Value Engineering Study

WWTP #2 Improvements

Coos Bay, OR

Final Report

June 2014

FINAL VALUE ENGINEERING STUDY REPORT

for

WWTP #2 IMPROVEMENTS

Coos Bay, OR

Coos Bay Project #:140011

IFA Project #: Y12005

June 2014

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ACKNOWLEDGEMENTS

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In addition, we would like to thank the members of SHN and CH2M Hill design team for sharing their knowledge about the project and for their responsiveness to our questions and requests throughout this value engineering study.

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Cover photo(s) courtesy of Don Stafford

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INTRODUCTION

Robinson, Stafford & Rude, Inc, assisted by technical specialists from Kennedy/Jenks, Tetra Tech, James Kressbach, AIA Architect, M.A. Mortenson Company, VK Tech Services, Charleston Sanitary District, The Dyer Partnership, SHN/CH2M Hill and City of Coos Bay personnel, conducted a 32-hour value engineering (VE) workshop on the preliminary design of the WWTP #2 Improvements for the City of Coos Bay, OR (the City) on December 10-13, 2013. The study was conducted in accordance with the guidelines of SAVE International® and EPA.

PROJECT DESCRIPTION

The proposed project will replace the existing activated sludge treatment system at WWTP #2 with a new sequencing batch reactor (SBR) system on a nearby site, complete with new influent pump station, headworks, SBR flow equalization and UV disinfection. Also included will be a new control building, garage and maintenance building and electrical building with standby generator. The designer's estimated construction cost is approximately $15 million. The project is scheduled to be complete in 2017.

CONSTRAINTS ON THE VE TEAM

The constraints that were placed on the VE Team by Coos Bay were:

- Treatment process must be a sequencing batch reactor
- The treatment must be constructed on the proposed site.

VE STUDY RESULTS

The VE Team developed 36 alternatives for improvement of the project value. Of these, 26 are costed VE alternatives, and 10 are design suggestions for which cost impacts were believed to be either minimal or not determinable.

Each VE alternative was evaluated to determine estimated impacts on construction costs, operation and maintenance costs and total life cycle costs, as well as the following other non-monetary performance factors:

- Flexibility
- Dependability
- Maintainability
- Odor Impacts
- Visual Impacts
- Noise Impacts

The following detailed VE alternatives were accepted in whole or in part as improvements to the preliminary design:

- B-3 – Change the structure of the buildings to a different material

- B-24 - Insulate and heat the shop
- B-30 - Use natural gas for all heating
- B-51 - Line the interior surfaces of the influent pump station wetwell with “T-Lock”
- B-60 - Revisit the use of aluminum elements outside to address salt spray corrosion
- B-76 – Add windows to the south side of the control building
- B-80 – Use LED lighting throughout the site
- M-1 – Shorten the design and construction schedules
- M-2 – Use mini-GMP price elements to speed construction
- M-7 – Demolish structures on the existing site as a part of this project
- P-5 – Use “Victaulic” joints for above-ground and submerged pipe
- P-18 - Put the odor control facilities on the new plant site
- P-33 - Use twist lock connections for the submersible pumps
- P-68 – Provide 3 WAS pumps instead of 4 (two installed and one on the shelf)
- P-113 – Design the plant for remote operation (most of the time)
- S-1 – Preserve the salvageable evergreens at the southeast corner of the site
- S-21 – Use an ornamental fence instead of chain link.

Implementation of these accepted changes will result in the following estimated cost savings:

VE Ideas resulting in net savings

- Estimated Accepted Capital Cost Savings $606,900
- Estimated Accepted Present Worth of O&M Cost Savings $290,000
- Estimated Accepted total Life Cycle Cost Savings $897,800

VE ideas for value improvement that result in net cost <u>additions</u>:

- Estimated Accepted Capital Cost Increase $1,558,000
- Estimated Accepted Present Worth of O&M Cost Savings $0
- Estimated Accepted total Life Cycle Cost Increase $1,558,000

In addition, the City of Coos Bay is further evaluating an additional VE team alternative (S-19 – Construct a sewer in Marple St.) for inclusion in the project.

INTRODUCTION
SECTION 1

INTRODUCTION

This report presents the results of a VE study conducted by Robinson, Stafford & Rude, Inc. (RSRI) on the design of the WWTP #2 Improvements in Coos Bay, Oregon for the City of Coos Bay (the City). The project designer is SHN/CH2M Hill (SHN/CH2M) and associated firms. The project was reviewed at completion of preliminary design. The 32-hour VE workshop was conducted in Coos Bay, Oregon. The members of the VE Team are listed in Appendix D.

The proposed project will replace the existing activated sludge treatment system at WWTP #2 with a new SBR system on a nearby site, complete with new influent pump station, headworks, SBR flow equalization and UV disinfection. Also included will be a new control building, garage and maintenance building and electrical building with standby generator. The designer’s estimated construction cost is approximately $15 million. The project is scheduled to be complete in 2017.

ORGANIZATION OF THIS REPORT

The report is organized to accomplish several purposes:

- Serve as a reference for final decision-makers to understand the implications of the various alternatives identified by the VE Team;
- Document the value engineering effort for City of Coos Bay, regulatory agencies, the public and/or other interested parties;
- Provide a reference document to track implementation of the accepted value engineering alternatives as the project design moves to completion.

This section, the **Introduction**, provides general information about the VE study that was conducted and suggestions about how to use this report and how to evaluate the VE Team alternatives.

The **Summary of Results** section provides an overview of the results of the VE study, including identification of those VE alternatives that were selected by the Owner and the Designer for incorporation into the project design. It is important to note that the VE Team does no design work and makes no design decisions on the project. All decisions regarding changes to the design resulting from the concepts advanced by the VE Team were made by the Owner and the Designer of record for the project.

The **Value Engineering Team Alternatives** section includes the details of all of the alternatives prepared by the VE Team. It is included to ensure a detailed understanding of the alternatives. Included in this section are comments about design validation, if appropriate, comprehensive alternatives packages, where appropriate, and the details of each individual VE Team alternative.

The detailed VE Team alternatives are listed first by major project area or function (the letter portion of the alternative number), and then by idea number within that project area or function, as follows:

- Buildings (B)
- Miscellaneous (M)
- Process (P)
- Site (S)

The **Appendices** provide additional technical detail about the project, additional detail about the value engineering process, an explanation of the basis for cost comparisons, and other details about the study which may be of interest to some report readers.

SCOPE OF THIS VALUE ENGINEERING STUDY

A value assessment study was conducted on the conceptual design of the treatment facilities several months prior to this study. This study is the only formal VE study currently planned for this project. The scope of this VE study encompasses all of the work associated with the construction of new treatment facilities for the Coos Bay Wastewater Treatment Plant Number 2.

The focus of the VE study is to identify areas of high cost (both initial and annual) and to recommend alternatives for reducing or increasing these costs to maintain or improve the required functions, performance, safety, and quality.

The value engineering work effort included the following work sessions:

- VE workshop – December 10-13, 2013

Project Constraints

One of the other things that may define the scope of the value engineering study is VE study constraints. These are aspects of the project that the City does not want scrutinized by the team, because they represent project elements that, in the opinion of the City, cannot be changed. Constraints may result from a variety of political, technical, or environmental causes. Excessive constraints inhibit the team's ability to identify creative opportunities for project enhancement. Inadequately defined constraints can result in the VE effort being wasted in areas where there is no possibility of change.

The following project constraints were defined for this VE study:

- Treatment Process must be a sequencing batch reactor
- The treatment must be constructed on the proposed site.

UNDERSTANDING VE TEAM ALTERNATIVES

The VE Team comments consist of individual detailed alternatives

Additionally, there are often good ideas for project improvement or cost reduction that are identified by the VE Team but, because of the time limitations imposed by the VE workshop duration, cannot be developed by the VE Team as VE alternatives. For this reason, this report includes the entire list of creative ideas identified by the VE Team, in Appendix H. The City and SHN/CH2M were provided the creative idea list to enable them to review all possible ideas that could improve the value of the project.

Individual Detailed Alternatives

Individual detailed VE alternatives identify opportunities for improving the value of the design. These alternatives are projected to accomplish one of the following:

- Maintain or improve the accomplishment of needed design functions at a lower life cycle cost
- Improve the accomplishment of needed design functions at the same or similar life cycle cost
- Improve the accomplishment of needed design functions for an appropriate increase in life cycle cost.

Each VE alternative includes:

- A summary of the currently proposed (original) design;
- A description of the change recommended by the VE Team;
- A summary of the advantages and disadvantages of the VE Team concept as compared with the original Designer's concept;
- A narrative comparing the original design and the recommended change and explaining the VE Team concept;
- An assessment of the performance of the VE alternative against the six performance factors identified by the City
- Sketches, where appropriate, to further illustrate the VE Team alternative;
- Calculations, where appropriate, to support the technical adequacy of the alternative;
- A capital cost comparison;
- A life cycle cost analysis, if appropriate.

Both capital and life cycle costs are shown in year 2016 dollars. Capital costs were based on the VE-Team-validated, cost estimate. Life cycle costing was based on a net discount rate of 4 percent per year, and an economic analysis period of 20 years. Labor rates and operations and maintenance costs were based on information provided by SHN/CH2M Hill- OMI.

The VE alternatives are presented as a "Shopping List" of value improvement opportunities for the City. Some alternatives are options related to the same issue, some are independent, and some overlap one another. For this reason, it is not possible to accept and implement all of the VE alternatives together. The City and their consultants evaluated each of the alternatives to determine which ones represent the best combination for project improvement.

Each of the detailed VE alternatives is intended to convey a concept for change, not to propose a detailed design that can only be accomplished in accordance with the detailed assumptions contained in the VE alternative. In order to calculate the cost impacts of these recommended changes, the VE Team had to make detailed assumptions about design issues to determine quantities, sizes, and costs.

To gain maximum benefit for the project, the VE alternatives should be reviewed to assess the viability of the concept presented, rather than focusing on the details assumed for costing. It is important to review the assumptions included in the VE alternative to insure that there is no flaw in the basic concept's viability, but the focus should be to determine how to make the concept work in a way that will benefit the City, rather than to look for minor flaws in the assumptions. Additionally, each part of an alternative must be evaluated on its own merit, rather than discarding an entire alternative because of concern over one particular aspect of the proposed change.

To confirm the accuracy of the VE Team's alternatives, the calculations and cost estimates prepared by the VE Team were checked to ensure that some significant error has not been made as a result of the speed with which the alternatives had to be prepared; and to ensure that all of the knowledge of the City, SHN/CH2M & Mortenson has been used to confirm the viability of the VE Team concepts.

Summary of Results
Section 2

SUMMARY OF RESULTS

INTRODUCTION

This section of the report provides a summary of the results of the value engineering study. It lists all of the alternatives prepared by the VE Team and presented to the City and SHN/CH2M for their consideration, as well as the decisions made by the City and SHN/CH2M regarding acceptance of the VE team alternatives.

Cost impacts shown in this section of the report reflect any revisions to the estimated cost impacts resulting from the City and SHN/CH2M reviews of the VE alternatives.

Detailed VE Alternatives

The VE Team identified 36 VE alternatives for consideration. A listing of these alternatives, the final agreed-upon estimated cost impacts, and the City decision about whether to include these recommended changes as the design proceeds are shown in Table 2-1.

Other Benefits

A VE study often results in benefits beyond cost savings. These benefits are generated as a part of an alternative, design suggestion, or from an observation made by the team or one of the other participants during the workshop. Below are some of the benefits realized from this study, in addition to the cost savings discussed above:

- Reduced energy consumption
- Easier maintenance.

Table 2-1
Summary of VE Alternative Acceptance

Idea No.	Description	VE Team Estimated Capital Cost Savings	VE Team Estimated Present Worth of O&M Cost Savings	VE Team Estimated Life Cycle Cost Savings	Flexibility	Dependability	Maintainability	Odor Impacts	Visual Impacts	Noise Impacts	Designer Estimated Capital Cost Savings	Designer Estimated Present Worth of O&M Cost Savings	Designer Estimated Life Cycle Cost Savings	Designer Recommendation	Final Owner/ Designer Decision	Accepted Capital Cost Savings	Accepted Present Worth of O&M Cost Savings	Accepted Total Life Cycle Cost Savings	Comments
WWTP # 2 Improvements – Coos Bay, OR																			
Performance Key: ▲Improved ▼Reduced ▶ Unchanged																			
	(B) Buildings																		
B-1	Combine shop and garage into office in one building	$137,000	--	$137,000	▲	▲	▲	▲	▲	▶				R/F	R/F				The shop and office building are functionally very different, and the City prefers to maintain the functions separate. However, the IPS and garage/shop will be combined.
B-3	Use pre-engineered metal buildings	($41,000)	--	($41,000)	▲	▲	▲	▶	▲	▶	$180,000	-	$180,000	F/P	F/P	$180,000	-	$180,000	The building design will be changed to a full-height CMU structure with a steel roof structure
B-23	Make single bathroom unisex	Design Suggestion			▲	▶	▶	▶	▶	▶				A	A				
B-24	Insulate and heat shop	Design Suggestion			▶	▶	▲	▶	▶	▶				A	A				
B-26	Replace concrete cover on equalization basin with metal roof	$214,000	--	$214,000	▲	▼	▲	▶	▲	▶	($130,000)	-	($130,000)	R	R				Further investigation by SHN/CH2M and Mortenson indicated that an aluminum cover would be more expensive than the original concrete cover design.
B-30	Use natural gas for all heating	Design Suggestion			▶	▲	▶	▶	▶	▶				A	A				
B-51	T-lock line interior surfaces of the Influent Pump Station wetwell	($83,000)	--	($83,000)	▶	▲	▲	▲	▶	▶	$27,700	-	$27,700	A	A	$27,700	-	$27,700	
B-60	Do not use aluminum for anything exposed to weather	Design Suggestion			▶	▶	▶	▶	▲	▶				P	P				SHN/CH2M will follow the guidance of the corrosion engineer provided during final design.
B-76	Add windows to south side of control building	Design Suggestion			▶	▶	▶	▶	▲	▶				A	A				
B-77	Flip control building 180-degrees; put staff entrance on back side	($3,000)	--	($3,000)	▲	▼	▼	▶	▲	▶				R	R				The City determined that, for this facility, easy operator access is more important than public access, since there is expected to be very little, if any public visitation.
B-80	Use LED lighting throughout site	Design Suggestion			▶	▶	▶	▶	▶	▶				A	A				
	(M) Miscellaneous																		
M-1	Shorten design and construction schedules	Design Suggestion			▼	▶	▶	▶	▶	▶				A	A				
M-2	Use Mini-GMP price elements to speed construction	Design Suggestion			▲	▲	▲	▶	▶	▶				A	A				

Idea No.	Description	VE Team Estimated Capital Cost Savings	VE Team Estimated Present Worth of O&M Cost Savings	VE Team Estimated Life Cycle Cost Savings	Flexibility	Dependability	Maintainability	Odor Impacts	Visual Impacts	Noise Impacts	Designer Estimated Capital Cost Savings	Designer Estimated Present Worth of O&M Cost Savings	Designer Estimated Life Cycle Cost Savings	Designer Recommendation	Final Owner/ Designer Decision	Accepted Capital Cost Savings	Accepted Present Worth of O&M Cost Savings	Accepted Total Life Cycle Cost Savings	Comments
WWTP # 2 Improvements – Coos Bay, OR																			
Performance Key: ▲Improved ▼Reduced ▶ Unchanged																			
M-7	Include demolition cost for existing site	($1,440,000)	--	($1,440,000)	▲	▶	▲	▶	▲	▶	($1,440,000)	--	($1,440,000)	A	A	($1,440,000)	--	($1,440,000)	The City has changed its planned approach to solids handling, which means that none of the existing treatment plant 2 facilities will be needed to support the operations of the new Plant 2. Accordingly, the existing plant will be demolished.
M-11	Re-roof existing operation pump station building	($41,000)	--	($41,000)	▲	▲	▲	▶	▶	▶				R	R				The City will be demolishing all facilities on the existing site, so this idea is rejected.
	(P) Process																		
P-1	Use existing secondaries for equalization storage to replace proposed	($110,000)	($194,000)	($304,000)	▲	▼	▼	▶	▲	▶				R	R				The City will be demolishing all facilities on the existing site, so this idea is rejected.
P-5	Use Victaulic joints instead of flanges couplings (or equivalent) instead of flanges for all above-ground and submerged pipe joints	$162,000	$2,000	$164,000	▲	▲	▲	▶	▶	▶	$162,000	$2,000	$164,000	A	A	$162,000	$2,000	$164,000	
P-14	Eliminate grit removal	$808,000	$79,000	$887,000	▶	▲	▼	▲	▲	▶				R	R				Additional investigation indicated that Oregon coastal communities tend to get sand in the sewer system through the joints, which can result in significant grit loadings, so this idea was rejected.
P-18	Put odor control on new plant site	$119,000	-	$119,000	▲	▲	▲	▲	▼	▶	$26,400	-	$26,400	A	A	$26,400	-	$26,400	
P-20	Move headworks and influent pump station to old plant site	$1,537,000	($68,000)	$1,469,000	▼	▶	▲	▲	▲	▶				R	R				Further review by the designer indicated that the costs of constructing the influent pump station at the existing site would be more expensive, because of the many conflicts. Additionally the City wants to consolidate all facilities on the new site for operational efficiency and safety reasons.
P-33	Use twist lock connections for submersible pumps	($16,000)	$45,900	$29,900	▲	▶	▲	▶	▶	▶	($16,000)	$45,900	$29,900	A	A	($16,000)	$45,900	$29,900	
P-42	Use common wall construction for everything but control building	$267,000	--	$267,000	▲	▶	▲	▶	▼	▲				R	R				Additional review by the designer and Mortenson indicated that the differing foundation requirements of the structures would actually result in a cost increase, so this idea was rejected.

A – *Accept;* F – *Further Study;* R – *Reject;* P – *Partially Accept,* TBD – *To Be Determined*

WWTP # 2 Improvements – Coos Bay, OR

Performance Key: ▲Improved ▼Reduced ▶ Unchanged

Idea No.	Description	VE Team Estimated Capital Cost Savings	VE Team Estimated Present Worth of O&M Cost Savings	VE Team Estimated Life Cycle Cost Savings	Flexibility	Dependability	Maintainability	Odor Impacts	Visual Impacts	Noise Impacts	Designer Estimated Capital Cost Savings	Designer Estimated Present Worth of O&M Cost Savings	Designer Estimated Life Cycle Cost Savings	Designer Recommendation	Final Owner/ Designer Decision	Accepted Capital Cost Savings	Accepted Present Worth of O&M Cost Savings	Accepted Total Life Cycle Cost Savings	Comments
P-47	Install “Zaps” system	$64,000	--	$64,000	▼	▼	▲	▶	▶	▶				R	R				The ZAPS system has not been approved by EPA, so this idea is rejected for now, but use of the ZAPS system will be re-evaluated if EPA approves the system in the future.
P-68	Provide 3 WAS pumps instead of 4	$57,000	($7,000)	$50,000	▼	▼	▲	▶	▶	▶				R	A	$57,000	($7,000)	$50,000	With the change in solids handling decided by the city, WAS will now be pumped to WWTP #1 from the SBR basins. The new design includes one pump for each basin.
P-71	Expand outfall now, use hypochlorite and don’t equalize flows	$1,780,000	$329,000	$2,109,000	▲	▼	▲	▲	▼	▶				R	R				Because DEQ is revisiting the NPDES discharge permit, and the resultant discharge requirements are not known, no changes can reasonably be made to the outfall at this time.
P-78	Line outfall and use pump station for peak effluent flows	($1,600,000)	0	($1,600,000)	▲	▶	▼	▶	▲	▲				R	R				Because DEQ is revisiting the NPDES discharge permit, and the resultant discharge requirements are not known, no changes can reasonably be made to the outfall at this time.
P-86	Use Strobic fan instead of biofilter	$71,000	$3,000	$74,000	▲	▲	▲	▼	▲	▲	$128,000	$3000	$131,000	R	R				Modeling was conducted by SHN/CH2M to determine whether strobic fans would meet the desired residual odor levels at the receptors, and it was found that they would not. There were additional concerns about the noise levels associated with strobic fans adjacent to a residential neighborhood.
P-88	Discharge air at old plant without odor treatment	$133,000	$11,000	$144,000	▼	▼	▲	▼	▲	▶				R	R				Modeling was conducted by SHN/CH2M to determine whether this would meet the desired residual odor levels at the receptors, and it was found that it would not. Additionally, the City is consolidating all facilities on the new site.
P-100	Eliminate influent pump station superstructure	$142,000	$1,000	$143,000	▼	▼	▼	▲	▼	▲				R	R				The City believes staff needs the protection of a building for servicing the influent pumps. However, the influent pump station will be combined with the shop/garage/electrical building.

A – ACCEPT; F – FURTHER STUDY; R – REJECT; P – PARTIALLY ACCEPT, TBD – TO BE DETERMINED

Idea No.	Description	VE Team Estimated Capital Cost Savings	VE Team Estimated Present Worth of O&M Cost Savings	VE Team Estimated Life Cycle Cost Savings	Flexibility	Dependability	Maintainability	Odor Impacts	Visual Impacts	Noise Impacts	Designer Estimated Capital Cost Savings	Designer Estimated Present Worth of O&M Cost Savings	Designer Estimated Life Cycle Cost Savings	Designer Recommendation	Final Owner/ Designer Decision	Accepted Capital Cost Savings	Accepted Present Worth of O&M Cost Savings	Accepted Total Life Cycle Cost Savings	Comments
WWTP # 2 Improvements – Coos Bay, OR																			
Performance Key: ▲Improved ▼Reduced ► Unchanged																			
P-111	Eliminate headcell; install primary, degrit primary sludge	($591,000)	($54,000)	($645,000)	▲	►	▼	►	►	►				R	R				This will add capital and O&M cost and an additional process; and, with the new plan to pump sludge to plant 1, will increase the potential for plugging problems in the transfer pumps and sludge forcemain.
P-113	Design plant for remote operation	$1,176,000	$492,000	$1,668,000	▼	▼	▼	►	▲	▲	$120,000	$250,000	$370,000	P	P	$120,000	$250,000	$370,000	The City has determined that total remote operation of the facility is not possible at this time; however, the plant will only be staffed part-time, and that the control building can be substantially reduced in size.
	(S) Site																		
S-1	Preserve salvageable evergreens at southeast corner	Design Suggestion			►	►	►	►	▲	▲				A	A				
S-8	Use plastic pipe for buried piping	Design Suggestion			▲	▲	▲	►	►	►	$49,800	-	$49,800	A	A	$49,800	-	$49,800	
S-19A	Construct sewer main on Marple for residents – Option A	($51,000)	--	($51,000)	►	►	►	►	►	►				F	F				The City is discussing to concept of installing a sewer line in Marple Street with the property owners. If the owners agree, then a sewer line will be installed. If installed, all homes must be connected.
S-19B	Construct sewer main on Marple for residents – Option B	($54,000)	--	($54,000)	►	►	►	►	►	►				F	F				
S-21	Use ornamental fence	($118,000)	--	($118,000)	►	▲	►	►	▲	►	($118,000)	-	($118,000)	A	A	($118,000)	-	($118,000)	
															Total Accepted Savings	**$606,900**	**$290,900**	**$897,800**	
															Total Value-Added Proposals	**($1,558,000)**	**-**	**($1,558,000)**	

A – *Accept*; F – *Further Study*; R – *Reject*; P – *Partially Accept*, TBD – *To Be Determined*

BUILDINGS (B)

VALUE ENGINEERING ALTERNATIVE

COOS BAY WWTP #2 IMPROVEMENTS
COOS BAY, OR

Idea No.	B-1	Idea Title	Combine shop/garage and control building into one building

ESTIMATED COST IMPACTS

	Capital Cost	Present Worth of O&M Cost	Total Present Worth Cost
Baseline Concept	151,000	--	151,000
Alternative Concept	14,000	--	14,000
Estimated Savings	137,000	--	137,000

ESTIMATED PERFORMANCE IMPACTS	Flexibility	Dependability	Maintainability	Odor	Visual	Noise
	▲	▲	▲	▲	▲	▬

Description of Baseline Concept

The existing concept is to place the non-process functions into two separate buildings. The shop, vehicle garage and main electrical room are located in one structure. The administrative and plant control spaces are located in a second building.

Description of Alternative Concept

The proposed idea is to combine the all of the non-process functions into a single structure.

Advantages	Disadvantages
• Consolidates all staff areas into a single structure • Simplifies building construction • Reduces quantity of CIP concrete walls • Frees up site area for future facilities	• Mixes “clean” and “dirty” spaces into one building • Reduces screening effect that multiple buildings provide • Might move electrical room further distance from large electrical load locations

Discussion

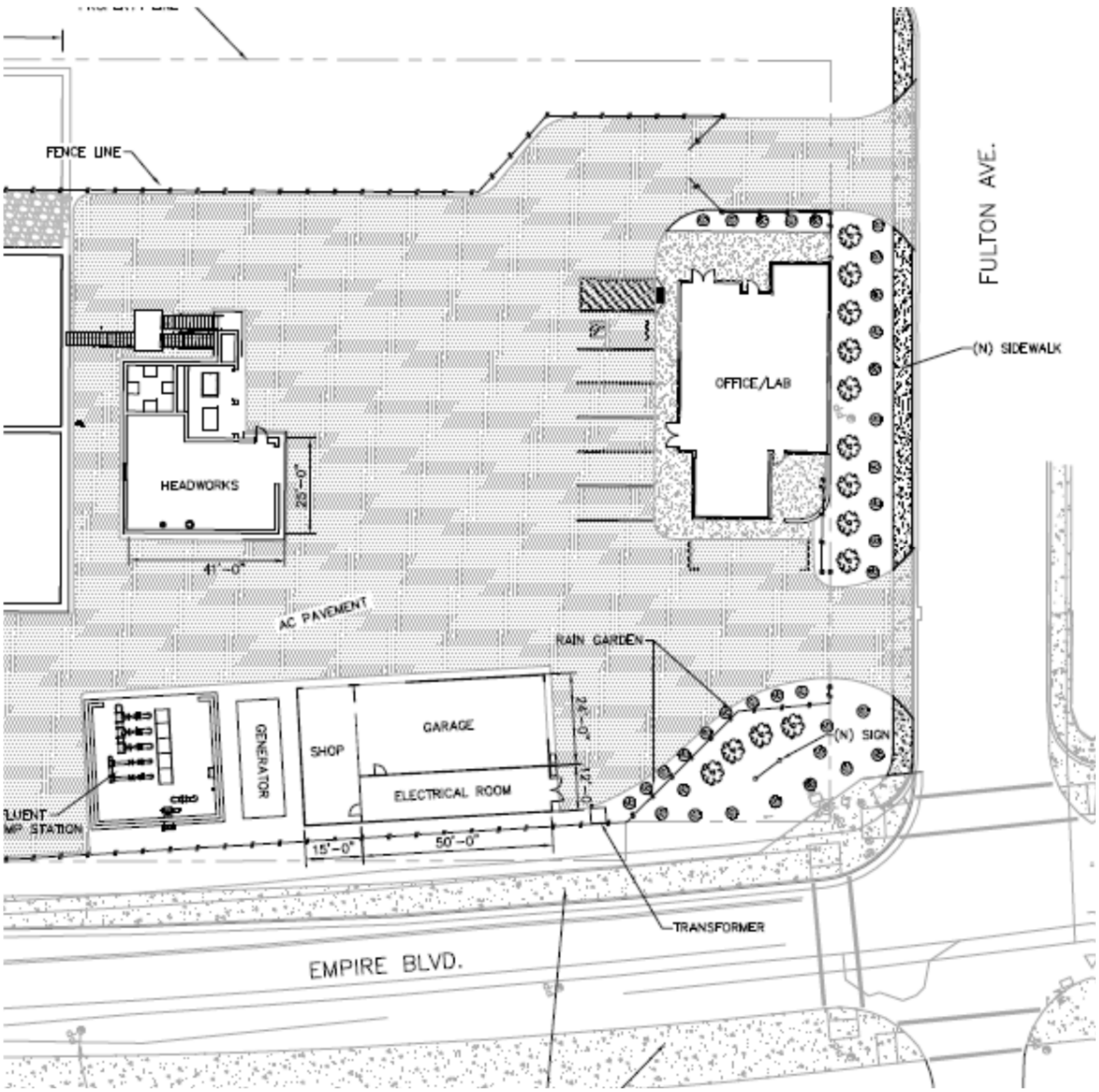
The existing concept has separated non-process functions into two buildings. The relatively clean spaces are located in the Control Building and relatively dirty spaces are located in the Garage/Shop Building. The main Electrical Room for the plant is located in the Shop/ Garage Building to be closer to the high-load process equipment. The buildings are designed fit into the architectural theme where exterior treatments are “uniform and complimentary across all structures on site”. The current architectural theme is utilizing 12” thick cast in place concrete (CIP) for the primary exterior wall material. The control building is located along Fulton Ave. along with two vehicles. The Shop/Garage is located along the Empire Blvd side of the site. Both are located near the property line and are sited to help screen the process areas of the site from public view.

The proposed idea is to consolidate the two buildings into a single structure that parallels Empire Blvd. All of the programmed spaces would remain at the same size. The control building spaces would be located near the southwest corner of the site. The parking stalls could be located where the current Control Bldg is sited. The electrical room could be located on the north end of the building, near the generator and process equipment. The shop could be located near the other staff support spaces.

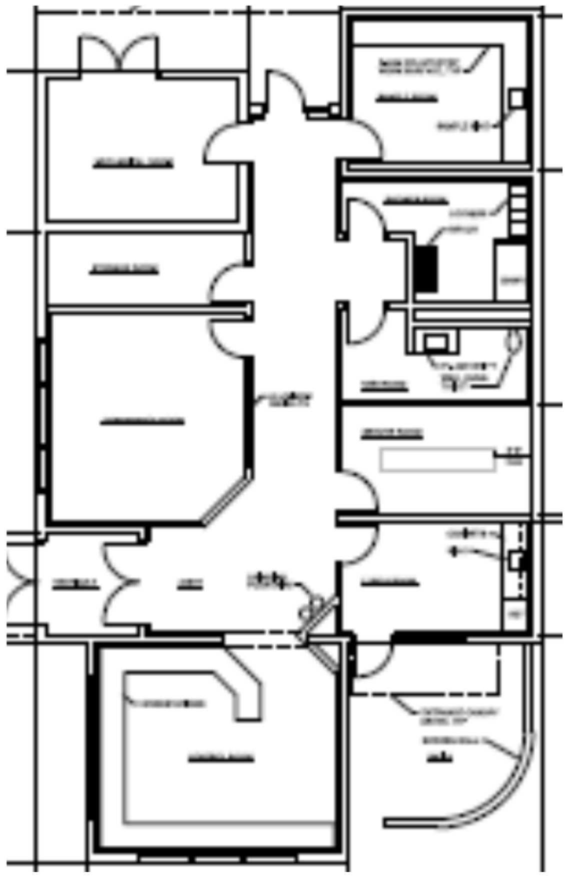
The proposed idea would be to build a single linear structure that forms a visual barrier along Empire Blvd. The idea assumes the same building systems are utilized. One advantage is that the total area of CIP concrete wall area would be reduced. The CIP walls would be replaced with stud and gypsum board construction. The roof could vary in height and be configured to express the needs of the interior functions. The shop/garage could be served by a central HVAC system.

The cost savings is primarily a reduction in CIP concrete exterior walls. For this idea the floors, roofs, number of doors and windows, and interior build-outs are considered equal to the original concept.

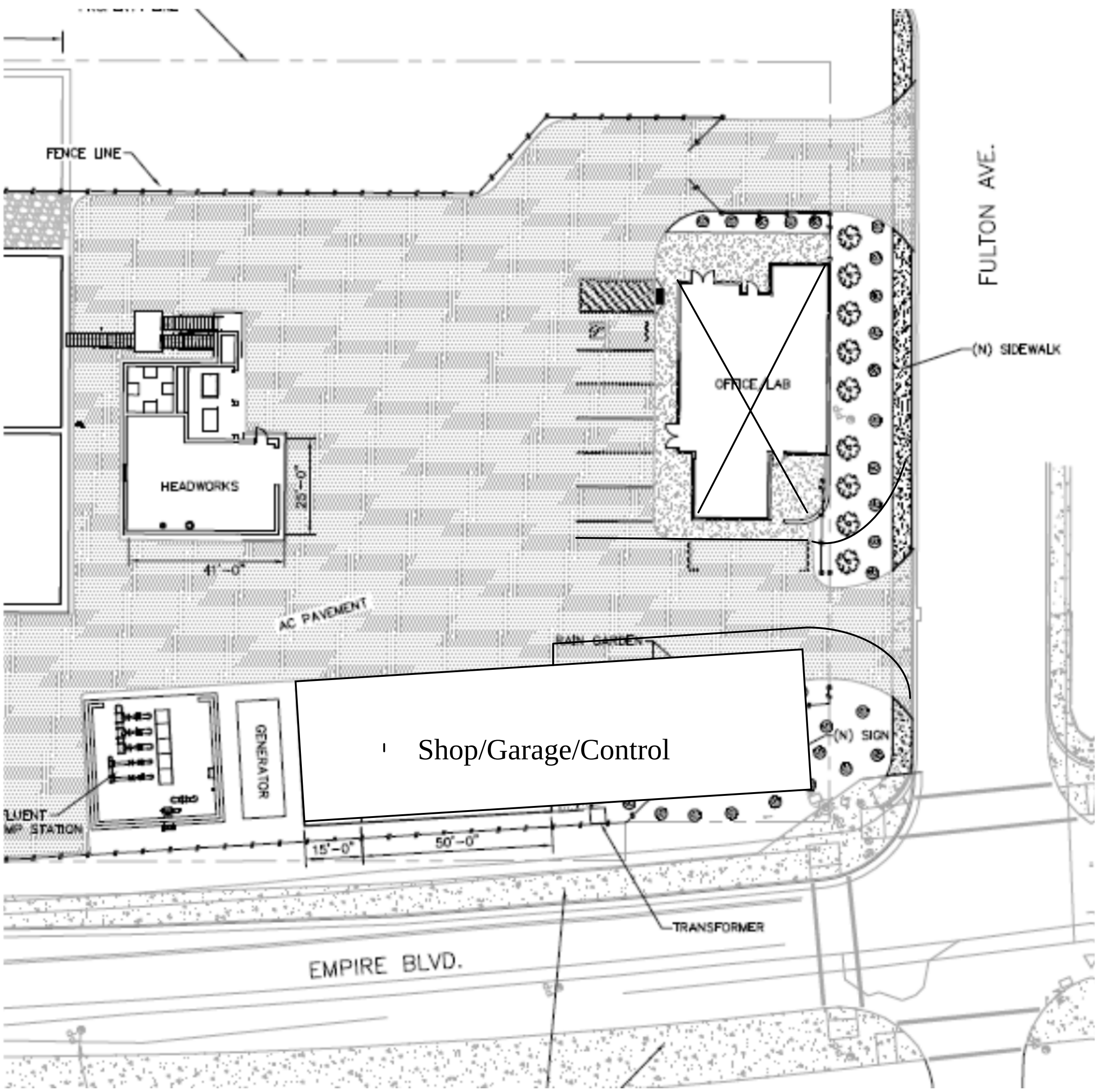
Baseline Sketch 1



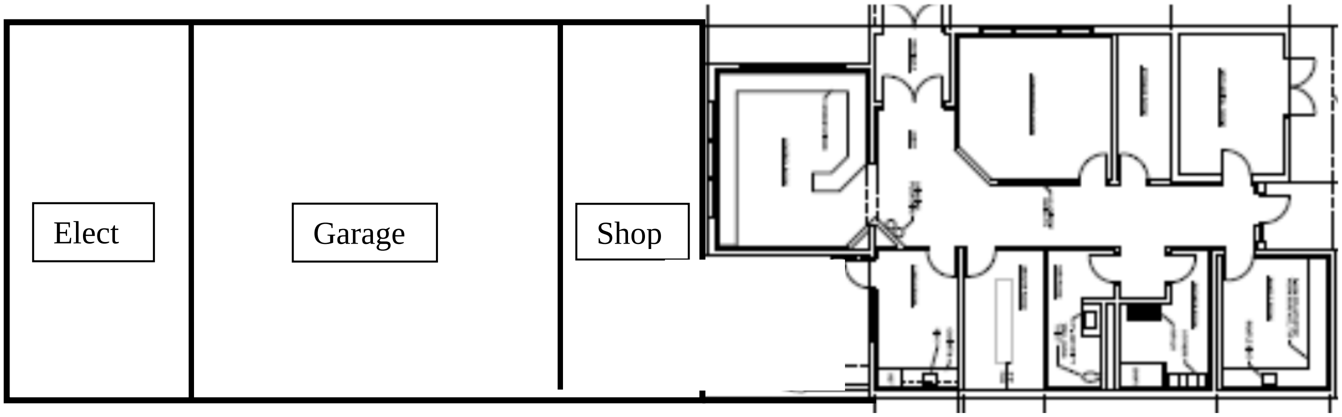
Baseline Sketch 2



Alternative Sketch 1



Alternative Building Layout 2



Calculations

End wall of Shop Bldg= 36’w x 18’h(assumed ave) x 8”t = 380cf

End wall of Control Bldg = 40’ x 16’ (ave) x 12”t = 640cf

Total conc wall = 1020 cf = 37.77 cu yd   say 38 cu yd

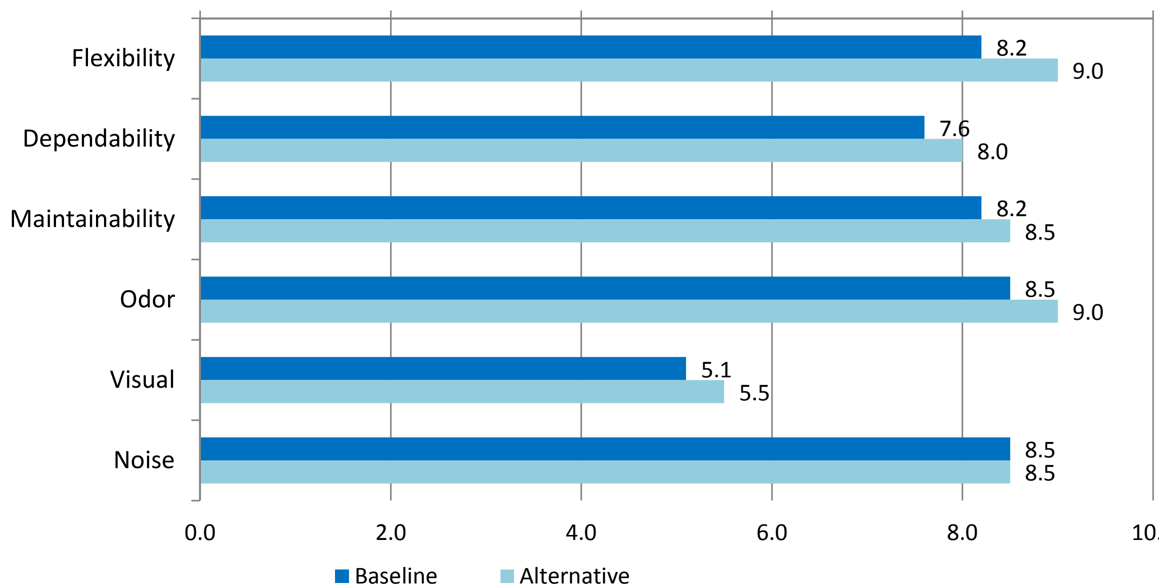
Use 640 sf for the area of stud wall that becomes the new common wall between buildings.

