13. APPENDIX A

13.1. PIPE LENGTH CALCULATIONS

Mueller

Mueller Associates, Inc.
Consulting Engineers

Project: Barns Classroom & Lab Bldg
Project No:
Subject: Pipe Length + Boreholes
Computed by: JAB Date: Feb. 1, 2012

Minimum Pipe Length: Horizontal

$\frac{440 \text{ ft}}{\text{ton}} \left(434.1 \text{ ton}\right) = 175,640 \text{ ft}$

Maximum Pipe Length: Horizontal

$\frac{600 \text{ feet}}{\text{ton}} \left(439.1 \text{ ton}\right) = 263,460 \text{ ft}$

Minimum Pipe Length: Vertical

$\frac{150 \text{ ft of borehole}}{\text{ton}} \left(439.1 \text{ ton}\right) \left(\frac{2 \text{ ft of pipe}}{1 \text{ ft of borehole}}\right) = 131,730 \text{ ft}$

Maximum Pipe Length: Vertical

$\frac{450 \text{ ft of borehole}}{\text{ton}} \left(439.1 \text{ ton}\right) \left(\frac{2 \text{ ft of pipe}}{1 \text{ ft of borehole}}\right) = 395,190 \text{ ft}$

Number of boreholes: minimum pipe length

$65,865 \text{ ft} \left(\frac{\text{borehole}}{150 \text{ ft}}\right) = 440 \text{ boreholes}$

$65,865 \text{ ft} \left(\frac{\text{borehole}}{450 \text{ ft}}\right) = 147 \text{ boreholes}$

Number of boreholes: maximum pipe length

$197,595 \text{ ft} \left(\frac{\text{borehole}}{150 \text{ ft}}\right) = 1,318 \text{ boreholes}$

$197,595 \text{ ft} \left(\frac{\text{borehole}}{450 \text{ ft}}\right) = 440 \text{ boreholes}$

13.2. EXCAVATION CALCULATIONS

Excavation for Single Layer of Pipe

Area = 2,500 ft² (437.1 feet) = 1,093,750 ft² swell factor = 1.26

depth = 3'

1,093,750 ft² (3 ft) (1 cy / 27 ft³) = 121,527 cy (1.25) = 152,466 Lcy

152,466 Lcy (1 day / 3 cy) (1.15 min / 1 load) (1 hr / 60 min) (1 day / 10 hr) = 96 days for excavator

152,466 kg (1 day / 270 kg) (1 / 6 dozers) = 95 days for 6 dozers

Cost for Excavator

1 excavator for 96 days (₱ 2,867 / excavator day) = ₱ 275,232

Cost for dozers

6 dozers (95 days) (₱ 1,328 / dozer day) = ₱ 756,960

Total = ₱1,032,192

Excavation for Double Layer of Pipe

Area = 2,500 ft² (437.1 feet) (1/2) = 548,875 ft² depth = 5' swell = 25%

548,875 ft² (5 ft) (1 cy / 27 ft³) (1.25) = 127,055 Lcy

127,055 Lcy (1 load / 3 cy) (1.15 min / 1 load) (1 hr / 60 min) (1 day / 10 hr) = 80 days for excavator

127,055 kg (1 day / 270 kg) (1 / 6 dozers) = 79 days for 6 dozers

Cost for Excavator

1 excavator (80 days) (₱ 2,867 / excavator day) = ₱ 229,360

Cost for 6 dozers

6 dozers (79 days) (₱ 1,328 / dozer day) = ₱ 629,496

Total = ₱ 858,856

13.3. INSTALLATION COST AND TIME

Time for Installation

1" Pipe

$263,460 \text{ LF} \left(\frac{\text{day}}{79.725 \text{ LF}}\right)\left(\frac{1}{3 \text{ crew}}\right) = 1,099 \text{ days}$

50 YDS units

$81 \text{ units} \left(\frac{8 \text{ hr}}{\text{unit}}\right)\left(\frac{1 \text{ day}}{10 \text{ hr}}\right) = 81 \text{ days}$

Wire

$3,693.5 \text{ LF} \left(\frac{\text{day}}{79.725 \text{ LF}}\right) = 47 \text{ days}$

Panels

$5 \text{ panels} \left(\frac{8 \text{ hr}}{\text{panel}}\right)\left(\frac{\text{day}}{10 \text{ hr}}\right) = 4 \text{ days}$

