SOUTH KING COMPLEX
PUGET SOUND ENERGY
FACILITY CONDITION ASSESSMENT
FINAL REPORT
AUGUST 18, 2016

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I. EXECUTIVE SUMMARY

1.1 Introduction

Puget Sound Energy (PSE) engaged MENG Analysis in April of 2016 to conduct a Facility Condition Assessment (FCA) of the South King Complex (SKC) located at 6905 S. 228th Street, Kent, WA 98032. The South King Complex includes a large 270,000 square foot building and storage yards on site and is leased by PSE. There is an additional ICON space at the facility that until recently was occupied by a separate tenant. This area is approximately 26,000 square feet. SKC is an integral site for PSE and supports multiple functions including office, engineering, warehousing and distribution, equipment repair shops, and light vehicle maintenance shops. As more building area has become available to lease in the building, PSE has improved the space with tenant improvements to expand its operations. Most recently, another tenant space leased by ICON became available and while this area is currently vacant, plans are underway to improve this tenant space for PSE operations. The condition of the building systems associated with this ICON space were excluded from the FCA scope of work.

This report includes both summary and detailed findings of the FCA field survey that was conducted in May 2016.

The goal of this FCA is to facilitate proactive asset management. The objectives of the FCA include: producing meaningful condition and cost data that can support strategic planning and budgeting; and the identification of major maintenance projects (i.e., repairs or system replacements) that will correct both short-term Observed Deficiencies (ODs), and long-term Predicted Renewals (PRs). The FCA findings will also inform future capital planning and budgeting. An additional objective of this FCA was to establish an assessment methodology and condition benchmarking process that could also be applied to the other facilities owned and operated by PSE.

This FCA report also includes reports for additional Enhanced FCA scope related tasks, including:

- Seismic Report - **Section 6**
- Site Hazard Risk Assessment Report - **Section 7**
- Infrared Inspection Report - **Section 8**
- Equipment Inventory List - **Section 9**

The FCA scope of work for the South King Complex was a three step process, as follows:

I. FCA Preparation:

- Project scoping
- Prioritization
- Facility inventory
- Operations and Maintenance (O&M) records
- Condition information

- O&M Workshop

II. Field Surveys:

- Facility condition assessments of selected buildings

III. Reporting

- Database:
    - i. Preparation and data analysis
- Draft FCA report
    - i. Review by PSE
    - ii. Incorporation of PSE's comments
- Final FCA report
- Presentations of findings

1.2 Survey Methodology

During the field survey, the team conducts a Rapid Visual Assessments of site and facility conditions. No destructive testing is performed. If the team in uncertain about the condition of a non-visible system, it is noted in the subsystem comments as possibly requiring further investigation.

1.3 Cost Estimating

The MENG Analysis Facility Condition Analysis (FCA) Database generates parametric cost estimates for the renewal or replacement of all facility subsystems as they reach the end of their predicted life cycle. These estimates are based on industry standards for expected life and typical component costs, and therefore should be used for general budgeting purposes.

Parametric cost estimating couples a structured estimating process with statistically based predictive modeling methods to provide a basis for high confidence estimates. The MENG Analysis parametric models are built from a set of equations developed by our cost estimators and based on years of industry data and knowledge.

1.4 General Findings

This report breaks the SKC site into two pieces: the facility (the building) and site infrastructure (site, utilities, etc). Both are well maintained by knowledgeable, dedicated maintenance staff and all upgrades to the facility and systems that have been completed by PSE are reflective of Class A tenant improvements.

Highlights of findings include:

- **General**: conditions of building systems were found to be in fair condition. However, due to some recent tenant improvements and the good condition ratings of highly weighted structural systems, the overall Weighted Average Condition score is 2.7, which is on the good side of fair. Building system conditions in the ICON space were not identified, since this area is intended for a major tenant improvement project. However, generally speaking the system conditions in the ICON space are very poor. The proposed tenant improvement will require virtually complete demolition/renovation, including HazMat remediation. Consequently, the Observed Deficiencies, Weighted Average Condition Scores and Facility Condition Index calculated for the SKC as a complete facility are at present grossly understated.