Alternative No.: B-1

Baseline Performance Assessment

Performance Attribute	Baseline	Alternative	Rationale for Change in Performance
Flexibility	8.2	9.0	Provides more site for future facilites
Dependability	7.6	8.0	More compact layout of staff areas
Maintainability	8.2	8.5	Less building exterior surface
Odor	8.5	9.0	No Change
Visual	5.1	5.5	More screening along Empire Blvd
Noise	8.5	8.5	No Change

Comparison of Performance



Functional Benefit Summary

ESTIMATED PERFORMANCE IMPACTS	Flexibility	Dependability	Maintainability	Odor	Visual	Noise
	▲	▲	▲	▲	▲	▬

Construction Cost Estimate

Alternative No.: B-1

			Baseline Concept		Alternative Concept	
Item	Unit of Meas.	Unit Cost	Quantity	Total	Quantity	Total
Exterior CIP wall	CY	$ 2,115	38	$ 80,370	0	$ -
				$ -		$ -
stud wall w/ GWB each face	SF	$ 12	0	$ -	640	$ 7,680
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
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				$ -		$ -
Subtotal				$ 80,370		$ 7,680
Markup	87.5	%		$ 70,324		$ 6,720
TOTALS				**$ 150,694**		**$ 14,400**
NET SAVINGS						**$ 136,294**
TOTALS ROUNDED				**$ 151,000**		**$ 14,000**
NET SAVINGS ROUNDED						**$ 137,000**

VALUE ENGINEERING ALTERNATIVE

COOS BAY WWTP #2 IMPROVEMENTS
COOS BAY, OR

Idea No.	B-3	Idea Title	Use pre-engineered metal buildings

ESTIMATED COST IMPACTS

	Capital Cost	Present Worth of O&M Cost	Total Present Worth Cost
Baseline Concept	581,000	--	581,000
Alternative Concept	622,000	--	622,000
Estimated Savings	(41,000)	--	(41,000)

ESTIMATED PERFORMANCE IMPACTS	Flexibility	Dependability	Maintainability	Odor	Visual	Noise
	▲	▲	▲	▬	▲	▬

Description of Baseline Concept

The existing concept is to provide a uniform and consistent architectural character with all buildings. The non-process buildings are planning to utilize cast in place concrete for the exterior walls that will be similar in color, texture and pattern to the process structures. These walls would be load bearing for the roof. Form liners would be used to add architectural feature to the concrete surfaces.

Description of Alternative Concept

The alternative concept is to utilize a pre-engineered steel framing system to support the roof and exterior walls of the two non-process buildings. The building could be clad in precast concrete panels to maintain the same character. The precast would provide a higher quality finish and more precise joint work.

Advantages	Disadvantages
• Improved concrete consistency • Improved appearance • Wider variety of patterns and finishes available • Less construction time • Lighter structural loading • Provides same durability as CIP concrete	• Less consistent with process facilities • Additional trades required on site

Discussion

The Architectural Design Criteria states that the "architectural exterior treatments should be uniform and complimentary across all structures on site". The two non-process buildings have been designed with cast-in-place (CIP) exterior walls, to be consistent with the process facilities that need to be CIP structures. Good finished CIP concrete is difficult to achieve. The quality of field formed concrete is highly dependent on the skills and diligence of the formwork carpenters and inspectors. The current design utilizes form liners and joint work to create textures and patterns on the wall surface. These techniques will help hide some of the imperfections, but seldom hides them all.

The proposed idea is not intended to propose a packaged metal clad (Butler) building typically used for agriculture or industrial uses. The alternative concept would utilize an industrial type pre-engineered steel frame for the primary structural members. The concept would be to use a system of beams and columns for the walls and a girders and metal joists for the roof. A standing seam metal roofing product with insulation would be used to cover the roofs. For this proposal, the exterior wall cladding would be precast concrete panels mounted to the steel frame. The precast panels would provide the same durability as the CIP with less material. The interior walls and build outs would be the same as in the original concept. The precast would utilize the same form liners and joints to coordinate with the process structure. The precast is fabricated in a shop environment, where higher quality shapes and finishes are achievable. The precast panels would be 6” thick rather than the 8” to 12” thickness necessary for CIP concrete. The interior finishes and insulation would be applied to stud framing in either alternative.

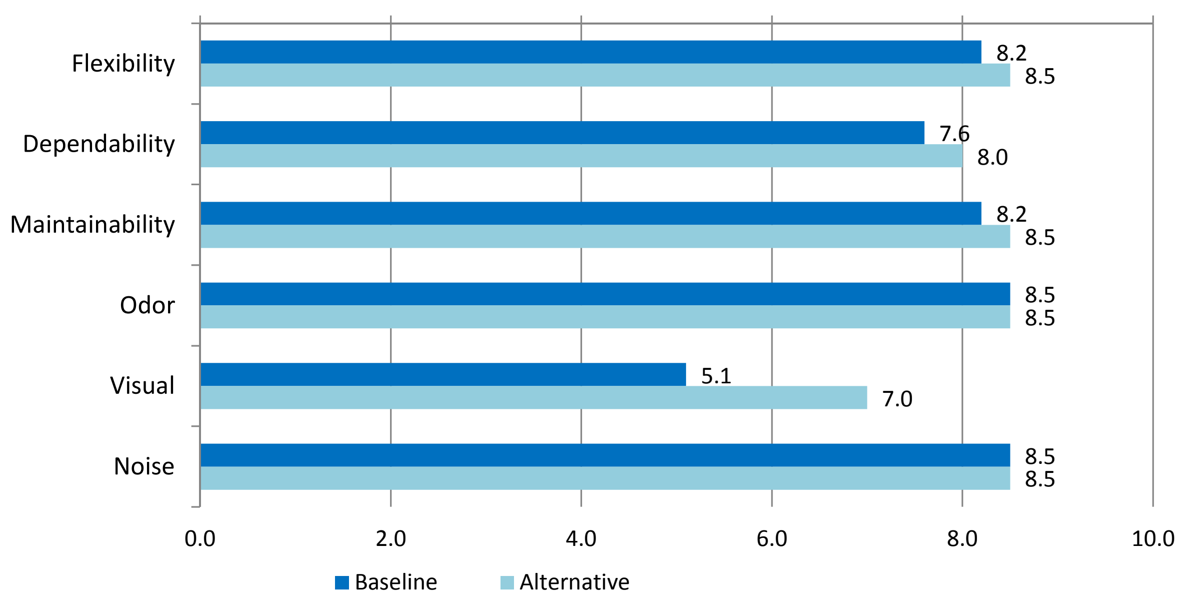
In addition, there are many other materials that could be used for cladding these buildings and work with the steel frame structure. There are higher grade industrial and commercial grade metal wall panels, brick and masonry veneers and stucco or stucco-like systems that could be utilized in lieu of the precast. These materials could then be integrated into parts of the process structure design to provide the desired complimentary look across all structures. Most of these materials would be even lighter in weight than concrete and could add additional savings to the steel framing.

Alternative No.: B-3

Baseline Performance Assessment

Performance Attribute	Baseline	Alternative	Rationale for Change in Performance
Flexibility	8.2	8.5	Building modifications are easier
Dependability	7.6	8.0	More precise fabrication
Maintainability	8.2	8.5	Need to maintain sealant joints
Odor	8.5	8.5	No Change
Visual	5.1	7.0	Better quality control, wider range of finishes
Noise	8.5	8.5	No Change

Comparison of Performance



Functional Benefit Summary

	Flexibility	Dependability	Maintainability	Odor	Visual	Noise
ESTIMATED PERFORMANCE IMPACTS	▲	▲	▲	▬	▲	▬

Construction Cost Estimate

Alternative No.: B-3

			Baseline Concept		Alternative Concept	
Item	Unit of Meas.	Unit Cost	Quantity	Total	Quantity	Total
Control Bldg - CIP walls	LS			$ 178,348	0	$ -
Control Bldg - precast wall panels	SF	$ 20.80	0	$ -	6,830	$ 142,064
Control Bldg - pre-eng steel frame	SF	$ 7.65		$ -	2,105	$ 16,103
			0	$ -		$ -
Shop - CIP walls	LS			$ 131,511		$ -
Shop - precast wall panels	SF	$ 20.80		$ -	7,701	$ 160,181
Shop - pre-eng steel framing	SF	$ 7.65		$ -	1,750	$ 13,388
			0	$ -		$ -
				$ -		$ -
Notes:				$ -		$ -
Roofs - assume no change				$ -		$ -
Interior build outs - assume no change				$ -		$ -
				$ -		$ -
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Subtotal				$ 309,859		$ 331,736
Markup	87.5	%		$ 271,127		$ 290,269
TOTALS				**$ 580,986**		**$ 622,004**
NET SAVINGS						**$ (41,019)**
TOTALS ROUNDED				**$ 581,000**		**$ 622,000**
NET SAVINGS ROUNDED						**$ (41,000)**

Life Cycle Cost Worksheet

Alternative No: **B-3**

	Life Cycle Period:	20	years	**Net Discount Rate:**	4.00%	**Baseline Concept**	**Alternative Concept**
A.	**Initial Cost**					$ 581,000	$ 622,000
					Initial Cost Savings		$ (41,000)
B.	**Annual Costs**						
	1. Maintenance						
	2. Operating						
	3. Energy						
	4.						
	5.						
	6.						
					Total Annual Costs	$ 0	$ 0
					Present Worth Factor	13.5903	13.5903
					Present Worth of Annual Costs	$ 0	$ 0
C.	**Replacement Costs**		**Year**	**Amount**	**PW Factor P/F**	**Present Worth**	**Present Worth**
ORIG	ALT	< Put "x" in appropriate box (original or alternate design)					
		1.			1.0000	$ -	$ -
		2.			1.0000	$ -	$ -
		3.			1.0000	$ -	$ -
		4.			1.0000	$ -	$ -
		5.			1.0000	$ -	$ -
		6.			1.0000	$ -	$ -
		7.			1.0000	$ -	$ -
					Present Worth of Replacement Costs	$ 0	$ 0
D.	**Total Annual Costs and Replacement Costs (B + C)**					$ 0	$ 0
E.					***Total Annual Costs and Replacement Costs (B + C) - ROUNDED***	**$0**	**$0**
					Annual Costs and Replacement Savings - ROUNDED		**$ 0**
F.	**Total Present Worth Cost (A + E)**					$ 581,000	$ 622,000
	Total Life Cycle Savings						$ (41,000)
G.					***TOTAL PRESENT WORTH COST (A + E) - ROUNDED***	**$ 581,000**	**$ 622,000**
H.					***TOTAL LIFE CYCLE SAVINGS - ROUNDED***		**$ (41,000)**

VALUE ENGINEERING ALTERNATIVE

COOS BAY WWTP #2 IMPROVEMENTS
COOS BAY, OR

Idea No.	B-23	Idea Title	Make single bathroom unisex

ESTIMATED COST IMPACTS

	Capital Cost	Present Worth of O&M Cost	Total Present Worth Cost
Baseline Concept			
Alternative Concept			
Estimated Savings			DESIGN SUGGESTION

ESTIMATED PERFORMANCE IMPACTS	Flexibility	Dependability	Maintainability	Odor	Visual	Noise
	▲	▬	▬	▬	▬	▬

Description of Baseline Concept

The current drawings do not yet define the design details for the bathroom and locker facilities

Description of Alternative Concept

Design the toilet and locker facilities with the concept that operators at the plant could be male, female or both.

Advantages	Disadvantages
• Avoids possible remodeling later to accommodate both genders • Avoids the potential for future discrimination claims	• None Noted

Discussion

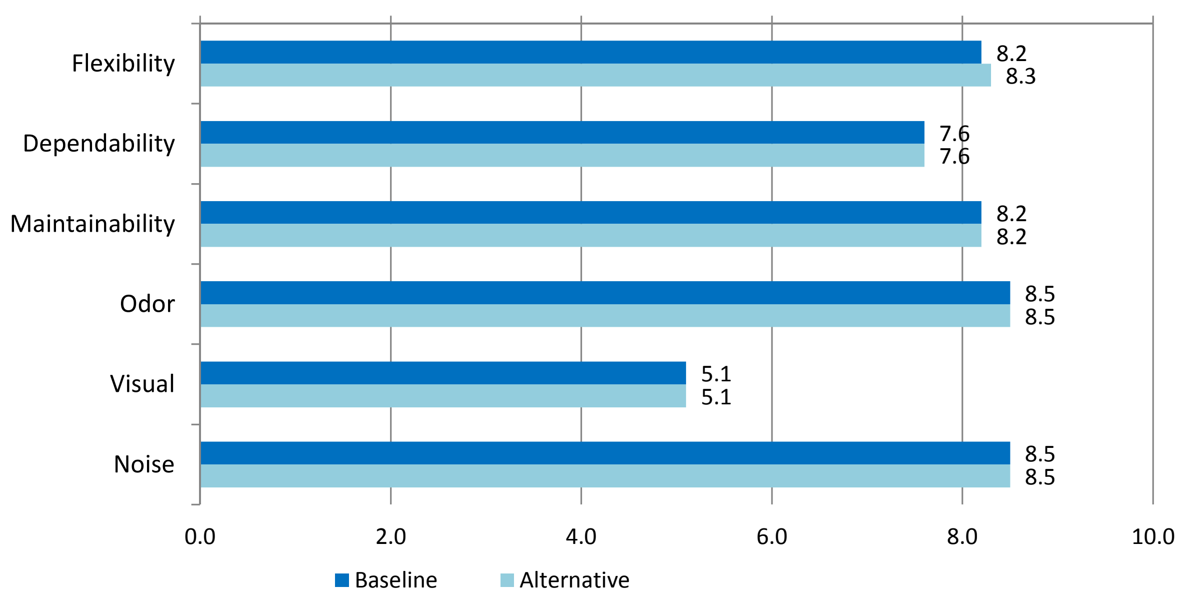
Even if the City does not currently have female operators on staff it is likely that at some point in the life of this facility that the city will have both male and female operators that may work in this treatment plant. Accordingly, we suggest that the toilet and locker facilities be designed with that eventuality in mind. This may be as simple as providing lockable doors and appropriate signing, but should be addressed during design.

Alternative No.: B-23

Baseline Performance Assessment

Performance Attribute	Baseline	Alternative	Rationale for Change in Performance
Flexibility	8.2	8.3	More easily accommodates operators of both genders
Dependability	7.6	7.6	No change
Maintainability	8.2	8.2	No change
Odor	8.5	8.5	No change
Visual	5.1	5.1	No change
Noise	8.5	8.5	No change

Comparison of Performance



Functional Benefit Summary

	Flexibility	Dependability	Maintainability	Odor	Visual	Noise
ESTIMATED PERFORMANCE IMPACTS						

VALUE ENGINEERING ALTERNATIVE

COOS BAY WWTP #2 IMPROVEMENTS
COOS BAY, OR

Idea No.	B-24	Idea Title	Insulate and heat shop

ESTIMATED COST IMPACTS

	Capital Cost	Present Worth of O&M Cost	Total Present Worth Cost
Baseline Concept			
Alternative Concept			
Estimated Savings			DESIGN SUGGESTION

ESTIMATED PERFORMANCE IMPACTS	Flexibility	Dependability	Maintainability	Odor	Visual	Noise
	–	–	▲	–	–	–

Description of Baseline Concept

The current drawings do not indicate whether the shop space is to be heated.

Description of Alternative Concept

If not currently planned, the VE team suggests that the shop area, and possibly also the garage area be insulated and heated.

Advantages	Disadvantages
• Improves maintenance efficiency • Reduces chance of injury due to cold hands during maintenance activities • Improves worker comfort and morale • If garage is heated, reduces potential for freezing of Vactor truck components	• Will result in slight increase in construction and operations cost for insulation and heating

Discussion

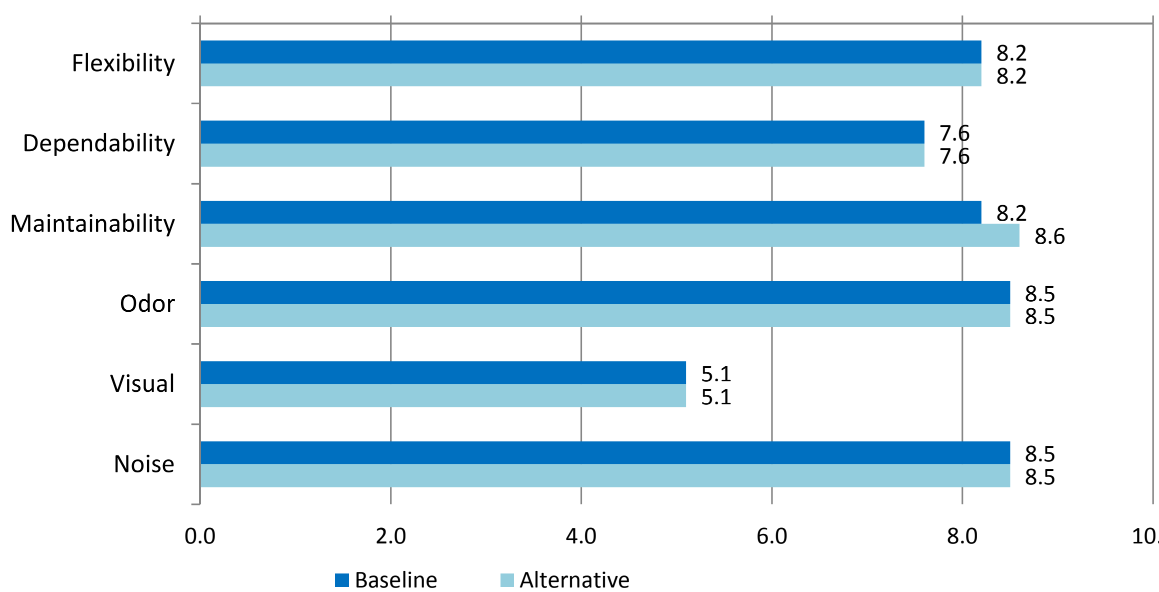
Though average daily winter low temperatures in Coos Bay are about 40 degrees F, temperatures in the 30's are not uncommon. Maintenance activities conducted in cold temperatures are less efficient, and may result in injury due to cold hands working on metal parts. It will also reduce condensation on tools and resulting corrosion. The VE team suggests providing insulation and heating for at least the shop area, and perhaps also for the garage area, where the Vactor truck will be stored. Heating the Vactor truck area will prevent possible freeze damage to the equipment, which has happened in the past. Use of an automated thermostat would minimize heating costs and permit warming the shop area when it is occupied.

Alternative No.: B-24

Baseline Performance Assessment

Performance Attribute	Baseline	Alternative	Rationale for Change in Performance
Flexibility	8.2	8.2	No change
Dependability	7.6	7.6	No change
Maintainability	8.2	8.6	Improved safety, efficiency and staff comfort for shop maintenance activities
Odor	8.5	8.5	No change
Visual	5.1	5.1	No change
Noise	8.5	8.5	No change

Comparison of Performance



Functional Benefit Summary

	Flexibility	Dependability	Maintainability	Odor	Visual	Noise
ESTIMATED PERFORMANCE IMPACTS						

VALUE ENGINEERING ALTERNATIVE

COOS BAY WWTP #2 IMPROVEMENTS
COOS BAY, OR

Idea No.	B-26	Idea Title	**Replace concrete cover on equalization basin with metal roof**

ESTIMATED COST IMPACTS

	Capital Cost	Present Worth of O&M Cost	Total Present Worth Cost
Baseline Concept	525,000	--	525,000
Alternative Concept	311,000	--	311,000
Estimated Savings	214,000	--	214,000

ESTIMATED PERFORMANCE IMPACTS	Flexibility	Dependability	Maintainability	Odor	Visual	Noise
	▲	▼	▲	▬	▲	▬

Description of Baseline Concept

The baseline concept is to provide a concrete roof slab for the suspended roof slab over the Equalization Basin.

Description of Alternative Concept

The alternative concept it to replace the concrete roof slab on the equalization basin with a metal roof.

Advantages	Disadvantages
• Cover/Roof materials are light weight and high strength • Cover/Roof materials could eliminate interior columns for spans to 30’-0” to 42’-0” • Cover/Roof materials are corrosion resistant • Panel systems are low profile • Provides UV screen and debris protection. • Cover/Roof materials can be removable in sections to provide access to all or limited areas of the equalization basin • Concrete materials exposed to sunlight and freezing will degrade resulting in cracks and maintenance costs associated with sealing cracks • Would not require an architectural waterproofing system to be placed over the exposed concrete cover/roof to provide a watertight surface	• Replacement materials may have a shorter life cycle than reinforced concrete materials

Discussion

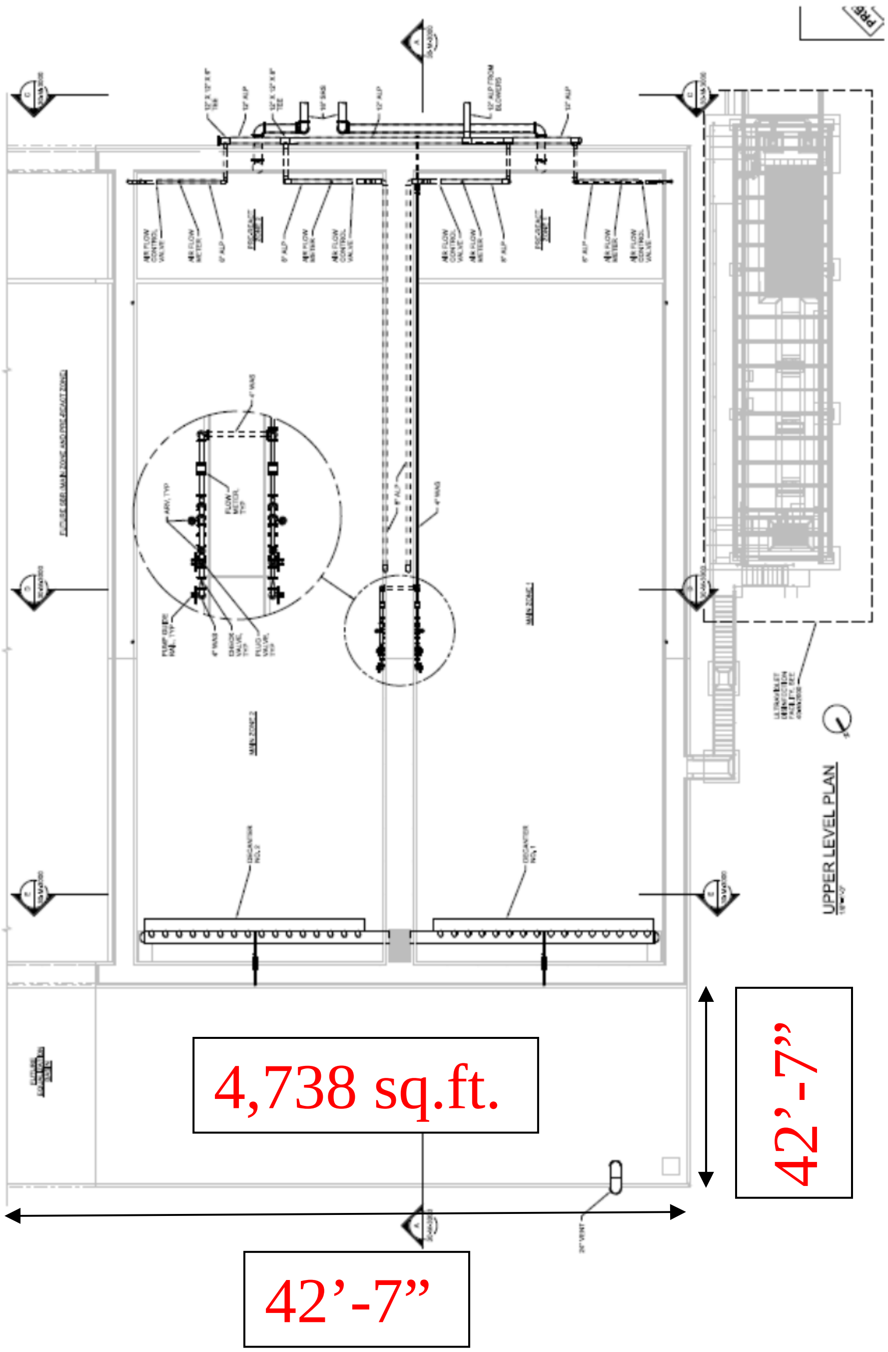
The baseline concept is to provide a concrete roof slab for the suspended roof slab over the Equalization Basin. The suspended concrete slab is intended to prevent sunlight exposure to the secondary effluent stored in the equalization basin and regrowth of biological matter.

The alternative concept it to replace the concrete roof slab on the equalization basin with a metal roof. There is currently no identified function for the top of the equalization basin. The concrete cover on the the equalization basin would be designed to support roof dead load, roof live loads of 20 psf, roof snow load of 25 psf (minimum), possibly floor live loads of 200 psf for process areas (including roofs of basins), wind loads, and seismic loads. While not shown on the Preliminary Drawings the 30’-0” to 42’-7” span for the concrete cover to support the dead and live loads may require additional columns or beams.

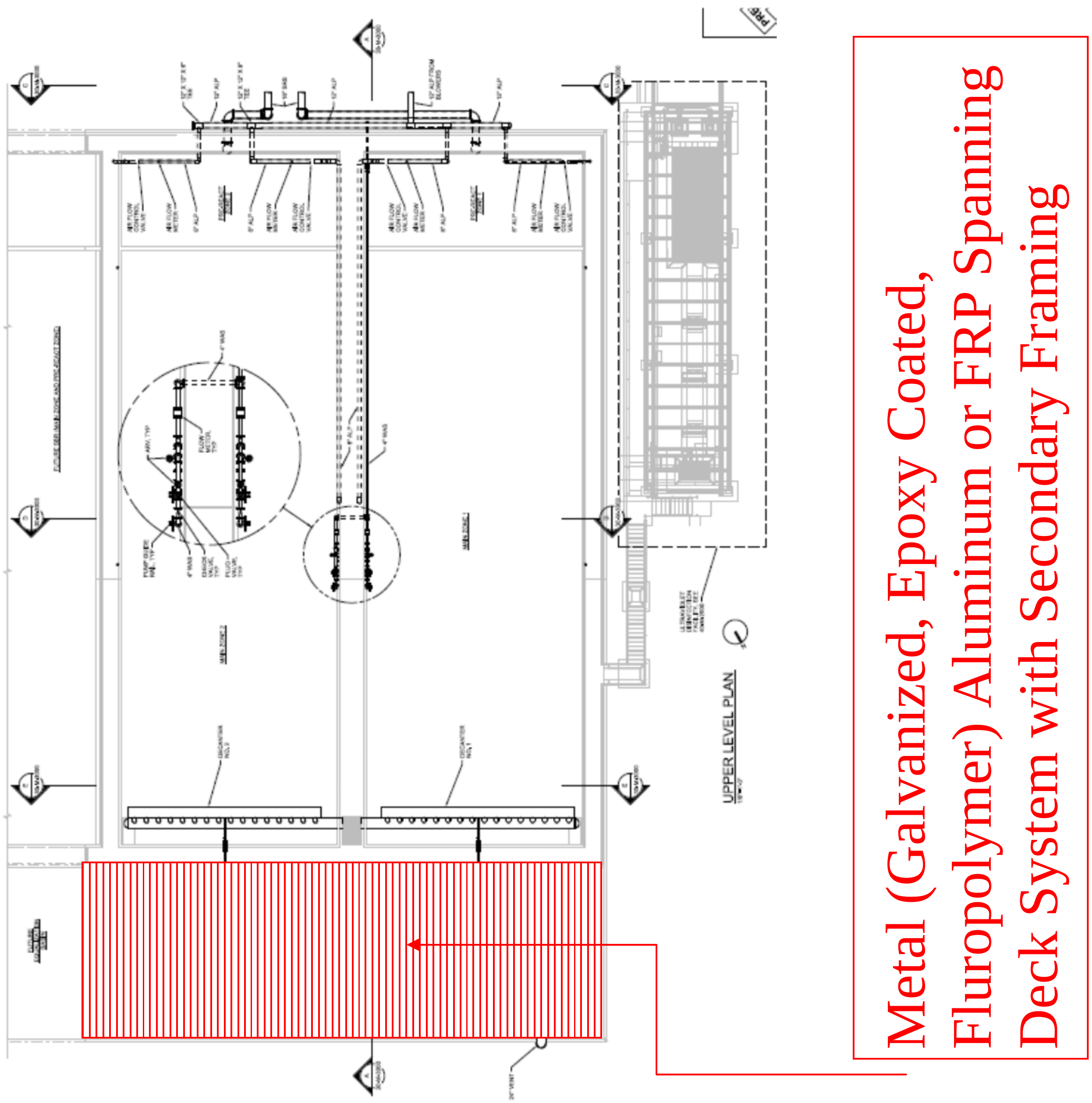
While the VE team alternative concept was based around replacement of the concrete roof slab with a metal roof it is unlikely that a metal roof would provide an equivalent life span as a concrete roof slab without adequate corrosion protection of the metal including either galvanizing, epoxy, or some type of floor polymer coating system. There are also several proprietary systems (Temcor (aluminum) or Enduro Composites (fiberglass)) for aluminum and fiberglass type covers including secondary framing that could cost effectively be utilized to provide a UV or sunlight barrier for the equalization basin and satisfy the roof live and snow load requirements.

The equalization basin is defined as 36’-0” x 100’-0” in the Preliminary Design Report; however, on the Contract Drawing Sheet 06-C-2000 the equalization basin is defined as 42’-7” x 100’-0”. This discrepancy should be resolved for cost estimate purposes.

Baseline Sketch



Alternative Sketch



Calculations

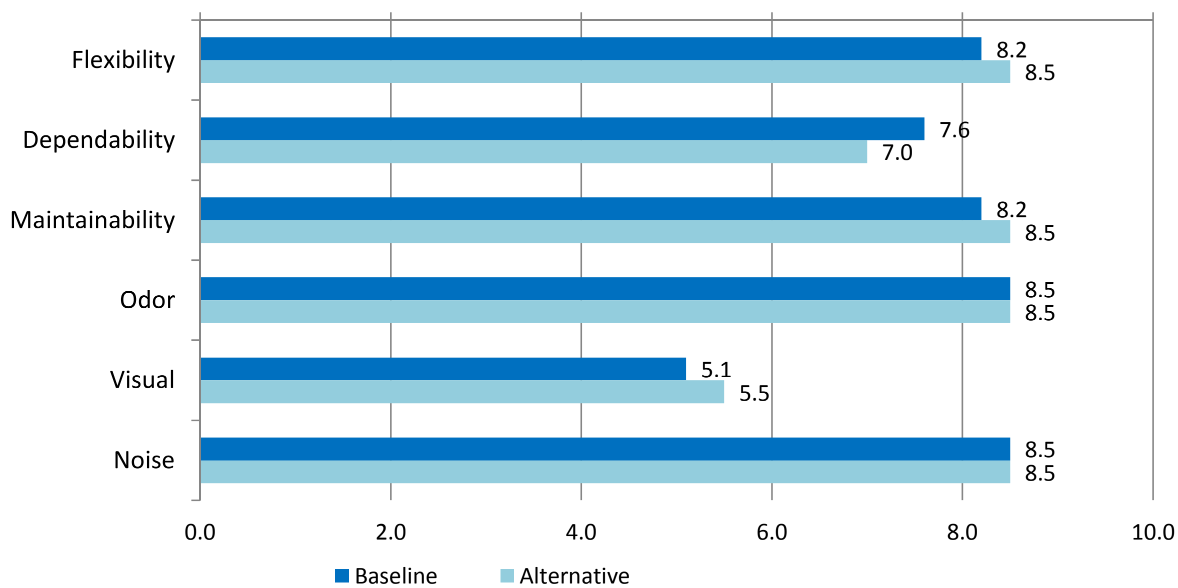
Concrete CY = 46’-0” wide x 103’-0” long x 2’-0” thick = 9,476 cuft / 27 = 350 cy

Area = 46’-0” wide x 103’-0” long = 4,738 sqft

Baseline Performance Assessment

Performance Attribute	Baseline	Alternative	Rationale for Change in Performance
Flexibility	8.2	8.5	Covers are faster and easier to install.
Dependability	7.6	7.0	Cover life may be less than concrete.
Maintainability	8.2	8.5	Easier to maintain. Individual areas can be removed and replaced.
Odor	8.5	8.5	No change.
Visual	5.1	5.5	No change unless covers are reflective. Potential for architectural improvements.
Noise	8.5	8.5	No change.

Comparison of Performance



Functional Benefit Summary

	Flexibility	Dependability	Maintainability	Odor	Visual	Noise
ESTIMATED PERFORMANCE IMPACTS	▲	▼	▲	▬	▲	▬

Construction Cost Estimate

Alternative No.: B-26

Item	Unit of Meas.	Unit Cost	Baseline Concept Quantity	Baseline Concept Total	Alternative Concept Quantity	Alternative Concept Total
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
Cast-in-Place Concrete	CY	$ 800.00	350	$ 280,000		$ -
				$ -		$ -
Metal Deck	SF	$ 35.00		$ -	4,738	$ 165,830
				$ -		$ -
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				$ -		$ -
Subtotal				$ 280,000		$ 165,830
Markup	87.5	%		$ 245,000		$ 145,101
TOTALS				**$ 525,000**		**$ 310,931**
NET SAVINGS						**$ 214,069**
TOTALS ROUNDED				**$ 525,000**		**$ 311,000**
NET SAVINGS ROUNDED						**$ 214,000**

VALUE ENGINEERING ALTERNATIVE

COOS BAY WWTP #2 IMPROVEMENTS
COOS BAY, OR

Idea No.	B-30	Idea Title	Use natural gas for heating

ESTIMATED COST IMPACTS

	Capital Cost	Present Worth of O&M Cost	Total Present Worth Cost
Baseline Concept			
Alternative Concept			
Estimated Savings			DESIGN SUGGESTION

ESTIMATED PERFORMANCE IMPACTS	Flexibility	Dependability	Maintainability	Odor	Visual	Noise

Performance impact: Not enough data available to make an informed decision.

Description of Baseline Concept

Use electrical for heating source.

Description of Alternative Concept

Use natural gas for all heating.

Advantages	Disadvantages
• Possible lower heating costs • Services on both sides of the property	• Unknown cost comparison • Expansion design plan doesn't have enough information to determine heating needs • Electrical power already going to building, natural gas means another trench

Discussion

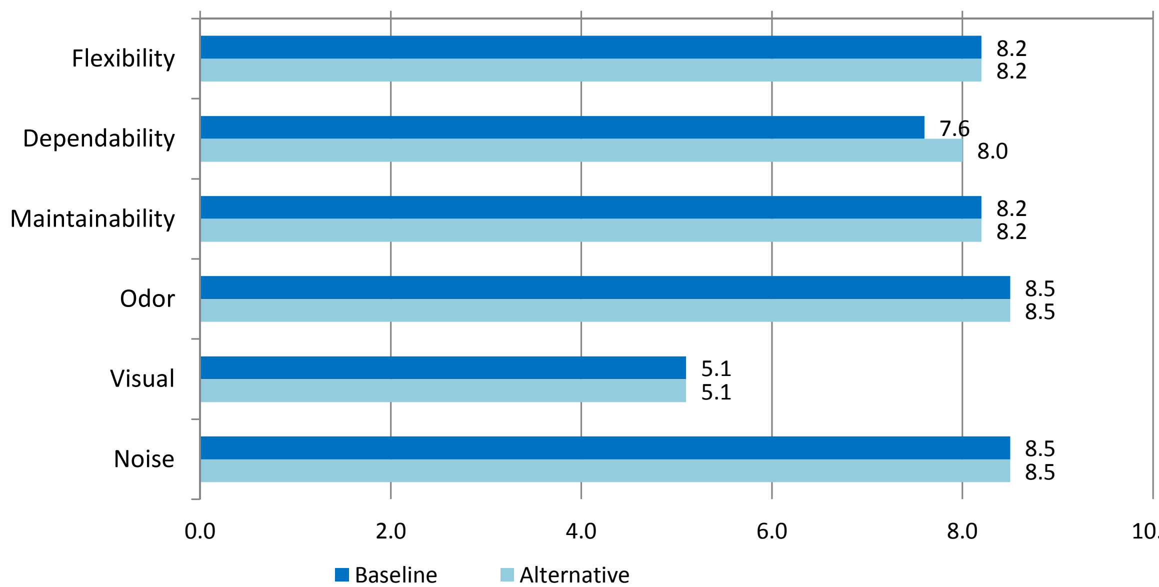
Is possible to save money on heating costs? NW Natural Gas stated that an engineer would need to look over all the data pertaining to the location before converting it into useful data. No data on design plan to calculate square footage that needs to be heated. Not enough time for this VE to recommend going forward.

Alternative No.: B-30

Baseline Performance Assessment

Performance Attribute	Baseline	Alternative	Rationale for Change in Performance
Flexibility	8.2	8.2	No impact
Dependability	7.6	8.0	Property is served by NWNG on two sides
Maintainability	8.2	8.2	Low maintenance
Odor	8.5	8.5	No impact
Visual	5.1	5.1	No impact
Noise	8.5	8.5	No impact

Comparison of Performance



Functional Benefit Summary

	Flexibility	Dependability	Maintainability	Odor	Visual	Noise
ESTIMATED PERFORMANCE IMPACTS						

VALUE ENGINEERING ALTERNATIVE

COOS BAY WWTP #2 IMPROVEMENTS
COOS BAY, OR

Idea No.	B-51	Idea Title	T-Lock line interior surfaces of the influent pump station wet well

ESTIMATED COST IMPACTS

	Capital Cost	Present Worth of O&M Cost	Total Present Worth Cost
Baseline Concept	0	--	0
Alternative Concept	83,000	--	83,000
Estimated Savings	(83,000)	--	(83,000)

ESTIMATED PERFORMANCE IMPACTS	Flexibility	Dependability	Maintainability	Odor	Visual	Noise
	▬	▲	▲	▲	▬	▬

Description of Baseline Concept

The baseline concept is to provide an Influent Pump Station with reinforced concrete wet well below grade.

Description of Alternative Concept

The alternative concept is to provide a PVC type or epoxy coated interior protective coating system on the interior reinforced concrete surfaces of the influent pump station wet well in order to extend the life of the structure.

Advantages	Disadvantages
• Protects cast-in-place concrete structures from corrosive effects of hydrogen sulfice and other sewer gases, acids, alkalies and industrial chemicals • Continuous plastic lining • Lining is easily repaired	• Additional time in construction associated with either application of T-Lock formline in the construction of the wall forms for the wet well • Additional time in construction after construction of the wet well for protection coating surface preparation and coating operations

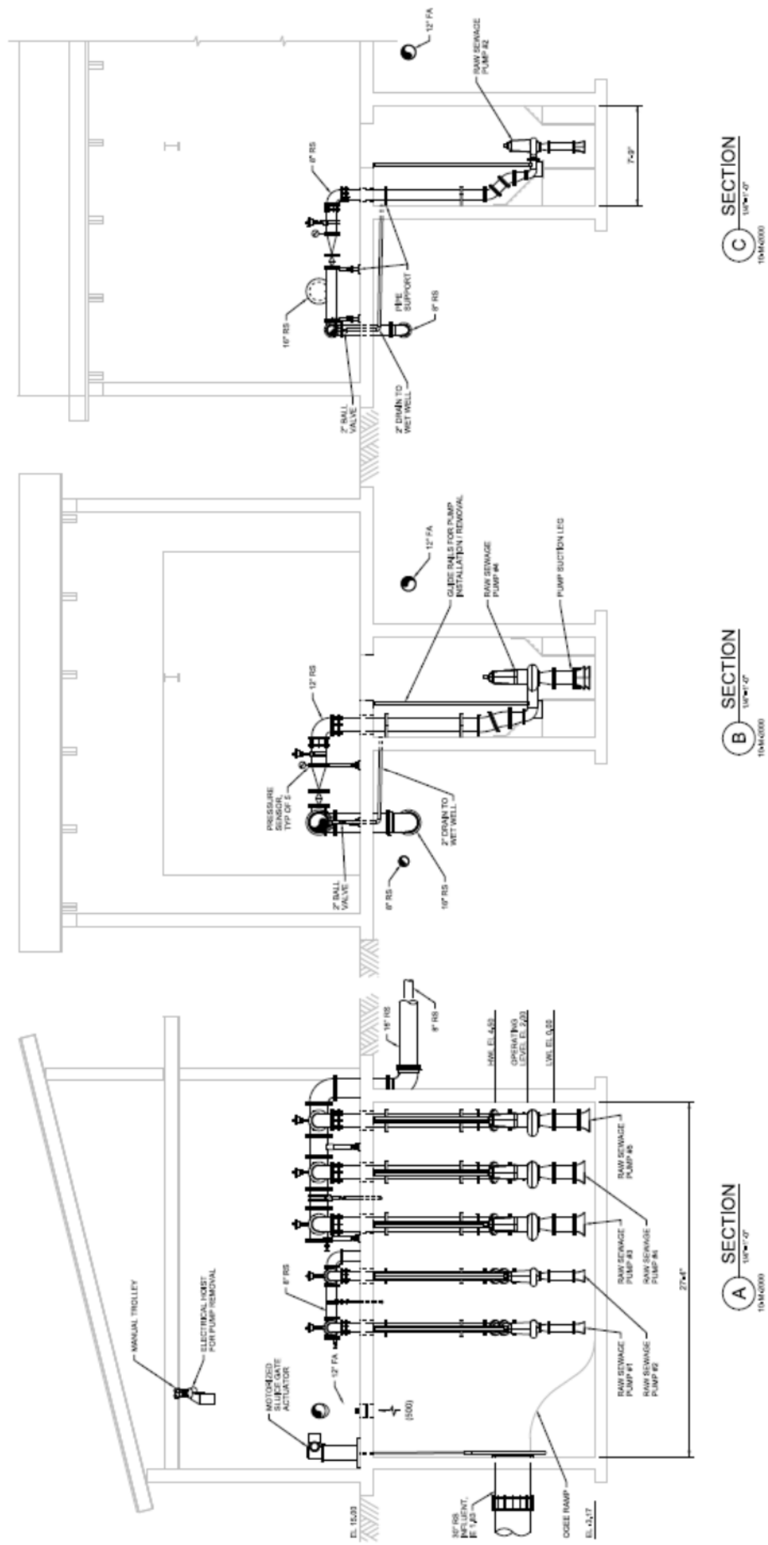
Discussion

The baseline concept is to provide an Influent Pump Station with reinforced concrete wet well below grade.

