MEMORANDUM

To: City Council

From: David J. Deutsch
City Manager

Subject: City Hall Generator/HVAC System

Date: October 6, 2008

In a September 10, 2008 memo to City Council on proposed changes to the City Hall Project as a result of the Value Engineering process, staff concluded as follows:

> "There is one additional item that needs to be brought to Council's attention. This involves the proposed emergency generator for this building. Because of the different size and complexity associated with this building, an emergency generator will need to be sized at 1500 KW rather than the 500 KW proposed in the Fentress study. The emergency generator for the current City Hall of approximately 40,000 square feet is 250 KW. Therefore, it seemed logical that a generator proposed as twice as large would accommodate the needs of a building that is twice as large. Unfortunately, that is not the case. While a generator that could provide full functionality to the police department, computer servers and life safety electricity to the rest of the building could be provided within the proposed cost estimate, it was felt by staff that City Council would want to provide a generator that would allow the entire building to continue functioning when power is lost. If a larger generator is installed, this will impact the overall budget for this project. Staff is preparing a separate report for City Council detailing this matter and will present this to you shortly for your review."

Working with the Architect and Project Manager, staff has further evaluated this issue and offers the following additional information for City Council consideration.

<u>Importance of Providing Full Power to the New City Hall in Adverse Circumstances</u>

When Hurricane Floyd hit the City in 1999, it exposed vulnerabilities in the ability of the City to provide services to residents during events where electricity outages

occur over a large portion of the City for extended periods of time. As a result of that event, the City has undertaken a program to systematically install generators at key buildings and facilities to allow the City the opportunity to continue municipal operations during adverse events. City residents have come to expect this service and staff feels that it is important to continue this approach and provide full power to the new City Hall.

Size of Generator Required at the New City Hall

An analysis has been performed by the mechanical engineering consultant working for Grimm + Parker, Sidhu Associates, showing that if the City wants to continue to provide a 100% building connected load during adverse events, then a 1500 KW generator is required (see Attachment 1).

However, of significance in this analysis is that one of the driving reasons for the need to install a 1500 KW generator to power the entire building is the 390,000 watts of connected load of the proposed electric heating system. The Value Engineering (VE) process recommended converting from a natural gas fired heating system to an electric heating system in order to save $553,479 in initial construction costs. If the City were to revert to a natural gas heating system, a 1000KW generator could be substituted and the building would be able to be operated at full power. This will be elaborated on further in this report.

Location of Generator Inside the Building or Outside the Building

Attachment 2 provides an analysis of the advantages and disadvantages of locating the generator inside versus outside the building. Attachment 3 and 4 show diagrams should the generator be located inside the building. Attachments 5 and 6 show diagrams should the generator be located outside the building.

It is $134,265 ($699,230 - $564,965) less to install the generator outside the building than to locate this inside the building (see Attachment 7).

Based on the analysis provided, staff would recommend that the generator be located outside the building. If the decision is made to locate the generator outside the building, every effort will be made to mitigate the noise impact on surrounding property owners.

Generator Fuel Tank

Because of the environmental issues and regulatory issues associated with locating fuel tanks underground (see Attachment 8), staff would recommend locating the fuel tank for the generator above ground. The fuel tank is proposed to be located under the generator.

We would also recommend installing a 5,000 gallon diesel fuel tank which will add $10,811. Our reason for this recommendation is that a 1000 KW generator uses

approximately 70 gallons of diesel fuel each hour of operation. A 5,000 gallon tank would therefore provide for approximately three days of operations in an extended outage situation.

Size of Generator and Type of HVAC System

As indicated earlier in this memo, if we install a natural gas system, we would be able to completely power the new City Hall with a 1000 KW generator rather than a 1500 KW generator. The difference in cost between the 1000 KW generator and the 1500 KW generator is $115,640 (see Attachment 9).

The main reason to consider reverting to natural gas is that our operating costs each year will be reduced by $35,308 based on an analysis performed by Sidhu consultants. The major downside to this proposal is that we would need to add back the $553,479 to our construction cost that was identified as saving in the VE study. This $553,479 would be reduced by $115,640 noted in the paragraph above because of a smaller generator, so the net increase in cost would be $437,839 ($553,479 - $115,640).

As Attachment 9 shows, the pay back for switching back to natural gas from electric and going with a 1000 KW generator versus a 1500KW generator would be 12.4 years given the price difference shown in the paragraph above ($437,839 cost difference/$35,308 cost savings per year). Since this building is expected to have a life span in excess of 50 years, the better life cycle cost decision seems to be to make the conversion back to natural gas and go with a 1000KW generator rather than a 1500KW generator.

If we revert back to natural gas from electric, our ability to obtain our original goal of LEED Silver may be enhanced. Also, from an environmental perspective, natural gas is preferable to electricity. Greenhouse gas emissions will be lower with natural gas.

