut this short I have class in a few minutes. Thank you for taking time out of your schedule to discuss this with me.

Bair: Thank you and have a good day.

Rutt: Thanks, good-bye

**Note:** I did not have a recording device present and I could not write fast enough to get every word he said. This is the majority of the conversation; some of this may be paraphrased.