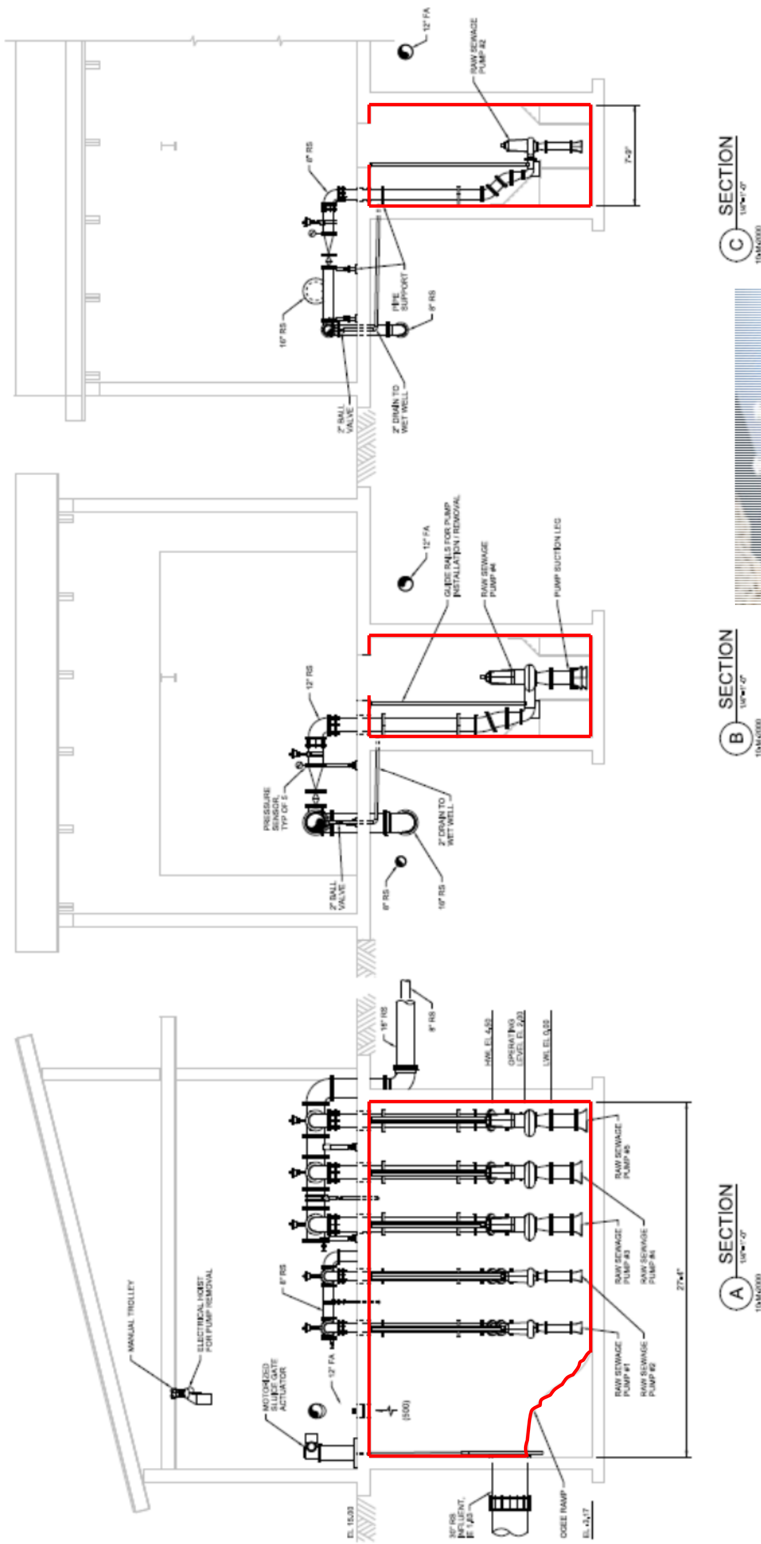
The alternative concept is to provide a PVC type or epoxy coated interior protective coating system on the interior reinforced concrete surfaces of the influent pump station wet well in order to extend the life of the structure.

In 1947 Ameron introduced T-LOCK, a T-ribbed poly-vinyl chloride lining material designed specifically to protect concrete pipe and cast-in-place structures from the corrosive effects of sewer gases, and acids and industrial chemicals. T-Lock provides a dense, impervious, continuous plastic lining to protect concrete substrates against hydrogen sulfide and other sewer gases, acids, alkalies and salts. Seams are heat welded to form a continuous lining over the entire structure. Lining can be repaired quickly and easily by removing the damaged area and welding another piece in its place.

Baseline Sketch



Alternative Sketch



Calculations

Wet Wall Surface Area – Estimated

30’-0” Long x 8’-0” Wide x 18’-0” Deep

Floor = 30’-0” x 8’-0” = 240 sq.ft.

Walls = (30’-0” + 30’-0” + 8’-0” + 8’-0”) x 18’-0” = 1,368 sq. ft.

Soffit = 30’-0” x 8’-0” = 240 sq.ft.

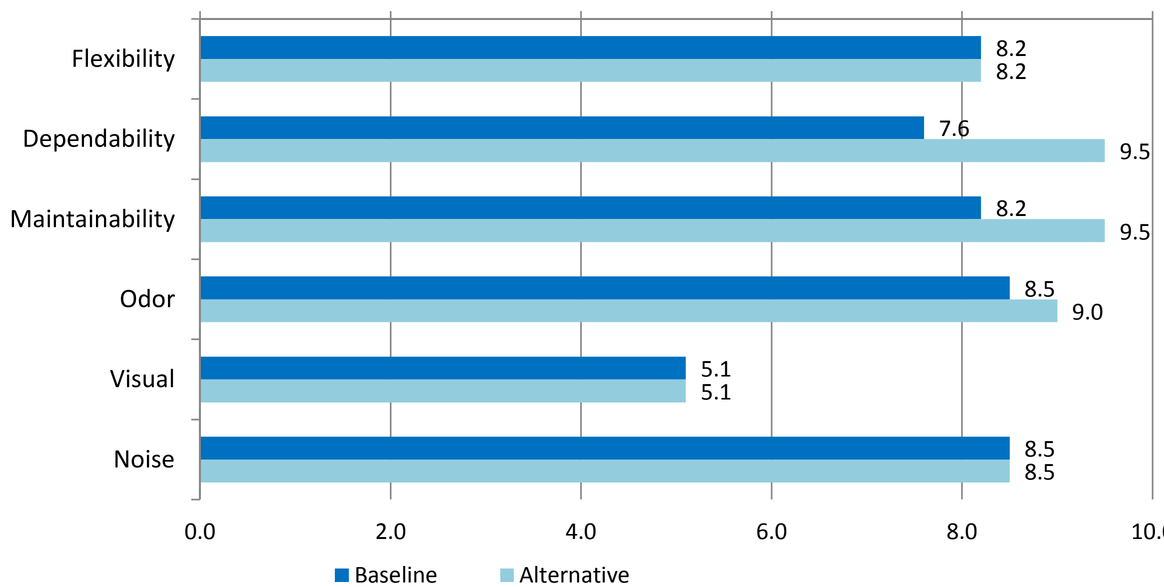
Total = 1,848 sq.ft.

Alternative No.: **B-51**

Baseline Performance Assessment

Performance Attribute	Baseline	Alternative	Rationale for Change in Performance
Flexibility	8.2	8.2	No change
Dependability	7.6	9.5	Wet well is dependable due to less corrosion
Maintainability	8.2	9.5	Maintenance reduced by smooth surfaces
Odor	8.5	9.0	Reduced because wash down is simple. Less accumulation of solids.
Visual	5.1	5.1	No change
Noise	8.5	8.5	No change

Comparison of Performance



Functional Benefit Summary

	Flexibility	Dependability	Maintainability	Odor	Visual	Noise
ESTIMATED PERFORMANCE IMPACTS						

Construction Cost Estimate

Alternative No.: **B-51**

			Baseline Concept		Alternative Concept	
Item	Unit of Meas.	Unit Cost	Quantity	Total	Quantity	Total
				$ -		$ -
Ameron T-Lock or Arrow Lock System	SF	$ 24	0	$ -	1,848	$ 44,352
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
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				$ -		$ -
				$ -		$ -
Subtotal				$ -		$ 44,352
Markup	87.5	%		$ -		$ 38,808
TOTALS				**$ 0**		**$ 83,160**
NET SAVINGS						**$ (83,160)**
TOTALS ROUNDED				**$ 0**		**$ 83,000**
NET SAVINGS ROUNDED						**$ (83,000)**

VALUE ENGINEERING ALTERNATIVE

COOS BAY WWTP #2 IMPROVEMENTS
COOS BAY, OR

Idea No.	B-60	Idea Title	Do not use aluminum for anything exposed to weather

ESTIMATED COST IMPACTS

	Capital Cost	Present Worth of O&M Cost	Total Present Worth Cost
Baseline Concept			
Alternative Concept			
Estimated Savings			DESIGN SUGGESTION

ESTIMATED PERFORMANCE IMPACTS	Flexibility	Dependability	Maintainability	Odor	Visual	Noise
	−	−	−	−	▲	−

Description of Baseline Concept

It is not certain whether the current design will be using aluminum railings, flashings or other components that may be exposed to the salt air.

Description of Alternative Concept

Do not use aluminum for components exposed to the salt air.

Advantages	Disadvantages
• Reduced corrosion potential	• May increase construction cost

Discussion

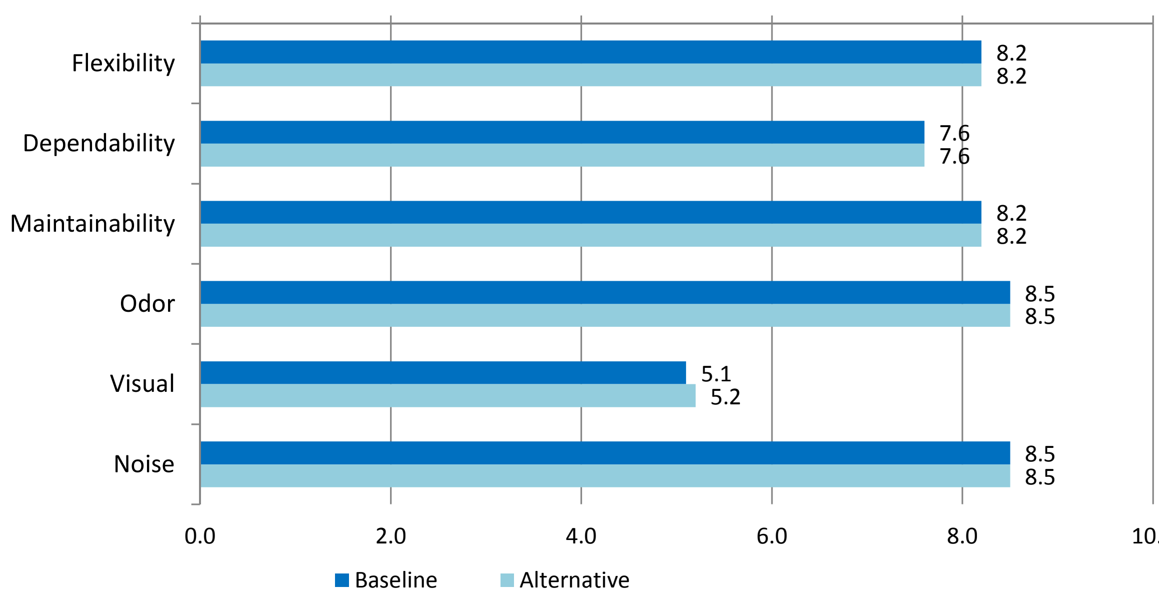
Aluminum that is not anodized is vulnerable to corrosion in areas with high moisture levels and salt is present in the air or moisture. While aluminum corrosion often does not affect the strength of the element, it does affect the aesthetics, and aluminum oxide is quite abrasive.

Alternative No.: B-60

Baseline Performance Assessment

Performance Attribute	Baseline	Alternative	Rationale for Change in Performance
Flexibility	8.2	8.2	No change
Dependability	7.6	7.6	No change
Maintainability	8.2	8.2	No change
Odor	8.5	8.5	No change
Visual	5.1	5.2	Small reduction in quality of appearance
Noise	8.5	8.5	No change

Comparison of Performance



Functional Benefit Summary

	Flexibility	Dependability	Maintainability	Odor	Visual	Noise
ESTIMATED PERFORMANCE IMPACTS						

VALUE ENGINEERING ALTERNATIVE

COOS BAY WWTP #2 IMPROVEMENTS
COOS BAY, OR

Idea No.	B-76	Idea Title	Add windows to south side of control building

ESTIMATED COST IMPACTS

	Capital Cost	Present Worth of O&M Cost	Total Present Worth Cost
Baseline Concept			
Alternative Concept			
Estimated Savings			DESIGN SUGGESTION

ESTIMATED PERFORMANCE IMPACTS	Flexibility	Dependability	Maintainability	Odor	Visual	Noise

Description of Baseline Concept

The current control building does not include any windows on the side facing Fulton Street (south side of building).

Description of Alternative Concept

Provide windows on the side of the building facing the street to give the building a more pleasing appearance.

Advantages	Disadvantages
• Improves the public "face" of the treatment plant	• Slight increase in construction cost • Slight increase in building heating cost

Discussion

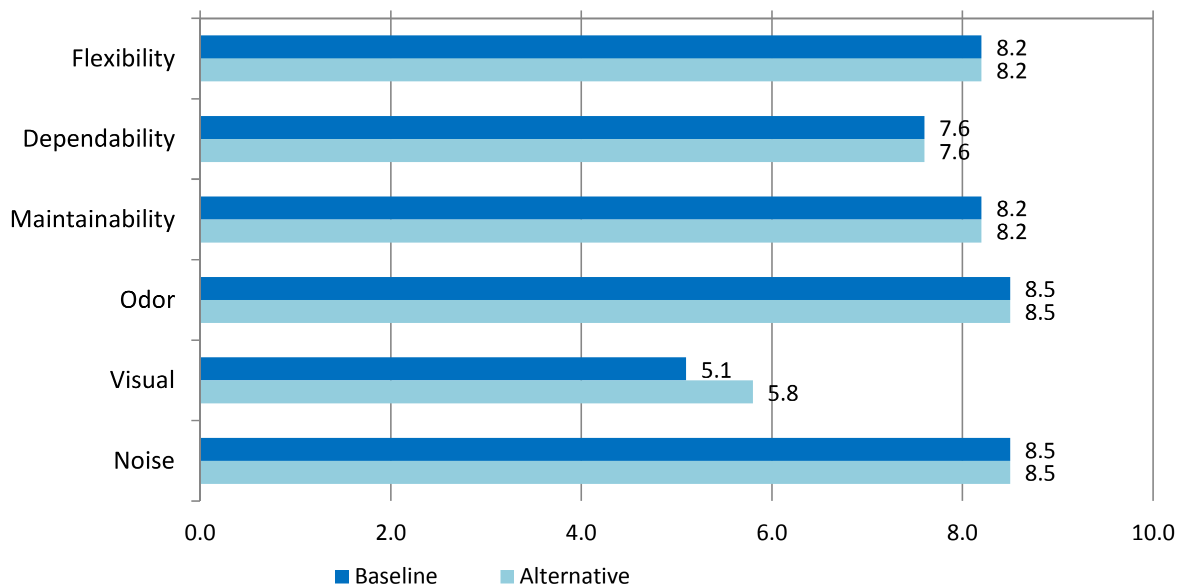
The current south elevation of the control building is a textured concrete wall, with no penetrations. This presents a cold and featureless image of the plant to the neighborhood and to those entering the treatment plant. The VE team suggests adding windows to the south side of the building to break up the blank concrete appearance and provide a more warm and inviting face to the neighborhood and to those visiting the plant. This will add a small amount to the construction cost, and the windows will result in additional heat loss in winter and heat gain in summer, but will also provide additional natural light into the building.

Alternative No.: B-76

Baseline Performance Assessment

Performance Attribute	Baseline	Alternative	Rationale for Change in Performance
Flexibility	8.2	8.2	No Change
Dependability	7.6	7.6	No Change
Maintainability	8.2	8.2	No Change
Odor	8.5	8.5	No Change
Visual	5.1	5.8	More inviting front to the plant entrance
Noise	8.5	8.5	No Change

Comparison of Performance



Functional Benefit Summary

ESTIMATED PERFORMANCE IMPACTS	Flexibility	Dependability	Maintainability	Odor	Visual	Noise

VALUE ENGINEERING ALTERNATIVE

COOS BAY WWTP #2 IMPROVEMENTS
COOS BAY, OR

Idea No.	B-77	Idea Title	Flip control building 180° and place a 2nd staff entrance on north side

ESTIMATED COST IMPACTS

	Capital Cost	Present Worth of O&M Cost	Total Present Worth Cost
Baseline Concept	0	--	0
Alternative Concept	3,000	--	3,000
Estimated Savings	(3,000)	--	(3,000)

ESTIMATED PERFORMANCE IMPACTS	Flexibility	Dependability	Maintainability	Odor	Visual	Noise
	▲	▼	▼	▬	▲	▬

Description of Baseline Concept

The baseline concept is for the Control Building with a single staff and visitor entrance on the North side of the building.

Description of Alternative Concept

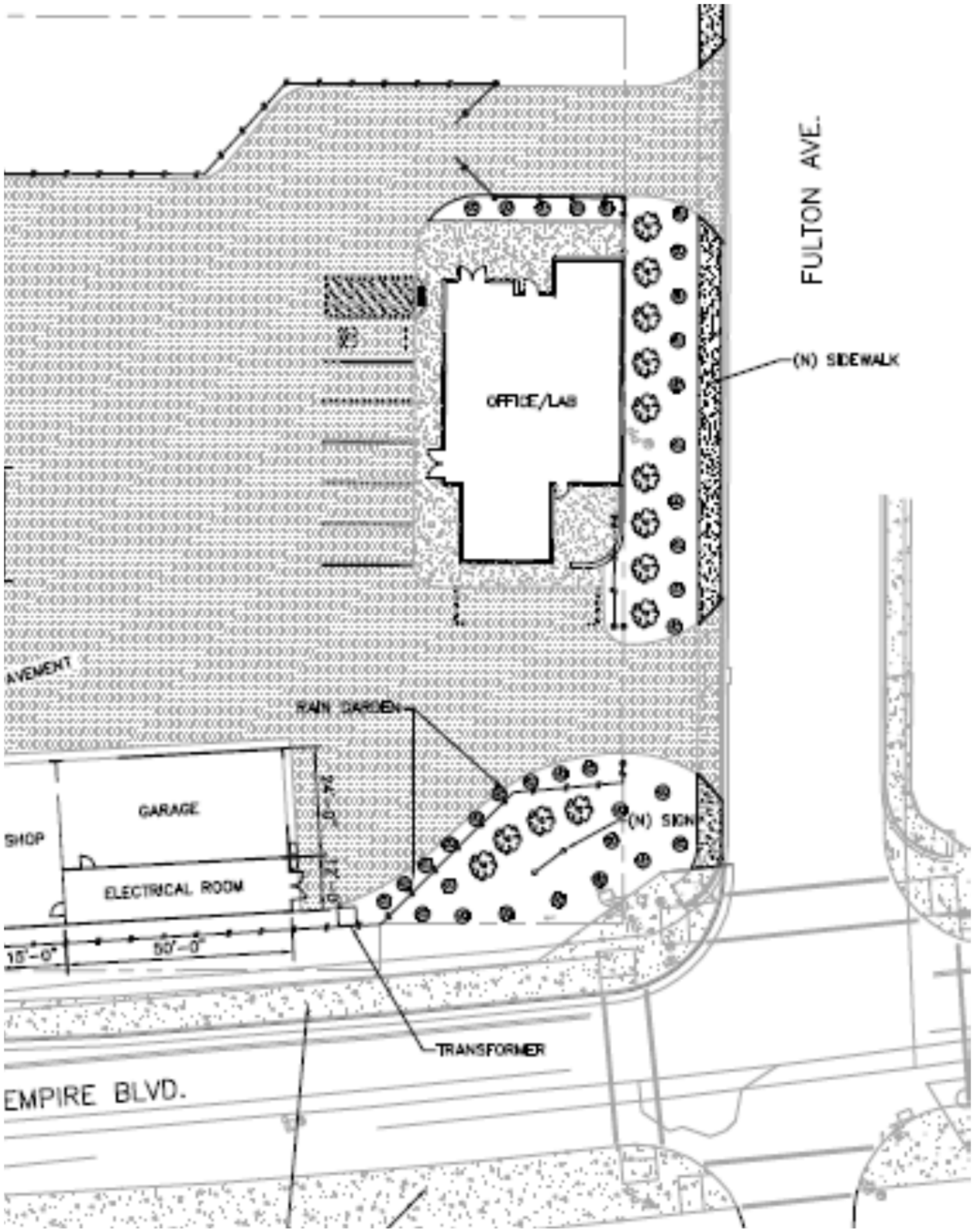
The alternative concept would be to rotate the building 180 degrees and provide a visitor/public entrance to the building from the south side along Fulton Avenue and a second staff entrance on the north side of the building.

Advantages	Disadvantages
• Creates a building in the community which is inviting to visitors from sidewalk/street • Replaces the flat/blank south elevation from facing the public along Fulton Ave. with the doors and windows of the North elevation • By separating the public/visitor entrance from the staff entrance keeps public/visitor entrance clean	• Requires adjustment in the layout of the interior space of the building for a second entrance • Decreases security by placing doors and windows along the sidewalk and street side along Fulton Avenue

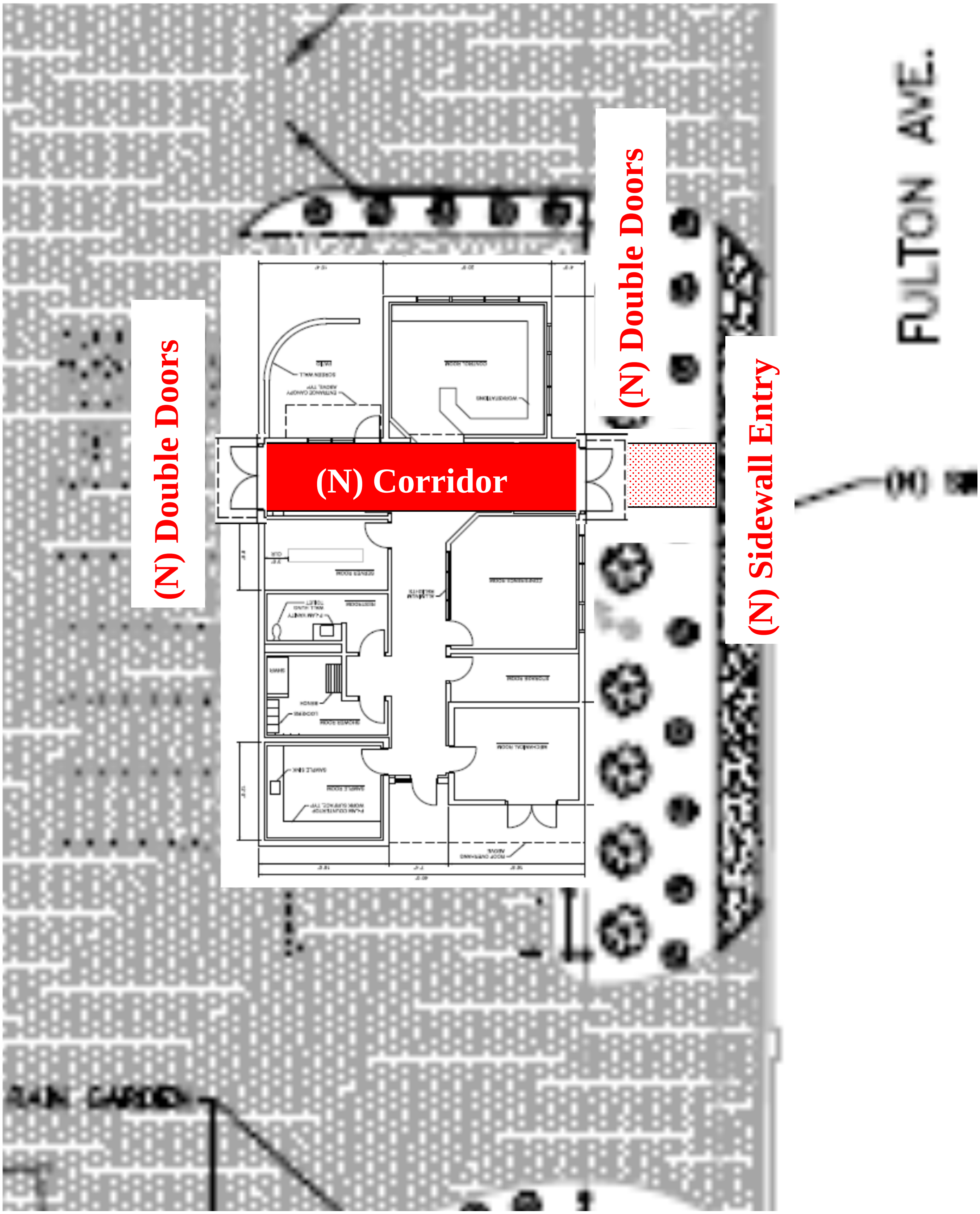
Discussion

The baseline concept is for the Control Building with a single Staff and Visitor Entrance on the North side of the building. The alternative concept would be to rotate the building 180 degrees and provide a Visitor/Public entrance to the building from the south side along Fulton Avenue and a second Staff entrance on the north side of the building. Creates a building in the community which is inviting to visitors from sidewalk/street. Replaces the flat/blank south elevation from facing the public along Fulton Ave. with the doors and windows of the North elevation. By separating the public/visitor entrance from the staff entrance keeps public/visitor entrance clean. Requires adjustment in the layout of the interior space of the building for a second entrance. Decreases security by placing doors and windows along the sidewalk and street side along Fulton Avenue. The layout of the interior spaces should be modified to relocate the control room to serve as a control point for visitor/public entry as well as observe the plant.

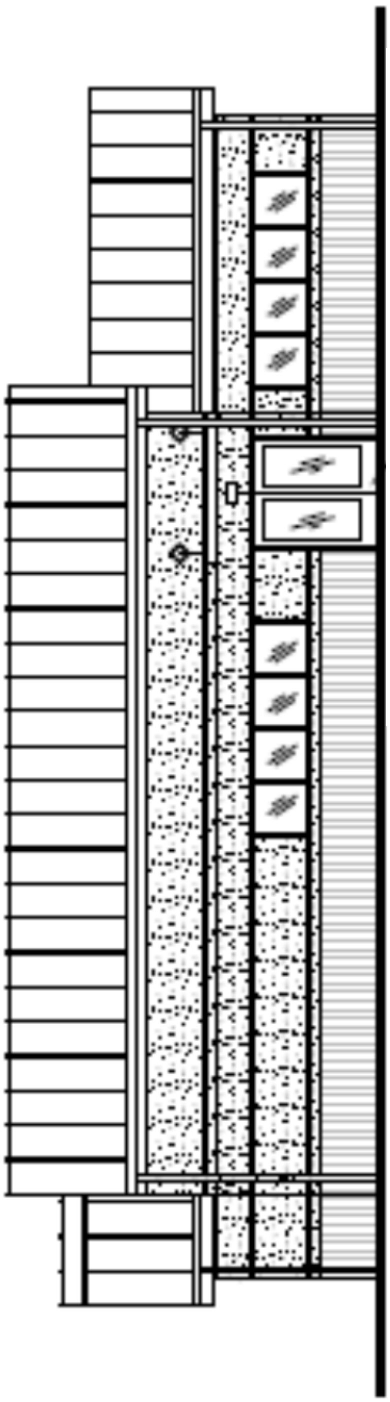
Baseline Sketch



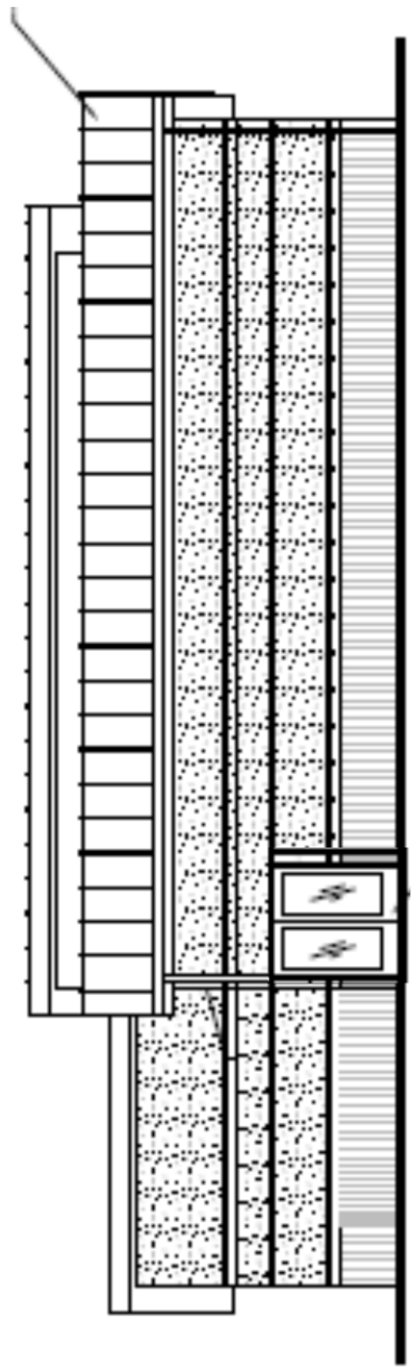
Alternative Sketch 1



Alternative Sketch 2



SOUTH ELEVATION



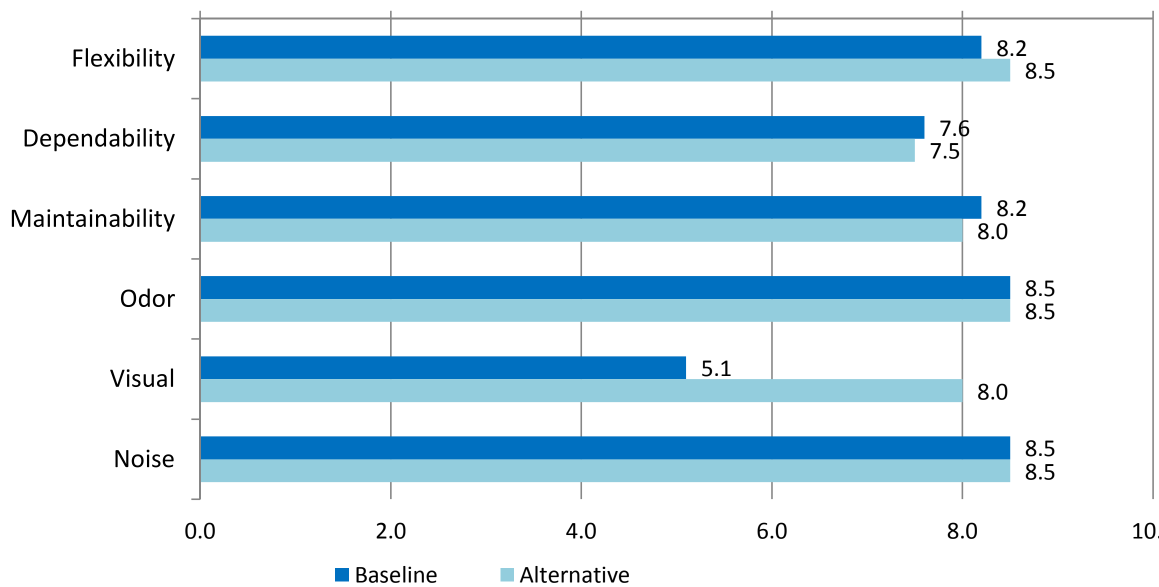
NORTH ELEVATION

Alternative No.: **B-77**

Baseline Performance Assessment

Performance Attribute	Baseline	Alternative	Rationale for Change in Performance
Flexibility	8.2	8.5	Allows gates to be locked and access controlled thru door
Dependability	7.6	7.5	Some reduction in site/worker security
Maintainability	8.2	8.0	Maintenance increase to repair broken windows
Odor	8.5	8.5	No change
Visual	5.1	8.0	Significant improvement in public exposure
Noise	8.5	8.5	No change in noise to public

Comparison of Performance



Functional Benefit Summary

	Flexibility	Dependability	Maintainability	Odor	Visual	Noise
ESTIMATED PERFORMANCE IMPACTS	▲	▼	▼	▬	▲	▬

VALUE ENGINEERING ALTERNATIVE

COOS BAY WWTP #2 IMPROVEMENTS
COOS BAY, OR

Idea No.	B-80	Idea Title	Use LED lighting throughout plant

ESTIMATED COST IMPACTS

	Capital Cost	Present Worth of O&M Cost	Total Present Worth Cost
Baseline Concept			
Alternative Concept			
Estimated Savings			DESIGN SUGGESTION

ESTIMATED PERFORMANCE IMPACTS	Flexibility	Dependability	Maintainability	Odor	Visual	Noise

Description of Baseline Concept

Standard lighting throughout the plant.

Description of Alternative Concept

Use energy saving LED lighting to provide a lower cost for energy and provide energy sustainability.

Advantages	Disadvantages
• Reduces energy cost throughout the life of the plant • Reduces heat	• Higher initial costs • Cost more to replace lamps

Discussion

Currently the City of Coos Bay has taken an active role in promoting energy management sustainability. Not only would using LED save money it is also an energy sustainability tactic. LED lighting supports sustainable design in several ways. When considering the sustainability of LEDs, the first aspect that generally springs to mind is low energy use. But there are plenty of others, including waste reduction, recyclability, the use of materials & resources and the effect on building and design practices.

ENERGY STAR qualified commercial LED lighting offers an unprecedented opportunity to save energy, maintenance and cooling costs and is a natural fit for cutting-edge renovation, new construction projects, or easy retrofits.

Qualified commercial products use at least 75% less energy and last 35 times longer than incandescent lighting. Plus, qualified LED lighting produces virtually no heat and provides optimal light color for any environment from parking lots to high-end show rooms.

Energy efficient - LED tuber lights use less than 50% of the energy that traditional fluorescent bulbs use. Not to mention, LED illumination lifespan is more than 6 times longer lasting than fluorescent lighting methods. Moreover, LED light tubes are ideally temperate which eliminates heat build-up.

Environmentally conscious - Conventional fluorescent tubes contain mercury and phosphor which present environmental and health risks. Choosing LED tube lighting is free of toxic materials and are 100% recyclable. Additionally, because of LED's unmatched durability, this greatly conserves material and production waste.

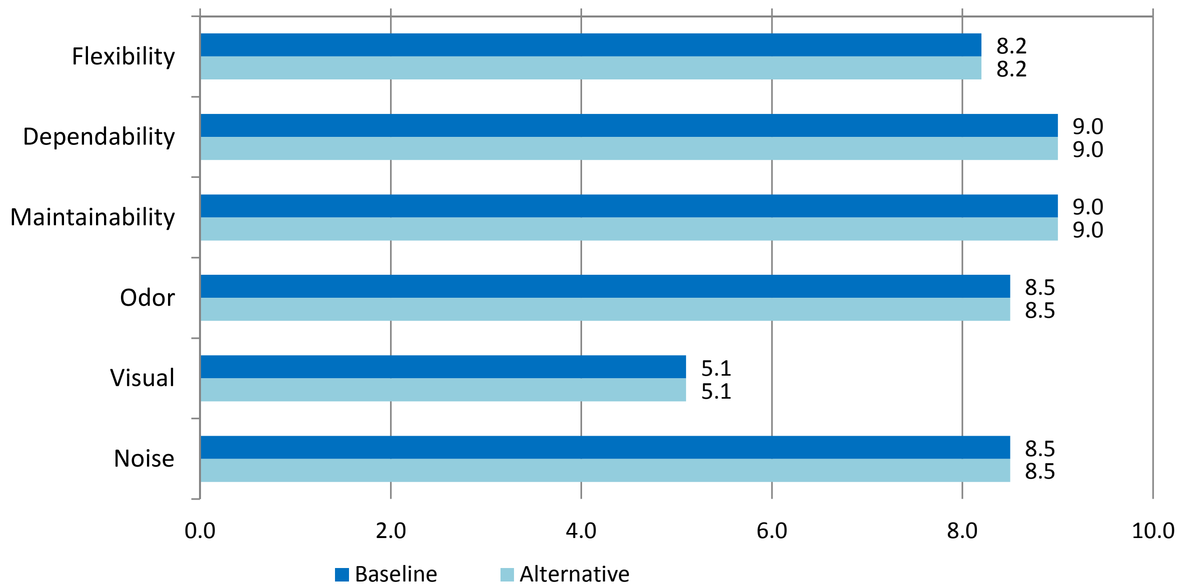
More ergonomic - Fluorescent lights require ballasts which not only add to the production cost of the lamp, but also causes an annoying buzzing noise. Fluorescent tubes also flicker and the light is most often flat and dull. Also, Fluorescent tubes cannot be recycled and therefore cause additional dumping costs. LED light tubes have superior design flexibility in which individual diodes can be controlled, resulting in dynamic lighting operation.

Alternative No.: B-80

Baseline Performance Assessment

Performance Attribute	Baseline	Alternative	Rationale for Change in Performance
Flexibility	8.2	8.2	No impact
Dependability	9.0	9.0	LED lights use 75% less energy and last 35 times longer
Maintainability	9.0	9.0	Lasts 35 times longer reducing manitenance
Odor	8.5	8.5	No impact
Visual	5.1	5.1	No impact
Noise	8.5	8.5	No impact

Comparison of Performance



Functional Benefit Summary

ESTIMATED PERFORMANCE IMPACTS	Flexibility	Dependability	Maintainability	Odor	Visual	Noise

MISCELLANEOUS (M)

VALUE ENGINEERING ALTERNATIVE

COOS BAY WWTP #2 IMPROVEMENTS
COOS BAY, OR

Idea No.	M-1	Idea Title	Shorten design & construction schedules

ESTIMATED COST IMPACTS

	Capital Cost	Present Worth of O&M Cost	Total Present Worth Cost
Baseline Concept			
Alternative Concept			
Estimated Savings			DESIGN SUGGESTION

ESTIMATED PERFORMANCE IMPACTS	Flexibility	Dependability	Maintainability	Odor	Visual	Noise
	▼	▬	▬	▬	▬	▬

Description of Baseline Concept

Currently, the City of Coos Bay's Mutual Agreement & Order (MAO) schedule requires that construction for the Wastewater Treatment Plant 2 (WWTP 2) project commence summer 2015. The plant is scheduled to be on-line Fall 2017. The City is planning on obtaining a loan through DEQ's State Revolving Fund program to fund the construction of the project. To date, the City has completed pre-design plans and as such has prepared and obtained approvals from DEQ for 15% design plans. The City is planning on commencing with Final Design in January 2014. The City has also acquired a CMGC contractor that will work with the design team during Final Design.