A downside to this conversion is that we have already authorized Grimm + Parker to move forward with the electric HVAC. Grimm + Parker estimates that converting back to natural gas could cause a three to four week delay. However, every effort would be made to minimize this delay.

If we were to install a 500 KW generator that would provide power to part of the building (full functionality to the police department, computer servers and life safety to the rest of the building) our increased cost over the earlier cost estimate would be $374,325. This is contrary to the information provided in the September 10, 2008 memo, quoted at the beginning of this memo, that indicated we could install a 500 KW generator within the cost estimate.

To summarize, if you look at this in terms of the overall impact on the budget it breaks down as follows:

	Power Partial Building, Stay with Electric Heat and put 500 KW Generator Outside	Power Partial Building, Convert Back to Natural Gas and put 500 KW Generator Outside	Power Entire Building, Convert Back to Natural Gas and put 1000 KW Generator Outside	Power Entire Building, Stay with Electric Heat and put 1500 KW Generator Outside
Construction Budget	$25,000,000	$25,000,000	$25,000,000	$25,000,000
Generator Net Cost Over Estimate	$374,325	$374,325	$449,325	$564,965
HVAC Conversion Back to Natural Gas	0	$553,479	$553,479	0
Increase Size of Diesel Tank from 3,000 Gallons to 5,000 Gallons	0	0	$10,811	$10,811
Total Revised Cost	$25,374,325	$25,927,804	$26,013,615	$25,575,776
Increase to City Hall Construction Budget Needed	$374,325	$927,804	$1,013,615	$575,776
Estimated Savings Per Year in Operating Cost of HVAC	0	$35,308	$35,308	0

Funding Options

To implement the recommendations regarding the size of the generator or change the HVAC system back to natural gas, there are two basic approaches that can be used to fund the cost increase.

1. We can use the design contingency of $1,316,300, that has already been funded by Council, to fund this difference. However, it may be prudent to leave this intact and preserve this until the bidding of the project to allow for any overruns at that point.

2. We can increase the size of the bond issue for this project to cover this difference.

Staff plans to meet with the City's Financial Advisor shortly regarding the size of the bond issue for this project. With the addition of the gymnasium project added to the FY 2009 budget, we intend to discuss whether the bond issue should be expanded to incorporate these decisions, and what the best mix of using fund balance and borrowing may be regarding these projects. We feel that the expertise that our Financial Advisors bring to this issue will be invaluable in helping the City optimize the decision as to how to fund these projects. Staff will report back to City Council shortly on this issue.

Staff Recommendation

There are several issues contained in this memorandum. Therefore, to summarize, staff recommends as follows:

1. Full power should be provided to City Hall in case of power outages. This will require the installation of a larger generator.

2. The generator should be located outside the building. It costs $134,265 less to install the generator outside the building.

3. The fuel tank should be 5,000 gallons and should be located above ground. This will add $10,811 to the cost of this building.

4. We should use natural gas for the HVAC system. This will add a net cost of $437,839 to the cost of this building. It will save $35,308 per year in operating costs. The payback for this change would be 12.4 years. Since this building will have a life span in excess of 50 years, from a life cycle cost perspective, the better decision is to use natural gas. Also, converting back to natural gas is a better decision from an environmental perspective. Finally, this decision may enhance our ability to achieve a LEED Silver rating.

5. Because of the recommendation in item one and four above, staff recommends the size of the generator be 1000 KW.

6. We do not recommend the use of the design contingency moneys of $1,316,300 to fund this addition. We instead recommend meeting with the City's Financial Advisor to determine the best combination of use of fund balance and borrowing to fund this project as well as the City's gymnasium project.

7. The net impact of all these recommendations is that staff recommends that Council authorize an additional $1,013,615 toward the budget of this building, and that staff be authorized to modify the contract for construction design cost with Grimm + Parker to $26,013,615 from $25,000,000.

DJD/JLF/adf

Attachments

BOWIE CITY HALL
LOAD CALCULATIONS

23-Sep-08

CASE-1 **100% BUILDING CONNECTED LOAD**

Sr No.	TYPE OF LOAD	AREA	CONNECTED WATTS/SF	CONNECTED LOAD (WATTS)	DEMAND
1	LIGHTING		Actual	45,992	43,692
2	HVAC (cooling)		Actual	300,000	240,000
3	COMPUTER		Actual	99,120	90,000
4	DEVICES	98,000	1.2	117,600	82,320
5	GENERAR RECP.		Actual	153,248	91,949
6	ADDITIONAL HEATING			390,000	390,000
7	ELEVATOR	3	17404		52,212
8	SERVER ROOM			50,000	50,000
					1,040,173
	TOTAL CONNECTED LOAD			1,155,960	
	DEMAND			1,040,173	
	10 % FUTURE LOAD			104,017	
	TOTAL LOAD			**1,144,191**	
	TOTAL AMPERS AT 480 VOLTS			**1,720**	
	Generator Size Required for Total Building				**1500 KW**