- **Observed Deficiencies** (ODs) are items that are observed during field assessments that require repair/replacement within a six-year period (2016-2021) and have costs greater than $5,000. The ODs for SKC total over $18.5 million.

- **Predicted Renewals** (PRs) are predicted cyclical renewal costs for all building systems, calculated through a predictive model based on typical life span of systems and construction/remodel year for the twenty-year period (2016-2035). For SKC, PRs are projected to total $30.6 million.

- **Opportunities:** The survey team noted just under $10 million of Opportunities. The largest cost opportunity is for replacing the entire building HVAC system to a new energy efficient system. This is estimated to cost $6.8 million. All Opportunities are included in the Facility Reports in **Section 5**.

- **Seismic**: While the facility appears to be in fairly good condition, it does have significant structural deficiencies in regards to its ability to resist code-prescribed seismic forces. If the building were to be identified as an "Essential Facility" the design forces increase dramatically, thereby triggering more required upgrades. (See **Section 6** for a detailed definition of Essential Facility and other classifications).

  Many of the structural details and connections, while commonly used during the era in which it was built, do not have capacity to transfer lateral forces from the roof to the foundation. In-plane shear capacities are deficient, as are out-of-plane wall anchorage. While existing drawings were not available for review, it is expected that the connection of the walls to the foundations will also need to be upgraded, in particular to achieve an Essential Facility status. Such necessary seismic upgrades are being estimated for costs, but initial considerations suggest the added value of these upgrades may be considered cost-prohibitive.

- **Critical Areas/Hazards Assessment:** Eight categories were evaluated and assessed, including an abbreviated risk assessment (i.e., low [3], medium [2], high [1] evaluations of probability and impact) that can be summarized as follows:

Hazard	Risk of Occurrence	Impact to Facility
Earthquake/Seismic	2	1
Flooding	3	1
Liquefaction	2	1
Steep Slopes/Landslides	3	3
Volcanic	3	1
Wetlands/Aquatic Resources	3	2
Drought	3	3

- **Electrical Infrared:** Ten specific locations and 52 pieces of equipment were surveyed with infrared thermography. Not all locations were surveyed consequently there may remain un-identified issues present in equipment that was excluded from the scope of work. Nevertheless, of the locations and equipment surveyed, no anomalies were identified and no acute or chronic items are recommended for correction. More details of the IR inspection are included in **Section 8**.

- **Building Envelope Infrared:** This study and analysis is pending favorable weather/temperature conditions.

- **Equipment Inventory** list and photos are included in **Section 9**.

1.5 General Condition Scores

The condition assessment process rates each subsystem in a facility with a qualitative score of 1 through 5 where:

1 = excellent
2 = good
3 = fair
4 = poor
5 = unacceptable

Subsystem scores are weighted by the cost of that subsystem relative to the total replacement value of the facility. This produces a weighted average condition score (WACS) for a building, but no WACS is developed for site infrastructure, due to the variability of systems that may or may not be present at the site. The WACS for the SKC is calculated at 2.7 (i.e., the good side of fair).

1.6 Facility Condition Index

A Facility Condition Index (FCI) is an industry standard used for benchmarking and evaluating a portfolio of facility assets over time. The FCI is the ratio between a facility's Backlog of Maintenance and Repair (BMAR) and the Current Replacement Value (CRV) of the facility. Please see the list of FCA terminology in Appendix **Section 10.3** for further explanation of FCI. The FCI for the SKC is calculated as 0.12. This FCI is about industry average based on the age and type of facility.

1.7 Projected Cost Summary

Estimated costs are calculated for both short-term Observed Deficiencies (ODs) as well as for long-term Predicted Renewals (PRs). The costs summarized here include typical construction markups as well as project development markups (design, management, etc.) and are calculated as 2016 present value costs.

Current Observed Deficiencies (2016 - 2021) total over $18.5 million for building and site systems.