Description of Alternative Concept

The City would like to explore ideas that would shorten the above described schedule with respect to both design and construction.

Advantages	Disadvantages
• Less impact to adjacent neighbors • Delivers lower cost to City and the rate payers • Costs annually increase. Longer schedule will incur those annual increases (material cost escalation) • Project will not have to compete (material costs and contractors) with proposed upcoming projects (LNG and North Spit/Jordan Cove) • The degradation of existing plant will benefit from a new plant being on line sooner rather later	• Shortening the schedule may not allow time to develop an ultimate Biosolids Plan and implement it with construction of Plant 2 • Environmental processing may take longer and thus not allow the schedule to be shortened • If project includes improvements to outfall, design for improvements and environmental processing may not allow schedule to be shortened

Discussion

In order to shorten the design and construction schedule the following ideas and tasks can be implemented:

At beginning of Final Design, work with design team, CMGC, and stakeholders to determine a design schedule. This will allow all parties to understand the constraints of the schedule and opportunities to advance the schedule. Focus on the schedule can include but not be limited to environmental processing, regulatory agency review, preparation of specifications (to prepare early bid packages and procure equipment), etc.

With respect to the environmental processing, it is necessary that the design team, CMGC, and stakeholders understand the timing and the challenges, if any, so that the schedule can be adequately modified to accommodate the processing. Along with the understanding of the environmental processing, there may be an in-water work window that will also have to be incorporated into any schedule changes/modifications.

The design team, CMGC, and stakeholders should create a “constraint specification” early in the final design process so that it is understood what the impacts, if any, are to schedule prior to construction. This can include environmental, plant constraints, wet weather, lead times, etc.

Early bid packages can be prepared for certain aspects of the project as early as 60% design. With the CMGC working closely with the design team and the stakeholders, the project will be able to assess the risk and management it properly, and determine which bid packages can be released prior to 90% design. These can include but not be limited to site work, piping, etc.

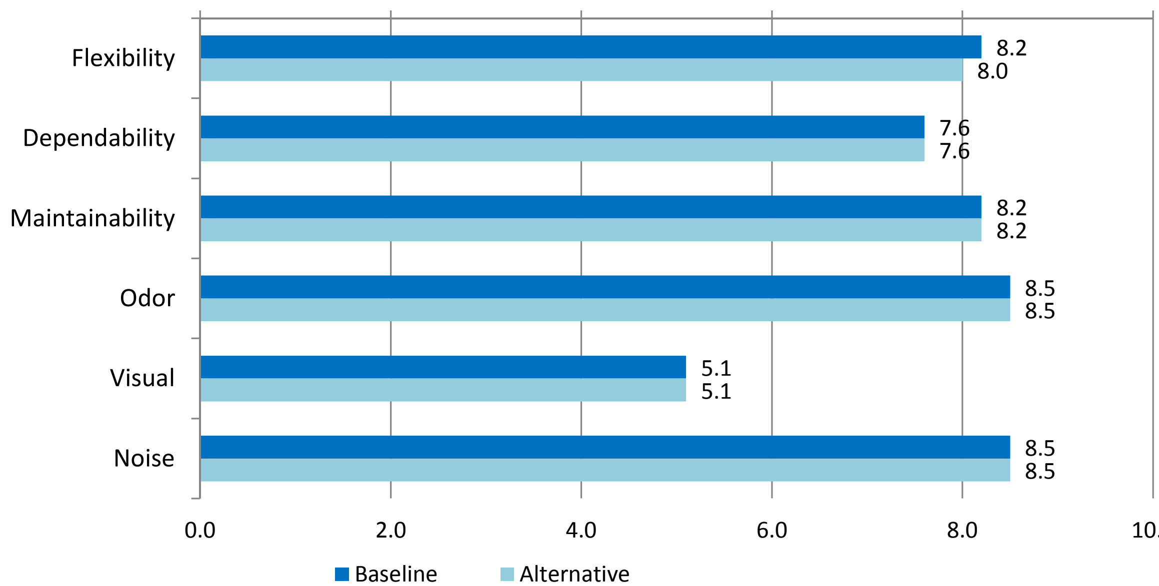
Early procurement of equipment (UV, SBR). It may be beneficial for the project to order any equipment determined to have a long lead delivered as early as possible and prior to 100% design documents to mitigate the possibility of the equipment not meeting the scheduled installation dates. This also allows time to resolve any engineering issues that come up regarding manufacturers proposed equipment prior to fabrication.

Alternative No.: M-1

Baseline Performance Assessment

Performance Attribute	Baseline	Alternative	Rationale for Change in Performance
Flexibility	8.2	8.0	With a more aggressive schedule it may limit the flexibillity
Dependability	7.6	7.6	No Change
Maintainability	8.2	8.2	No Change
Odor	8.5	8.5	No Change
Visual	5.1	5.1	No Change
Noise	8.5	8.5	No Change

Comparison of Performance



Functional Benefit Summary

	Flexibility	Dependability	Maintainability	Odor	Visual	Noise
ESTIMATED PERFORMANCE IMPACTS						

VALUE ENGINEERING ALTERNATIVE

COOS BAY WWTP #2 IMPROVEMENTS
COOS BAY, OR

Idea No.	M-2	Idea Title	Use Mini-GMP price elements to speed construction

ESTIMATED COST IMPACTS

	Capital Cost	Present Worth of O&M Cost	Total Present Worth Cost
Baseline Concept			
Alternative Concept			
Estimated Savings			DESIGN SUGGESTION

ESTIMATED PERFORMANCE IMPACTS	Flexibility	Dependability	Maintainability	Odor	Visual	Noise
	▲	▲	▲	▬	▬	▬

Description of Baseline Concept:

The current documents do not make mention of early procurement of materials

Description of Alternative Concept

This alternative deals with the use of mini-guaranteed maximum price for long lead materials and equipment in an effort to shorten the overall construction process.

Advantages	Disadvantages
• Engineer can complete design based on materials to be actually provided • Allows for critical submittals to be process and approved well in advance of construction • Allows project team to purchase materials early to reduce escalation exposure • Allows for a more accurate set of bid documents when actual equipment is incorporated • Eliminates the potential that the bidding community drives the equipment type versus the engineer or customer • Reduces RFI's and change orders because of design confidence	• Project is locked into technology at time of purchase instead of making purchase of current technology

Discussion

This alternative concept is not new to the engineer or the CM/GC, it is however new to Coos Bay. With a lack of familiarity we recommend that the CM/GC conduct a workshop for the engineer and City of Coos Bay (specifically purchasing department) to the understanding can be aligned. The core benefit of this process is to be able to purchase long lead items so that they can be made available in time for construction. Also a benefit is the engineering support by the equipment manufacturer with regards to specialized systems. Finally, by selecting a system or method early we can incorporate actual information into the bidding document which will bring lower costs and less risk to the all team members.

When left to the bidding community it is very difficult to assure that the best and most desirable equipment will be provided. This method of procurement is not to be confused as sole sourcing. The CM/GC has used this procurement practice on several public works project in Oregon, including project that were funded with state and federal loans or grants.

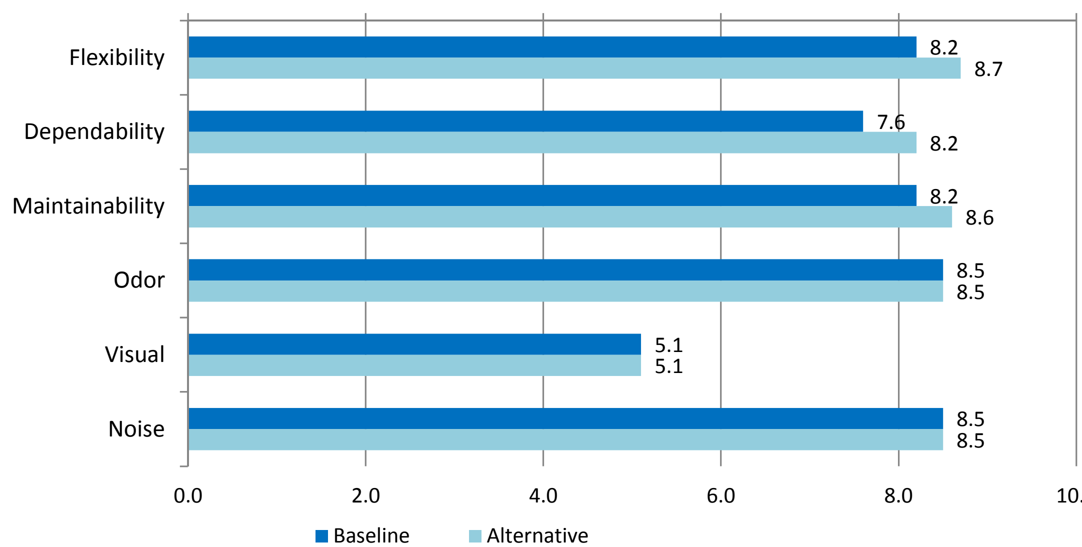
For this exercise it is very difficult to determine the overall cost savings associated with this method. However in our experience there is a reduction in RFI (request for information) and/or Change Orders. With the design being based on actual equipment we can greatly reduce the risk that the process will be dictated by the subcontractor community.

Alternative No.: M-2

Baseline Performance Assessment

Performance Attribute	Baseline	Alternative	Rationale for Change in Performance
Flexibility	8.2	8.7	Allows for creativity with regards to purchasing options.
Dependability	7.6	8.2	Allows for project team to assure that dependable materials selections are made by the team and not low bid contractor
Maintainability	8.2	8.6	Allows for maintainability to be built into process early by selecting certain elements using this procurement
Odor	8.5	8.5	No significant impact
Visual	5.1	5.1	No significant impact
Noise	8.5	8.5	No significant impact

Comparison of Performance



Functional Benefit Summary

	Flexibility	Dependability	Maintainability	Odor	Visual	Noise
ESTIMATED PERFORMANCE IMPACTS	▲	▲	▲	▬	▬	▬

VALUE ENGINEERING ALTERNATIVE

COOS BAY WWTP #2 IMPROVEMENTS
COOS BAY, OR

Idea No.	M-7	Idea Title	Include demolition cost for existing site

ESTIMATED COST IMPACTS

	Capital Cost	Present Worth of O&M Cost	Total Present Worth Cost
Baseline Concept	0	80,000	80,000
Alternative Concept	1,440,000	0	1,440,000
Estimated Savings	(1,440,000)	80,000	(1,360,000)

ESTIMATED PERFORMANCE IMPACTS	Flexibility	Dependability	Maintainability	Odor	Visual	Noise
	▲	▬	▲	▬	▲	▬

Description of Baseline Concept:

The current 30% design documents do not reference any demolition requirements for the existing plant site.

Description of Alternative Concept

This alternative concept is based on including the cost of demolishing the existing plant once the new plant is on line.

Advantages	Disadvantages
• The existing site can be repurposed now instead of maintaining the abandon site • City will not be spending money to maintain and existing site without benefit • Once demolition is complete the City could option to sell property and potentially show a net gain • Will eliminate any potential vandalism	• May constrain the BioSoilds options currently under review • Eliminates potential treatment options

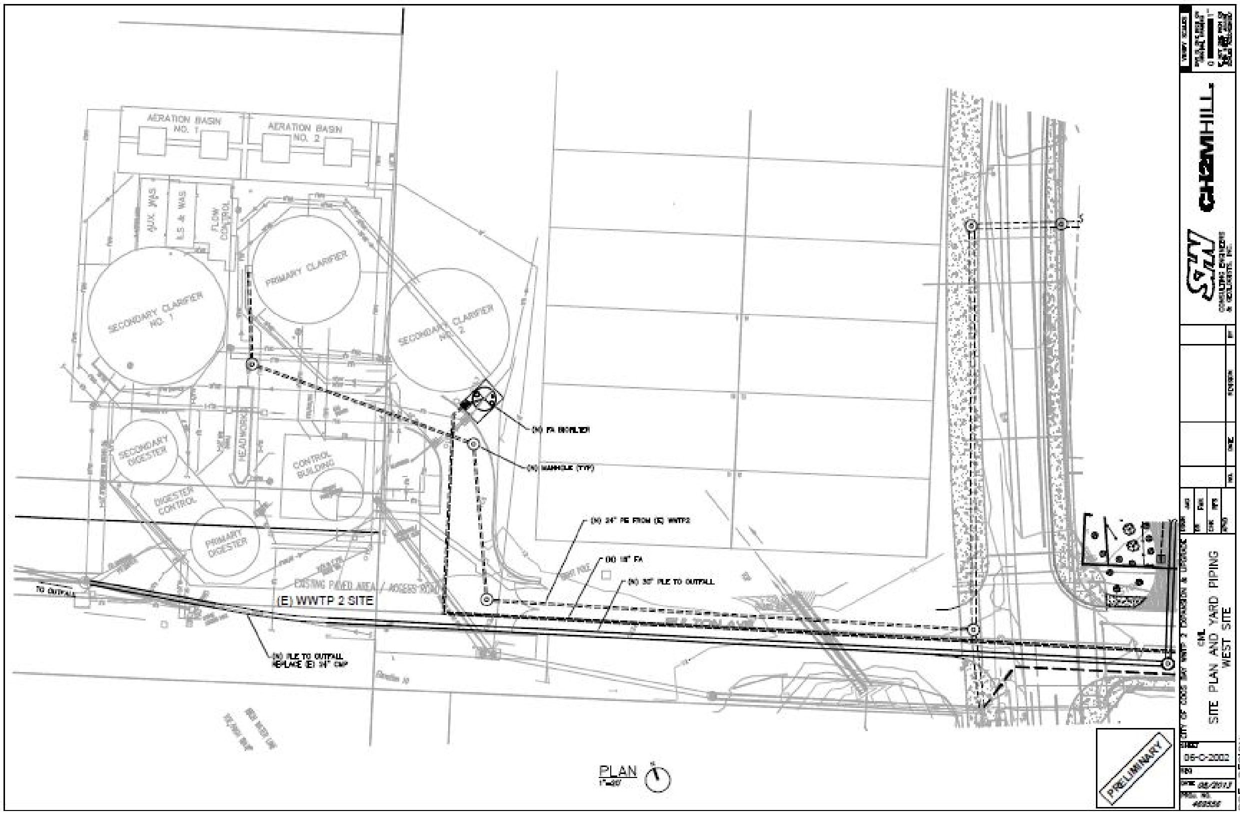
Discussion

The purpose of this alternative is to determine a budget cost for the demolition of the existing plant once the new WWTP is started up and commissioned. There are some challenges when determining the cost associated with the demolition of the existing plant. The direct costs of demolition of the existing plant are definable by the existing documents. What is lacking is any potential hazard abatement required during this demo. The existing plant was constructed prior to determination of hazardous materials. Materials such as lead based paint; asbestos, along with electrical components and interior finish which may present a remediation challenge. For this exercise we will include the cost for a hazardous material study and using prudent business practices will determine an allowance to mitigate hazardous materials.

Currently the City of Coos Bay is in the process of determining a long term plan for BioSoilds handling. This alternative concept does not take into account leaving any process or administrative structure once demolition is complete.

We will include cost for the restoration of the existing site with native grasses and low maintenance ground cover.

Baseline Sketch



Alternative Sketch

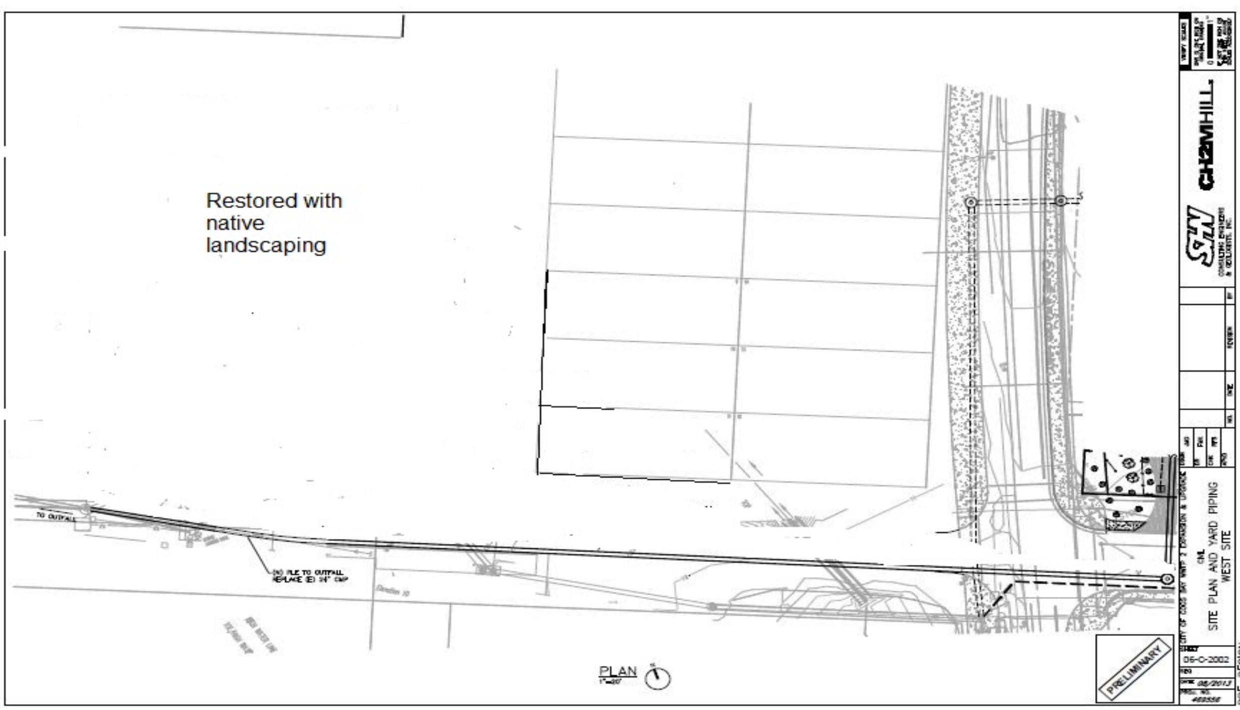


FIGURE 1

Calculations

Demo the following structures

Existing Headworks

New/Current Headworks

Primary Clarifier

Secondary Clarifiers

Intermediate Pump Station

Aeration Basins

Digester Control Building

Digesters

Control Building

Waste Gas Burner

Site paving/storm drainage

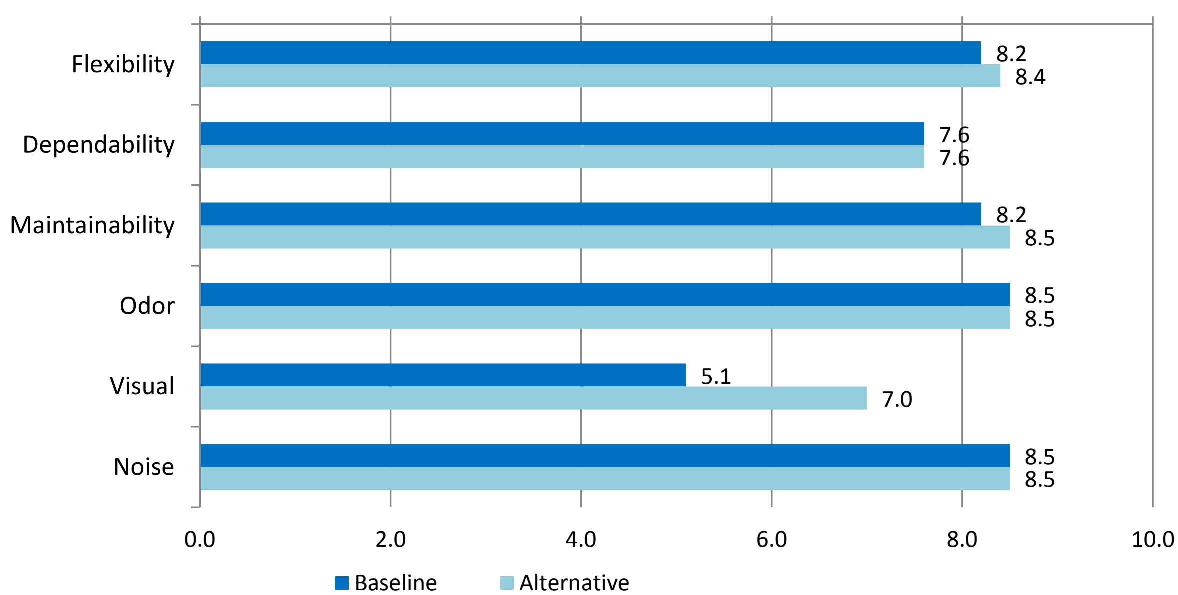
Existing utilities no greater than 5 feet in depth

Alternative No.: M-7

Baseline Performance Assessment

Performance Attribute	Baseline	Alternative	Rationale for Change in Performance
Flexibility	8.2	8.4	Allows for flexibility for repurposing site when needed
Dependability	7.6	7.6	Not applicable
Maintainability	8.2	8.5	Reduces maintenance costs and impact to the City
Odor	8.5	8.5	No change
Visual	5.1	7.0	This greatly enhances the visual aspects of the overall project and could be perceived positively by the public
Noise	8.5	8.5	Eliminates any noise generated by the existing plant by removing all sources

Comparison of Performance



Functional Benefit Summary

ESTIMATED PERFORMANCE IMPACTS	Flexibility	Dependability	Maintainability	Odor	Visual	Noise

Construction Cost Estimate

Alternative No.: M-7

Item	Unit of Meas.	Unit Cost	Baseline Concept Quantity	Baseline Concept Total	Alternative Concept Quantity	Alternative Concept Total
Include cost to demo existing plant				$ -		$ -
DIRECT CISTS				$ -		$ -
Demo existing headworks structure	TN	$ 55	0	$ -	324	$ 17,824
Demo current headworks structure	TN	$ 55	0	$ -	1,304	$ 71,704
Demo Primary Clarifier	TN	$ 55	0	$ -	514	$ 28,265
Demo Secondary Clarifier	TN	$ 55	0	$ -	742	$ 40,820
Demo Aeration Basin	TN	$ 55	0	$ -	350	$ 19,250
Demo Intermediate Pump Station	TN	$ 55	0	$ -	350	$ 19,250
Demo Digester Control Building	TN	$ 55	0	$ -	593	$ 32,593
Demo Digesters	TN	$ 55	0	$ -	2,270	$ 124,823
Demo Waste Gas Burner	TN	$ 55	0	$ -	10	$ 550
Demo paving & storm drainage	SY	$ 0.67	0	$ -	11,092	$ 7,431
Demo all utilities buried 5 feet or less.	LF	$ 10.00	0	$ -	6,000	$ 60,000
Fill demolished structure foot print with clean fill material	TN	$ 30.00	0	$ -	9,684	$ 290,518
Final grade site	SY	$ 0.22		$ -	33,611	$ 7,394
Place top soil	CY	$ 10.00		$ -	2,241	$ 22,407
Plant Native Landscaping (Allowance)	LS	$ 25,000		$ -	1	$ 25,000
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
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				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
Subtotal				$ -		$ 767,828
Markup	87.5	%		$ -		$ 671,849
TOTALS				**$ 0**		**$ 1,439,677**
NET SAVINGS						**$ (1,439,677)**
TOTALS ROUNDED				**$ 0**		**$ 1,440,000**
NET SAVINGS ROUNDED						**$ (1,440,000)**

Life Cycle Cost Worksheet

Alternative No: **M-7**

Life Cycle Period: 20 years	Net Discount Rate: 4.00%				Baseline Concept	Alternative Concept
A.	**Initial Cost**				$ 0	$ 1,440,000
				Initial Cost Savings		$ (1,440,000)
B.	**Annual Costs**					
	1. Maintenance (8 hours per week at 26 weeks per year)				$ 5,876	$ -
	2. Operating				$ -	$ -
	3. Energy				$ -	$ -
	4.					
	5.					
	6.					
				Total Annual Costs	$ 5,876	$ 0
				Present Worth Factor	13.5903	13.5903
				Present Worth of Annual Costs	$ 79,857	$ 0

C.		**Replacement Costs**	**Year**	**Amount**	**PW Factor P/F**	**Present Worth**	**Present Worth**
ORIG	ALT	**< Put "x" in appropriate box (original or alternate design)**					
		1.			1.0000	$ -	$ -
		2.			1.0000	$ -	$ -
		3.			1.0000	$ -	$ -
		4.			1.0000	$ -	$ -
		5.			1.0000	$ -	$ -
		6.			1.0000	$ -	$ -
		7.			1.0000	$ -	$ -
		Present Worth of Replacement Costs				$ 0	$ 0

		Baseline Concept	Alternative Concept
D.	**Total Annual Costs and Replacement Costs (B + C)**	$ 79,857	$ 0
E.	***Total Annual Costs and Replacement Costs (B + C) - ROUNDED***	**$ 79,900**	**$0**
	Annual Costs and Replacement Savings - ROUNDED		**$ 79,900**
F.	**Total Present Worth Cost (A + E)**	$ 79,857	$ 1,440,000
	Total Life Cycle Savings		$ (1,360,143)
G.	***TOTAL PRESENT WORTH COST (A + E) - ROUNDED***	**$ 80,000**	**$ 1,440,000**
H.	***TOTAL LIFE CYCLE SAVINGS - ROUNDED***		**$ (1,360,000)**

VALUE ENGINEERING ALTERNATIVE

COOS BAY WWTP #2 IMPROVEMENTS
COOS BAY, OR

Idea No.	M-11	Idea Title	Re-roof existing operation /pump station building

ESTIMATED COST IMPACTS

	Capital Cost	Present Worth of O&M Cost	Total Present Worth Cost
Baseline Concept	0	--	0
Alternative Concept	41,000	--	41,000
Estimated Savings	(41,000)	--	(41,000)

ESTIMATED PERFORMANCE IMPACTS	Flexibility	Dependability	Maintainability	Odor	Visual	Noise
	▲	▲	▲	▬	▬	▬

Description of Baseline Concept

Currently the existing Operation/Pump Station Building at Plant 2 has an inadequate roof. The roof is flat and is subject to leaks during storm events.

Description of Alternative Concept

The current plan for the proposed plant incorporates an interim Biosolids plan. This interim plan will involves keeping the existing plant on-line for an additional 2-5 years. That means that the existing plant has the potential to remain in operations through the year 2022. This concept explores re-roofing the existing operations/pump station building to protect the equipment and electronics that are housed inside.

Advantages	Disadvantages
• Protect the existing equipment from water damage • Extend the life of the roof • Protect against a catastrophic failure • Manage a safety issue	• Upon implementation of the ultimate Biosolids plan, this building may not be required or utilized • Added cost for a building that is not anticipated to be utilized after the implementation of the ultimate Biosolids plan • Additional cost

Discussion

Operation has identified three major leaks; however it is likely that other leaks exist. Due to the age of the roof, the length of time that the leaks have been occurring, and the fact that in all likelihood the damage is extensive and more leaks exist the recommendation would be to replace the entire roof area. In order to re-roof the flat roof it is recommended that all of the existing material be stripped. Additionally, replace any failing flashing and any decking that is not solid and smooth. A rubber membrane is also recommended.

Additional Considerations

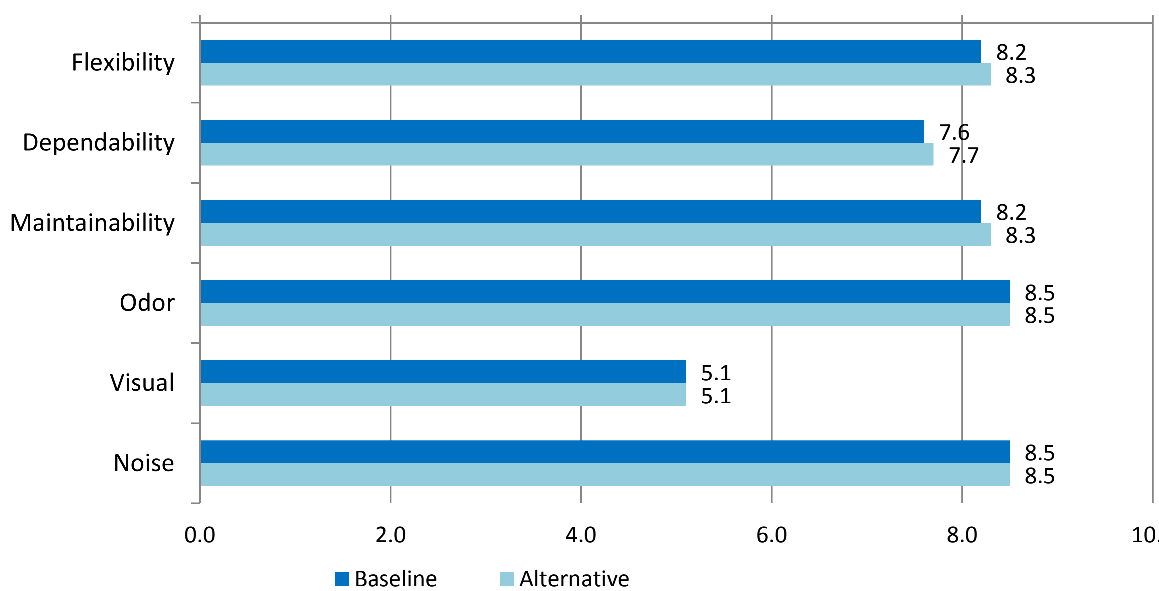
If this idea does not become a part of the scope of work associated with this project, it is recommended that operations and maintenance (OMI-CH2M HILL) adds this repair to the O&M CIP list that they provide to City Staff annually.

Alternative No.: M-11

Baseline Performance Assessment

Performance Attribute	Baseline	Alternative	Rationale for Change in Performance
Flexibility	8.2	8.3	By replacing the roof, it will protect the equipment and electronics that are housed in the existing control building.
Dependability	7.6	7.7	By replacing the roof, it will protect the equipment and electronics that are housed in the existing control building.
Maintainability	8.2	8.3	No maintenace will be required, so it will be easier during storm events.
Odor	8.5	8.5	No change
Visual	5.1	5.1	No change
Noise	8.5	8.5	No change

Comparison of Performance



Functional Benefit Summary

	Flexibility	Dependability	Maintainability	Odor	Visual	Noise
ESTIMATED PERFORMANCE IMPACTS						

Construction Cost Estimate

Alternative No.: M-11

Item	Unit of Meas.	Unit Cost	Baseline Concept Quantity	Baseline Concept Total	Alternative Concept Quantity	Alternative Concept Total
				$ -		$ -
Mopped Roof Removal (demo)	SF	$ 1.80		$ -	1,459	$ 2,626
Remove Roof Insulation	SF	$ 0.35			1,459	$ 511
Remove Roof Sheathing	SF	$ 0.48			1,459	$ 700
Replace Roof Sheathing	SF	$ 1.21			1,459	$ 1,765
New 1-1/2" Rigid Insulation	SF	$ 0.89			1,459	$ 1,299
Elastomeric Membrane Roof (EPDM)	SF	$ 4.60		$ -	1,459	$ 6,711
Replace flashing	SF	$ 0.50		$ -	1,459	$ 730
Remove Awnings	SF	$ 2.00			1,103	$ 2,206
Replace Awnings	SF	$ 5.00			1,103	$ 5,515
						$ -
						$ -
				$ -		$ -
				$ -		$ -
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				$ -		$ -
				$ -		$ -
				$ -		$ -
Subtotal				$ -		$ 22,063
Markup	87.5	%		$ -		$ 19,305
TOTALS				**$ 0**		**$ 41,368**
NET SAVINGS						**$ (41,368)**
TOTALS ROUNDED				**$ 0**		**$ 41,000**
NET SAVINGS ROUNDED						**$ (41,000)**

PROCESS (P)

VALUE ENGINEERING ALTERNATIVE

COOS BAY WWTP #2 IMPROVEMENTS
COOS BAY, OR

Idea No.	P-1	Idea Title	Use existing secondary clarifiers for flow equalization and replace propose EQ basins

ESTIMATED COST IMPACTS

	Capital Cost	Present Worth of O&M Cost	Total Present Worth Cost
Baseline Concept	1,150,000	149,000	1,299,000
Alternative Concept	1,260,000	343,000	1,603,000
Estimated Savings	(110,000)	(194,000)	(304,000)

ESTIMATED PERFORMANCE IMPACTS	Flexibility	Dependability	Maintainability	Odor	Visual	Noise
	▲	▼	▼	▬	▲	▬

Description of Baseline Concept

The SBR process requires flow equalization to minimize downstream process sizing (UV and outfall) and the proposed EQ basins are shown as part of the SBR basins.

Description of Alternative Concept

The proposed alternative is to use the existing secondary basins for flow equalization. This would eliminate the proposed EQ basins on the new site. This alternative would require relocating the UV disinfection process to the existing treatment plant site.

Advantages	Disadvantages
• Uses existing concrete basins • Overcomes the flow limitations of the existing outfall • Eliminates new concrete basins • Allows SBR and Headworks to be lower • Lower influent pump station energy costs	• Leaves active processes at the existing plant site • Adds a pump station • Operational challenges with coordination between old and new plant

Discussion

The proposed EQ basins have a working volume of 215,000 gallons and a working depth of 8 feet. Secondary clarifier No. 1 has a volume of ~214,000 gallons and a side wall depth of 11.5 feet. Secondary clarifier No. 2 (175,000) gallons would be available for future expansion. The existing EQ basin is designed to operate between elevations 19.0 and 27.0. The secondary clarifiers operating levels would be from elevation 7.0 to 18.5. This difference in elevations would require a pump station to lift the water to an elevation that allows the flow to be discharged through the UV process and the outfall. The require lift would be to approximately elevation 19.3. The existing intermediate pump station would be fitting with new pumps to perform this task. The disinfection process could be constructed as an in-vessel UV reactor that is a potential cost savings

This alternative attempts to take advantage of existing assets (concrete tanks) that can provide long-term solutions to the needs of the new treatment process. The disadvantage of the alternative is that the existing secondary tanks at located below the hydraulic grade that would allow for gravity flow through the outfall. This alternative will require pumping to use the existing outfall.

Eliminating the proposed EQ storage basins eliminates 3,600 square feet of slab area, 272 linear feet of footings, and 272 linear feet of concrete walls (23 feet tall) at the SBR. This eliminates approximately 960 cubic yards of new concrete (slab – 540 CY, footings – 120 CY, Walls – 300 CY).

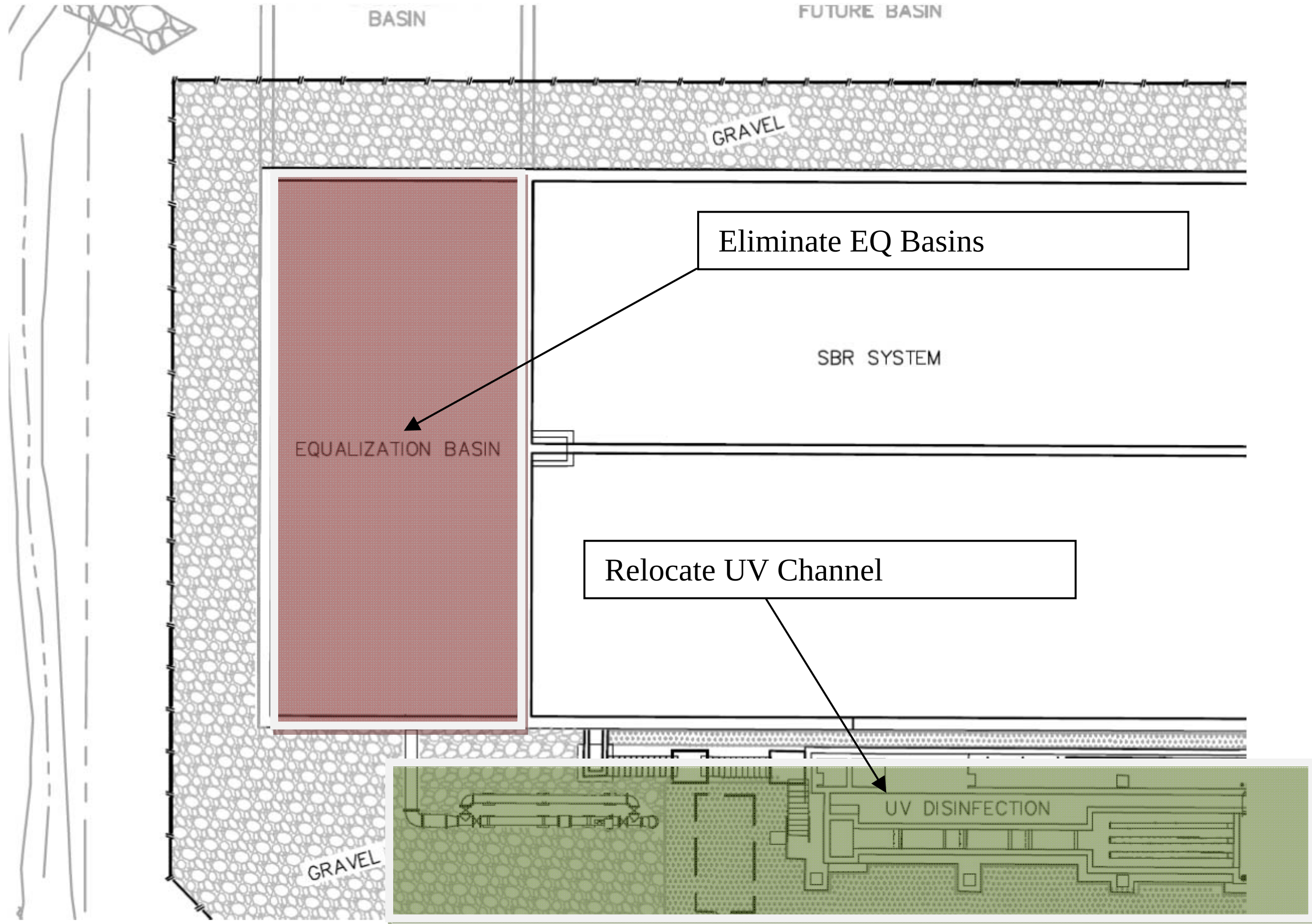
Reusing the secondary clarifier will require the removal of the mechanical equipment and some new piping to connect the clarifiers to the discharge pipeline from the new plant and some discharge piping to connect the intermediate pump station to the relocated UV channel. The clarifier would need to be covered to prevent algae growth in the basin.

The relocation of the EQ storage to the existing plant site will also require the relocation of the UV process. The UV channel as designed could be moved to the existing site but the ground elevation at the new site is at approximately 14 feet. The elevation of the top of the concrete channel needs to be at a minimum of 22 feet. The ground elevation at the proposed elevation of the UV channel is 15 feet. The UV channel could be accommodated at the existing site with minimal changes.