CASE-Z **100% BUILDING CONNECTED LOAD (w/original design - GAS FOR REHEAT)**

Sr No.	TYPE OF LOAD	AREA	CONNECTED WATTS/SF	CONNECTED LOAD (WATTS)	DEMAND
1	LIGHTING		Actual	45,992	43,692
2	HVAC (cooling)		Actual	300,000	240,000
3	COMPUTER		Actual	99,120	90,000
4	DEVICES	98,000	1.2	117,600	82,320
5	GENERAR RECP.		Actual	153,248	91,949
6	ADDITIONAL HEATING			0	0
7	ELEVATOR	3	17404		52,212
8	SERVER ROOM			50,000	50,000
					650,173
	TOTAL CONNECTED LOAD			765,960	
	DEMAND			650,173	
	10 % FUTURE LOAD			65,017	
	TOTAL LOAD			**715,191**	
	TOTAL AMPERS AT 480 VOLTS			**1,075**	
	Generator Size Required for Total Building				**1000 KW**

Generator Size	Required (24 hour tank)	Standard Fuel Tank dimensions			
	Fuel Cons. per Hr (gl)	Tank Capacity (gl)	L (in)	W (in)	H (in)
1500KW	111.5	2,676	17'	9'	3'

Generator Inside/Outside Building Advantages/Disadvantages

Inside - Advantages

1. Avoids negative visual impact on outside of building.

2. Noise impact on external users may be reduced.

3. Space already allocated in Detailed Design Drawing for inside location.

4. Do not need to identify space for generator location on outside which could result in loss of parking spaces. However, the fuel tank and building transformer still need to be located outside.

Inside - Disadvantages

1. Noise impact on internal users may be increased.

2. Value Engineering Process indicated that locating generator outside would result in cost reduction.

3 Will require additional sound attenuation to cut down noise.

4. Requires additional ventilation louver and possibly fan costs to vent out fumes.

5. Vibration to building when generator in use.

6. Exhaust and diesel fumes may be released into building.

7. May be difficult to perform mechanical repairs on major components.

8. More difficult to repair generator unit in future.

Outside - Advantages

1. Value Engineering Process indicated that locating generator outside would result in cost reduction.

2. Noise impact on internal users may be reduced.

3. Frees up space inside building for alternative uses.

4. May be easier to perform mechanical repairs on major components.

5. Exhaust or diesel fumes would be outside of building.

6. Much easier to replace generator in future.

Outside - Disadvantages

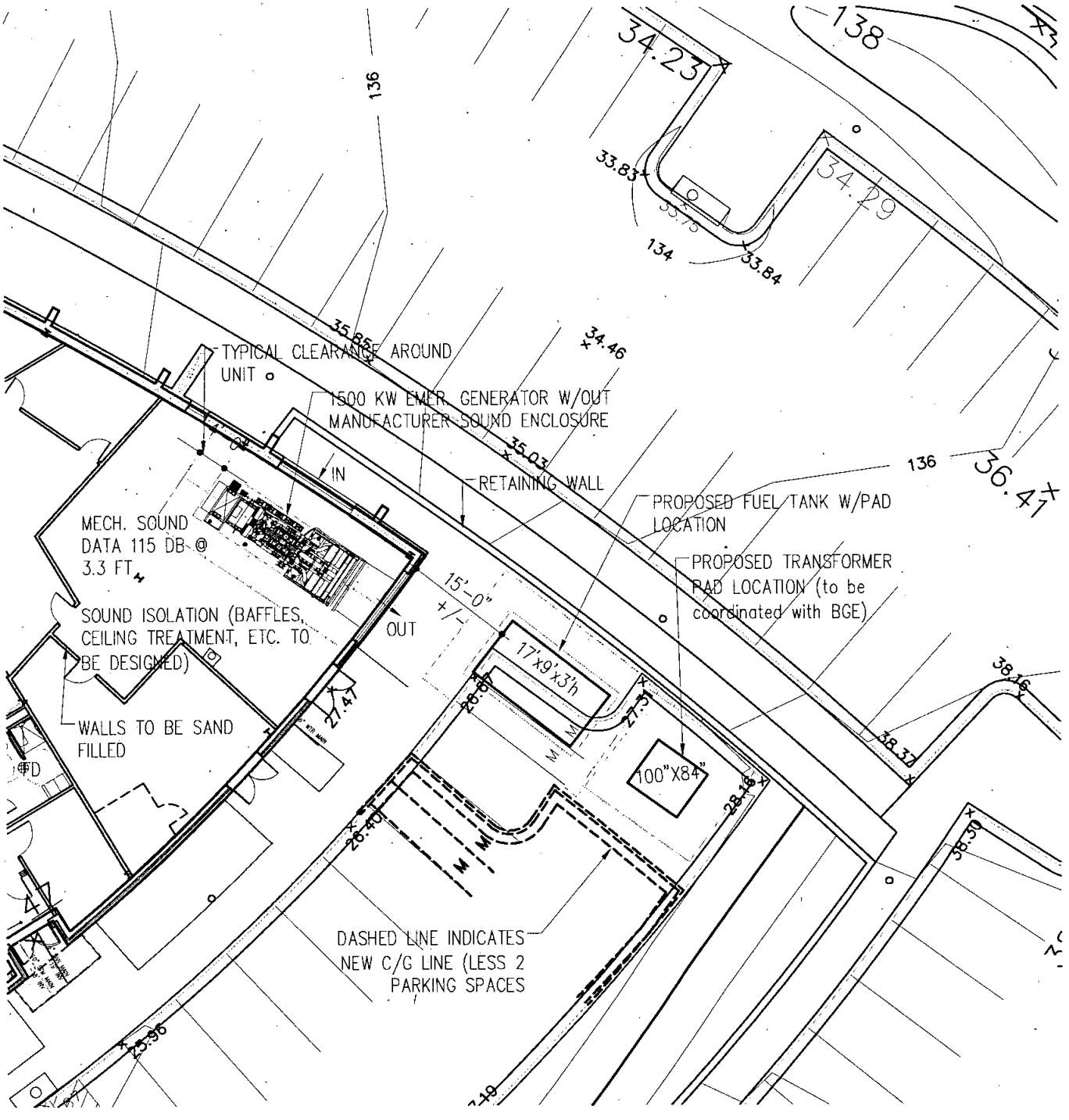
1. Visual site impact may be adversely impacted. Sound enclosure is tall.