- o Approximately 16 deficiencies were identified.

- Items with a direct cost of less than $5,000 are not detailed in the OD report but are noted in subsystem comments if considered significant. These items were not individually costed.

Observed Deficiencies Peak Cost Year:

- 2018 = $9.59million
- 2021 = $7.13 million

Observed Deficiencies System Deficiencies:

- HVAC: $13.5 million
- Electrical: $2.2 million
- Fire Protection: $1.2 million

- 20-year (2016-2035) Predicted Renewal = $30.6 million
- Predicted Renewal Peak Cost Years:
    - 2017 = 4.3 million
    - 2024 = 6.8 million
    - 2026 = $8 million
- Predicted Renewal System Deficiencies:
    - Electrical: $6.9 million
    - HVAC: $5.3 million
    - Interior Finishes: $4.4 million
    - Exterior Closure: $3.9 million

Note: 5-year Observed Deficiencies should not be added to 20-year Predicted Renewals. Observed Deficiencies are short-term condition issues observed by field surveyors, while Predicted Renewals are long-term based on a predictive model that factors system costs, condition scores and life cycles.

1.8 Additional Observations

Additional notes on observations made in the field that do not necessarily constitute a renewal cost or deficiency are listed below. These items may have contributing factors to current building systems or may require additional review or other corrective action.

- **Site**: This site is well maintained with one exception being the storm drain infiltration at the southwest corner of property. Low area near north loading dock experiences some flooding during intense rain events.

  There are several parking areas that have been added at different time periods so paving and lighting reflects variable age/lifecycles. Large storage yard is functional and appears to be serving the purpose for large electrical equipment.

- **Program**: The building reflects several additions and changes in program uses. The larger mezzanine is now for occupant offices, storage and mechanical equipment.

  The southeast corner of warehouse includes systems/infrastructure for flammable storage and waste treatment that may or may not still be functionally required.

- **Lighting**: The quality of lighting in the warehouse area is marginal/fair and certainly an opportunity for upgrade. According to PSE staff, approximately 25% of the fixtures are backed up by a standby generator.

- **Exterior Envelope:** The overall exterior envelope of the complex appeared to be in good to fair shape with some areas in need of basic maintenance such as paint and re-caulking of concrete panel joints and window frames. The roof and coping are mostly newer with the exception of the large canopy over the main loading bays. Some of the exterior metal siding panels have damage due to impact and weathering and should be replaced.

  The exterior walls and roof of the occupied areas (conditioned spaces) do not have consistent thermal and air-infiltration assemblies. A review of the envelope for energy performance would be beneficial.

- **Accessibility**: The SKC is generally accessible with a few exceptions. Most basic components such as railings, stairs, restroom fixtures/partitions, and door hardware have been updated since the original date of construction but not all meet current code standards. Some of the older restrooms do not meet dimensional requirements and require significant reconfiguration. The overall access/egress of the facility appeared to comply with current codes.

1.9 Conclusions

The condition assessment found that notwithstanding the age of the SKC building, due to the quality of tenant improvements made over the years by PSE, the overall conditions are in surprisingly fair condition. It is important to note, however, that approximately 10% of the entire building area was not included in the assessment and considering the general poor/unacceptable condition of systems in the ICON space, overall conditions are grossly understated. This may be an important asset management consideration, particularly in conjunction with seismic performance concerns for a facility that is considered critical to operations.

II. SUMMARY REPORTS – OBSERVED DEFICIENCIES

2.1 Observed Deficiencies Summary

Costs associated with Observed Deficiencies (ODs) occur primarily with the facility, not site infrastructure.

Facility	
South King Complex Facility	18,330,704
South King Complex Infrastruct..	208,206
Grand Total	18,538,910

Exhibit 2A. Observed Deficiency Costs by Site - Table

Costs drivers for the peak cost years of 2018 and in 2021 are HVAC and Fire Protection systems in 2018, and Electrical Service and Branch Wiring & Lighting in 2021.