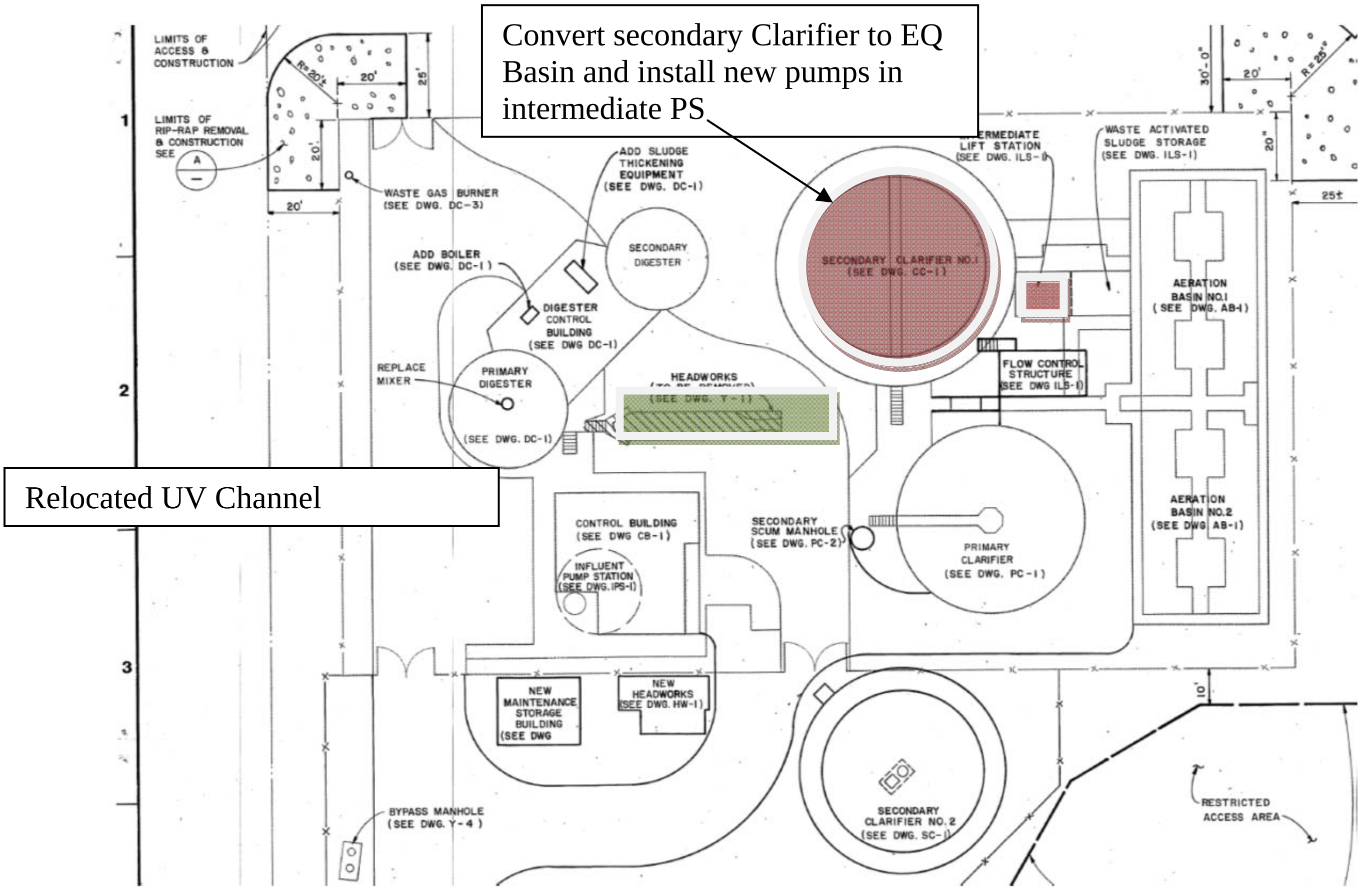
This alternative also allows the design to incorporate a lower elevation for the SBR and Headworks at the new plant site. This reduces construction costs and reduces the visual impacts of the headworks and SBR. Since the alternative equalization basin is approximately 12 feet lower than the proposed equalization basin the hydraulic profile of the headworks and SBR can be lowered at the new plant site. The geotechnical report recommends remove unsuitable fill material to approximately elevation 9.0 feet at the new site and then backfilling with 6 feet of imported fill material to raise the SBR and headworks to the proper elevation (elevation 15.0 feet) for the proposed hydraulic grade line. If the alternate equalization basins are used it will not be necessary to bring in the 6 feet of structural fill material and the bottom SBR can be at elevation 9.0 feet. The top elevation of the headworks would be lowered from approximately elevation 63.0 feet to elevation 57.0 feet. The savings will include the structural fill for backfilling the site to a higher elevation.

Once the headworks and SBR are constructed at a lower elevation it will reduce the size of the pumps in the influent pump station. The influent pumps are designed to pump against 53 feet of total dynamic head at peak flow conditions. The TDH would be reduced to 47 feet in peak flow conditions. This change may impact pump sizing and will reduce energy use in the influent pump station by approximately 20% annually.

Baseline Sketch



Alternative Sketch



Calculations

Concrete

Slab 36 x 100 x 2 = 7,200 cf = 270 CY

Walls (36+36+100) X 23 X 1.25 = 4,950 CF = 200 CY

Footings (36+36+100) X 4 X 3 = 2,064 CF = 80 CY

Clarifier Cover

56^2*3.14/4= 2,500 SF

Structural Fill

250' x 120' x 6'= 180,000 CF = 6,700 CY

Pump Energy Use

Base

2/3 of year average 600 gpm x 42'/(39.6 x .55%) = 12.0 HP

1/3 year average 1,200 gpm x 52/(39.6 x 55%) = 30 HP

243 days x 24 hrs/day x 12 HP x .76 kW/HP = 54,000 kWh

122 days x 24 hrs/day x 30 HP x .76 kW/HP = 67,000 kWh

121,000 kWh x $.09/kWh = $11,000

Alternative

2/3 of year average 600 gpm x 36'/(39.6 x .55%) = 10 HP

1/3 year average 1,200 gpm x 46/(39.6 x 55%) = 26 HP

243 days x 24 hrs/day x 10 HP x .76 kW/HP = 45,000 kWh

122 days x 24 hrs/day x 26 HP x .76 kW/HP = 59,000 kWh

104,000 kWh x $.09/kWh = $9,5000

Assume Intermediate PS cost to run is $5,000/yr

SITE (S)

VALUE ENGINEERING ALTERNATIVE

COOS BAY WWTP #2 IMPROVEMENTS
COOS BAY, OR

Idea No.	S-1	Idea Title	Preserve salvageable evergreens at southeast corner

ESTIMATED COST IMPACTS

	Capital Cost	Present Worth of O&M Cost	Total Present Worth Cost
Baseline Concept			
Alternative Concept			
Estimated Savings			DESIGN SUGGESTION

ESTIMATED PERFORMANCE IMPACTS	Flexibility	Dependability	Maintainability	Odor	Visual	Noise
	−	−	−	−	▲	▲

Description of Baseline Concept

The current site plan does not address whether the evergreens at the southeast corner of the site are to be preserved.

Description of Alternative Concept

Define the evergreens on drawings as trees to be preserved and protected.

Advantages	Disadvantages
• Reduces the impact on the neighborhood • Complies with a citizen request	• None noted at this time

Discussion

The evergreens on the southeast corner of the site are the only evergreens of any size on the site. Preservation of these trees will maintain at least a small part of the aesthetic quality of the Pacific Northwest forest, and will reduce the visual impact on the neighborhood slightly. At this time, there is insufficient detail in the design to determine if this will be costly, or even possible. However, if it can reasonably be done, it will convey to the surrounding community an indication of the City's sensitivity to the impact of the project on the neighborhood, and will reduce the view impact of the new construction on the homes to the southeast of the site. The photo, extracted from Google Earth shows the trees in question.


S Empire Blvd
Evergreens to be preserved
Fulton Ave
© 2013 Google

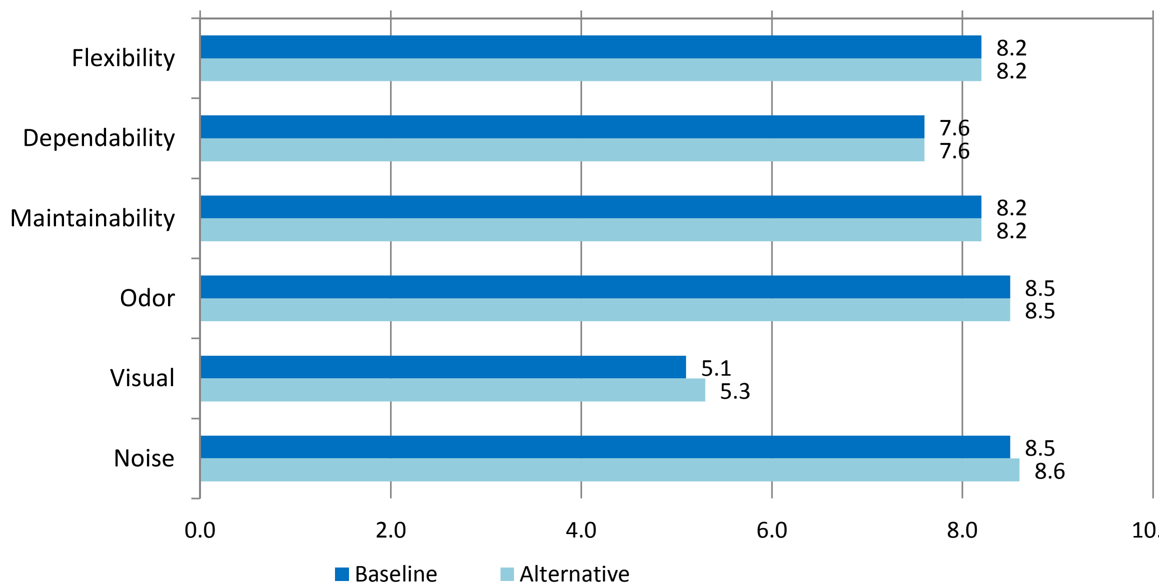
Performance

Alternative No.: S-1

Baseline Performance Assessment

Performance Attribute	Baseline	Alternative	Rationale for Change in Performance
Flexibility	8.2	8.2	No Change
Dependability	7.6	7.6	No Change
Maintainability	8.2	8.2	No Change
Odor	8.5	8.5	No Change
Visual	5.1	5.3	Will reduce the amount of change in the view corridor from the southeast.
Noise	8.5	8.6	Possibly slight noise attenuation

Comparison of Performance



Functional Benefit Summary

ESTIMATED PERFORMANCE IMPACTS	Flexibility	Dependability	Maintainability	Odor	Visual	Noise

VALUE ENGINEERING ALTERNATIVE

COOS BAY WWTP #2 IMPROVEMENTS
COOS BAY, OR

Idea No.	S-8	Idea Title	Use plastic pipe underground

ESTIMATED COST IMPACTS

	Capital Cost	Present Worth of O&M Cost	Total Present Worth Cost
Baseline Concept			
Alternative Concept			
Estimated Savings			DESIGN SUGGESTION

ESTIMATED PERFORMANCE IMPACTS	Flexibility	Dependability	Maintainability	Odor	Visual	Noise
	▲	▲	▲	▬	▬	▬

Description of Baseline Concept

To use carbon steel pipe underground.

Description of Alternative Concept

Use plastic pipe for buried pipe lines. Either PVC (Polyvinyl Chloride) or HDPE (High density polyethylene).

Advantages	Disadvantages
• Simplifies installation. • Proven to withstand wear • Corrosion is less	• PVC can break when hit with enough force

Discussion

High density polyethylene (HDPE) has been used for municipal and industrial water applications for almost 50 years. HDPE's heat-fused joints create a leak free, self restraint, monolithic pipe structure that allows the pipe to be pulled from one area to another with minimum disruption to traffic or the environment; the fused joint will also eliminate infiltration into the pipe and exfiltration into the environment. HDPE has other benefits which include chemical, abrasion, fatigue, seismic and corrosion resistance.

HDPE has been used in drinking water pipe applications for almost 50 years and has been gaining approval and growth in municipalities ever since. HDPE is specified and/or approved in AWWA C901, AWWA C906, NSF 14, NSF 16 and ASTM D3035 HDPE has been is use for sewer pipe applications for more than 30 years. Independent testing of HDPE in sewer service for 25 years showed no significant changes in the material's physical or chemical properties.
Strong, durable, light-weight and flexible, these piping systems require significantly less energy to fabricate, transport and install than metal or concrete alternatives. With superior resistance to corrosion and abrasion, plastic piping systems also supply long service life, excellent joint performance and offer leak free protection-all adding up to exceptional value.
HDPE has been\is use for sewer pipe applications for more than 30 years. Independent testing of HDPE in sewer service for 25 years showed no significant changes in the material's physical or chemical properties.

Baseline Sketch

HDPE has been is use for sewer pipe applications for more than 30 years. Independent testing of HDPE in sewer service for 25 years showed no significant changes in the material's physical or chemical properties

Alternative Sketch

Table A
Allowances for Momentary Surge Pressures Above PR or PC for Pipes Made From PE4710 and PE3710 Materials[1].

Pipe Standard Diameter Ratio (SDR)	Standard Static Pressure Rating (PR) or, Standard Pressure Class (PC) for water @ 73°F, psig	Standard Allowance for Momentary Surge Pressure Above the Pipe's PR or PC			
		Allowance for Recurring Surge		Allowance for Occasional Surge	
		Allowable Surge Pressure, psig	Resultant Allowable Sudden Change in Velocity, fps	Allowable Surge Pressure, psig	Resultant Allowable Sudden Change in Velocity, fps
32.5	63	32	4.0	63	8.0
26	80	40	4.5	80	9.0
21	100	50	5.0	100	10.0
17	125	63	5.6	125	11.2
13.5	160	80	6.2	160	12.4
11	200	100	7.0	200	14.0
9	250	125	7.7	250	15.4
7.3	320	160	8.7	320	17.4

1. AWWA C906-07 limits the maximum Pressure Class of PE pipe to the values shown in Table B. At the time of this printing C906 is being revised to allow PC values in Table A to be used for PE3710 and PE4710 materials.

Check the latest version of C906

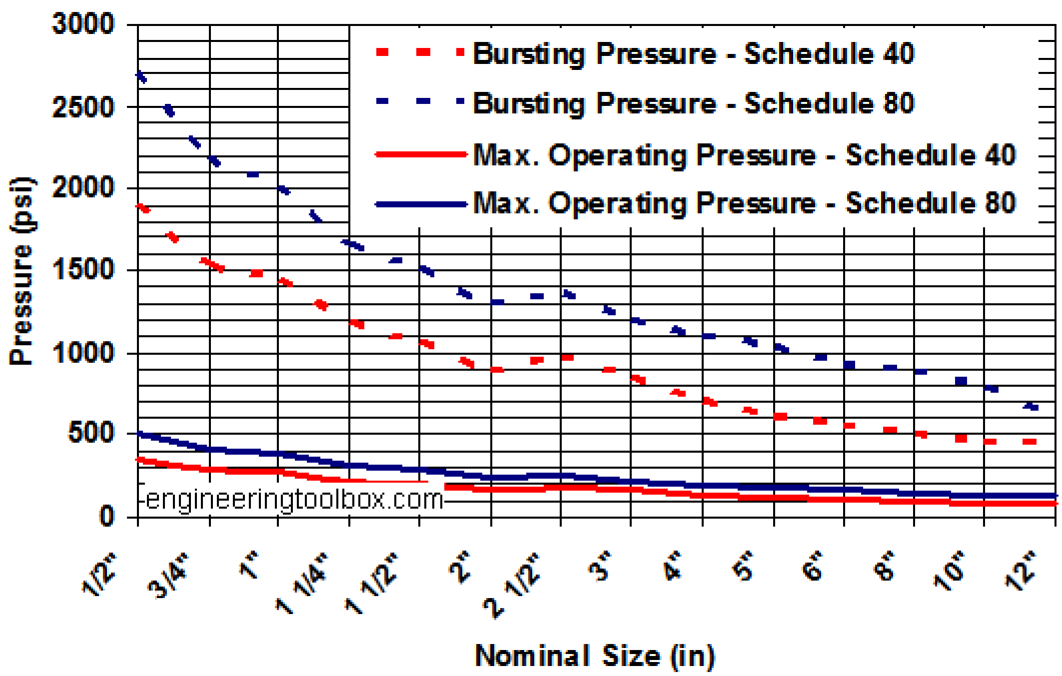
Table B
Allowances for Momentary Surge Pressures Above PR or PC for Pipes Made from PE 2708, PE3408, PE3608, PE3708 and PE4708 Materials.

Pipe Standard Diameter Ratio (SDR)	Standard Static Pressure Rating (PR) or, Standard Pressure Class (PC) for water @ 73°F, psig	Standard Allowance for Momentary Surge Pressure Above the Pipe's PR or PC			
		Allowance for Recurring Surge		Allowance for Occasional Surge	
		Allowable Surge Pressure, psig	Resultant Allowable Sudden Change in Velocity, fps	Allowable Surge Pressure, psig	Resultant Allowable Sudden Change in Velocity, fps
32.5	50	25	3.1	50	6.2
26	63	32	3.6	63	7.2
21	80	40	4.0	80	8.0
17	100	50	4.4	100	8.8
13.5	125	63	4.9	125	9.8
11	160	80	5.6	160	11.2
9	200	100	6.2	200	12.4

7.3	250	125	6.8	250	13.6

Maximum operating and required burst pressure of PVC - Polyvinyl Chloride - pipe fittings

Maximum operating and required minimum bursting pressures at *73°F (23°C)* for PVC pipe fittings according ASTM D1785 "Standard Specification for Poly Vinyl Chloride (*PVC*) Plastic Pipes Schedules 40 and 80 are indicated in the diagram and table below:



PVC				
Nominal Pipe Size *(inches)*	Required Minimum Burst Pressure *(psi)*		Maximum Operating Pressure *(psi)*	
	Schedule 40 1)	Schedule 80 2)	Schedule 40	Schedule 80
1/2	1910	2720	358	509

PVC				
Nominal Pipe Size *(inches)*	Required Minimum Burst Pressure *(psi)*		Maximum Operating Pressure *(psi)*	
	Schedule 40[1)]	Schedule 80[2)]	Schedule 40	Schedule 80
3/4	1540	2200	289	413
1	1440	2020	270	378
1 1/4	1180	1660	221	312
1 1/2	1060	1510	198	282
2	890	1290	166	243
2 1/2	870	1360	182	255
3	840	1200	158	225
4	710	1110	133	194
5	620	1040	117	173
6	560	930	106	167
8	500	890	93	148
10	450	790	84	140

PVC				
Nominal Pipe Size *(inches)*	Required Minimum Burst Pressure *(psi)*		Maximum Operating Pressure *(psi)*	
	Schedule 40[1)]	Schedule 80[2)]	Schedule 40	Schedule 80
12	420	600	79	137

1. ASTM D2466 - 06 Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40
2. ASTM D2467-04e1 Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80

- *1 psi (lb/in^2) = 6,894.8 Pa (N/m^2)*

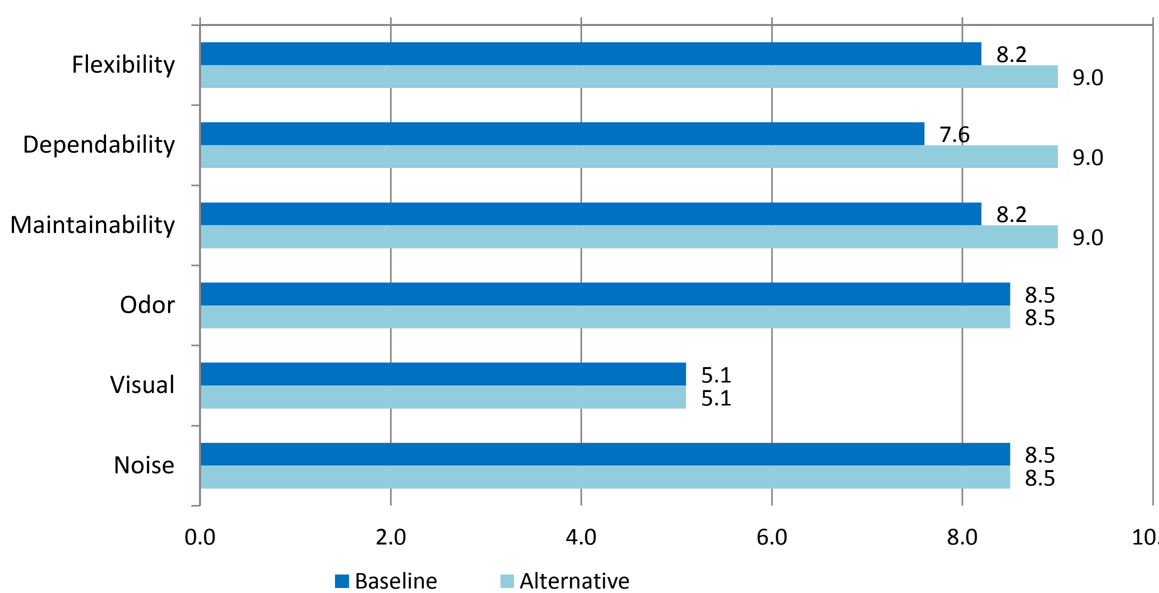
Note! The maximum operating pressures derates with temperature. At the maximum operating temperature for PVC - *140^{o}F (60^{o}C)* - the strength is derated to approximately *20%* of the strength at *73^{o}F (23^{o}C)*.

Alternative No.: S-8

Baseline Performance Assessment

Performance Attribute	Baseline	Alternative	Rationale for Change in Performance
Flexibility	8.2	9.0	Once the plant buld is complete, the building can be put to another purpose.
Dependability	7.6	9.0	Roof has to be replace in order to keep water out of electrical panels
Maintainability	8.2	9.0	Staff will be able to provide maintence on roof equipment without taking precatuions to keep from falling through.
Odor	8.5	8.5	No change
Visual	5.1	5.1	No change
Noise	8.5	8.5	No change

Comparison of Performance



Functional Benefit Summary

	Flexibility	Dependability	Maintainability	Odor	Visual	Noise
ESTIMATED PERFORMANCE IMPACTS	▲	▲	▲	▬	▬	▬

VALUE ENGINEERING ALTERNATIVE

COOS BAY WWTP #2 IMPROVEMENTS
COOS BAY, OR

Idea No.	S-19A	Idea Title	Construct sewer main on Marple for residents

ESTIMATED COST IMPACTS

	Capital Cost	Present Worth of O&M Cost	Total Present Worth Cost
Baseline Concept	--	--	--
Alternative Concept	51,000	--	51,000
Estimated Savings	(51,000)	--	(51,000)

ESTIMATED PERFORMANCE IMPACTS	Flexibility	Dependability	Maintainability	Odor	Visual	Noise

Description of Baseline Concept

Currently neighboring homes to the upcoming Wastewater Treatment Plant 2 (WWTP 2) project do not have access to public sewer and are served by septic tanks. These homes are old and at some point will need to replace the septic tank.

Description of Alternative Concept

Explore the feasibility of installing a gravity line along the portion of S. Marple Street adjacent to the project.

Advantages	Disadvantages
• By installing a gravity sewer line, it may help with neighbor relations • Expand users to the system • Provide owners with a choice when their septic system fails	• Additional Cost

Discussion

The City conducted a townhall meeting in Empire to educate the adjacent neighbors about the upcoming Wastewater Treatement Plant 2 (WWTP 2) project. The meeting was conducted summer 2012 and was attended by several of the neighbors, council member (Counselor Groth), and the press (The World). During the meeting the resident of 629 S. Marple Street requested that the proposed WWTP2 project incorporate into the scope of work the construction of a sewer line along the portion of Marple adjacent to the project. Currently, the City's Municipal Code requires the following:

13.15.210 Private wastewater disposal.

(3) When a collection line or service lateral becomes available within 300 feet of a property served by a private sewage disposal system, the user shall construct a private lateral to connect the property to the wastewater system, and any septic tanks, cesspools, or other private sewage disposal system shall, at the owner's sole expense, be abandoned in accordance with state law. [Ord. 331 § 3, 2003].

When the septic tanks fail for these homeowners they will be required to connect to the public system. This will most likely be a significant expense for these individual homeowners. By installing a gravity line along this segment it will provide the existing 4 homes with access to public sewer along with an undeveloped property (between 661 and 629).

Option A:

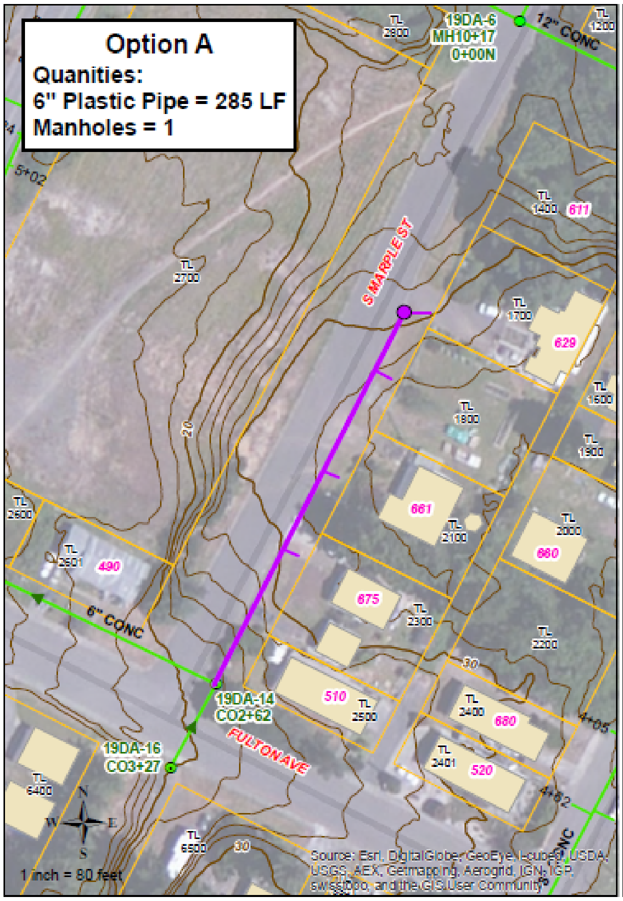
There is an exhibiting 6 inch concrete gravity sewer line along Fulton between Empire Blvd and S. Marple Street. However that line is shallow (exact depths not known at this time). A 6 inch gravity line can be installed within the easterly portion of the right of way and out of the traveled lane (to reduce costs). The line can be shallow (minimum 2 foot depth) and tie into the existing manhole located at the north east corner of the Fulton and Marple intersection.

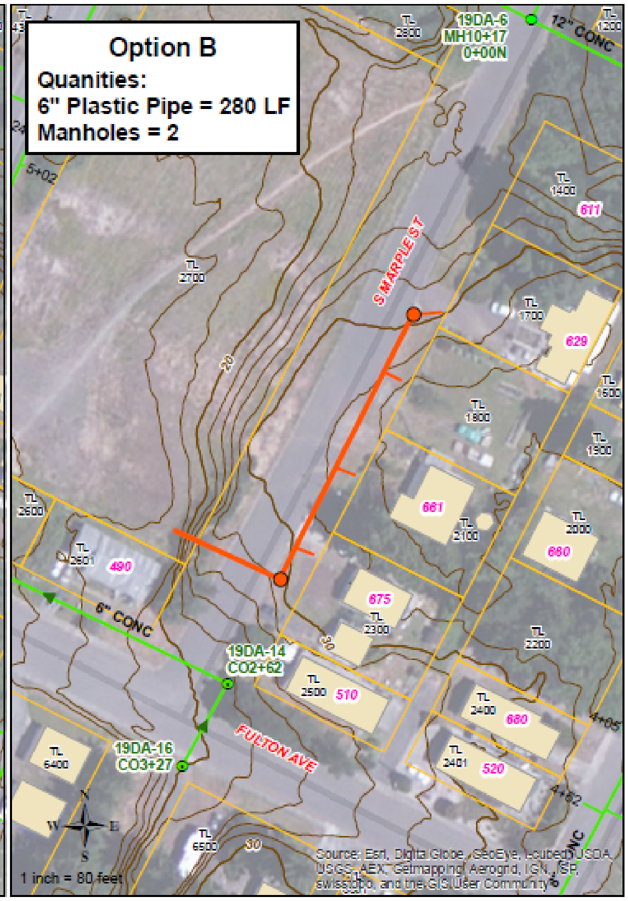
Additional Considerations:

This option does not address the future sewer service for 611 S. Marple. There is an existing sewer line that runs east to west at the intersection of Marple and the undevelpemed Webster right of way. This existing line is approximately 60 feet from the northwest property corner for 611. This property is very constrained from a development standpoint. The majority of this property has a creek bisecting it and will require environmental processing for any development. If this property is eventually developed the City will allow the property owner to install a lateral along Marple that will extend from the property to the existing sewer line at Marple and Webster.

Baseline Sketch

Alternative Sketch



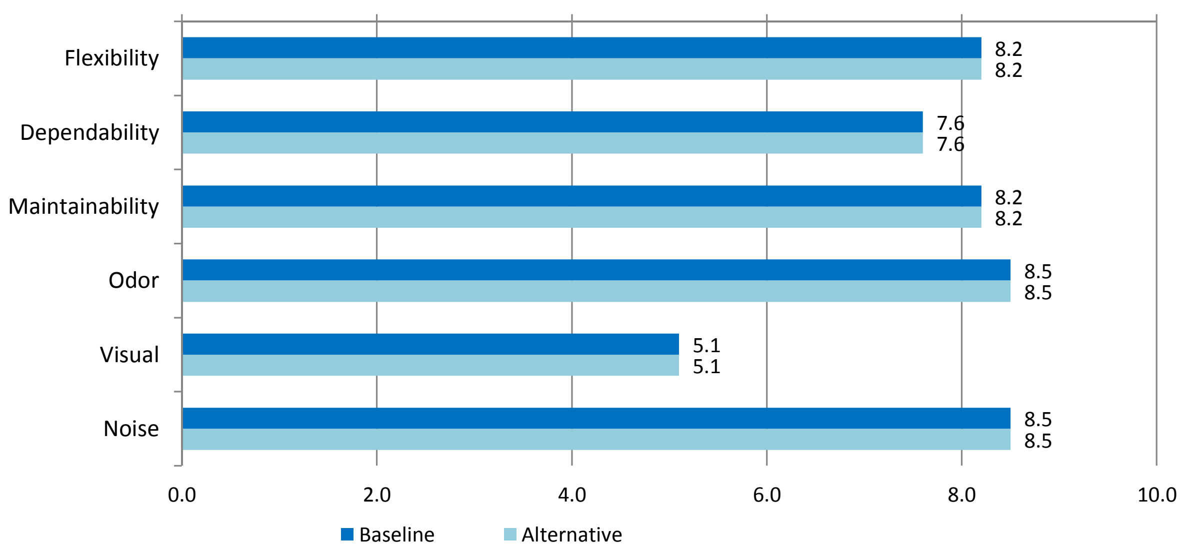


Alternative No.: S-19A

Baseline Performance Assessment

Performance Attribute	Baseline Concept	Alternative Concept	Rationale for Change in Performance
Flexibility	8.2	8.2	No Change
Dependability	7.6	7.6	No Change
Maintainability	8.2	8.2	No Change
Odor	8.5	8.5	No Change
Visual	5.1	5.1	No Change
Noise	8.5	8.5	No Change

Comparison of Performance



Functional Benefit Summary

ESTIMATED PERFORMANCE IMPACTS	Flexibility	Dependability	Maintainability	Odor	Visual	Noise

Construction Cost Estimate

Alternative No.: S-19A

Item	Unit of Meas.	Unit Cost	Quantity	Total	Alternative Concept Quantity	Alternative Concept Total
Option A				$ -		$ -
6 inch sanitary sewer	LF	$ 85		$ -	285	$ 24,225
manholes	ea	$ 3,000		$ -	1	$ 3,000
				$ -		$ -
				$ -		$ -
				$ -		$ -
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				$ -		$ -
				$ -		$ -
Subtotal				$ -		$ 27,225
Markup	87.5	%		$ -		$ 23,822
TOTALS				**$ 0**		**$ 51,047**
NET SAVINGS						**$ (51,047)**
TOTALS ROUNDED				**$ 0**		**$ 51,000**
NET SAVINGS ROUNDED						**$ (51,000)**

VALUE ENGINEERING ALTERNATIVE

COOS BAY WWTP #2 IMPROVEMENTS
COOS BAY, OR

Idea No.	S-19B	Idea Title	Construct sewer main on Marple for residents

ESTIMATED COST IMPACTS

	Capital Cost	Present Worth of O&M Cost	Total Present Worth Cost
Baseline Concept	--	--	--
Alternative Concept	54,000	--	54,000
Estimated Savings	(54,000)	--	(54,000)

ESTIMATED PERFORMANCE IMPACTS	Flexibility	Dependability	Maintainability	Odor	Visual	Noise

Description of Baseline Concept

Currently neighboring homes to the upcoming Wastewater Treatment Plant 2 (WWTP 2) project do not have access to public sewer and are served by septic tanks. These homes are old and at some point will need to replace the septic tank.

Description of Alternative Concept

Explore the feasibility of installing a gravity line along the portion of S. Marple Street adjacent to the project.

Advantages	Disadvantages
• By installing a gravity sewer line, it may help with neighbor relations • Expand users to the system • Provide owners with a choice when their septic system fails	• Additional Cost

Discussion

The City conducted a townhall meeting in Empire to educate the adjacent neighbors about the upcoming Wastewater Treatement Plant 2 (WWTP 2) project. The meeting was conducted summer 2012 and was attended by several of the neighbors, council member (Counselor Groth), and the press (The World). During the meeting the resident of 629 S. Marple Street requested that the proposed WWTP2 project incorporate into the scope of work the construction of a sewer line along the portion of Marple adjacent to the project. Currently, the City's Municipal Code requires the following:

13.15.210 Private wastewater disposal.

(3) When a collection line or service lateral becomes available within 300 feet of a property served by a private sewage disposal system, the user shall construct a private lateral to connect the property to the wastewater system, and any septic tanks, cesspools, or other private sewage disposal system shall, at the owner's sole expense, be abandoned in accordance with state law. [Ord. 331 § 3, 2003].

When the septic tanks fail for these homeowners they will be required to connect to the public system. This will most likely be a significant expense for these individual homeowners. By installing a gravity line along this segment it will provide the existing 4 homes with access to public sewer along with an undeveloped property (between 661 and 629).

Option B:

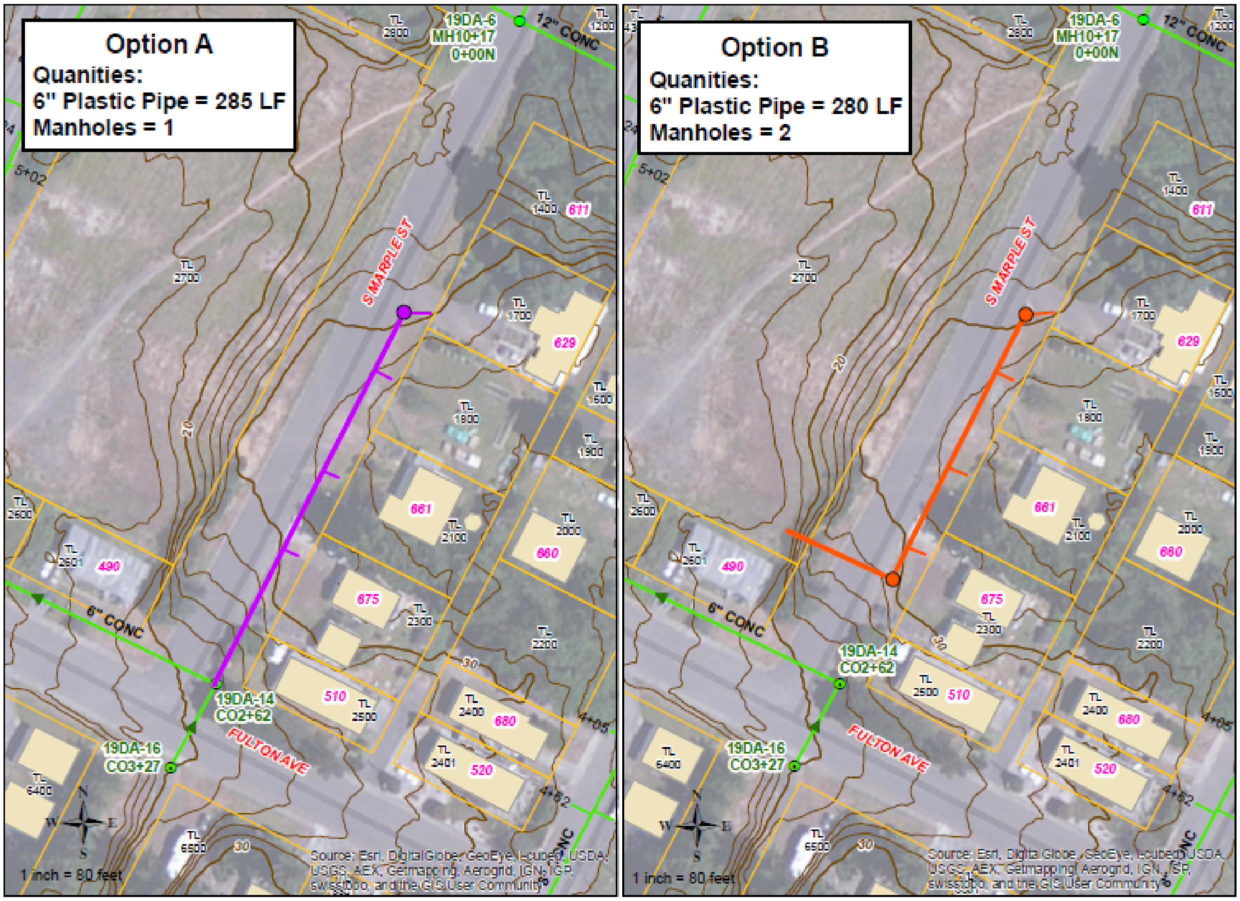
If this proposed line cannot gravity to the existing manhole at Fulton and Marple, then the line can cut across Marple in front of 675 S. Marple and tie into the plant.

Additional Considerations:

This option does not address the future sewer service for 611 S. Marple. There is an existing sewer line that runs east to west at the intersection of Marple and the undevelpemed Webster right of way. This existing line is approximately 60 feet from the northwest property corner for 611. This property is very constrained from a development standpoint. The majority of this property has a creek bisecting it and will require environmental processing for any development. If this property is eventually developed the City will allow the property owner to install a lateral along Marple that will extend from the property to the existing sewer line at Marple and Webster.

Baseline Sketch

Alternative Sketch

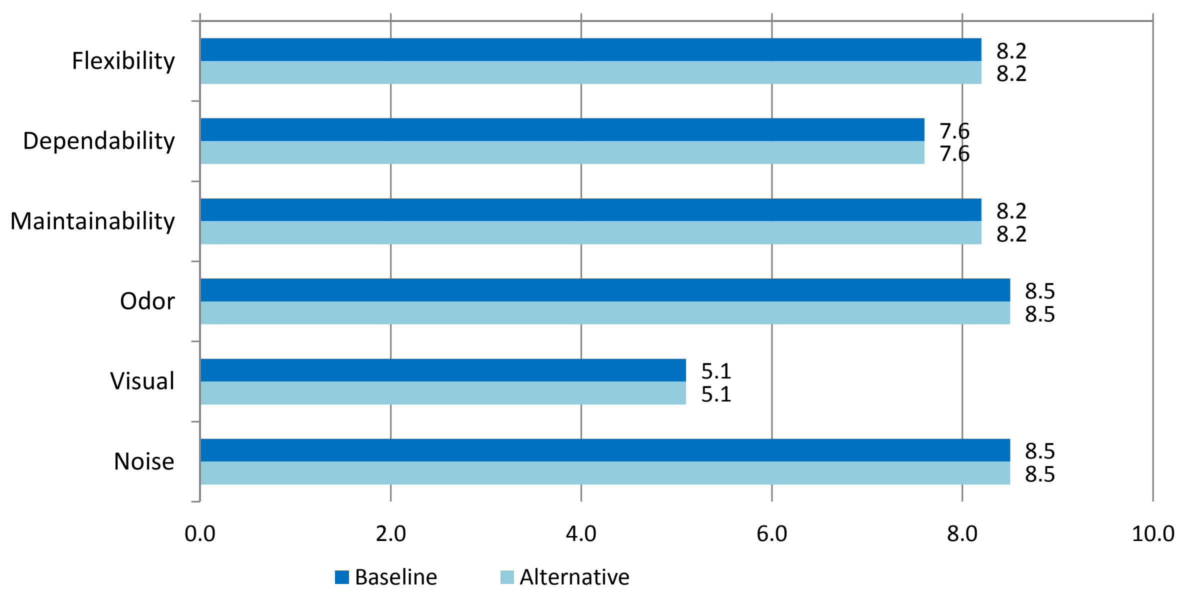


Alternative No.: S-19B

Baseline Performance Assessment

Performance Attribute	Baseline Concept	Alternative Concept	Rationale for Change in Performance
Flexibility	8.2	8.2	No Change
Dependability	7.6	7.6	No Change
Maintainability	8.2	8.2	No Change
Odor	8.5	8.5	No Change
Visual	5.1	5.1	No Change
Noise	8.5	8.5	No Change

Comparison of Performance



Functional Benefit Summary

ESTIMATED PERFORMANCE IMPACTS	Flexibility	Dependability	Maintainability	Odor	Visual	Noise

Construction Cost Estimate

Alternative No.: S-19B

Item	Unit of Meas.	Unit Cost	Quantity	Total	Alternative Concept Quantity	Alternative Concept Total
Option B				$ -		$ -
6 inch sanitary sewer	LF	$ 85.00		$ -	280	$ 23,800
manholes	ea	$ 3,000.00		$ -	2	$ 6,000
				$ -		$ -
				$ -		$ -
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				$ -		$ -
Subtotal				$ -		$ 29,800
Markup	87.5	%		$ -		$ 26,075
TOTALS				**$ 0**		**$ 55,875**
NET SAVINGS						**$ (55,875)**
TOTALS ROUNDED				**$ 0**		**$ 56,000**
NET SAVINGS ROUNDED						**$ (56,000)**

VALUE ENGINEERING ALTERNATIVE

COOS BAY WWTP #2 IMPROVEMENTS
COOS BAY, OR

Idea No.	S-21	Idea Title	Use ornamental fence

ESTIMATED COST IMPACTS

	Capital Cost	Present Worth of O&M Cost	Total Present Worth Cost
Baseline Concept	146,000	--	146,000
Alternative Concept	264,000	--	264,000
Estimated Savings	(118,000)	--	(118,000)

ESTIMATED PERFORMANCE IMPACTS	Flexibility	Dependability	Maintainability	Odor	Visual	Noise
	—	▲	—	—	▲	—

Description of Baseline Concept

The existing concept is to enclose the entire new site with 6' high chain link fence and screen using privacy slats. Fence will be topped with 3-strand barbed wire. Includes two automatic sliding gates. Site fencing is to follow City code.