2. Reduction in parking spaces where generator, fuel tank and building transformer will be located.

3. Noise impact on residents may be greater.

4. Potential noise impact on internal users similar to impact that our current generator has in Council Chambers and in IT.

Attachment 3



BOWIE CITY HALL

EMERGENCY GENERATOR: CASE 1 – INSIDE BUILDING

SCALE: 1"=20'-0"

DATE	SKETCH
23 SEPT. 08	A-1

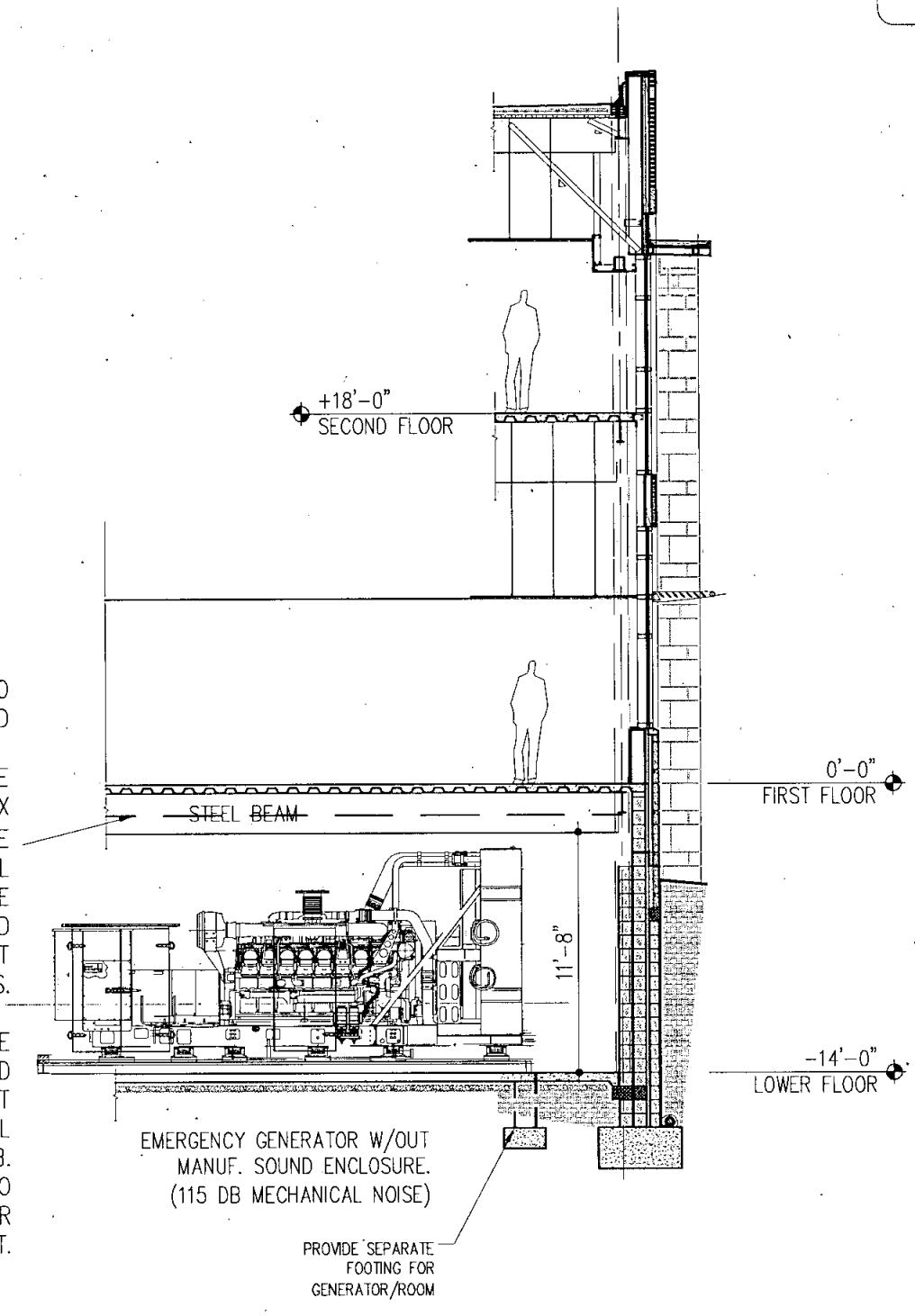
GRIMM+PARKER ARCHITECTS

2 Bethesda Metro Center
Suite 1350
Bethesda, MD 20814
Tel 240.223.0500
Fax 240.223.0510

1355 Beverly Road