Cost of Installation

1" Pipe

$3 \text{ crew} \left(1,099 \text{ days}\right)\left(\frac{10 \text{ hr}}{\text{day}}\right)\left(\frac{\$33.25}{\text{hr-crew}}\right) = \$1,096,252.50$

50 YDS units

$81 \text{ days}\left(\frac{10 \text{ hr}}{\text{day}}\right)\left(\frac{\$33.25}{\text{hr}}\right) = \$26,932.50$

Wire

$47 \text{ days}\left(\frac{10 \text{ hr}}{\text{day}}\right)\left(\frac{\$33.00}{\text{hr}}\right) = \$15,510.00$

Panels

$4 \text{ days}\left(\frac{10 \text{ hr}}{\text{day}}\right)\left(\frac{\$33.00}{\text{hr}}\right) = \$1,320.00$

Excavation

$80 \text{ days}\left(\frac{10 \text{ hr}}{\text{day-crew}}\right)\left(1 \text{ crew}\right)\left(\frac{\$28.50}{\text{hr}}\right) = \$22,800.00$

$47 \text{ runs}\left(\frac{10 \text{ hr}}{\text{day-trench}}\right)\left(6 \text{ trenches}\right)\left(\frac{\$478.50}{\text{hr}}\right) = \$135,040$