Description of Alternative Concept

The alternative is to use more decorative or ornamental fencing to enhance visual aesthetics. The alternative may help to minimize the "industrial look" of the site from the outside. There are a variety of ways this might be accomplished. Some alternatives include 8' colored powder coated tight mesh chain link fencing and posts (may preclude need for barbed wire topping); decorative 8' high concrete wall; 8' high wrought iron fencing which could include decorative concrete "posts".

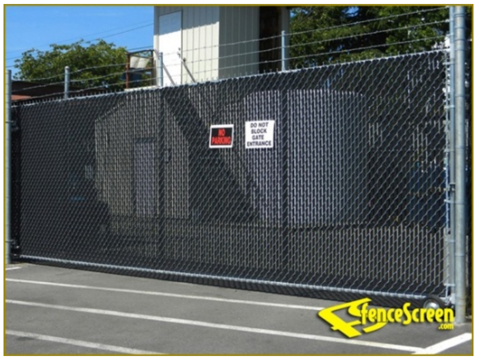
Advantages	Disadvantages
• Improves site aesthetics • Improve community acceptance of project • Maintains site security	• Increase construction cost • Increased replacement cost

Discussion

The alternative is feasible. Proposed chain link fence with barbed wire will likely be unacceptable to the City's elected officials and the community due to the prominent location of the treatment plant site along South Empire Boulevard and its proximity to a residential neighborhood.

Pre-design narrative, section PD.09, states that fencing will be 6' high while the cost estimate, PD.18, App B uses 8' high fencing.

Baseline Sketch

Alternative Sketch



Calculations

1200 LF of 8’ high fencing

2 ea 12’ wide by 8’ high automatic sliding gates

Propose replacing chain link fencing with wrought iron fencing, same quantities and dimensions as originally proposed. $75/linear foot for wrought iron is what is used on cost spreadsheet. This per foot cost may be low, but is best estimate we have.

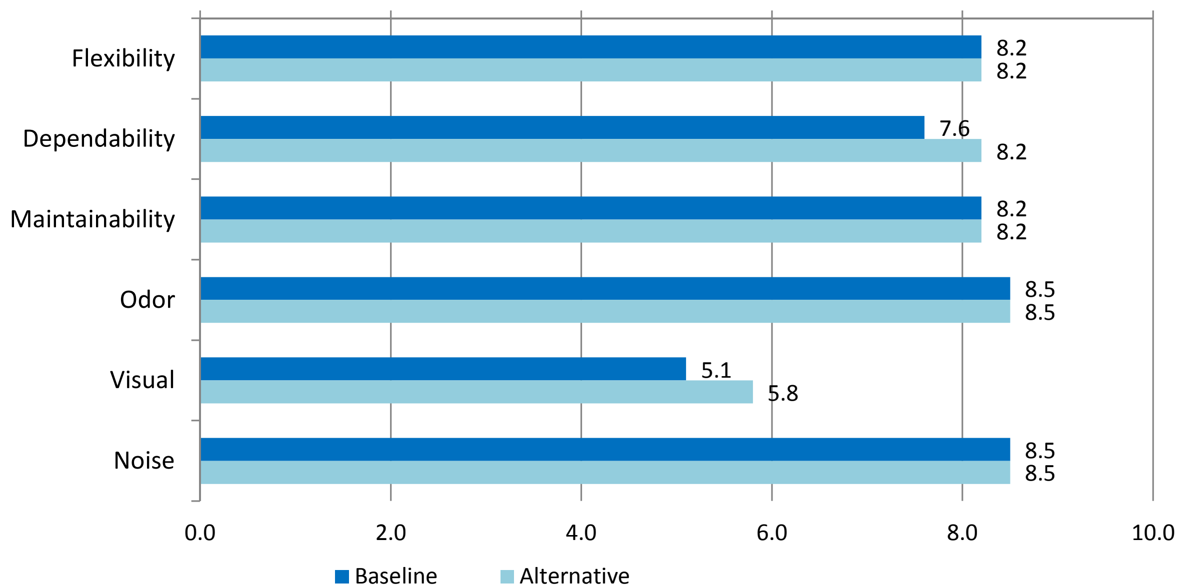
Performance

Alternative No.: S-21

Baseline Performance Assessment

Performance Attribute	Baseline	Alternative	Rationale for Change in Performance
Flexibility	8.2	8.2	No Change
Dependability	7.6	8.2	Improved, more robust material
Maintainability	8.2	8.2	No Change
Odor	8.5	8.5	No Change
Visual	5.1	5.8	Improved, more visually appealing
Noise	8.5	8.5	No Change

Comparison of Performance



Functional Benefit Summary

	Flexibility	Dependability	Maintainability	Odor	Visual	Noise
ESTIMATED PERFORMANCE IMPACTS						

Construction Cost Estimate

Alternative No.: S-21

Item	Unit of Meas.	Unit Cost	Baseline Concept Quantity	Baseline Concept Total	Alternative Concept Quantity	Alternative Concept Total
8' Chain link fence with 3 strand barb installed	lf	$ 25	1,200	$ 30,000		$ -
8' Automatic sliding gate, 12' wide	ea	$ 24,000	2	$ 48,000		$ -
				$ -		$ -
8' Wrought Iron fencing	lf	$ 75		$ -	1,200	$ 90,000
8' Automatic sliding gate, wrought iron, 12' wide	ea	$ 25,500		$ -	2	$ 51,000
				$ -		$ -
				$ -		$ -
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Subtotal				$ 78,000		$ 141,000
Markup	87.5	%		$ 68,250		$ 123,375
TOTALS				**$ 146,250**		**$ 264,375**
NET SAVINGS						**$ (118,125)**
TOTALS ROUNDED				**$ 146,000**		**$ 264,000**
NET SAVINGS ROUNDED						**$ (118,000)**

APPENDICES

PROJECT DESCRIPTION
APPENDIX A

PROJECT DESCRIPTION

The proposed project will replace the existing activated sludge treatment system at WWTP #2 with a new SBR system on a nearby site, complete with new influent pump station, headworks, SBR flow equalization and UV disinfection. Also included will be a new control building, garage and maintenance building and electrical building with standby generator. The designer's estimated construction cost is approximately $15 million. Figure A-1 shows the locations of the existing Treatment Plant 2 and the proposed location of the new facilities.

Figure A-1 – Site Location

Photo Courtesy of Google Earth

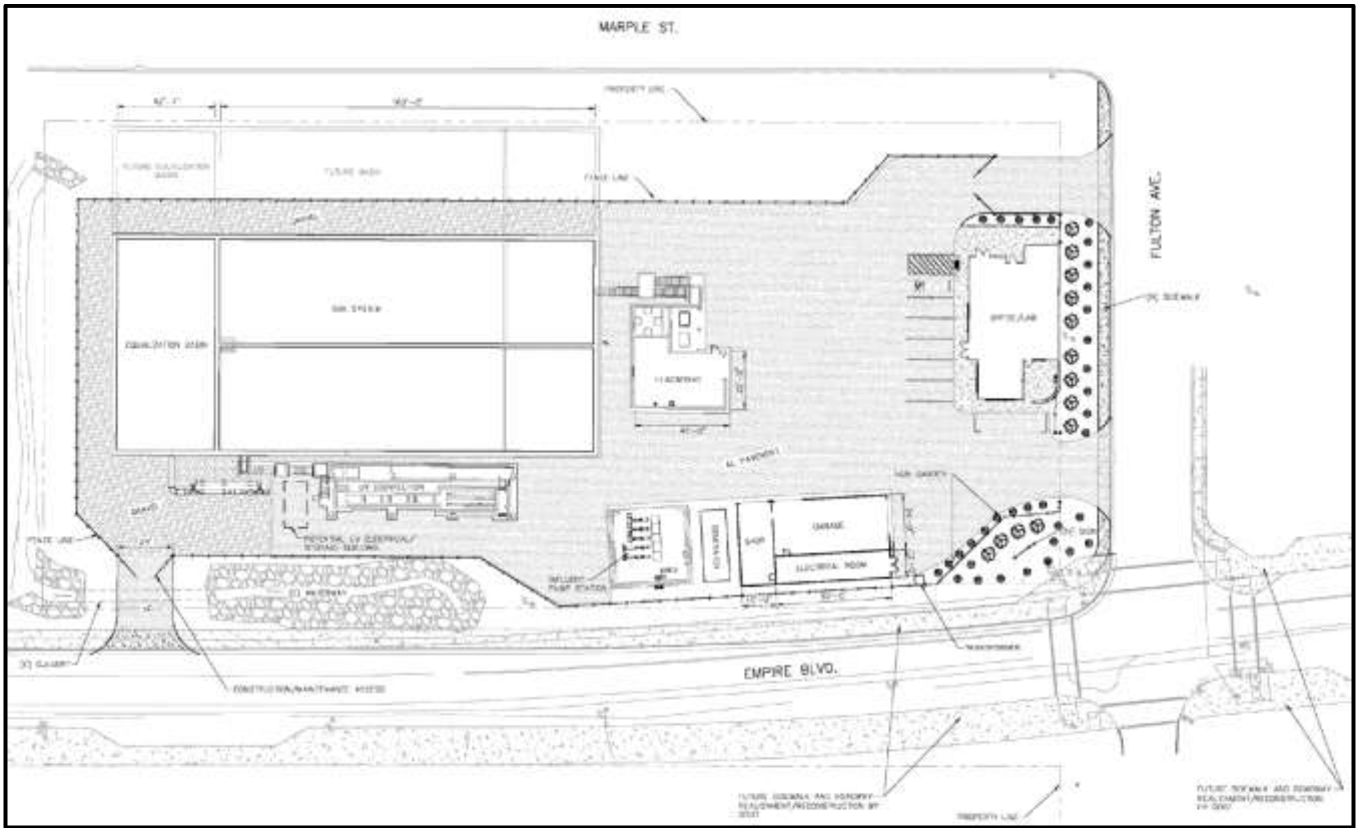
The major elements of the facility,as provided to the VE Team, will be as follows:

- Trench style Influent Pump Station
- Headworks incorporating influent screening, grit removal, screenings conveying and storage, and screened raw sewage flow splitting
- Sequencing batch reactors (SBRs)with effluent flow equalization and waste-activated sludge pumping
- UV disinfection system with non-potable water pumping system
- Odor control system located at existing site

- Control Building
- Electrical Building
- Maintenance/Garage Building

Figure A-2 shows the proposed site plan for the new facilities.

FIGURE A-2 NEW PLANT SITE PLAN



Site Plan Courtesy of CH2M Hill

INFLUENT PUMP STATION

A new influent pump station will be constructed on the new treatment plant site, using a trench-style wetwell. Fiver submersible pumps will be provided: two, 17 hp dry weather pumps; and two 45 hp wet weather pumps, with a 45 hp standby pump. The dry weather pumps will discharge to the plant through an 8-inch forcemain and the wet weather pumps will discharge through a 16-inch forcemain. Flows will range from a night-time, dry weather low flow at startup of less than 400gpm to a peak instantaneous wet weather flow of 5,700 gpm. All five pumps will have variable frequency drives (VFDs).

HEADWORKS

The headworks will include two mechanically cleaned fine screens, with a manually-cleaned bypass bar careen and transfer and discharge conveyors; a composite influent sampler; a headcell grit removal system, with a teacup grit classifier and a grit snail; influent flow control weirs for the SBR system; dumpsters for storage and disposal of screenings and grit.

The fine screens will be 6 mm moving media screens, each sized to handle 6.15 mgd. The bar screen will have 3/8-inch bar openings. Two washer/compactors, one transfer conveyor and one discharge conveyor will also be provided.

A refrigerated composite sampler will be installed on the screening floor, drawing samples downstream of the fine screens.

A single 8.2 mgd Headcell® unit will be installed. Two, 250 mgd grit pumps will move the grit to a teacup® cyclonic separator, sized for 200 gpm, and the separated grit will be discharged to a grit snail® for further dewatering prior to discharge to the grit dumpster, for transfer to the landfill.

Two manually-operated gates will be installed for balancing of flows to the SBRs. Space will be provided for a third gate to be added when the plant is expanded in the future.

SEQUENCING BATCH REACTORS

Two 1.16 million gallon SBR tanks will be provided, with a design solids retention time (SRT) of 10 days. The system is designed to nitrify down to a minimum operating temperature of 14^{o} C. Each tank will have a motorized decanter installed on the opposite end of the tank from the influent. Three adjustable speed 1300 scfm positive displacement blowers (two duty, one standby) will be provided for aeration of the SBRs. Flow control valves will be used to adjust the air distribution to the tanks. Two submersible mixers will be provided in each tank for use during the anoxic cycle. A scum and foam removal system is being investigated but no decision has yet been made. A flow equalization tank will be provided following the SBRs to limit maximum flow to 6.31 mgd to the subsequent processes. Waste activated sludge will be removed from each SBR tanks by two 250 mgd submersible pumps (one duty, one standby), equipped with VFDs.

DISINFECTION SYSTEM

Effluent from the SBRs will be disinfected using a low-pressure, high intensity ultraviolet (UV) lamp system, designed to accommodate a peak flow of 6.31 mgd. The UV System will have one UV channel with three banks

of UV modules (two duty, one standby), capable of dosing at 30 mj/cm^2. An automated, in-channel, lamp sleeve cleaning system will be included. A sodium hypochlorite system will provide a chlorine residual of 0.5 – 1.0 mg/L. The UV system will be connected to the standby power system, and an uninterruptable power supply will be provided for the UV controller and the lamps. A wetwell will be provided downstream of the UV contact channel to house the two, vertical turbine plant water pumps (1 duty, one standby). Sodium hypochlorite will also be feed to the plant water system.

ODOR CONTROL

Odor control will be provided for the influent pump station and the headworks. Odorous air will be drawn from the influent wet well and directed to the odor control system. Screening channels and equipment will be enclosed and the odorous air from those areas and the screening and grit dumpster room will also be directed to the odor control system.. The headcell® feed channels, the headcell, and all grit removal equipment will be totally enclosed and the odorous air will be drawn off the channels and individual units by the odor control system.

Odor scrubbing will be provided by an engineered media, packaged biofilter. A single, 12-foot diameter contact vessel will be provided, discharging through a short stack by a single centrifugal fan.

BUILDINGS

Five new buildings will be constructed at the new plant site. All will be of reinforced concrete construction, with raised seam metal roofs. The new buildings are as follows:

- Influent pump station building
- Headworks building
- Electrical building
- Shop/garage building
- Control building

The Influent Pump Station will be a three-sided building. It will have a utilitarian interior finish with a concrete floor and wall surfaces and an exposed, painted or galvanized shed-style metal roof deck.

The upper level of the two story headworks building will house water channels and screening. The bottom level will provide space for a roll-off dumpster, electrical equipment, and blowers. The building will be combined with the headcell® that is a two story tank.

The electrical building will be a single story building and will house the main electrical gear for the plant.

The shop building will be a single story building housing a small shop facility and a garage space for a vactor truck.

The control building will house a plant control room for two operators, a unisex restroom and shower room, a lunchroom, a conference room, a server room, a sampling room, a storage room, and a mechanical room. The control building has a clerestory-style roof to allow natural light into the lobby and corridor and, indirectly, into the conference room and control room.

VE Process Description

Appendix B

VALUE ENGINEERING PROCESS DESCRIPTION

The value engineering (VE) study was conducted to review and evaluate the proposed project to identify areas of high initial and annual costs, and to suggest opportunities to reduce these costs while maintaining or improving performance. Alternatives are recommended to achieve these goals without jeopardizing the performance of the required project functions or the project's reliability.

PARTICIPANTS

The value engineering process included participation by many people from the Owner, the Designer(s), members of the VE Team, and others. The participants in the process are shown in Appendix C.

VE STUDY PROCESS

The VE study was organized into three major parts:

1. Pre-Workshop
2. Workshop
3. Post-Workshop

Part 2, the workshop, was further divided into a six-step process called the "job plan". This six-step job plan is consistent with the standards of SAVE International, which is the international value engineering professional organization; the ASTM standards for value engineering: and U.S federal government standards for value engineering.

PRE-WORKSHOP

Pre-workshop activities include scheduling, collecting background information on the project, and developing cost models. Most of the background information was generated by the Designer and reviewed by the VE Team prior to the study. Coordination with the Owner and Designer prior to the workshop enhanced the workshop's effectiveness by allowing members of the value engineering team to review available information on design concepts, cost data, design criteria, reports, and scheduling before the workshop began.

WORKSHOP

The VE workshop was an intensive multi-day session during which the project design was analyzed for optimization of capital costs and operation and maintenance (O&M) costs. The six-step VE job plan provides an organized and highly systematized approach during this portion of the study for identifying high cost areas of the project and confirming or improving the ability of the project to accomplish its functional objectives.

The functional requirements for the project were critically analyzed to assure performance. Portions of the project that were not functionally required or that contained major portions of project costs were targeted for value improvements.

The six phases of the job plan are:

- Information Phase

- Function Analysis Phase
- Creative Phase
- Judgment Phase
- Development Phase
- Presentation Phase.

A copy of the workshop agenda is included at the end of this appendix.

Information Phase

At the beginning of the workshop, it was important to understand the background against which the design was developed. This background was provided in an oral overview by the Owner and the project Designer team. The overview and subsequent efforts provided information on the following topics:

- Project constraints on the VE Team
- Economic data for life cycle cost analysis
- Project cost
- Functional requirements.

These presentations provided the VE Team with a description of the project, issues, and concerns from their perspective. The Owner's and the Designer's discussions provided the VE Team with an overview of the goals, issues, and expectations from their respective points of view. As a part of the Information Phase, modeling was done to help the VE Team focus on those parts of the project that generate the largest targets of opportunity for value improvement. These models are shown in Appendix F in this report.

Function Analysis Phase

During the Function Analysis Phase, the VE Team used function analysis tools to analyze the project. This analysis helped the team confirm its understanding of the overall project objectives and analyzed the functions of key project elements. The VE Team leader led the team through an in-depth discussion of the possible functions of the key project elements to clearly and precisely identify the purposes of each.

In addition to identifying the essential project functions, this phase of the workshop was also used for achieving two other goals:

- The unification of the individual VE Team members into a synergistic, cohesive team, and
- The stimulation of creative ideas prior to beginning the subsequent creative phase.

A detailed description of the function analysis process used for this VE study is shown in Appendix G of this report.

Creative Phase

This step in the VE process involved generating ideas using creativity techniques. The team recorded all ideas regardless of their feasibility. Judgment of the ideas was not allowed during the Creative Phase. The team looked for a large quantity of ideas. These ideas were later screened in the Judgment Phase of the workshop. The ideas generated in the workshop are included in Appendix H of this report. The list should be reviewed carefully for ideas not developed during the workshop that could be further evaluated or modified by the design team for use in the project.

Judgment Phase

In this phase of the workshop, the team selected the ideas with the most merit for further development. After an initial vote, the ideas were discussed to reassess whether all those selected by the vote should be developed, and whether any not selected for development should be reconsidered. The following criteria were used for selection:

- Is it a good idea in the opinion of the VE Team?
- How much value improvement does it offer?
- Is it likely to be accepted?

Ideas were selected for development as VE alternatives based on all three criteria. Other ideas were selected for development as design suggestions primarily on the basis of the first two criteria rather than for cost savings. Some design suggestions may save costs, others may increase costs, and the cost impact of some could not be predicted adequately with information and time available to the team. Not all ideas were developed. Generally, those ideas with a greater number of votes were developed first.

Mid-Workshop Review

Following the Judgment Phase, key Owner and Designer representatives reviewed the list of ideas selected for development to identify any selected ideas that either:

- had fatal flaws, and thus are not viable;
- were not selected for development by the VE Team, but the Owner or Designer would like for them to be developed into VE alternatives.

Adjustments were then made to the list of ideas to be developed by the VE Team to reflect these changes.

Development Phase

During the Development Phase of the workshop, each selected idea was analyzed by one or more VE Team members to determine whether the alternative was viable. Concepts were dropped from consideration when they were found to be either infeasible or not cost effective. The remaining ideas were each expanded into workable alternatives to the original design concepts. Development consisted of preparing a description of the VE alternative, determining life cycle cost, and evaluating advantages and disadvantages. Some concepts were combined with other ideas when they will be most useful if considered together. The basis for estimating the cost impacts of the VE alternatives are shown in Appendix E.

Each alternative includes a brief narrative comparing the original design and the proposed change. Sketches and design calculations were developed if needed to clarify and support the alternative. Each alternative also includes a comparison of the performance of the baseline design verses the VE alternative. The VE Team leader, other team members and Owner personnel reviewed each alternative to ensure completeness and accuracy. The VE alternatives developed during the workshop are presented in Section 2 of this report.

Presentation Phase

The last phase of this workshop was the presentation of alternatives. The presentation was made on the last day of the VE workshop to representatives of the Owner and the project design consultants. The VE Team described the alternatives and the rationale that went into the development. The acceptability of the alternatives was not debated at this time.

POST-WORKSHOP

The Post-Workshop Phase of this VE study consisted of preparing the Value Engineering Study Reports and coordinating with the Owner and the project Designers to help make decisions regarding the acceptance of the VE alternatives.

VE Study Agenda

Wastewater Treatment Plant #2

Coos Bay, OR

December 10-13, 2013

Tuesday – December 10, 2013

8:00 – 8:20 Introduction

Participant Introduction

Review of Agenda

Workshop Guidelines

8:20 – 8:45 Owner/Client Presentation

Project Goals & Purpose

Key Project Issues For VE Team

Constraints on VE Team Recommendations

8:45 – 11:15 Designer presentation

Overview

Basis of Design

Rationale for Design Choices

Description of Project Elements

11:15 – 12:00 Team Review of Documents

12:00 – 1:00 Lunch break

1:00 – 1:45 Team Review of Documents

1:45 – 5:00 Project Analysis/Function Analysis

Wednesday – December 11, 2013

8:00 – 9:00 Project Analysis/Function Analysis (Cont.)

9:00 – 12:00 Creative Idea Generation

12:00 – 1:00 Lunch Break

1:00 – 2:30 Creative Idea Generation (Cont.)

2:30 – 4:00 Evaluation of Ideas

4:00 – 5:00 Begin VE Recommendation Development

THURSDAY – DECEMBER 12, 2013

8:00 – 9:00 Owner/ Review of Ideas Selected for Development With Team Leader

8:00 – 12:00 VE Recommendation Development (Cont.)

12:00 – 1:00 Lunch Break

1:00 – 5:00 VE Recommendation Development (Cont.)

FRIDAY – DECEMBER 13, 2013

8:00 – 12:00 VE Recommendation Development (Cont.)

12:00 – 1:00 Lunch Break

1:00 – 2:00 VE Recommendation Development (Cont.)

2:00 – 3:00 Prepare for VE Team Presentation

3:00 – 5:00 VE Team Presentation of VE Recommendations

Participants
Appendix C

ATTENDEES

Project Name: Coos Bay Wastewater Treatment Plant #2 **Date:** December 10-13, 2013

10	11	12	13	NAME / ORGANIZATION / ADDRESS	TITLE / ROLE	PHONE	CELL	EMAIL
X	X	X	X	Barraza, Don Kennedy/Jenks Consultants 303 Second Street, Ste 300 South San Francisco, CA 94107	Structural	415-243-2483		donbarraza@kennedyjenks.com
X	X	X	X	Bogus, Brad Tetra Tech 7080 SW Fir Loop Portland, OR 97223	WWTP Process Specialist	~~503-684-9097~~ 503 598 2514	503 926 2810	brad.bogus@tetratech.com
X	X	X	X	Deas, Tabi Robinson, Stafford & Rude, Inc. 5021 Tangerine Avenue South Gulfport, Florida 33707	Assistant VE Team Leader	727-328-2921	813-758-9971	tabi@rsri.net
X	X	X	X	Houser, Rod Kennedy/Jenks 200 2nd St, Suite 210 Santa Rosa, CA 95401	Project Manager	707-508-7156		rodhouser@kennedyjenks.com
X				Kraushaar, Steve Tetratech	Civil	503-684-9097		steven.kraushaar@tetratech.com
X	X	X	X	Kressbach, Jim — JAMES KRESSBACH AIA Architects 8003 Sand Point Way NE, Ste B54 Seattle, WA 98115	Architect	206-214-7431	206 · 214 · 7431	kressbach.AIA@comcast.net
X	X	X	X	Stafford, Don Robinson, Stafford & Rude, Inc. 5021 Tangerine Avenue South Gulfport, FL 33707	VE Team Leader	727-328-2921	727-328-2914	don@rsri.net

ATTENDEES

Project Name: <u>Coos Bay Wastewater Treatment Plant #2</u> **Date:** <u>December 10-13, 2013</u>

10	11	12	13	Name / Organization / Address	Title / Role	Phone	Cell	Email
X	X	X	X	Van Kirk, Dennis VK Tech Services 10013 NE Hazel Dell Ave., #197 Vancouver, WA 98685-5203	Cost Estimator	360-574-0736	360-989-8047	dvk@vktechservices.com
X			X	Rodger Craddock City of Coos Bay 500 Central AVE Coos Bay OR 97420	City Manager	541-269-8912	541 404-0752	rcraddock @coosbay.org
X	X	X	X	Jim Hossley City of Coos Bay 500 Central Ave Coos Bay, OR 97420	Public Works Director	(541)269-1181 ext 2250	(541) 217-9450	jhossley@coosbay.org
X			X	JOHN CHIRRICK CHARLESTON SANITARY P.O. BOX 5522 CHARLESTON, OR. 97420				
X	X		X	STEVE MAJOR THE DYER PARTNERSHIP 1330 TEAKWOOD AVE COOS BAY, OR 97420	CSD ENGINEER	(541)269-0732	(541) 290-0011	SMAJOR@ DYERPART.COM
X		X	X	Mark Denning SHN Consulting Eng. & Geologists 275 Market Ave Coos Bay	Design Team Project Mgr.	(541) 266-9890	(541) 290-8737	mdenning @shn-engr.com

ATTENDEES

Project Name: Coos Bay Wastewater Treatment Plant #2 **Date:** December 10-13, 2013

10	11	12	13	NAME / ORGANIZATION / ADDRESS	TITLE / ROLE	PHONE	CELL	EMAIL
X	X	X	X	MIKE MC Daniel CH2M HILL OMI 680 Ivy AVE 97420 Coos BAY, OR ~~97459~~	ASST Project MANAGER	541 267-3966	541 290 8258	Mike.mcDaniel@CH2M.com
X	X	X	X	TOM PAUL MORTENSON 10230 NE POINTS DR KIRKLAND WA 98033	CONSTRUCTION EXECUTIVE	425 497 6661	425 449 6994	tom.PAUL@MORTENSON.COM
X	X	X	X	Pat Kavan CH2M HILL 680 Ivy St. Coos Bay OR 97420	Manager of wastewater system	541 267 3966	541 290 5789	Patrick.Kavan@CH2M.com
X	X	X	X	JENNIFER WIRSING CITY OF COOS BAY 500 CENTRAL AVE COOS BAY OR 97420	ENGINEERING SERVICE COORDINATOR	541-269-1181 X 2247	541-217-4933	jwirsing@coosbay.org
phone			X	CRAIG MASSIE CH2M HILL				
phone			X	DAVE BRUNKOW CH2M HILL				

ATTENDEES

Project Name: Coos Bay Wastewater Treatment Plant #2 **Date:** December 10-13, 2013

10	11	12	13	NAME / ORGANIZATION / ADDRESS	TITLE / ROLE	PHONE	CELL	EMAIL
X	X		Phone	Jon Gasik OREGON DEQ 221 Stewart Ave. Medford, OR	Senior Engineer Process Regulatory	541-776-6242		gasik.jon@deq.state.or.us

VE TEAM MEMBER INFORMATION
APPENDIX D

VE TEAM MEMBER INFORMATION

Coos Bay WWTP #2 Improvements
December 10-13, 2013

Name, Organization & Address	Role	Phone	Cell	Email
Barraza, Don Kennedy/Jenks Consultants 303 Second Street, Ste 300 South San Francisco, CA 94107	Structural	415-243-2483	-	donbarraza@kennedyjenks.com
Bogus, Brad Tetra Tech 7080 SW Fir Loop Portland, OR 97223	WWTP Process Specialist	503-598-2514	503-926-2810	brad.bogus@tetratech.com
Deas, Tabi Robinson, Stafford & Rude, Inc. 5021 Tangerine Avenue South Gulfport, Florida 33707	Assistant VE Team Leader	727-328-2921	813-758-9971	tabi@rsri.net
Gasik, John (1) Oregon DEQ 221 Stewart Ave. Medford, OR	Regulatory issues	541-776-6242	-	Gasik.jon@deq.state.or.us
Hossley, Jim City of Coos Bay 500 Central Ave. Coos Bay, OR 97420	Public Works Director	541-269-1181 x2250	541-217-9450	jhossley@coosbay.org
Houser, Rod Kennedy/Jenks 200 2nd Street, Suite 210 Santa Rosa, CA 95401	Project Manager	707-508-7156	-	rodhouser@kennedyjenks.com
Kavan, Pat CH2M Hill – OMI 680 Ivy Ave. Coos Bay, OR 97420	Operations	541-267-3966	541-290-5789	Patrick.kavan@ch2m.com
Kraushaar, Steve (1) Tetra Tech 7080 SW Fir Loop Portland, OR 97223	Civil	503-684-9097	-	steven.kraushaar@tetratech.com

Kressbach, Jim Jim Kressbach, AIA Architect 8003 Sand Point Way NE, Ste B54 Seattle, WA 98115	Architect	206-214-7431	206-214-7431	kressbach.AIA@comcast.net
Major, Steve (1) The Dyer Partnership 1330 Teakwood Ave. Coos Bay, OR 97420	Charleston Sanitary District Engineer	541-269-0732	541-290-0011	smajor@dyerpart.com
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Stafford, Don Robinson, Stafford & Rude, Inc. 5021 Tangerine Avenue South Gulfport, FL 33707	VE Team Leader	727-328-2921	727-328-2914	don@rsri.net
Van Kirk, Dennis VK Tech Services 10013 NE Hazel Dell Ave., #197 Vancouver, WA 98685-5203	Cost Estimator	360-574-0736	360-989-8047	dvk@vktechservices.com
Wirsing, Jennifer City of Coos Bay 500 Central Ave. Coos Bay, OR 97420	Engineering Services Coordinator	541-269-1181 x2247	541-217-4933	jwirsing@coosbay.org

BASIS OF COSTING

APPENDIX E

BASIS OF COSTING

The VE team leader and cost estimator reviewed the capital cost estimate provided to the VE Team to determine the reasonableness of the project budget, and to ensure a common basis for cost comparisons of VE alternatives with the original design.

Review of the costs included comparison of unit prices to recently received prices for similar projects and to published unit price indices. Unit prices for unique project elements were compared to prices based on applicable crew compositions and production rates, where appropriate. Vendor quotations were obtained for unique and/or major equipment and compared to those in the design cost estimate. Adjustments were made to the estimate provided to the VE Team, where appropriate, to bring unit prices and quantities into conformance with the design documents and presentation information provided to the VE Team. The VE Team then used this "validated" estimate as the basis for all capital cost comparisons in the VE alternatives.

The VE Team comments based on this review are as follows:

- The estimate does not support the level of detail shown in the plans. However, the unit costs in the line items are accurate within the context of this study. The estimate is dated July, 2013, and the drawings are dated August, 2013. An analysis of the content of the estimate, compared to the drawings reveals significant scope differences that indicate that the cost estimate was not updated before the drawings were submitted for this Value Engineering study. Some of the differences are as follows:
    - Site work in the estimate includes the cost of a 200 SF Electrical Building. The Electrical Building shown in the drawings scales at 600 SF and has been made part of the Shop/Garage Building. Site electrical distribution is not included in the estimate.
    - The Influent Pump Station scales at 1,750 SF and is called out at 981 SF in the estimate.
    - There is an allowance of $100,000 in the estimate for the Plant Drain Pump Station, but this structure in not included in the drawings.
    - The Headworks Building is called out at 930 SF in the cost estimate and is shown at approx. 1,800 SF on the drawings.
    - The SBR structure in the drawings scales at 19,950 SF plus another 9,450 SF as future construction while the estimate calls this out at 29,184 SF with no indication of future construction.
    - Electrical is not included in the estimate for the Ultraviolet Disinfection facility or for the Odor Control facility.

- The Basis of Estimate memorandum, supports the details shown in the cost estimate with the following exceptions:
    - The Work Breakdown Structure in the Scope of Work includes a Plant Drain Pump Station that is not shown in the drawings.
    - The General Contractor markup percentages shown in Table 5.1 are appropriate except that, given the scope differences, the undeveloped information (Lump Sum allowances), and the deviation from the original assumption of the Design- Bid-Build method of delivery to CMGC lead this reviewer to conclude that the contingency, at 20%, is too low, and should be adjusted to no less than 25% until a Level 3 cost estimate can be performed. For the purpose of VE study pricing, we have made this adjustment.

- The Subcontractor markups shown in Table 5.2, while reasonable, are not consistent with those shown on the Detailed Summary of the estimate.
- For the purpose of developing ideas in the VE Study, we recommend that the markup structure in the estimate, except for contingency and escalation, should be used. However, the inconsistencies should be resolved, with the input of the CMGC before the next level of estimate is performed.
- The escalation rate used in the estimate, according to the Basis of Estimate memorandum is based on the approximate mid-point of construction being June of 2015, with a project duration of 18 months. The project schedule in the RFP dated October 1, 2013 indicates a mid-point of June, 2016, and CMGC input indicates a construction duration of 24 months.
- We have adjusted the cost estimate accordingly for the purpose of this study using 3% per year, beginning on the date of the estimate.
- The adjustments above result in a revised contingency of $2,944,158 and an escalation percentage of 9.2%, producing a revised construction total of approximately $ 16.5 Million.

Life cycle cost comparisons were prepared for all of the VE alternatives that are expected to affect either annual costs of operation and maintenance or which have equipment replacement cycles that would require equipment replacement for either the existing design concept of the VE concept within the economic analysis period selected for the project. The basis for the life cycle costing analysis is shown in Table E-1. All costs are presented in year 2016 dollars.

TABLE E-1. COST COMPARISON ASSUMPTIONS	
Year of Analysis	2016
Analysis Period	20 years
Net Discount Rate	4% per year
Uniform Series Present Worth Factor	13.59
Single-Payment Present Worth Factor	
5-Year	.8219
10-Year	.6756
15-Year	.5553
Energy	
Electricity	$0.09 / KWH
Propane – Amerigas	$3.77/gal
Fuel (diesel)	$3.30 /gal
Chemicals	
Sodium Hypochlorite	$1.07/gal
Bisulfite	$2.16/gal
Labor	$28.25/hour
Generalized O&M	
Structures	0.5% of capital cost per year
Mechanical/Electrical Equipment	4% of capital cost per year
Building operations & maintenance	$2.00/square foot/year

MODELING ANALYSIS
APPENDIX F

MODELING ANALYSIS

To assist the VE Team in better understanding the project and the distribution of resources within the project, the VE Team prepared several models of project resources. The VE Team prepared one cost model for the project, as follows:

- Table F-1 is a capital cost model, based on the Designer's estimate for construction of the project.

The cost model was used by the team for the following purposes:

- to identify parts of the project with the greatest costs;
- to estimate the greatest differences between cost and worth;
- to aid in focusing the efforts of the team during the study.

A review of the cost model prepared for this project indicated that the largest construction components of cost are:

- Concrete (37%)
- Process Equipment (26%)
- Electrical (9%)
- Process Piping (7%)

These four construction elements constitute nearly 80% of the total construction cost of the project and were thus focus areas for the VE team.

Project: Coos Bay WWTP #2 Expansion
Location: Coos Bay, OR

CAPITAL COST MODEL

	SBR		Headworks Bldg		Sitework & Yd Pipe		Disintection		Influent PS		Control Bldg		Shop		Plant Drain PS		Odor Control		TOTAL		cum.
Element	Cost	%	Cost	%	Cost	%	Cost	%	Cost	%	Cost	%	Cost	%	Cost	%	Cost	%	Cost	%	%
Concrete	$2,323,000	27.1%	$212,100	2.5%		0.0%	$130,700	1.5%	$169,300	2.0%	$195,600	2.3%	$154,900	1.8%		0.0%	$3,500	0.0%	$3,189,100	37.2%	37.2%
process equipment	$640,000	7.5%	$963,800	11.3%		0.0%	$594,100	6.9%		0.0%		0.0%		0.0%		0.0%	$75,200	0.9%	$2,273,100	26.5%	63.8%
Electrical	$80,000	0.9%	$120,000	1.4%	$379,000	4.4%	$5,200	0.1%	$79,600	0.9%	$51,100	0.6%	$29,100	0.3%		0.0%		0.0%	$744,000	8.7%	72.4%
Process Piping	$110,700	1.3%		0.0%	$341,300	4.0%	$97,900	1.1%	$69,500	0.8%		0.0%		0.0%		0.0%		0.0%	$619,400	7.2%	79.7%
Pumps		0.0%		0.0%		0.0%	$95,900	1.1%	$172,200	2.0%		0.0%		0.0%	$100,000	1.2%		0.0%	$368,100	4.3%	84.0%
Instrumentation & Controls	$25,000	0.3%	$115,000	1.3%		0.0%		0.0%	$65,000	0.8%		0.0%		0.0%		0.0%		0.0%	$205,000	2.4%	86.4%
Earthwork		0.0%		0.0%	$115,000	1.3%		0.0%	$21,000	0.2%		0.0%		0.0%		0.0%		0.0%	$136,000	1.6%	88.0%
Valves & Gates		0.0%	$67,300	0.8%		0.0%	$26,400	0.3%	$33,300	0.4%		0.0%		0.0%		0.0%		0.0%	$127,000	1.5%	89.4%
Dewatering		0.0%		0.0%	$111,700	1.3%		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%	$111,700	1.3%	90.7%
Foul Air Duct/Piping		0.0%	$42,500	0.5%	$62,800	0.7%		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%	$105,300	1.2%	92.0%
Landscaping		0.0%		0.0%	$86,000	1.0%		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%	$86,000	1.0%	93.0%
Manholes		0.0%		0.0%	$80,500	0.9%		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%	$80,500	0.9%	93.9%
Fencing & Gates		0.0%		0.0%	$78,000	0.9%		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%	$78,000	0.9%	94.8%
Metals		0.0%		0.0%		0.0%		0.0%	$16,300	0.2%	$31,800	0.4%	$23,300	0.3%		0.0%		0.0%	$71,400	0.8%	95.7%
Paving		0.0%		0.0%	$64,000	0.7%		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%	$64,000	0.7%	96.4%
Sheet Piling		0.0%		0.0%		0.0%		0.0%	$48,000	0.6%		0.0%		0.0%		0.0%		0.0%	$48,000	0.6%	97.0%
Interior Walls & Finishes		0.0%		0.0%		0.0%		0.0%		0.0%	$42,200	0.5%		0.0%		0.0%		0.0%	$42,200	0.5%	97.5%
Thermal & Moisture Protect.		0.0%	$6,700	0.1%		0.0%		0.0%	$8,100	0.1%	$15,800	0.2%	$11,500	0.1%		0.0%		0.0%	$42,100	0.5%	98.0%
Doors & windows		0.0%		0.0%		0.0%		0.0%		0.0%	$22,400	0.3%	$8,800	0.1%		0.0%		0.0%	$31,200	0.4%	98.3%
Wetlands Landscaping		0.0%		0.0%	$30,000	0.4%		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%	$30,000	0.4%	98.7%
Sidewalks		0.0%		0.0%	$28,400	0.3%		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%	$28,400	0.3%	99.0%
HVAC		0.0%	$10,000	0.1%		0.0%		0.0%		0.0%		0.0%	$15,700	0.2%		0.0%		0.0%	$25,700	0.3%	99.3%
Miscellaneous		0.0%		0.0%		0.0%		0.0%		0.0%	$25,300	0.3%		0.0%		0.0%		0.0%	$25,300	0.3%	99.6%
Curbing		0.0%		0.0%	$12,600	0.1%		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%	$12,600	0.1%	99.7%
Masonry		0.0%		0.0%		0.0%		0.0%		0.0%	$11,900	0.1%		0.0%		0.0%		0.0%	$11,900	0.1%	99.9%
Cranes & Hoists		0.0%		0.0%		0.0%		0.0%	$4,500	0.1%		0.0%	$4,500	0.1%		0.0%		0.0%	$9,000	0.1%	100.0%
Signage		0.0%		0.0%	$1,400	0.0%		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%	$1,400	0.0%	100.0%
TOTAL	$3,178,700	37.1%	$1,537,400	17.9%	$1,390,700	16.2%	$950,200	11.1%	$686,800	8.0%	$396,100	4.6%	$247,800	2.9%	$100,000	1.2%	$78,700	0.9%	$8,566,400	100.0%	

Subcontractor OH&P	$736,000
Subtotal	$9,302,400
General Conditions	$651,500
Subtotal	$9,953,900
Contractor's OH&P	$1,493,900
Bonds & Insurance	$323,400
Subtotal	$11,771,200
Contingency	$2,355,300
Subtotal	$14,126,500
Escalation to Midpoint of Constr.	$841,500
TOTAL CONSTRUCTION COST	**$14,968,000**

FUNCTION ANALYSIS
APPENDIX G

FUNCTION ANALYSIS

Function Determination

Defining functional requirements for the project allowed the Owner to be sure that the facility, as designed, would fulfill needed purposes. The project was analyzed to determine what functions are being accomplished by the current design.