Suite 105
McLean, VA 22101
Tel 703.903.9100
Fax 703.903.9755

11720 Beltsville Drive
Suite 600
Calverton, MD 20705
Tel 301.595.1000
Fax 301.595.0089

Attachment 4



BOWIE CITY HALL

EMERGENCY GENERATOR: CASE 1A – OUTSIDE BUILDING (ELEVATION STUDY)

SCALE: 1/8"=1'-0"

DATE	SKETCH
23 SEPT. 08	A-2

GRIMM+PARKER ARCHITECTS

2 Bethesda Metro Center
Suite 1350
Bethesda, MD 20814
Tel 240.223.0500
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1355 Beverly Road
Suite 105
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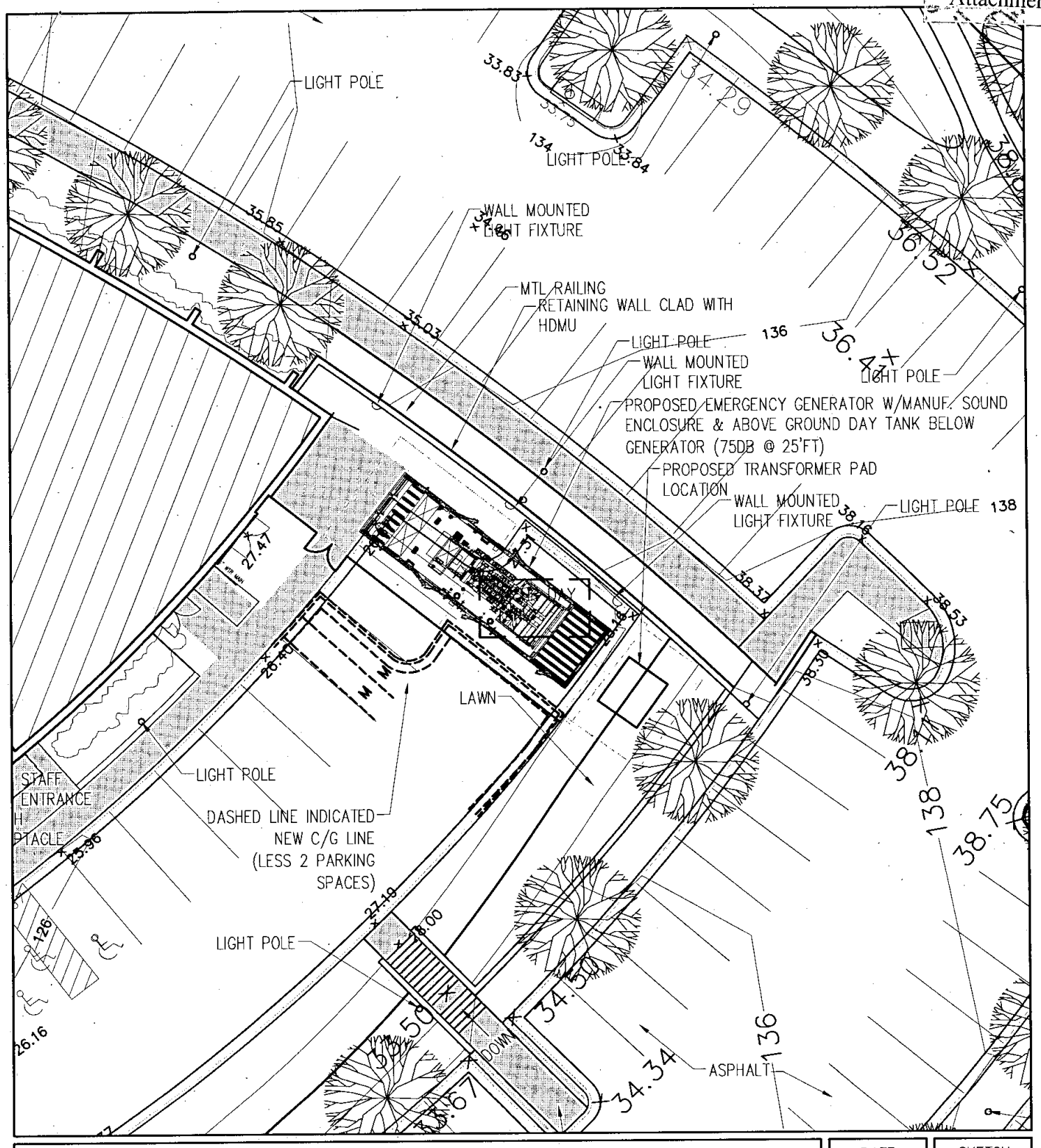