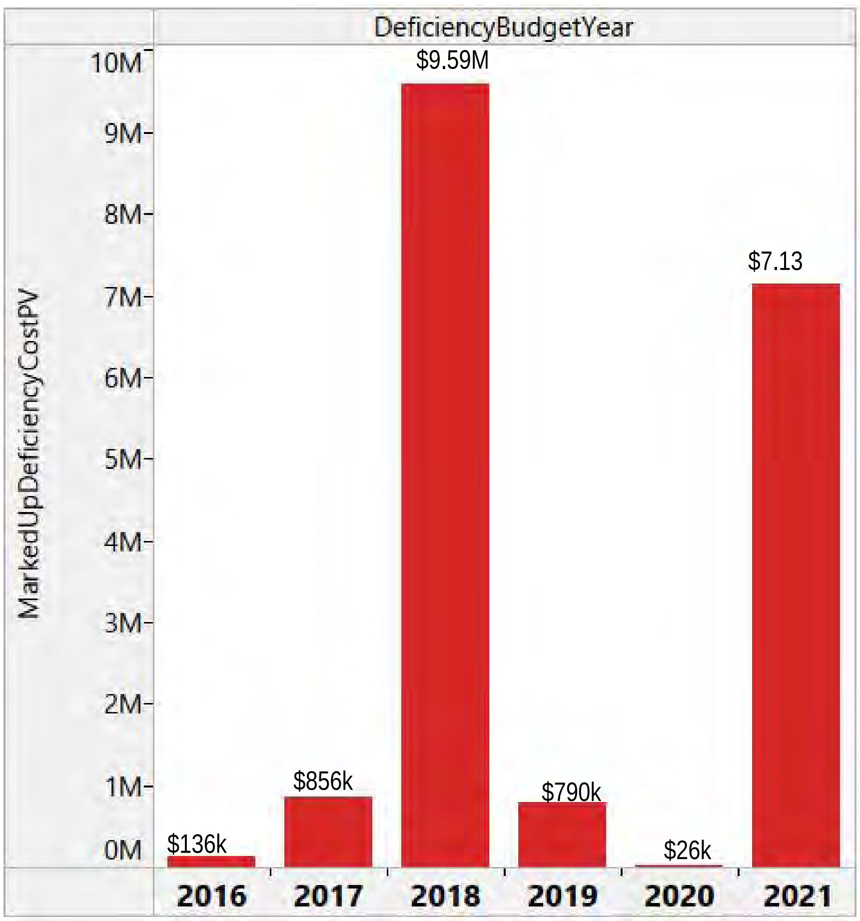


Exhibit 2B. Observed Deficiencies by Year - Graph

2.1.2 Observed Deficiency Costs by Facility

The following table breaks out the 2016 - 2020 OD costs by facility vs. infrastructure:

Facility	2016	2017	2018	2019	2020	2021	Grand Total
South King Complex Facili..	136,013	856,636	9,582,683	790,077		6,965,295	18,330,704
South King Complex Infra..			13,424		25,834	168,948	208,206
Grand Total	136,013	856,636	9,596,107	790,077	25,834	7,134,243	18,538,910

Exhibit 2C. Observed Deficiency Costs by Facility and Year – Table

2.1.3 Observed Deficiency Costs by System

HVAC and Electrical systems are the highest cost building systems in need of short-term replacement or repair. HVAC costs are driven by the condition of the older central air handling units, extensive hydronic piping, terminal units, controls, and warehouse exhaust system. Electrical costs are driven by the aging primary electrical service, branch wiring and lighting, and fire alarm system, which while remaining functional are considered at the end of their useful life.