Total Cost

$\$1,096,252.50 + \$26,932.50 + \$15,510 + \$1,320 + \$22,800 + \$135,040$

$= \$1,297,905$

14. APPENDIX B

14.1. MECHANICAL SPACE LAYOUT

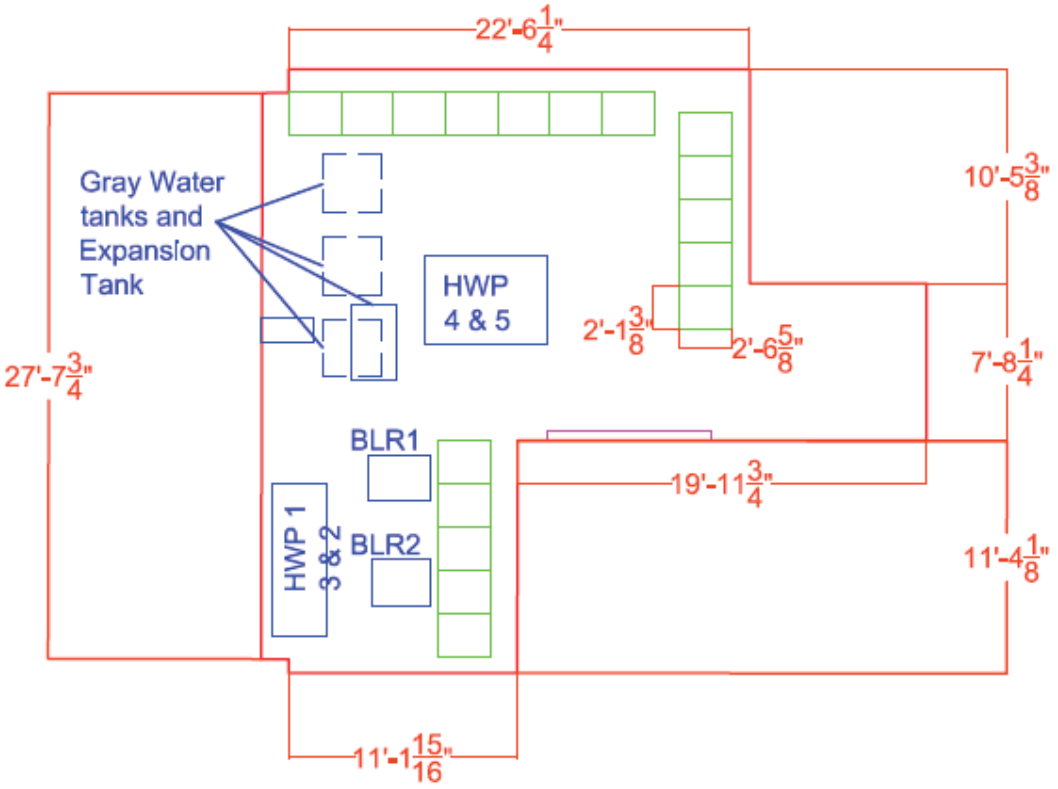

FIGURE 3: MECHANICAL ROOM LAYOUT