BOWIE CITY HALL

EMERGENCY GENERATOR: CASE 1A – OUTSIDE BUILDING

SCALE: 1"=20'-0"

DATE	SKETCH
23 SEPT. 08	A-3

GRIMM+PARKER ARCHITECTS

2 Bethesda Metro Center
Suite 1350
Bethesda, MD 20814
Tel 240.223.0500
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1355 Beverly Road
Suite 105
McLean, VA 22101
Tel 703.903.9100
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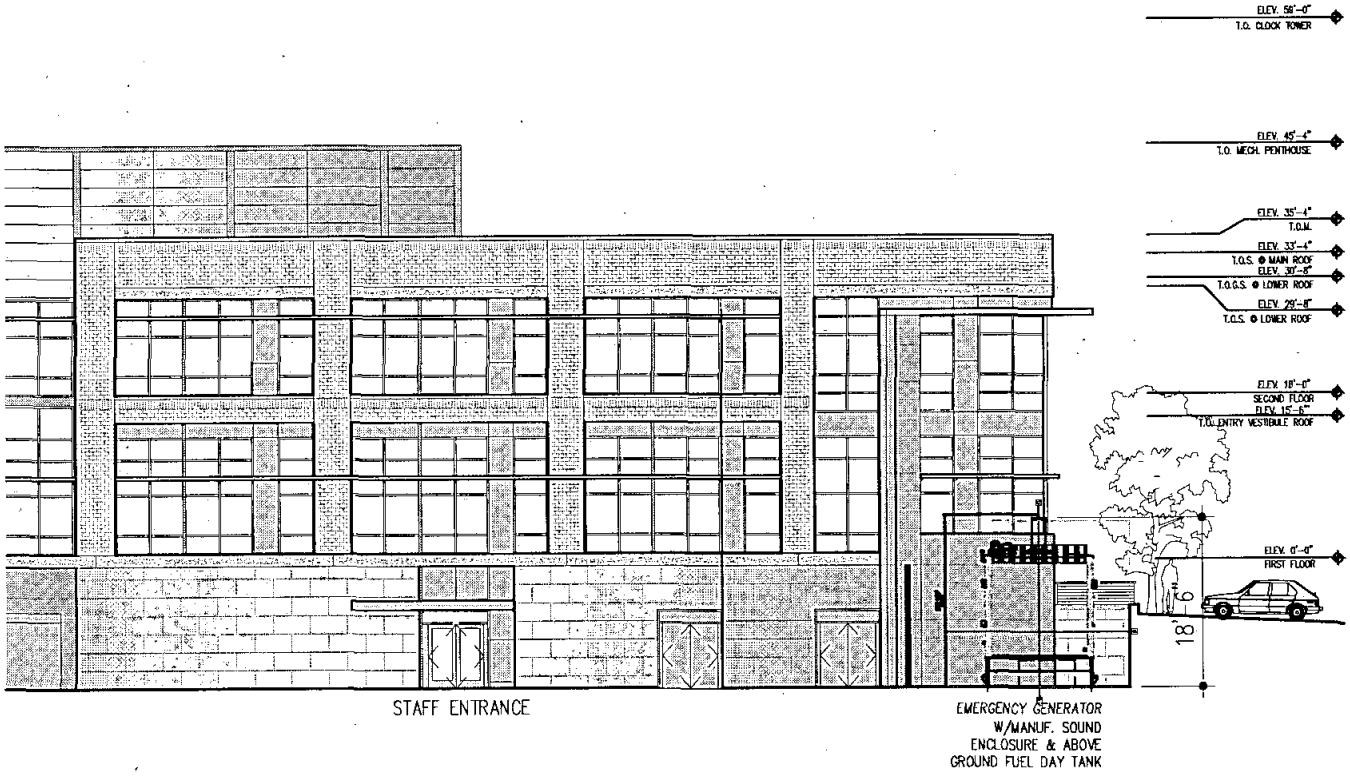