Function analysis was used as a tool to help the team to think in terms of specific project functions and their costs. It provided a function-based structure for a comprehensive analysis of the project design. This analysis was the catalyst for the idea generation that resulted in the ideas that are presented later in this report as alternatives for cost savings.

The function analysis worksheets are included at the end of this appendix.

TABLE G-1
FUNCTION ANALYSIS
WWTP #2 Improvements – Coos Bay, OR

	Function	
Component	Verb	Noun
Entire Project	Satisfy	Permit
	Improve	Reliability
	Increase	Capacity
SBR	Improve	Reliability
	Limit	Risk
	Limit	Cost
	Accommodate	Future-Changes
	Meet	BOD-Limit
	Meet	TSS-Limit
	Limit	Disinfection-Requirements
	Regulate	Flowrate
Headworks	Remove	Inorganics
	Facilitate	Inorganic-Disposal
	Split	Flows
	Remove	Debris
	Facilitate	Debris-Disposal
	Measure	Flowrate
	Shelter	People
	Shelter	Equipment
	Contain	Odors
	Reduce	Visual-Impact
Sitework & Yard Piping	Convey	Flows
	Limit	Entry
	Block	Views
	Improve	Views
	Mitigate	Added-Runoff
	Stabilize	Driving-Surface
	Convey	Electrical-Power
Disinfection	Meet	Permit
	Kill	Pathogens
	Control	Flowrate
Control Building	Shelter	Employees
	Protect	Electronics
	House	Process-Monitoring
	Store	Supplies

	Function	
Component	Verb	Noun
	Support	Staff-Needs
Maintenance Facilities	Protect	Electrical-Equipment
	Extend	Equipment-Life
	Prevent	Freeze-Damage
	Shelter	Maintenance
	Enable	Maintenance

CREATIVE IDEA LIST

APPENDIX H

TABLE H-1 CREATIVE IDEAS & EVALUATIONS		
WWTP #2 Improvements	Coos Bay, OR	
Idea No.	Description	Votes
B-29	Install security cameras	1
B-30	**Use natural gas for all heating**	**6**
B-31	Move blowers out of headworks, move closer to electrical building	0
B-32	**Provide A/C to electrical room**	**8**
B-33	Remove sample room	1
B-34	Utilize pervious paving; reduce storm drain system	3
B-35	Don't use shed roofs on building	0
B-36	Don't use metal roofs on buildings	5
B-37	Enclose generator	4
B-38	Provide carport in lieu of enclosed garage	0
B-39	Provide carport; put heater on vactor pump	1
B-40	Delete potential UV electrical storage building	0
B-41	Utilize garage for shop; eliminate shop space	1
B-42	Eliminate the hoists in shop	0
B-43	Utilize glass block in shop for natural light	0
B-44	Utilize control building at existing site for office/staff functions	0
B-45	Provide LEED certification for office/lab	1
B-46	Don't design for LEED certification	1
B-47	Eliminate gypsum board on interior finishes in control room	0
B-48	Use wood roof truss system	0
B-49	Remove all interior doors except restrooms	1
B-50	Put headworks second story facilities on top on SBR pre-reaction tanks	4
B-51	**T-lock line interior surfaces of the Influent Pump Station wetwell**	**6**
B-52	Use stained concrete floors on control building	4
B-53	Delete finished ceilings in control building	0
B-54	Design control building to look like house	0
B-55	Use steel-frame structure and pre-cast concrete wall panels	0
B-56	Move exterior stairs to inside building	5
B-57	Replace concrete landing supports with steel supports on exterior stairs	5
B-58	Make exterior stairs all aluminum	1
B-59	Replace coiling overhead doors with regular overhead doors	1

TABLE H-1 CREATIVE IDEAS & EVALUATIONS		
WWTP #2 Improvements	**Coos Bay, OR**	
Idea No.	Description	Votes
B-60	Do not use aluminum for anything exposed to weather	2
B-61	Convert existing structures into parks and recreation buildings	2
B-62	Convert existing structures into fish hatcheries	2
B-63	Convert existing site into wetland area/park	3
B-64	Use stainless steel for machine guards	1
B-65	At disinfection facility, use screen walls and eliminate roof	0
B-66	Use translucent plastic roofing over disinfection/headworks	1
B-67	Eliminate fiberglass screen panels at headworks	3
B-68	Eliminate interior doors and paint in control building	0
B-69	Eliminate vestibule in control building	0
B-70	Eliminate one of the drinking fountains	0
B-71	Convert existing building into community center with parking	2
B-72	Create an eco-roof at control building	0
B-73	Hire a muralist to paint wall of SBR building	3
B-74	Rent space for advertising on SBR building	1
B-75	Add skylights to control building	1
B-76	Add windows to south side of control building	3
B-77	**Flip control building 180-degrees; put staff entrance on back side**	**6**
B-78	Reduce amount of concrete paving around control building	1
B-79	Include bill payment slot to control building	0
B-80	**Use LED lighting throughout site**	**8**
B-81	Cover equalization basin with solar panels	0
B-82	Cover all buildings with solar panels	1
B-83	Use solar-augmented water heating	1
B-84	Design building for silver LEED, even if doesn’t get certified	2
B-85	Design office/lab for bronze LEED	0
B-86	Don’t design control building for public access for ADA	0
	(M) Miscellaneous	
M-1	**Shorten design and construction schedules**	**6**
M-2	Use mini-guaranteed maximum price elements to speed construction	5
M-3	Use two bid packages: one for new site; one for existing site	0

TABLE H-1 CREATIVE IDEAS & EVALUATIONS		
WWTP #2 Improvements	**Coos Bay, OR**	
Idea No.	Description	Votes
M-4	Decommission all electrical at existing site	1
M-5	Apply for Federal Water Resource Development Act funding	0
M-6	Use SRF sponsorship option for wetlands protection	0
M-7	**Include demolition cost for existing site**	**7**
M-8	Upgrade site security at existing site	0
M-9	**Create demo plan for existing site**	**6**
M-10	**Eliminate interim biosolids option, build final**	**7**
M-11	**Re-roof existing operation pump station building**	**6**
M-12	Install piping under Empire Blvd. before Empire improvements	3
M-13	Defer Empire improvements	0
M-14	Install all needed utilities in Empire before Empire improvements	5
M-15	Early procurement of critical equipment	4
M-16	Construct control building early and use as construction office	0
M-17	Construct gravity sewer and outfall in a common trench	2
M-18	Accelerate all permitting review processes	2
M-19	Review environmental process requirements	4
	(P) Process	
P-1	**Use existing secondaries for equalization storage to replace proposed**	**6**
P-2	Use existing secondaries for pre-treatment equalization	3
P-3	Use existing wet process tankage for equalization	1
P-4	Use welded steel above-grade manifolds	3
P-5	**Use Victaulic joints instead of flanges**	**7**
P-6	Use in-line UV instead of channel	4
P-7	Delete influent flowmeters	1
P-8	Use hypochlorite for disinfection	4
P-9	Use high efficiency blowers	2
P-10	Put piping in utilidor in common corridor	5
P-11	Reduce headloss from SBR to EQ basins	4
P-12	Move headworks upstream of influent pump station	5
P-13	Rotate SBRs 90-degrees	1
P-14	**Eliminate grit removal**	**6**

TABLE H-1 CREATIVE IDEAS & EVALUATIONS		
WWTP #2 Improvements		**Coos Bay, OR**
Idea No.	Description	Votes
P-15	Manifold WAS lines from SBRs to common wetwell	3
P-16	Eliminate influent sluice gate	5
P-17	Build a single SBR tank	0
P-18	**Put odor control on new plant site**	**8**
P-19	Move headworks to old plants site	1
P-20	**Move headworks and influent pump station to old plant site**	**6**
P-21	Defer installation of one or more pumps	4
P-22	**Revisit peaking factor for I/I for new development**	**7**
P-23	Put control panels in conditioned spaces	3
P-24	Put influent pump station below headworks	3
P-25	Don't cover EQ basin	2
P-26	Cover SBRs	0
P-27	Use soft starters instead of VFDs	2
P-28	Use vactor truck as backup air supply for SBRs	0
P-29	Provide a single influent flow meter	2
P-30	Use flume at headworks instead of meters	0
P-31	**Find ways to lower structures**	**7**
P-32	Convert existing influent pump station to submersible station and don't build a new influent pump station	3
P-33	**Use twist lock connections for submersible pumps**	**6**
P-34	Use Teflon-coated diffusers	0
P-35	Use natural gas for generator instead of diesel fuel	1
P-36	Take W3 water off of SBRs and eliminate W3 pumps	0
P-37	Put grit washer at ground level	0
P-38	Increase influent sewer size to store peaks	3
P-39	Renovate old plant and build smaller new plant	0
P-40	Eliminate combination air /relief valves at influent pump station	3
P-41	Relocate headworks next to SBR and use common wall construction	4
P-42	**Use common wall construction for everything but control building**	**8**
P-43	Provide 2-inch hoses for reuse water	1
P-44	Provide large drains in all areas	1

TABLE H-1 CREATIVE IDEAS & EVALUATIONS		
WWTP #2 Improvements		**Coos Bay, OR**
Idea No.	Description	Votes
P-45	Use existing site for dry weather SBR and treat wet weather added flows at new site	1
P-46	Use single pressure transmitter on manifold instead of individual ones for each pump	2
P-47	**Install "Zaps" system**	**8**
P-48	Put head cell in stand-alone vessel outside of structure	1
P-49	Make influent pump station dry pit type	0
P-50	Replace headworks with paper clip	0
P-51	**Build SBR Basins 2 & 3 and defer Basin 1**	**7**
P-52	Build headworks and influent pump station between pre-reaction tanks	0
P-53	**Build 3 SBR tanks now use Basin 3**	**7**
P-54	Use portable gantry or davit crane instead of monorail at influent pump station	2
P-55	Build all 3 basins now, use one for chlorine contact, build UV disinfection when Basin 3 needed for treatment	2
P-56	Use chlorine and use EQ basin for contact time	3
P-57	Reuse existing portable gantry from existing lift station instead of monorail	2
P-58	Provide separate odor control united for influent pump station and headworks	5
P-59	Build EQ basins below SBRs	0
P-60	Use 316 SS for exposed metal	1
P-61	Cover bar screens with fiberglass enclosures and eliminate canopy	0
P-62	Eliminate washer-compactor	0
P-63	Defer SBR mixers	5
P-64	Provide freeze protection for headworks	2
P-65	Use common wall construction for UV and SBR	5
P-66	Find other location for W3 pumps	0
P-67	Provide only one WAS pump per SBR basin	0
P-68	**Provide 3 WAS pumps instead of 4**	**6**
P-69	Pressurize W3 water with hydropneumatic tank	1
P-70	Perform flow test on outfall diffuser	5
P-71	**Expand outfall now, use hypochlorite and don't equalize flows**	**6**
P-72	Provide influent and effluent composite samplers	2

TABLE H-1 CREATIVE IDEAS & EVALUATIONS		
WWTP #2 Improvements	**Coos Bay, OR**	
Idea No.	Description	Votes
P-45	Use existing site for dry weather SBR and treat wet weather added flows at new site	1
P-46	Use single pressure transmitter on manifold instead of individual ones for each pump	2
P-47	**Install "Zaps" system**	**8**
P-48	Put head cell in stand-alone vessel outside of structure	1
P-49	Make influent pump station dry pit type	0
P-50	Replace headworks with paper clip	0
P-51	**Build SBR Basins 2 & 3 and defer Basin 1**	**7**
P-52	Build headworks and influent pump station between pre-reaction tanks	0
P-53	**Build 3 SBR tanks now use Basin 3**	**7**
P-54	Use portable gantry or davit crane instead of monorail at influent pump station	2
P-55	Build all 3 basins now, use one for chlorine contact, build UV disinfection when Basin 3 needed for treatment	2
P-56	Use chlorine and use EQ basin for contact time	3
P-57	Reuse existing portable gantry from existing lift station instead of monorail	2
P-58	Provide separate odor control united for influent pump station and headworks	5
P-59	Build EQ basins below SBRs	0
P-60	Use 316 SS for exposed metal	1
P-61	Cover bar screens with fiberglass enclosures and eliminate canopy	0
P-62	Eliminate washer-compactor	0
P-63	Defer SBR mixers	5
P-64	Provide freeze protection for headworks	2
P-65	Use common wall construction for UV and SBR	5
P-66	Find other location for W3 pumps	0
P-67	Provide only one WAS pump per SBR basin	0
P-68	**Provide 3 WAS pumps instead of 4**	**6**
P-69	Pressurize W3 water with hydropneumatic tank	1
P-70	Perform flow test on outfall diffuser	5
P-71	**Expand outfall now, use hypochlorite and don't equalize flows**	**6**
P-72	Provide influent and effluent composite samplers	2

TABLE H-1 CREATIVE IDEAS & EVALUATIONS		
WWTP #2 Improvements	**Coos Bay, OR**	
Idea No.	Description	Votes
P-73	Relocate manifold drains to low point	0
P-74	Raise EQ basin elevation and raise UV facilities	0
P-75	Provide vacuum prime influent pump station	0
P-76	Defer second mechanical screen	4
P-77	Construct effluent pump station for peak flows	2
P-78	**Line outfall and use pump station for peak effluent flows**	**4**
P-79	Revisit SBR sizing	1
P-80	Revisit aeration sizing with respect to ammonia	0
P-81	Revisit design flows and loads	4
P-82	Use portable gantry crane at UV instead of bridge crane	1
P-83	Put hatches in roof at UV and eliminate bridge crane	4
P-84	Use sluiceway instead of conveyors for bar screens	0
P-85	Use grinders instead of bar screens	1
P-86	**Use Strobic fan instead of biofilter**	**8**
P-87	Use carbon steel for air piping on top of SBRs	0
P-88	**Discharge air at old plant without odor treatment**	**6**
P-89	Use weighted gate instead of weir at UV channel	1
P-90	Use wider, shallower SBRs	3
P-91	Lower SBRs and pump effluent	5
P-92	Lower headworks and pump to SBRs	5
P-93	Expand and upgrade at old plant, use new site for influent equalization tank	1
P-94	Put new influent pump station where existing manhole is	0
P-95	Add ferric chloride feed at influent pump station and eliminate odor control	1
P-96	Fully enclose UV system	2
P-97	Fully enclose headworks	1
P-98	Use only 2 large pumps	1
P-99	**Revisit the pump approach in the influent pump station to simplify it**	**6**
P-100	**Eliminate influent pump station superstructure**	**7**
P-101	Put influent pumps in cans	0
P-102	Put headworks ahead of influent pumps and use vertical turbine solids handling pumps	2

TABLE H-1 CREATIVE IDEAS & EVALUATIONS		
WWTP #2 Improvements	**Coos Bay, OR**	
Idea No.	Description	Votes
P-73	Relocate manifold drains to low point	0
P-74	Raise EQ basin elevation and raise UV facilities	0
P-75	Provide vacuum prime influent pump station	0
P-76	Defer second mechanical screen	4
P-77	Construct effluent pump station for peak flows	2
P-78	**Line outfall and use pump station for peak effluent flows**	**4**
P-79	Revisit SBR sizing	1
P-80	Revisit aeration sizing with respect to ammonia	0
P-81	Revisit design flows and loads	4
P-82	Use portable gantry crane at UV instead of bridge crane	1
P-83	Put hatches in roof at UV and eliminate bridge crane	4
P-84	Use sluiceway instead of conveyors for bar screens	0
P-85	Use grinders instead of bar screens	1
P-86	**Use Strobic fan instead of biofilter**	**8**
P-87	Use carbon steel for air piping on top of SBRs	0
P-88	**Discharge air at old plant without odor treatment**	**6**
P-89	Use weighted gate instead of weir at UV channel	1
P-90	Use wider, shallower SBRs	3
P-91	Lower SBRs and pump effluent	5
P-92	Lower headworks and pump to SBRs	5
P-93	Expand and upgrade at old plant, use new site for influent equalization tank	1
P-94	Put new influent pump station where existing manhole is	0
P-95	Add ferric chloride feed at influent pump station and eliminate odor control	1
P-96	Fully enclose UV system	2
P-97	Fully enclose headworks	1
P-98	Use only 2 large pumps	1
P-99	**Revisit the pump approach in the influent pump station to simplify it**	**6**
P-100	**Eliminate influent pump station superstructure**	**7**
P-101	Put influent pumps in cans	0
P-102	Put headworks ahead of influent pumps and use vertical turbine solids handling pumps	2

TABLE H-1 CREATIVE IDEAS & EVALUATIONS		
WWTP #2 Improvements	**Coos Bay, OR**	
Idea No.	Description	Votes
P-103	Install 2 mm screens now, ahead of pump station and use vertical turbine pumps	4
P-104	Increase footprint of headworks' second level to match floor below	0
P-105	Build headworks flow reaction control weirs into pre-reaction tank structure	1
P-106	Build headworks building of structural steel and sheet rock	0
P-107	Install diesel backup pumps and reduce generator size	0
P-108	File appeal to remove regulations	0
P-109	**Revisit plant hydraulics**	**6**
P-110	Use fly ash in concrete	0
P-111	**Eliminate headcell; install primary, degrit primary sludge**	**3**
P-112	Remove automated backwash strainer	2
P-113	**Design plant for remote operation**	**7**
P-114	Use organic media biofilter with locally-supplied media	1
P-115	Use on-site generated hypochlorite for disinfection	3
P-116	Use FRP finger weirs	3
	(S) Site	
S-1	Preserve salvageable evergreens at southeast corner	3
S-2	Use pervious paving	0
S-3	Use water bound macadam paving	0
S-4	Use stone columns instead of over-excavation for SBR	0
S-5	**Limit asphalt to high traffic areas, use grasscrete for low traffic areas**	**8**
S-6	Enhance Riparian area	0
S-7	Bore and jack under Empire	0
S-8	**Use plastic pipe for buried piping**	**6**
S-9	Put all on-site power lines underground	1
S-10	Relocate garage door and reduce paving on south side of garage	4
S-11	Eliminate reinforcing in ductbanks less than 15 kVA	1
S-12	Eliminate ductbanks, direct bury cable	2
S-13	Provide additional landscaping along western site ditch	0
S-14	Create environmental "bank" and eliminate on-site wetlands	1
S-15	Move headworks to east property line and incorporate into embankment	5

MATERIAL PROVIDED TO THE VE TEAM

APPENDIX I

APPENDIX I

MATERIALS PROVIDED TO THE VE TEAM

Document Title/Description	Source/Author	Date
Preliminary Design Drawings	SHN/CH2M Hill	8/19/2013
Preliminary Design Report	SHN/CH2M Hill	8/2013
WWTP #2 Dive Report	Orca Divers	12/2/2009
NPDES Permit – Outfall 1 – Draft Permit	Oregon DEQ	2013
NPDES Permit Evaluation & Fact Sheet – Coos Bay #2	Oregon DEQ	2013
Request for Comments – Coos Bay NPDES WWTP #2	Oregon DEQ	2013
Tech Memo – Coos Bay WWTP #2 Final Cost Estimate	CH2M Hill	5/15/2012
Value Assessment at Facilities Plan Amendment Phase Report	CH2M Hill	3/2012
MAO WQ/M-WR-03-022 – Amendment 3	Oregon DEQ	3/2/2012
Tsunami Evacuation Map – Coos Bay Peninsula	Oregon Dept. of Geology and Mineral Industries	5/11/2012
Coos Bay WWTP #2 Facilities Plan Amendment, volumes 1 & 2	Civil West Engineering Services	11/20/2012
Permit Modification – Permit 100771 for pump station overflows	Oregon DEQ	12/15/2004
NPDES Permit No. 100771	Oregon DEQ	8/21/2003
MAO WQ/M-WR-03-022	Oregon DEQ	8/21/2003
MAO WQ/M-WR-03-022 – Modification No. 1	Oregon DEQ	6/19/2009
Treatment Plant Construction Drawings	HGE Inc.	1973
Treatment Plant Improvement Construction Drawings	Century West Engineering	1990
Coos Bay WWTP # 2 Improvements – 3D drawing	SHN/CH2M Hill	8/20/2013
Designer’s Slide Presentation to VE Team	SHN/CH2M Hill	12/2013

RESPONSES TO VE TEAM ALTERNATIVES
APPENDIX J

RESPONSE TO VALUE ENGINEERING ALTERNATIVE

Project Name: **WWTP #2 Improvements**

Project Location: **Coos Bay, Oregon**

VE Alternative No.: **B-1**

VE Alternative Title: **Combine shop and garage into office in one building**

RESPONSE:

Accept ___ Partially Accept ___ Reject _X_ Further Study _X__

Agree with estimated savings ___ Disagree with estimated savings ___

Revised estimate of savings (if savings disputed):	Capital	$__________ ______
	Present worth of O&M	$ ________________
	Total Present worth	$ ________________

Discussion (Explain reasons for rejection, partial rejection or further study):

The design team had not considered a single building because the office was a part of the original design and the garage was proposed later. However with that said, the uses are very different. From an operations and aesthetic standpoint it appears keeping these buildings separate is more beneficial to the project. For these reasons, after further study, the alternative was rejected

However from this discussion, it was determined that the shop could be combined with the influent pump station.

RESPONSE TO VALUE ENGINEERING ALTERNATIVE

Project Name: **WWTP #2 Improvements**

Project Location: **Coos Bay, Oregon**

VE Alternative No.: **B-3**

VE Alternative Title: **Use pre-engineering metal buildings**

RESPONSE:

Accept ___ Partially Accept ___ Reject ___ Further Study _X__

Agree with estimated savings ___ Disagree with estimated savings _See Below__

Revised estimate of savings (if savings disputed): Capital $__________ ______

Present worth of O&M $ ________________

Total Present worth $ ________________

Discussion (Explain reasons for rejection, partial rejection or further study):

A LiveMeeting with the City of Coos Bay, CH2M HILL, and Mortenson Construction was held on February 24, 2014 to review VE proposal B-3 Pre-Engineered Metal Buildings (PEMB). At that meeting, two concepts were identified for development for the Garage/Shop/Electrical room and IPS area which are to be combined into a single facility. Since then, a third concept using full height CMU walls, either as a skin on a pre-engineered metal building or integral with the design of the building, were considered. The four alternatives are summarized below:

- Base – PEMB with full height metal siding
- Option 1 - PEMB with 4 foot CMU wainscot and metal siding above.
- Option 2 - PEMB with CMU non-structural full height
- Option 3 - Full height CMU structural exterior with steel roof structure.

Each concept will use the same building plan shown in Attachment A. Each concept will include a separate overhead coiling door to the shop and garage areas. Exit doors will be provided per code. Interior walls will be framed and sheathed with durable finish materials. Natural daylight will be provided whenever possible; however, skylights will not be considered in this facility. The metal roofing system will remain unchanged and will be extended to provide a canopy over the manufacturer provided generator enclosure to be located adjacent the building. Electrical designers will confirm that the distance from the transformer, electrical gear in the electrical room, and engine generator do not become excessive.

Mortenson identified the following construction costs for the options:

- Base $224,430.
- Option 1 $223,788 ($642 savings)
- Option 2 $268,044 ($43,614 additional cost)
- Option 3 $269,208 ($44,778 additional cost)

CH2M HILL identified that there were no additional engineering costs associated with the Base Option, Option 1, or Option 3, and possibly minor additional costs associated with option 2. For aesthetics, the City prefers either Option 2 or Option 3. It has been determined that since Option 3 achieves the aesthetics at no additional engineering costs, Option 3 is the preferred alternative.

RESPONSE TO VALUE ENGINEERING ALTERNATIVE

Project Name: **WWTP #2 Improvements**

Project Location: **Coos Bay, Oregon**

VE Alternative No.: **B-23**

VE Alternative Title: **Make a single bathroom unisex**

RESPONSE:

Accept _X__ Partially Accept ___ Reject ___ Further Study _X__

Agree with estimated savings ___ Disagree with estimated savings ___

Revised estimate of savings (if savings disputed):	Capital	$__________ ______
	Present worth of O&M	$ ________________
	Total Present worth	$ ________________

Discussion (Explain reasons for rejection, partial rejection or further study):

Upon confirming that a unisex bathroom was allowed per code, a revised Control Building floor plan was updated and a unisex bathroom is incorporated into the layout (Attachment D). This alternative was accepted.

There were several alternatives from the VE (B-23, B-77, and P-113) that contributed to the reduced size of the control building and associated savings will be accounted for in the 60 percent design.

RESPONSE TO VALUE ENGINEERING ALTERNATIVE

Project Name: **WWTP #2 Improvements**

Project Location: **Coos Bay, Oregon**

VE Alternative No.: **B-24**

VE Alternative Title: **Insulate and heat shop**

RESPONSE:

Accept _X__ Partially Accept ___ Reject ___ Further Study ___

Agree with estimated savings ___ Disagree with estimated savings ___

Revised estimate of savings (if savings disputed):	Capital	$__________ ______
	Present worth of O&M	$ ________________
	Total Present worth	$ ________________

Discussion (Explain reasons for rejection, partial rejection or further study):

RESPONSE TO VALUE ENGINEERING ALTERNATIVE

Project Name: **WWTP #2 Improvements**

Project Location: **Coos Bay, Oregon**

VE Alternative No.: **B-26**

VE Alternative Title: **Replace concrete cover on equalization basin with metal roof**

RESPONSE:

Accept ___ Partially Accept ___ Reject _X__ Further Study _X__

Agree with estimated savings ___ Disagree with estimated savings _See Attachment B ($130,000)

Revised estimate of savings (if savings disputed): Capital $__________ ______

Present worth of O&M $ ________________

Total Present worth $ ________________

Discussion (Explain reasons for rejection, partial rejection or further study):

CH2M HILL gathered a quote from Halston for aluminum covers. CH2M HILL also provided a preliminary design basis for the current preliminary design concept of a concrete roof. Mortenson developed pricing for the concrete option. Results of this cost analysis indicate the cost for metal covers is approximately $300,000, approximately $130,000 more than the baseline concrete cover approach. For this reason, this alternative has been rejected. Attachment B summarizes the cost comparison.

RESPONSE TO VALUE ENGINEERING ALTERNATIVE

Project Name: **WWTP #2 Improvements**

Project Location: **Coos Bay, Oregon**

VE Alternative No.: **B-30**

VE Alternative Title: **Use natural gas for all heating**

RESPONSE:

Accept __X_ Partially Accept ___ Reject ___ Further Study ___

Agree with estimated savings ___ Disagree with estimated savings ___

Revised estimate of savings (if savings disputed):	Capital	$__________ ______
	Present worth of O&M	$ ________________
	Total Present worth	$ ________________

Discussion (Explain reasons for rejection, partial rejection or further study):

RESPONSE TO VALUE ENGINEERING ALTERNATIVE

Project Name: **WWTP #2 Improvements**

Project Location: **Coos Bay, Oregon**

VE Alternative No.: **B-51**

VE Alternative Title: **T-Lock line interior surfaces of the influent pump station wetwell**

RESPONSE:

Accept _X__ Partially Accept ___ Reject ___ Further Study _X__

Agree with estimated savings ___ Disagree with estimated savings _$27,700__

Revised estimate of savings (if savings disputed): Capital $_________

Present worth of O&M $ ________________

Total Present worth $ ________________

Discussion (Explain reasons for rejection, partial rejection or further study):

SHN/CH2M HILL provided marked up predesign drawings to Mortenson showing the extent of coverage needed for either a coating system or the T-Lock liner system proposed. During the weekly project coordination meeting on February 25, 2014, this item was discussed further. It is recommended that this proposal be accepted for the following reasons:

- On a recent design build project, CH2M HILL found T-lock to be less expensive than a coating system.
- Both Mortenson and CH2M HILL have had projects where the quality of the coating application has been poor and lead to premature and costly failures. Subsequent recoating can be expense and require bypass pumping for extensive periods of time to allow the manufacturer's required curing period.
- The T-Lock system is permanent, requires not reapplication, and Mortenson has extensive experience with it.

The cost comparison between the coating system and the T-lock liner is in Attachment C and concludes that the T-lock liner results in a savings of $27,700. Therefore, this alternative has been accepted.

RESPONSE TO VALUE ENGINEERING ALTERNATIVE

Project Name: **WWTP #2 Improvements**

Project Location: **Coos Bay, Oregon**

VE Alternative No.: **B-60**

VE Alternative Title: **Do not use aluminum for anything exposed to weather**

RESPONSE:

Accept ___ Partially Accept _X__ Reject ___ Further Study _X__

Agree with estimated savings ___ Disagree with estimated savings ___

Revised estimate of savings (if savings disputed):	Capital	$__________ ______
	Present worth of O&M	$ ________________
	Total Present worth	$ ________________

Discussion (Explain reasons for rejection, partial rejection or further study):

SHN/CH2M HILL will follow the direction of the corrosion engineer during the 60% design. Note that in some cases, aluminum is the most suitable corrosion resistant material for coastal exposed applications.

RESPONSE TO VALUE ENGINEERING ALTERNATIVE

Project Name: **WWTP #2 Improvements**

Project Location: **Coos Bay, Oregon**

VE Alternative No.: **B-76**

VE Alternative Title: **Add windows to south side of control building**

RESPONSE:

Accept _X__ Partially Accept ___ Reject ___ Further Study ___

Agree with estimated savings ___ Disagree with estimated savings ___

Revised estimate of savings (if savings disputed): Capital $__________ ______

Present worth of O&M $ ________________

Total Present worth $ ________________

Discussion (Explain reasons for rejection, partial rejection or further study):

RESPONSE TO VALUE ENGINEERING ALTERNATIVE

Project Name: **WWTP #2 Improvements**

Project Location: **Coos Bay, Oregon**

VE Alternative No.: **B-77**

VE Alternative Title: **Flip control building 180-degrees; put staff entrance on back side**

RESPONSE:

Accept ___ Partially Accept ___ Reject _X__ Further Study _X__

Agree with estimated savings ___ Disagree with estimated savings ___

Revised estimate of savings (if savings disputed):	Capital	$__________ ______
	Present worth of O&M	$ ________________
	Total Present worth	$ ________________

Discussion (Explain reasons for rejection, partial rejection or further study):

A LiveMeeting with the City of Coos Bay, CH2M HILL, and Mortenson Construction was held on February 24, 2014 to review VE proposal B-23 unisex bathroom, B-77 building orientation, and P-113 design Plant for remote operation.

After consideration of this alternative it was rejected. The original orientation of the building facilitates operator access and versus public access.

RESPONSE TO VALUE ENGINEERING ALTERNATIVE

Project Name: **WWTP #2 Improvements**

Project Location: **Coos Bay, Oregon**

VE Alternative No.: **B-80**

VE Alternative Title: **Use LED lighting throughout site**

RESPONSE:

Accept _X__ Partially Accept ___ Reject ___ Further Study ___

Agree with estimated savings ___ Disagree with estimated savings ___

Revised estimate of savings (if savings disputed): Capital $__________ ______

Present worth of O&M $ ________________

Total Present worth $ ________________

Discussion (Explain reasons for rejection, partial rejection or further study):

RESPONSE TO VALUE ENGINEERING ALTERNATIVE

Project Name: **WWTP #2 Improvements**

Project Location: **Coos Bay, Oregon**

VE Alternative No.: **M-1**

VE Alternative Title: **Shorten design and construction schedules**

RESPONSE:

Accept _X__ Partially Accept ___ Reject ___ Further Study ___

Agree with estimated savings ___ Disagree with estimated savings ___

Revised estimate of savings (if savings disputed): Capital $__________ ______

Present worth of O&M $ ________________

Total Present worth $ ________________

Discussion (Explain reasons for rejection, partial rejection or further study):

RESPONSE TO VALUE ENGINEERING ALTERNATIVE

Project Name: **WWTP #2 Improvements**

Project Location: **Coos Bay, Oregon**

VE Alternative No.: **M-2**

VE Alternative Title: **Use Mini-GMP price elements to speed construction**

RESPONSE:

Accept _X__ Partially Accept ___ Reject ___ Further Study ___

Agree with estimated savings ___ Disagree with estimated savings ___

Revised estimate of savings (if savings disputed):	Capital	$__________ ______
	Present worth of O&M	$ ________________
	Total Present worth	$ ________________

Discussion (Explain reasons for rejection, partial rejection or further study):

RESPONSE TO VALUE ENGINEERING ALTERNATIVE

Project Name: **WWTP #2 Improvements**

Project Location: **Coos Bay, Oregon**

VE Alternative No.: **M-7**

VE Alternative Title: **Include demolition cost for existing site**

RESPONSE:

Accept _X__ Partially Accept ___ Reject ___ Further Study _X__

Agree with estimated savings ___ Disagree with estimated savings ___

Revised estimate of savings (if savings disputed): Capital $__________ ______

Present worth of O&M $ ________________

Total Present worth $ ________________

Discussion (Explain reasons for rejection, partial rejection or further study):

At the time that the VE was performed, the project was proposing to keep a portion of the existing plant on-line for the interim biosolids solution. However since the VE, the City has moved forward with an ultimate biosolids solution and as a result, the existing plant will not need to remain on line and can be demolished. The scope of work for the demo can be included in the overall scope of work associated with the proposed Plant 2. This alternative has been accepted.

RESPONSE TO VALUE ENGINEERING ALTERNATIVE

Project Name: **WWTP #2 Improvements**

Project Location: **Coos Bay, Oregon**

VE Alternative No.: **M-11**

VE Alternative Title: **Re-roof existing operation pump station building**

RESPONSE:

Accept ___ Partially Accept ___ Reject __X_ Further Study __X_

Agree with estimated savings ___ Disagree with estimated savings ___

Revised estimate of savings (if savings disputed): Capital $__________ ______

Present worth of O&M $ ________________

Total Present worth $ ________________

Discussion (Explain reasons for rejection, partial rejection or further study):

At the time that the VE was performed, the project was proposing to keep a portion of the existing plant on-line for the interim biosolids solution. However since the VE, the City has moved forward with an ultimate biosolids solution and as a result, the existing plant will not need to remain on line and can be demolished. Since the existing site is being demolished, it will not be necessary to re-roof the existing operations building. This alternative has been rejected.

RESPONSE TO VALUE ENGINEERING ALTERNATIVE

Project Name: **WWTP #2 Improvements**

Project Location: **Coos Bay, Oregon**

VE Alternative No.: **P-1**

VE Alternative Title: **Use existing secondaries for equalization storage to replace proposed**

RESPONSE:

Accept ___ Partially Accept ___ Reject _X__ Further Study ___

Agree with estimated savings ___ Disagree with estimated savings ___

Revised estimate of savings (if savings disputed):	Capital	$__________ ______
	Present worth of O&M	$ ________________
	Total Present worth	$ ________________

Discussion (Explain reasons for rejection, partial rejection or further study):

This further complicates the construction and likely increases the cost owing to the structural modifications necessary to extend the life of the clarifiers. This would introduce the need for intermediate pumping and increase the cost of operations. Additionally, this alternative is not cost effective. This alternative has been rejected.

RESPONSE TO VALUE ENGINEERING ALTERNATIVE

Project Name: **WWTP #2 Improvements**

Project Location: **Coos Bay, Oregon**

VE Alternative No.: **P-5**

VE Alternative Title: **Use Victaulic joints instead of flanges cou0plings for all above ground and submerged pipe joints**

RESPONSE:

Accept _X__ Partially Accept ___ Reject ___ Further Study ___

Agree with estimated savings ___ Disagree with estimated savings ___

Revised estimate of savings (if savings disputed): Capital $__________ ______

Present worth of O&M $ ________________

Total Present worth $ ________________

Discussion (Explain reasons for rejection, partial rejection or further study):

We are already designing for this. Therefore, this alternative has been accepted.

RESPONSE TO VALUE ENGINEERING ALTERNATIVE

Project Name: **WWTP #2 Improvements**

Project Location: **Coos Bay, Oregon**

VE Alternative No.: **P-14**

VE Alternative Title: **Eliminate grit removal**

RESPONSE:

Accept ___ Partially Accept ___ Reject _X__ Further Study ___

Agree with estimated savings ___ Disagree with estimated savings _X__

Revised estimate of savings (if savings disputed):	Capital	$__________ ______
	Present worth of O&M	$ ________________
	Total Present worth	$ ________________

Discussion (Explain reasons for rejection, partial rejection or further study):

The team agreed that the Oregon Coastal communities have a higher need for grit removal owing to sand intrusion in the collection system. Additionally the cost savings analysis in the draft report does not consider additional labor and equipment for annual maintenance. This alternative has been rejected.

RESPONSE TO VALUE ENGINEERING ALTERNATIVE

Project Name: **WWTP #2 Improvements**

Project Location: **Coos Bay, Oregon**

VE Alternative No.: **P-18**

VE Alternative Title: **Put odor control on new plant site**

RESPONSE:

Accept __X_ Partially Accept ___ Reject ___ Further Study _X__

Agree with estimated savings ___ Disagree with estimated savings _$26,400__

Revised estimate of savings (if savings disputed): Capital $___ ______

Present worth of O&M $ ________________

Total Present worth $ ________________

Discussion (Explain reasons for rejection, partial rejection or further study):

Cost of trenching a 16-inch HDPE pipe was estimated to be approximately $44/ft. This cost includes 30 percent mark-up, trenching, installation, and pipe material cost. Multiplying this by an estimated 600 feet of duct would have a savings of approximately $26,400.