OD by System

System	
Electrical	2,214,061
Fire Protection	1,232,276
HVAC	13,510,367
Plumbing	1,209,789
Roofing	164,211
Site Civil / Mechanical Utilities	13,424
Site Electrical utilities	168,948
Site Improvements	25,834
Grand Total	18,538,910

Exhibit 2D. Observed Deficiency Costs by System – Table

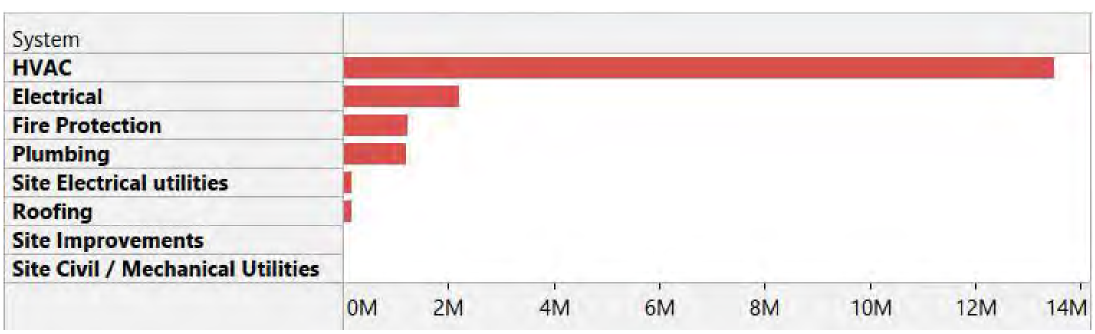


Exhibit 2E. Observed Deficiency Costs by System - Graph

2.1.4 Observed Deficiency Costs by Subsystem

Subsystem	
Controls and Instrumentation	3,695,733
Domestic Water Distribution	790,077
Electrical Distribution	44,349
Electrical Service and Distribution	1,161,516
Fire Protection Sprinkler Systems	1,232,276
HVAC Distribution Systems	4,788,545
Heat Generating Systems	692,425
Lighting and Branch Wiring	2,375,829
Low Voltage Fire Alarm	939,772
Other HVAC Systems and Equipment	1,055,501
Rain Water Drainage	419,712
Roadways	25,834
Roof Coverings	164,211
Site Lighting	168,948
Storm Sewer	13,424
Terminal and Package Units	3,085,198
Grand Total	20,653,350

HVAC Distribution, Lighting & Branch Wiring, followed by Controls and Instrumentation are the top three subsystem cost categories and reflect the age of these primary building systems.