BOWIE CITY HALL

EMERGENCY GENERATOR: CASE 1A – OUTSIDE BUILDING (ELEVATION STUDY)

SCALE: 1"=20'-0"

DATE	SKETCH
23 SEPT. 08	A-4

GRIMM+ PARKER ARCHITECTS

2 Bethesda Metro Center
Suite 1350
Bethesda, MD 20814
Tel 240.223.0500
Fax 240.223.0510

1355 Beverly Road
Suite 105
McLean, VA 22101
Tel 703.903.9100
Fax 703.903.9755

11720 Beltsville Drive
Suite 600
Calverton, MD 20705
Tel 301.595.1000
Fax 301.595.0089

Attachment 7

Bowie City Hall
1500 KW Emergency Generator COST ESTIMATE

9/23/2008

Case 1: 100% BUILDING CONNECTED LOAD - INSIDE BUILDING (sketches A-1 & A-2)

Description	Qty	Unit	UP Matls	Materials	UP Labor	Labor	UP Equip	Equipment	Total	Remarks
1500 KW Generator	1.00	ea	309,635.00	325,385.00	1,000.00	1,000.00	1,000.00	1,000.00	$343,135.00	
Transfer Switch	1.00	ea	inc abv	-		-		-	$0.00	
3000 gal supply tank	1.00	ea	32,272.00	32,272.00	20,000.00	20,000.00	3,500.00	3,500.00	$55,772.00	
Sound Attenuation (building)	1.00	lot	40,000.00	40,000.00	40,000.00	40,000.00	4,000.00	4,000.00	$84,000.00	to be designed
Exhaust System	1.00	lot	6,500.00	6,500.00	5,000.00	5,000.00	1,500.00	1,500.00	$13,000.00	
Wire & Connections	1.00	lot	50,000.00	50,000.00	50,000.00	50,000.00	5,000.00	5,000.00	$105,000.00	
Concrete Foundation 25' x 8' x 18" thk	12.00	cy	240.00	2,880.00	180.00	2,160.00	25.00	300.00	$5,340.00	
			590,497.00	457,037.00		118,160.00		15,300.00	$590,497.00	
		0.05	Sales Tx	22,851.85	0.45	53,172.00	sales tax	765.00	$76,788.85	
					Burden			Sub Total	$667,285.85	
							0.10	Overhead sub	$66,728.59	
								Sub Total	$734,014.44	
							0.10	Profit sub	$73,401.44	
								Sub Total	$807,415.88	
							0.235	GC mark-up	$189,742.73	
								Total	*$997,158.61*	
										w/deleted cost of
								Grand Total	**$699,230.35**	750kw

Case 1A: 100% BUILDING CONNECTED LOAD - OUTSIDE BUILDING (sketches A-3 & A-4)

Description	Qty	Unit	UP Matls	Materials	UP Labor	Labor	UP Equip	Equipment	Total	Remarks
1500 KW Generator	1.00	ea	435,446.00	451,196.00	1,000.00	1,000.00	3,000.00	3,000.00	$470,946.00	includes manuf. sound enclosure
Transfer Switch	1.00	ea	inc abv	-		-		-	$0.00	
3000 gal supply tank	1.00	ea	32,272.00	32,272.00	20,000.00	20,000.00	3,500.00	3,500.00	$55,772.00	
Wire & Connections	1.00	lot	10,000.00	10,000.00	10,000.00	10,000.00	1,000.00	1,000.00	$21,000.00	
Concrete Foundation 25' x 8' x 18" thk	12.00	cy	240.00	2,880.00	180.00	2,160.00	25.00	300.00	$5,340.00	
			537,308.00	496,348.00		33,160.00		7,800.00	$537,308.00	
		0.05	Sales Tx	24,817.40	0.45	14,922.00	sales tax	390.00	$40,129.40	
					Burden			Sub Total	$577,437.40	
							0.10	Overhead sub	$57,743.74	
								Sub Total	$635,181.14	
							0.10	Profit sub	$63,518.11	
								Sub Total	$698,699.25	
							0.235	GC mark-up	$164,194.32	
								Total	*$862,893.58*	
										w/deleted cost of
								Grand Total	**$564,965.32**	750kw