14.2. Proposed Location for remaining Pumps

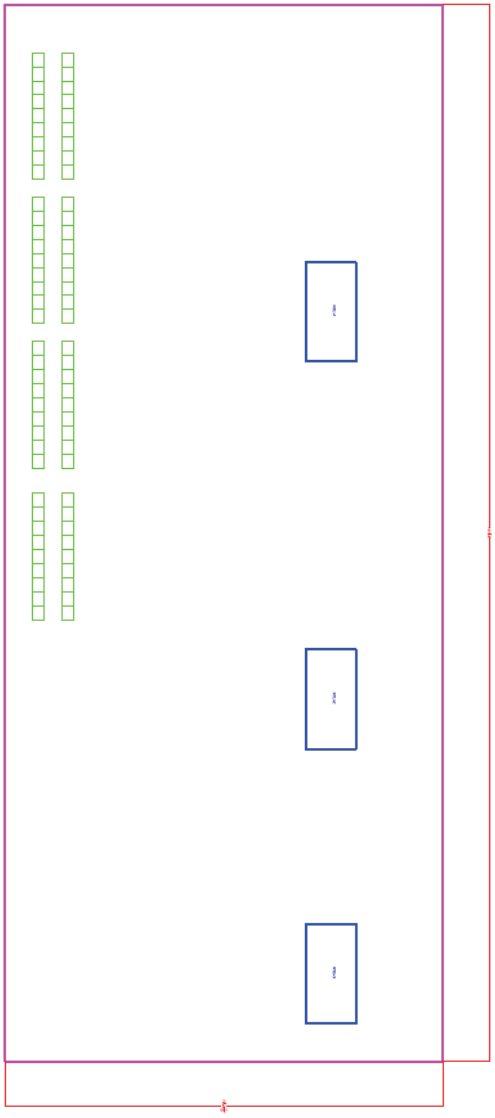

FIGURE 4: LOWER ROOF PROPOSED LOCATION FOR REMAINING PUMPS

14.3. PROPOSED SCHEMATIC DESIGN

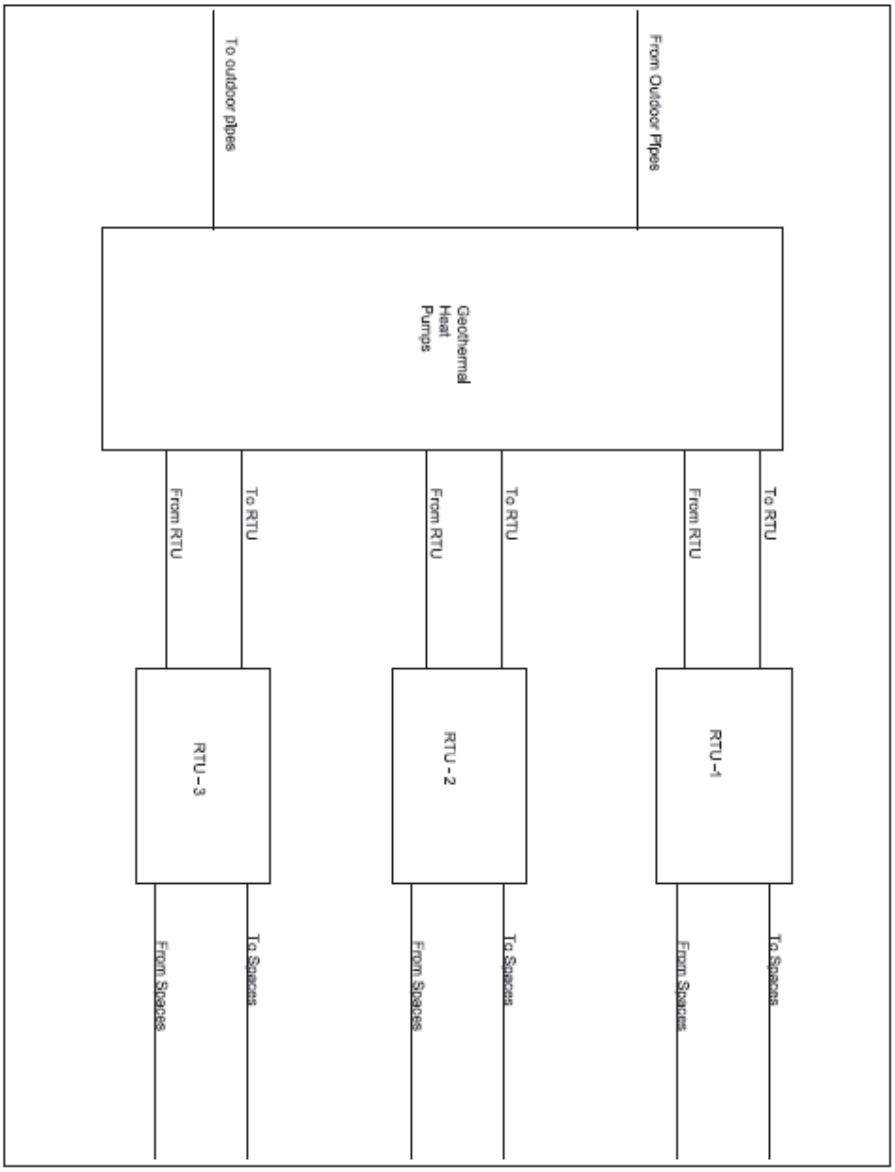