Advantages

- Save approximately $26,400 in piping to facilities at new site. Placing the odor control equipment at the new site will decrease the amount of piping needed which will save costs on pipe material and trenching installation.
- An AERMOD dispersion model was conducted with the bio filter placed at the new site and showed that the results had little to no change from values in the preliminary design technical memo. This indicates that odors should not exceed the offsite goals of 10ppb H_2S and 10DT.

Disadvantages

- Placing the bio filter at the new site decreases the distance to residential areas and therefore heightens the risk of odor complaints in case of equipment malfunction or temporary shutdown. Regardless of the dispersion model results, there is greater risk associated with this location due to reduced buffer zone.
- Under calm conditions, based on modeling conducted under worst case calm conditions, there is a possibility that bio filter stack odors may not achieve ideal dilution before touching down at sensitive receptors (neighbors) at the elevated terrain immediately east of the Plant. Calm conditions are expected to occur approximately 10 percent of the time (~800 hours per year).

This alternative has been accepted.

RESPONSE TO VALUE ENGINEERING ALTERNATIVE

Project Name: **WWTP #2 Improvements**

Project Location: **Coos Bay, Oregon**

VE Alternative No.: **P-20**

VE Alternative Title: **Move headworks and influent pump station to old plant site**

RESPONSE:

Accept ___ Partially Accept ___ Reject _X__ Further Study ___

Agree with estimated savings ___ Disagree with estimated savings _X__

Revised estimate of savings (if savings disputed): Capital $__________ ______

Present worth of O&M $ ________________

Total Present worth $ ________________

Discussion (Explain reasons for rejection, partial rejection or further study):

The team saw this as being more costly than new construction. The existing site is already heavily constrained, construction in the area of the existing pump station is inadequate for screening and influent pumping. Furthermore, the City prefers to keep all components on one site. This alternative has been rejected.

RESPONSE TO VALUE ENGINEERING ALTERNATIVE

Project Name: **WWTP #2 Improvements**

Project Location: **Coos Bay, Oregon**

VE Alternative No.: **P-33**

VE Alternative Title: **Use twist lock connections for submersible pumps**

RESPONSE:

Accept __X_ Partially Accept ___ Reject ___ Further Study ___

Agree with estimated savings ___ Disagree with estimated savings ___

Revised estimate of savings (if savings disputed): Capital $__________ ______

Present worth of O&M $ ________________

Total Present worth $ ________________

Discussion (Explain reasons for rejection, partial rejection or further study):

RESPONSE TO VALUE ENGINEERING ALTERNATIVE

Project Name: **WWTP #2 Improvements**

Project Location: **Coos Bay, Oregon**

VE Alternative No.: **P-42**

VE Alternative Title: **Use common wall construction for everything but control building**

RESPONSE:

Accept ___ Partially Accept ___ Reject _X__ Further Study ___

Agree with estimated savings ___ Disagree with estimated savings _X__

Revised estimate of savings (if savings disputed):	Capital	$__________ ______
	Present worth of O&M	$ ________________
	Total Present worth	$ ________________

Discussion (Explain reasons for rejection, partial rejection or further study):

This was already evaluated in predesign. Costs were anticipated to be higher owing to the significant differences in the foundation requirements for the headworks, SBR, and UV Disinfection. The CMGC contractor confirmed this. This alternative has been rejected.

RESPONSE TO VALUE ENGINEERING ALTERNATIVE

Project Name: **WWTP #2 Improvements**

Project Location: **Coos Bay, Oregon**

VE Alternative No.: **P-47**

VE Alternative Title: **Install “Zaps” system**

RESPONSE:

Accept ___ Partially Accept ___ Reject _X__ Further Study ___

Agree with estimated savings ___ Disagree with estimated savings __X_

Revised estimate of savings (if savings disputed):	Capital	$__________ ______
	Present worth of O&M	$ ________________
	Total Present worth	$ ________________

Discussion (Explain reasons for rejection, partial rejection or further study):

The City will evaluate the value of this in the future when EPA has made a determination about using the ZAPS LiquID unit for compliance monitoring. The VE showed a savings, however at this time there may not be a savings because the project cannot eliminate the sample room. This alternative has been rejected.

RESPONSE TO VALUE ENGINEERING ALTERNATIVE

Project Name: **WWTP #2 Improvements**

Project Location: **Coos Bay, Oregon**

VE Alternative No.: **P-68**

VE Alternative Title: **Provide 3 WAS pumps instead of 4**

RESPONSE:

Accept ___ Partially Accept ___ Reject __X_ Further Study ___

Agree with estimated savings ___ Disagree with estimated savings ___

Revised estimate of savings (if savings disputed):	Capital	$__________ ______
	Present worth of O&M	$ ________________
	Total Present worth	$ ________________

Discussion (Explain reasons for rejection, partial rejection or further study):

The team felt better redundancy and simplicity of design was achieved with the 4 pump approach. This alternative has been rejected.

RESPONSE TO VALUE ENGINEERING ALTERNATIVE

Project Name: **WWTP #2 Improvements**

Project Location: **Coos Bay, Oregon**

VE Alternative No.: **P-71**

VE Alternative Title: **Expand outfall now, use hypochlorite and don't equalize flows**

RESPONSE:

Accept ___ Partially Accept ___ Reject _X__ Further Study ___

Agree with estimated savings ___ Disagree with estimated savings ___

Revised estimate of savings (if savings disputed):	Capital	$__________ ______
	Present worth of O&M	$ ________________
	Total Present worth	$ ________________

Discussion (Explain reasons for rejection, partial rejection or further study):

Due to regulatory and permitting uncertainties, the outfall work cannot occur at present. The delay that this would cause if it was included in the Plant 2 scope of work would be more costly to the City than the savings presented in the VE report. This alternative has been rejected.

RESPONSE TO VALUE ENGINEERING ALTERNATIVE

Project Name: **WWTP #2 Improvements**

Project Location: **Coos Bay, Oregon**

VE Alternative No.: **P-78**

VE Alternative Title: **Line outfall and use pump station for peak effluent flows**

RESPONSE:

Accept ___ Partially Accept ___ Reject _X__ Further Study ___

Agree with estimated savings ___ Disagree with estimated savings ___

Revised estimate of savings (if savings disputed): Capital $__________ ______

Present worth of O&M $ ________________

Total Present worth $ ________________

Discussion (Explain reasons for rejection, partial rejection or further study):

Due to regulatory and permitting uncertainties, the outfall work cannot occur at present. Additionally, this alternative is not cost effective. This alternative has been rejected.

RESPONSE TO VALUE ENGINEERING ALTERNATIVE

Project Name: **WWTP #2 Improvements**

Project Location: **Coos Bay, Oregon**

VE Alternative No.: **P-86**

VE Alternative Title: **Use Strobic fan instead of biofilter**

RESPONSE:

Accept ___ Partially Accept ___ Reject __X_ Further Study __X_

Agree with estimated savings ___ Disagree with estimated savings _$128,000__

Revised estimate of savings (if savings disputed): Capital $__________ ______

Present worth of O&M $ ________________

Total Present worth $ ________________

Discussion (Explain reasons for rejection, partial rejection or further study):

An evaluation was conducted for locating a 2,250 cfm, Strobic fan on top of a building at 30 feet above grade on the new site. Dilution air for the model BS-005, described above, is 700 cfm. With 700 cfm dilution the expected peak discharge concentrations are:

- Expected peak outlet H2S concentration =8.2ppm
- Expected peak outlet odor concentration = 7681DT

An AERMOD dispersion model was conducted, under these input concentrations, and concluded that if the Strobic fan stack release height is 30 feet, the offsite goals of 10ppb H2S and 10DT will not be exceeded. However, AERMOD does not effectively model calm wind conditions. Therefore, Screen3 was used to model this condition.

Screen3 is a screening dispersion model tool to predict dispersion offsite impacts based on worst case conditions (including calm winds). Screen3 model results showed that on a calm day at a release height of 30 feet, the maximum ground level offsite H2S concentrations would be 18ppb H2S, which exceeds the offsite limit by 80 percent. This is 8ppb H2S over the offsite limit of 10ppb H2S. The receptor that recorded this reading was located at 30 feet height and 820 feet away to simulate the elevated terrain east of new Plant site. According to the wind rose plot for 2008-2013 (see preliminary design technical memorandum), 10 percent of the winds are below one knots (calm winds). Using this information and the results from Screen3, this is there are approximately 875 hours out of the year that could potentially have odors greater than the offsite odor criteria when using a dispersion fan located at the new site.

Advantages

- Cost of Strobic fan by Strobic Air, model BS-005, is approximately $11,000-$12,000. This includes dilution plenum and motorized outside air dilution dampers. Since the existing biofilter would be eliminated this would save approximately $128,000 in capital costs ($140,000 minus $12,000).

Disadvantages

- If actual odors are proved to be greater than currently projected odors, the dispersion fan approach is more sensitive to this versus a vapor phase odor treatment system approach and therefore exhibits greater risk. This is because odors will not be specifically controlled and could result in complaints from time to time based on actual elevated odor concentrations. Similarly, any short-term odor spikes will also be more likely to impact offsite with the dispersion fan.

- If the Strobic fan is not located at least 30 feet high, offsite odor criteria will be exceeded and could cause odor complaints.

- The Screen3 model indicates that if the Strobic fan stack is elevated at 30 feet, offsite odor limits will be exceeded during calm winds (approximately 10 percent of the time or 875 hours per year) east of the new Plant site where terrain is elevated.

- Strobic fans at this elevation can emit noise that could result in elevated noise levels past the fence line, if located at the new site.

Because of the likely potential for objectionable odors, and the close proximity that this plant has to its neighbors, this proposal is not accepted.

RESPONSE TO VALUE ENGINEERING ALTERNATIVE

Project Name: **WWTP #2 Improvements**

Project Location: **Coos Bay, Oregon**

VE Alternative No.: **P-88**

VE Alternative Title: **Discharge air at old plant without odor treatment**

RESPONSE:

Accept ___ Partially Accept ___ Reject _X__ Further Study _X__

Agree with estimated savings ___ Disagree with estimated savings ___

Revised estimate of savings (if savings disputed): Capital $__________ ______

Present worth of O&M $ ________________

Total Present worth $ ________________

Discussion (Explain reasons for rejection, partial rejection or further study):

See discussion in P-86.

Because of the likely potential for objectionable odors, this proposal has not been accepted. Additionally, the City has elected to have all components of the new plant on one site, including the odor control.

RESPONSE TO VALUE ENGINEERING ALTERNATIVE

Project Name: **WWTP #2 Improvements**

Project Location: **Coos Bay, Oregon**

VE Alternative No.: **P-100**

VE Alternative Title: **Eliminate influent pump station superstructure**

RESPONSE:

Accept ___ Partially Accept ___ Reject _X__ Further Study ___

Agree with estimated savings ___ Disagree with estimated savings ___

Revised estimate of savings (if savings disputed):	Capital	$__________ ______
	Present worth of O&M	$ ________________
	Total Present worth	$ ________________

Discussion (Explain reasons for rejection, partial rejection or further study):

The coast has severe wind and rain and the pumps and components located within the IPS structure need protection. Additionally, the structure will provide protection for operations staff. However, upon discussion, the City and Plant staff felt that it might be beneficial to combine the IPS with the shop/garage/electrical building. This alternative has been rejected.

RESPONSE TO VALUE ENGINEERING ALTERNATIVE

Project Name: **WWTP #2 Improvements**

Project Location: **Coos Bay, Oregon**

VE Alternative No.: **P-111**

VE Alternative Title: **Eliminate HeadCell; install primary, degrit primary sludge**

RESPONSE:

Accept ___ Partially Accept ___ Reject __X_ Further Study ___

Agree with estimated savings ___ Disagree with estimated savings ___

Revised estimate of savings (if savings disputed):	Capital	$__________ ______
	Present worth of O&M	$ ________________
	Total Present worth	$ ________________

Discussion (Explain reasons for rejection, partial rejection or further study):

This process change is undesirable as it decreases the value the SBR provides as a single facility to provide the entire wastewater treatment. By adding the expense of an upstream unit process, introduces the need for anaerobic digestion and several more costly unit processes including primary clarification, primary sludge pumping, primary scum pumping, and associated odor treatment needs. This alternative has been rejected.

RESPONSE TO VALUE ENGINEERING ALTERNATIVE

Project Name: **WWTP #2 Improvements**

Project Location: **Coos Bay, Oregon**

VE Alternative No.: **P-113**

VE Alternative Title: **Design plant for remote operation**

RESPONSE:

Accept ___ Partially Accept __X_ Reject ___ Further Study _X__

Agree with estimated savings ___ Disagree with estimated savings ___

Revised estimate of savings (if savings disputed):	Capital	$__________ ______
	Present worth of O&M	$ ________________
	Total Present worth	$ ________________

Discussion (Explain reasons for rejection, partial rejection or further study):

A LiveMeeting with the City of Coos Bay, CH2M HILL, and Mortenson Construction was held on February 24, 2014 to review VE proposal B-23 unisex bathroom, B-77 building orientation, and P-113 design Plant for remote operation. The intention of P-113 was to design the completely remote operation of Plant 2 and delete the control building in its entirety. It was determined that the plant could not be fully operated on remote because of the headworks and UV system. However it was determined that the operators time there would not be full time and some sort of remote operation is achievable. As such, the team modified this alternative to optimize the building space reduce the overall size and cost.

A revised Control Building floor plan will be updated based on the concept provided in Attachment D. The revisions include:

- Create a unisex bathroom
- Reduce the size of the control room and the lab area
- Combine the conference room and break area
- Relocate the server room
- Reduce the size of the mechanical room, if possible
- Retain the orientation of the building to the site to facilitate operator access versus public access

The exterior revised concept for the Control Building will follow the concept located in Attachment D. The reduced size and associated savings will be accounted for in the 60 percent design.

RESPONSE TO VALUE ENGINEERING ALTERNATIVE

Project Name: **WWTP #2 Improvements**

Project Location: **Coos Bay, Oregon**

VE Alternative No.: **S-1**

VE Alternative Title: **Preserve salvageable evergreens at southeast corner**

RESPONSE:

Accept X__ Partially Accept ___ Reject ___ Further Study ___

Agree with estimated savings ___ Disagree with estimated savings ___

Revised estimate of savings (if savings disputed):	Capital	$__________ ______
	Present worth of O&M	$ ________________
	Total Present worth	$ ________________

Discussion (Explain reasons for rejection, partial rejection or further study):

RESPONSE TO VALUE ENGINEERING ALTERNATIVE

Project Name: **WWTP #2 Improvements**

Project Location: **Coos Bay, Oregon**

VE Alternative No.: **S-8**

VE Alternative Title: **Use plastic pipe for buried piping**

RESPONSE:

Accept __X_ Partially Accept ___ Reject ___ Further Study _X__

Agree with estimated savings ___ Disagree with estimated savings ___

Revised estimate of savings (if savings disputed): Capital $__________ ______

Present worth of O&M $ ________________

Total Present worth $ ________________

Discussion (Explain reasons for rejection, partial rejection or further study):

SHN/CH2M HILL identified buried metal piping systems for replacement with plastic piping systems as shown in Attachment E. Mortenson developed pricing associated with the use of plastic piping systems and identified a potential savings of $49,800.

RESPONSE TO VALUE ENGINEERING ALTERNATIVE

Project Name: **WWTP #2 Improvements**

Project Location: **Coos Bay, Oregon**

VE Alternative No.: **S-19A**

VE Alternative Title: **Construct sewer main on Marple for residents – Option A**

RESPONSE:

Accept ___ Partially Accept _X__ Reject ___ Further Study ___

Agree with estimated savings ___ Disagree with estimated savings ___

Revised estimate of savings (if savings disputed): Capital $__________ ______

Present worth of O&M $ ________________

Total Present worth $ ________________

Discussion (Explain reasons for rejection, partial rejection or further study):

At this time, the City is coordinating with the property owners located off of Marple Street. If the City is to install this line, then per DEQ, the adjacent homeowners must connect (since they are within 300 feet of the new line). Not all of the homeowners may want to do this. With that said, if the homeowners agree, then the City will install the new sewer line.

RESPONSE TO VALUE ENGINEERING ALTERNATIVE

Project Name: **WWTP #2 Improvements**

Project Location: **Coos Bay, Oregon**

VE Alternative No.: **S-19B**

VE Alternative Title: **Construct sewer main on Marple for residents – Option B**

RESPONSE:

Accept ___ Partially Accept _X__ Reject ___ Further Study ___

Agree with estimated savings ___ Disagree with estimated savings ___

Revised estimate of savings (if savings disputed): Capital $__________ ______

Present worth of O&M $ ________________

Total Present worth $ ________________

Discussion (Explain reasons for rejection, partial rejection or further study):

At this time, the City is coordinating with the property owners located off of Marple Street. If the City is to install this line, then per DEQ, the adjacent homeowners must connect (since they are within 300 feet of the new line). Not all of the homeowners may want to do this. With that said, if the homeowners agree, then the City will install the new sewer line.

RESPONSE TO VALUE ENGINEERING ALTERNATIVE

Project Name: **WWTP #2 Improvements**

Project Location: **Coos Bay, Oregon**

VE Alternative No.: **S-21**

VE Alternative Title: **Use ornamental fence**

RESPONSE:

Accept _X__ Partially Accept ___ Reject ___ Further Study ___

Agree with estimated savings ___ Disagree with estimated savings ___

Revised estimate of savings (if savings disputed): Capital $__________ ______

Present worth of O&M $ ________________

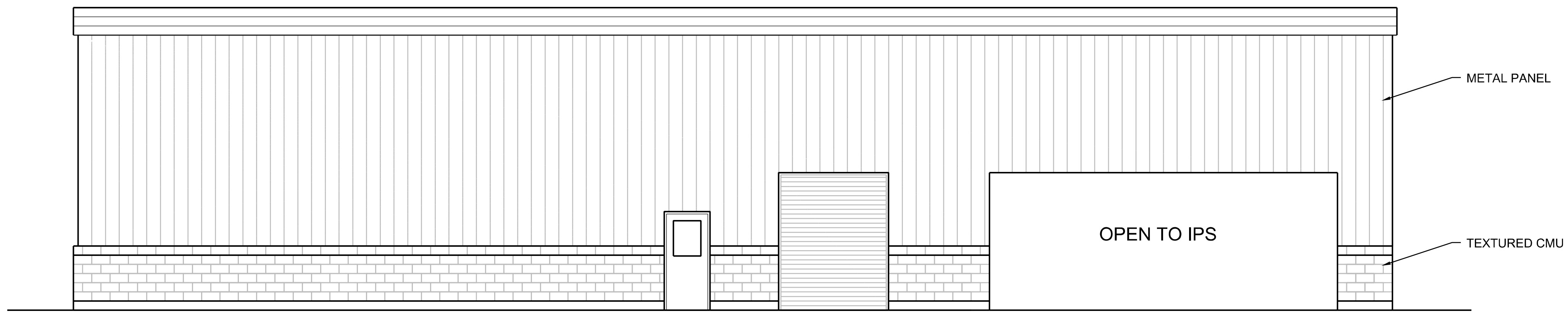
Total Present worth $ ________________

Discussion (Explain reasons for rejection, partial rejection or further study):

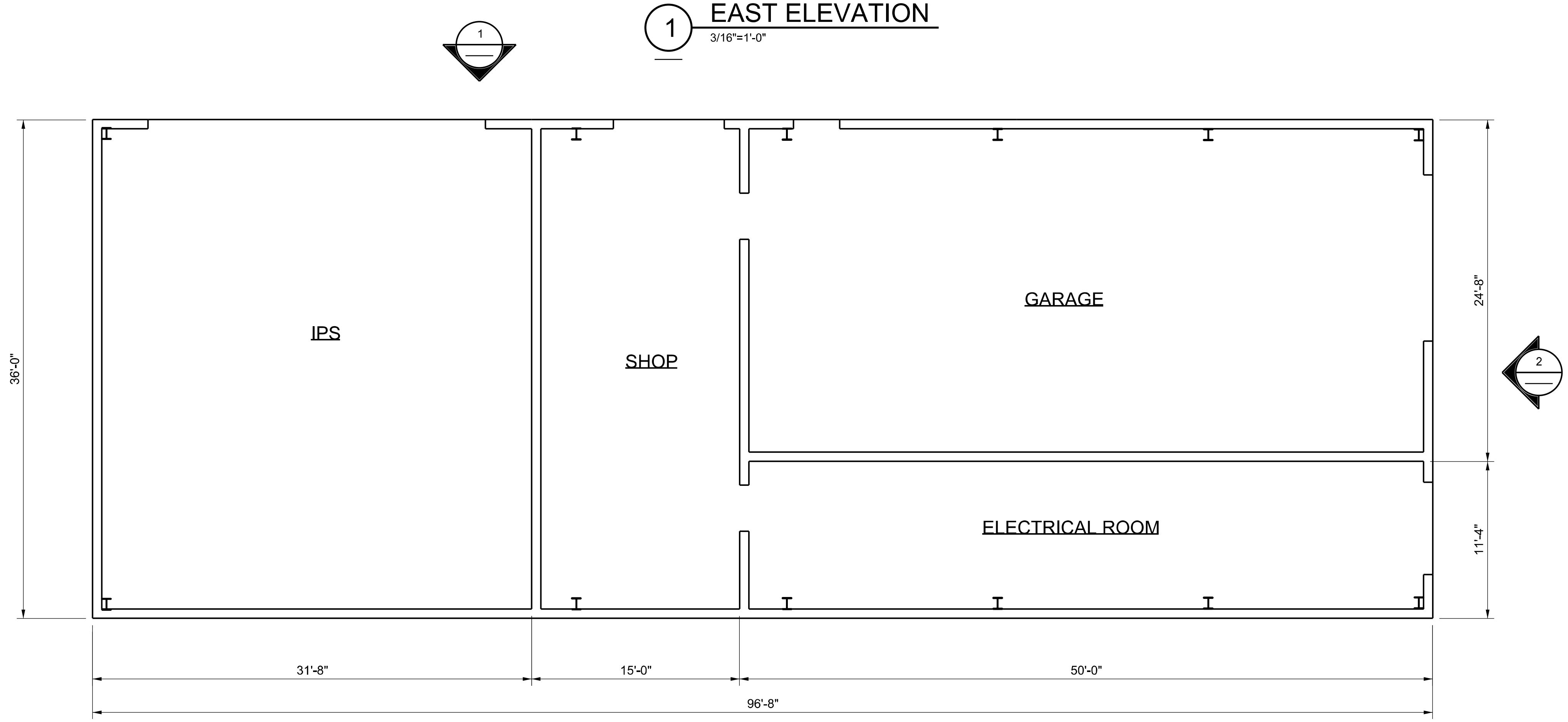
This will be driven by our land use process; however a simple chain link will not work.

Attachment A

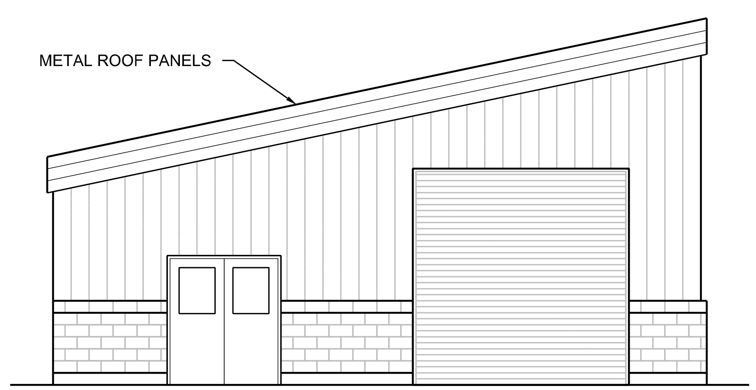
Layout for Garage/Shop/Electrical Room and IPS Area



1 EAST ELEVATION
3/16"=1'-0"

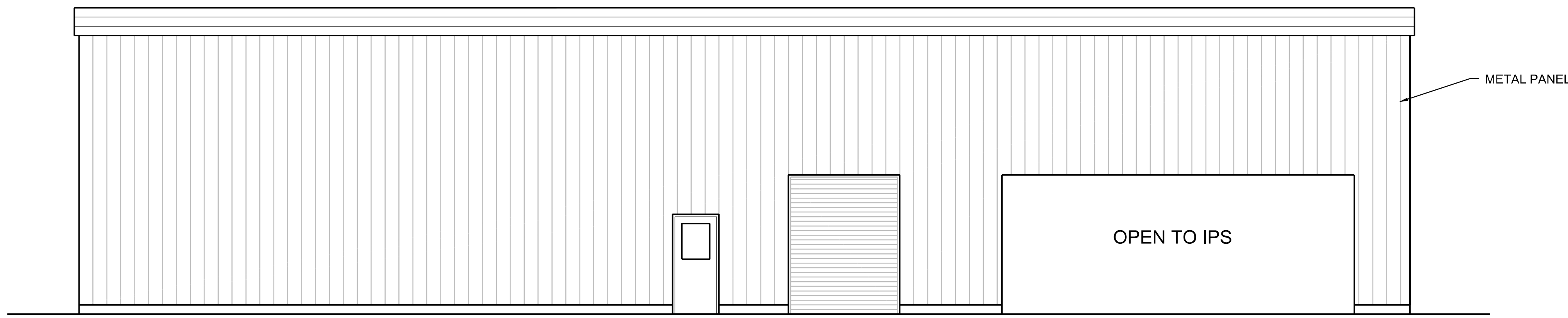


FLOOR PLAN
3/16" = 1'-0"

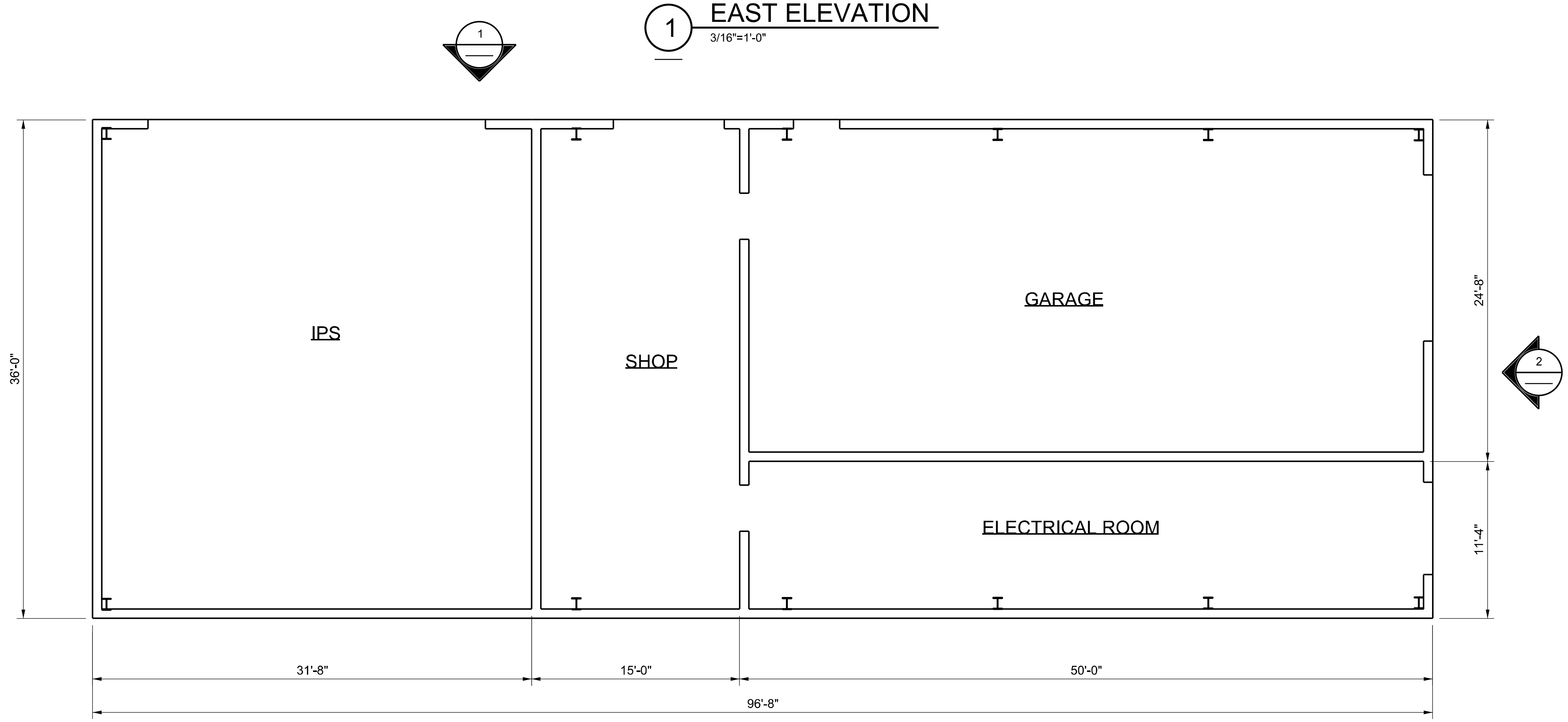


2 SOUTH ELEVATION
3/16"=1'-0"

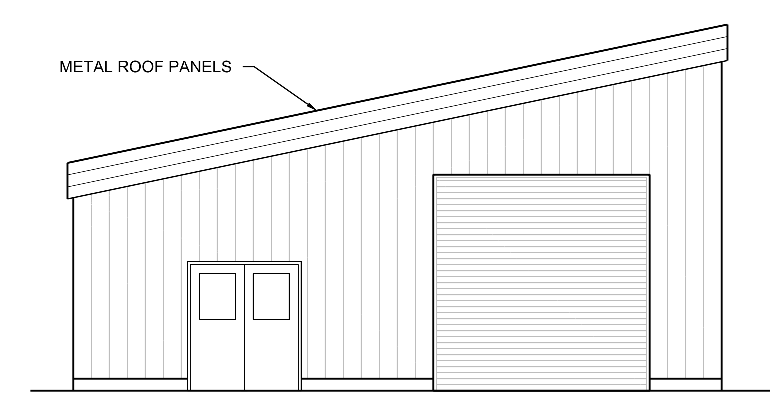
OPTION 1



1 EAST ELEVATION
3/16"=1'-0"



FLOOR PLAN
3/16" = 1'-0"



2 SOUTH ELEVATION
3/16"=1'-0"

OPTION 2

Attachment B

Cost Comparison for VE Alternative B-26

(Replace Concrete Cover On Equalization Basin With Metal Roof)

COST MANAGEMENT DETAIL BACKUP ESTIMATE

Coos Bay WWTP

Worksheet

March 11, 2014

1.0	Basin Lid- compare CIP Concrete(base assumption) and Prefab Alum lids						
ITEM	**DESCRIPTION**	**QTY**	**U/M**		**U/P**		**TOTAL**
	Delete - Base Assumption						
	Forming	-3600.00	sf	$	20.00	$	(72,000)
						$	-
	Rebar	-20.6	tons	$	2,150.00	$	(44,255)
	Concrete: P & F					$	-
	Deck	-3600	sf	$	12.00	$	(43,200)
	Beam	-100.00	lf	$	65.00	$	(6,500)
	Columns	-72	vlf	$	85.00	$	(6,120)
	total conc = 151cy					$	-
	Hatches	-3	ea	$	8,500.00	$	(25,500)
						$	-
						$	-
						$	-
						$	-
						$	-
						$	-
						$	-
						$	-
	Add					$	-
						$	-
	Prefab Alum Lids	3600	sf	$	85.00	$	306,000
						$	-
	Hatches	3.00	ea	$	8,500.00	$	25,500
						$	-
						$	-
						$	-
						$	-
						$	-
						$	-
						$	-
						$	-
	DIRECT COST ESTIMATE					**$**	**133,900**

Attachment C

Cost Comparison Between the Coating System and the T-lock Liner

(VE Alternative B-51)

COST MANAGEMENT DETAIL BACKUP ESTIMATE

Coos Bay WWTP

Worksheet

March 14, 2014

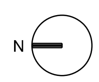
B51 **Lining or coating at IPS wet well and headworks channels**

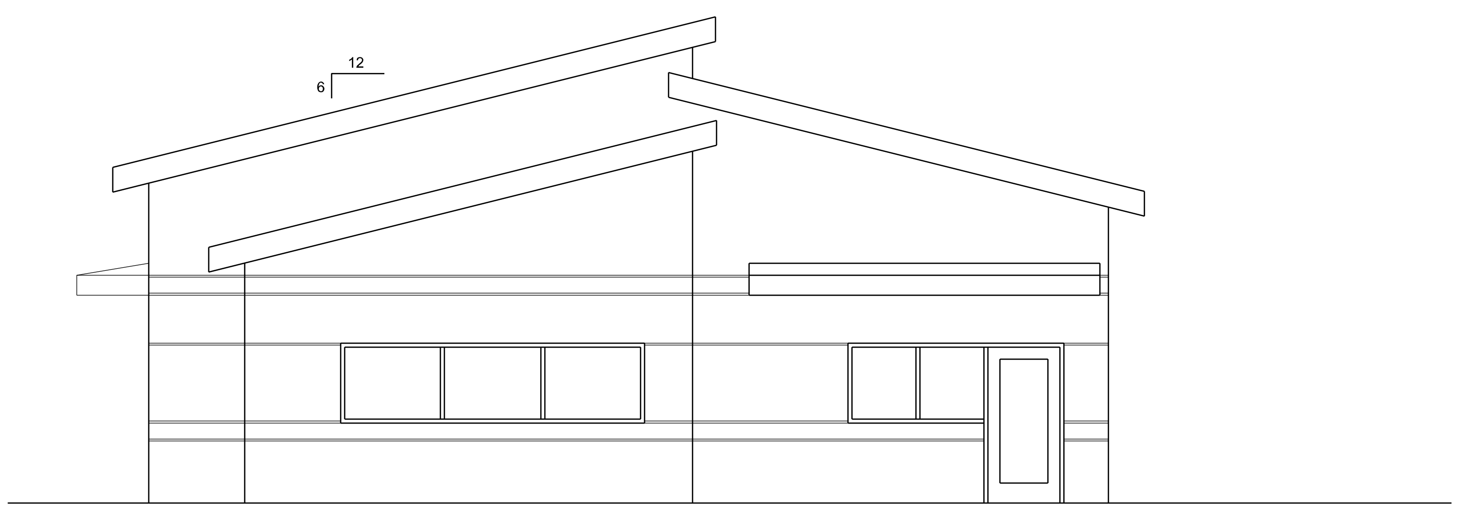
ITEM	DESCRIPTION	QTY	U/M	U/P	TOTAL
	Delete - base assumption				
					$ -
	Coating:				$ -
	IPS:				$ -
	Walls	-1368.00	vsf	$ 25.00	$ (34,200)
	Soffits	-304.00	sf	$ 25.00	$ (7,600)
	Ogee/ledges	-264.00	sf	$ 25.00	$ (6,600)
					$ -
	Headworks:				$ -
	Channel walls	-2250.00	sf	$ 25.00	$ (56,250)
					$ -
					$ -
					$ -
	Add				$ -
					$ -
	T-Lock type lining:				$ -
	IPS:				$ -
	Walls	1368.00	sf	$ 18.00	$ 24,624
	Soffits	304.00	sf	$ 18.00	$ 5,472
	Ogee - not sure how this works in lining material	264.00	sf	$ 24.00	$ 6,336
					$ -
	Headworks:				$ -
	Channel walls	2250.00	sf	$ 18.00	$ 40,500
					$ -
					$ -
					$ -
					$ -
					$ -
					$ -
					$ -
					$ -
				DIRECT COST ESTIMATE	**$ (27,700)**

Attachment D

Control/Operations Building Floor Plan

FLOOR PLAN
1/4"=1"



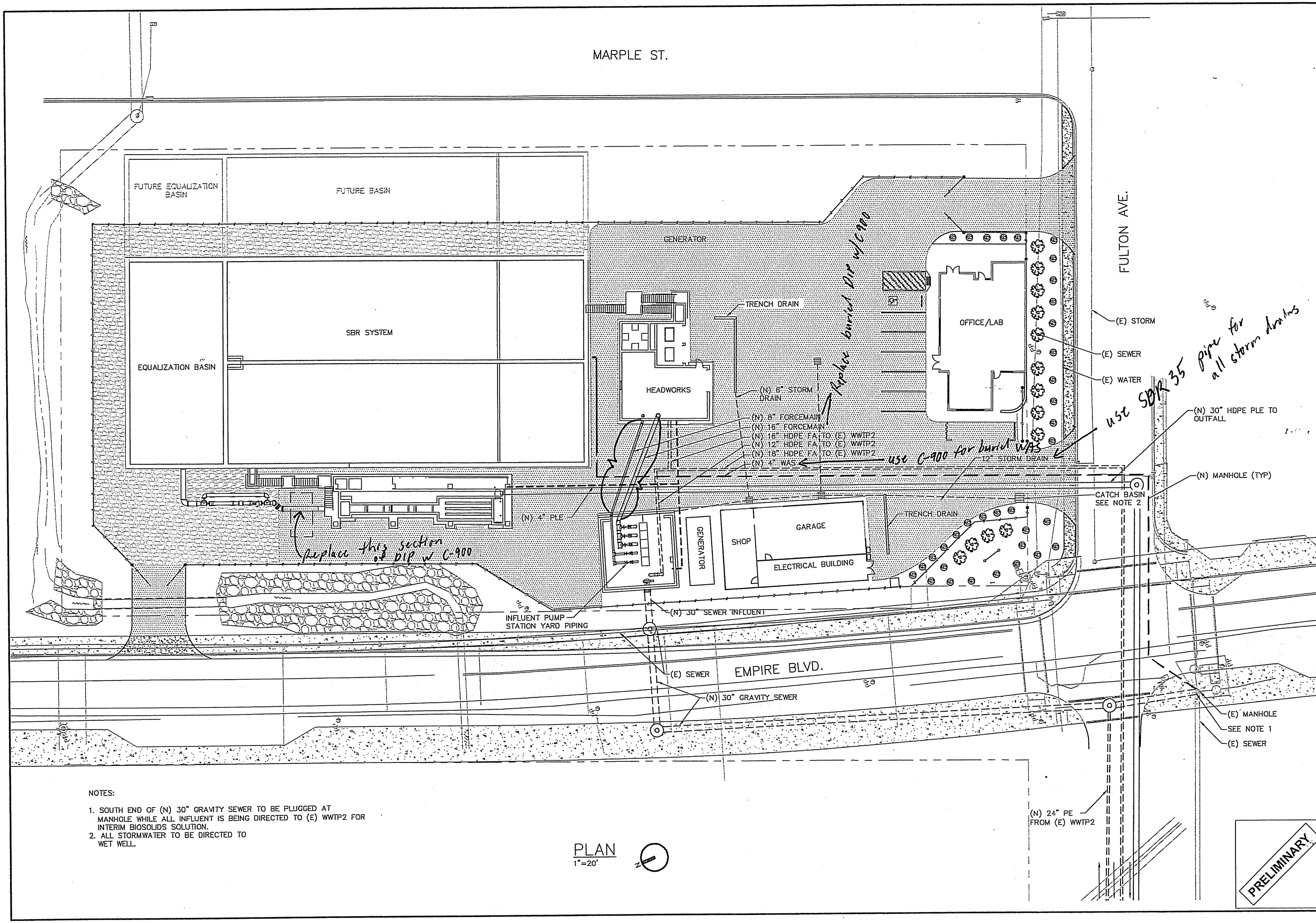


WEST ELEVATION
1/4"=1"

CONTROL BUILDING
COOS BAY, OREGON

Attachment E

Identification of Buried Metal Piping Systems for Replacement with Plastic Piping Systems



NOTES:

1. SOUTH END OF (N) 30" GRAVITY SEWER TO BE PLUGGED AT MANHOLE WHILE ALL INFLUENT IS BEING DIRECTED TO (E) WWTP2 FOR INTERIM BIOSOLIDS SOLUTION.
2. ALL STORMWATER TO BE DIRECTED TO WET WELL.

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

CH2MHILL.

SHN CONSULTING ENGINEERS & GEOLOGISTS, INC.

NO.	DATE	REVISION	BY

DSGN JMD
DR FMK
CHK RFS
APVD

CITY OF COOS BAY WWTP 2 EXPANSION & UPGRADE

CIVIL
SITE PLAN AND YARD PIPING PLAN

SHEET 06-C-2001
SEQ
DATE 08/2013
PROJ. NO. 469556

PRE-DESIGN