DD Cost Estimate (7/25/08)

Delete 750 KW Unit			($179,172.00)
Delete 5000 gallon ug fuel tank			($20,197.80)
		Sub Total	($199,369.80)
	0.10	Overhead sub	($19,936.98)
		Sub Total	($219,306.78)
	0.10	Profit sub	($21,930.68)
		Sub Total	($241,237.46)
	0.235	GC mark-up	($56,690.80)
		Grand Total	**($297,928.26)**

Line Item:

5000 gal supply tank	1.00	ea	43,083.00	43,083.00	20,000.00	20,000.00	3,500.00	3,500.00	66,583.00

Line Item:

1000 KW emer.gen only	$250,000.00

Underground Storage Tank (UST) vs. Above Ground Storage Tank (AST)

Advantages of a UST:

- It is buried underground making the area more aesthetically pleasing.
- It is less likely to be vandalized.

Disadvantages of a UST:

- Maryland Department of the Environment (MDE) requires a certified inspection of a UST every three (3) years at a cost of $1,000 per inspection.
- Deficiencies noted during the certified inspection must be corrected. Average cost for correcting deficiencies found in the last UST inspections was $1,200 per UST.
- MDE requires an annual hydrostatic sump test for each UST spill bucket at a cost of $250 per test.
- A UST requires an Automated Tank Gauge (ATG) system to monitor leaks. Cost to install these systems is approximately $5,000 per UST. Annual inspection fee for each ATG is $200.
- MDE requires an annual calibration of each ATG at a cost of $250 per test.
- Most insurance carriers will not insure a UST over 21 years of age. A UST that old must be excavated and replaced.
- Excavation of a UST is very costly. Removal of a UST at City Hall in 2005 cost more than $17,000.
- Pollution liability insurance for a UST is more costly than it is for an AST.
- MDE requires a UST to have two monitoring wells adjacent to the tank at a drilling cost of $2,100 per well.
- Regulations for a UST frequently change. As regulations change, the City incurs additional costs to keep the UST in compliance. Five years ago, for example, certified inspections, annual hydrostatic sump tests, and annual ATG calibration tests were not required.
- A leak from a UST could occur and go undetected for a period of time leading to costly cleanup expenses.

Advantages of an AST:

- There is an instant visual inspection of the tank every day.
- If a leak develops, it is spotted easily and more easily contained.
- There is no need for an ATG to monitor leaks.
- There are no fees for MDE required certified inspections, hydrostatic sump tests, and ATG calibration tests.

Disadvantages of an AST:

- It is more visible and more susceptible to vandalism if not adequately protected.

NEW BOWIE CITY HALL

Summary Comprison for Emergency Generator & HVAC

Generator Size HVAC System	**Case 1 Inside 1500kw** Electric HVAC VE ALT	**Case 1A Outside 1500 kw** Electric HVAC VE ALT	**Case Z Inside 1000 kw** Gas Boilers&RTU DD Cost Est	**Case Z Outside 1000 kw** Gas Boilers&RTU DD Cost Est
Total Cost from G+P 9/23/08 Emergency Generator Cost Estimate Spreadsheet Including Markups and 7% Escalation	$997,159	$862,894	$881,518	$747,253
Credit for 750kw Generator included G+P 7/25/08 100% DD Cost Est. Includiung Markups and 7% Escalation	-$297,928	-$297,928	-$297,928	-$297,928
TOTAL Minus Credit	**$699,230**	**$564,965**	**$583,590**	**$449,325**
Delta Cost Difference If Generator Is Outside		-$134,265		-$134,265
TOTAL Minus Credit	**$699,230**	**$564,965**	**$583,590**	**$449,325**
DELTA Cost Difference If Case 1 Selected vs. Case Z	$115,641	$115,641	-$115,641	-$115,641
VE Alt M5 & M6 (No added savings for M6 per G+P Engs)	$553,479			
VE Alt Savings minus cost difference for larger generator	$437,838			
DELTA Yearly LCC Difference for Electric vs Gas Per G+P 6-2-08 Spreadsheet	$35,308			
YEARS LCC to Deplete VE Alt Savings	12.40			
Delta Cost Difference for 5,000 Gallon Fuel Tank	**$10,811**			

NOTE:

Case Z Costs were Derived from G+P's 9-23-08 Generator Cost Comparison Cost Est. Page By Replacing Cost Line Item for 1500kw with Cost Line Item for 1000kw and adding cost for exterior sound enclosure for Outside Cost.
Exterior Sound Enclosure Cost Derived by Subtracting 1500kw Interior from 1500kw Exterior Generator Line Item which = $127,811.