FIGURE 5: SCHEMATIC DESIGN FOR PROPOSED SYSTEM

15. APPENDIX C

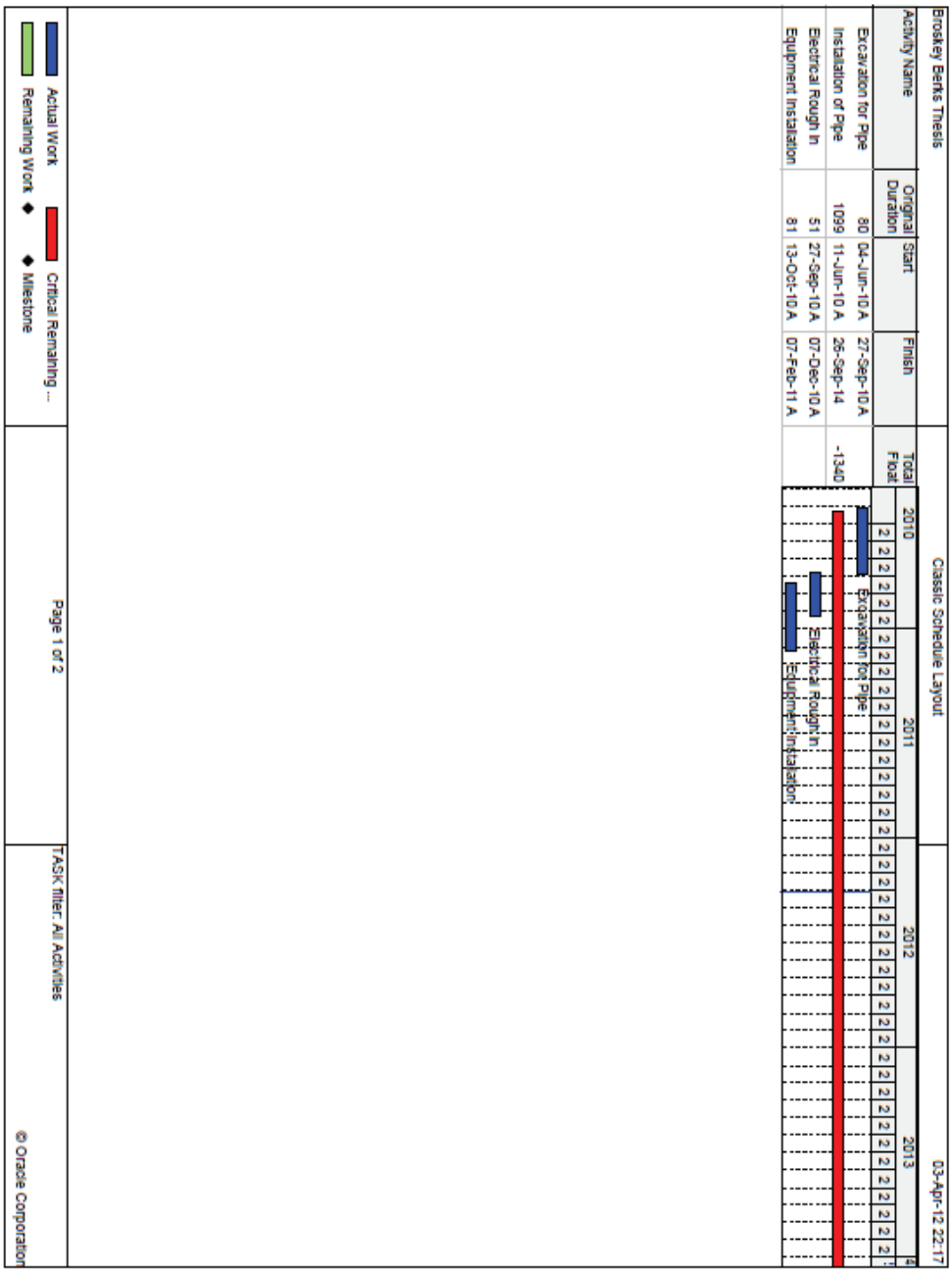

FIGURE 6: PAGE ONE OF THE PROPOSED SYSTEM SCHEDULE

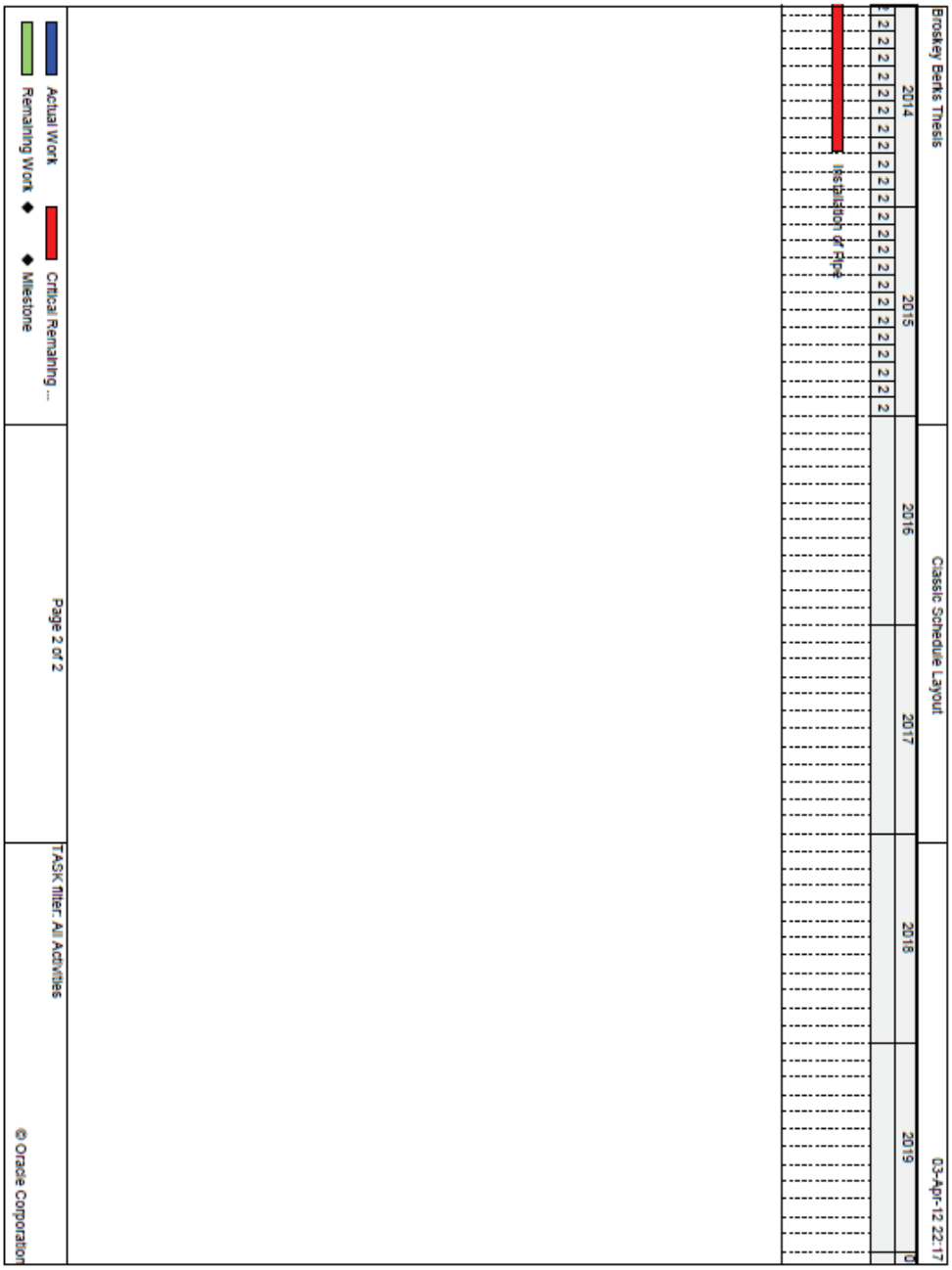

FIGURE 7: PAGE TWO SCHEDULE