Exhibit 2F. Observed Deficiency Costs by Subsystem – Table

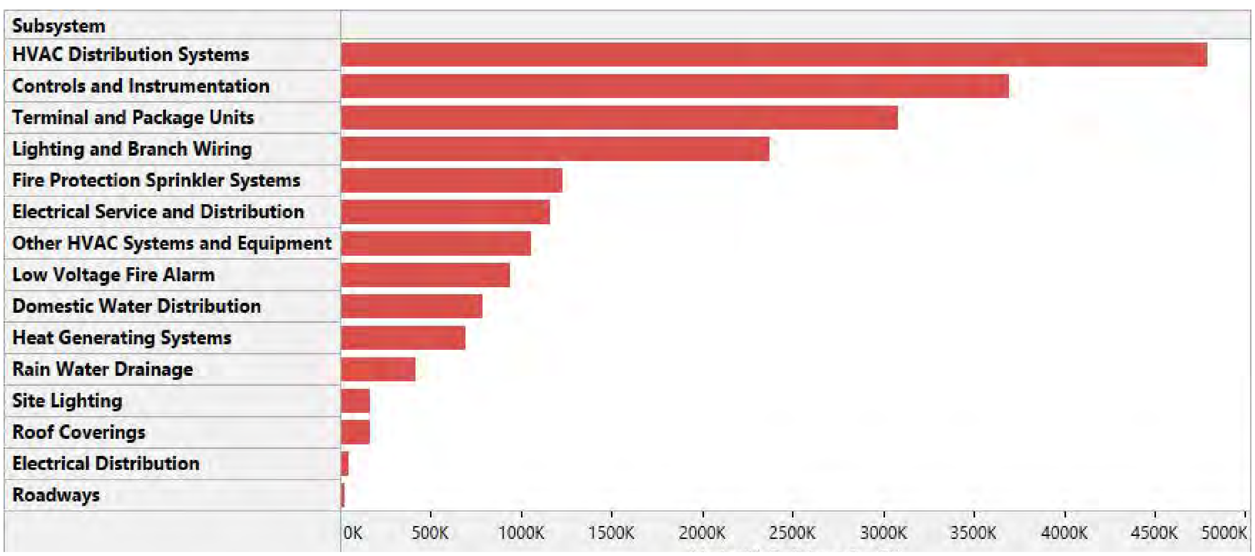


Exhibit 2G. Observed Deficiency Costs by Subsystem – Graph

III. SUMMARY REPORTS – Predicted Renewals

3.1 20-Year Predicted Renewals (PRs)

PRs for building systems are based on 2016 dollars for a 20-year period from 2016 to 2035.

The MENG Analysis Facility Condition Analysis (FCA) Database generates parametric cost estimates for the renewal or replacement of all facility subsystems as they reach the end of their predicted life cycle. These estimates are based on industry standards for expected life and typical component costs, and therefore should be used for general budgeting purposes.

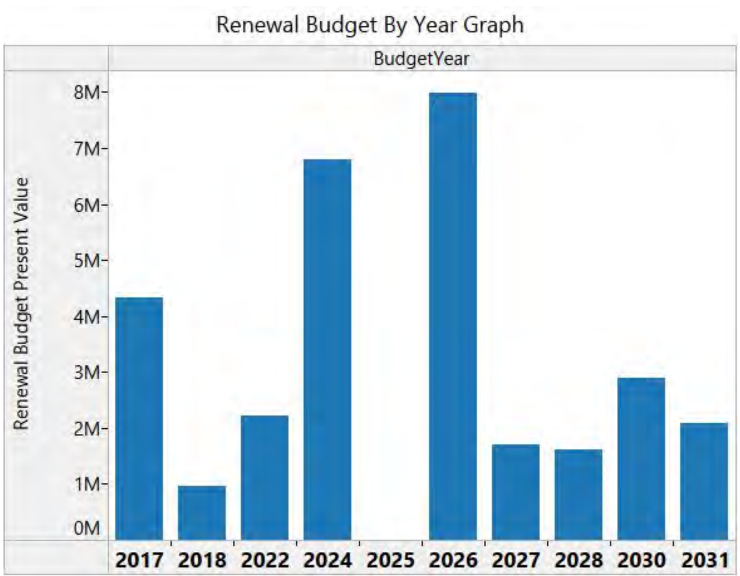
For PSE, a 20-year PR horizon was selected, which will support planning and budgeting for long-term major maintenance needs. Renewal costs are projected to be $30.7 million for this period.

It is important to note that for planning and budgeting purposes, one should not add both the 2016-2020 ODs and the 2016-2020 PRs. ODs are Observed Deficiencies that are specifically identified by the FCA Survey Team, whereas the predicted renewals from the same period are theoretical projections that factor the age of systems, their relative conditions, and modeled costs of systems. PRs are useful to highlight systems that may not have been observable.

PR by Year Table

BudgetYear	
2017	4,329,369
2018	975,390
2022	2,229,847
2024	6,793,582
2025	9,978
2026	7,991,845
2027	1,713,354
2028	1,605,954
2030	2,903,778
2031	2,093,840
Grand Total	**30,646,936**

Exhibit 3A. Predicted Renewal by Year – Table



*Graph shows cost from 2016 to 2035 for all buildings and systems

Exhibit 3B. Predicted Renewal by Year – Graph

Predicted Renewals by System

Top three system categories projected for PRs include Electrical, HVAC, and Interior Finishes.

Renew by System

System	
Electrical	6,858,739
Exterior Closure	3,926,327
Fire Protection	1,852,364
HVAC	5,275,293
Interior Construction	1,355,656
Interior Finishes	4,381,278
Plumbing	3,841,871
Roofing	3,145,429
Special Construction	9,978
Staircases	0
Grand Total	30,646,936

Exhibit 3C. Predicted Renewal by System – Table

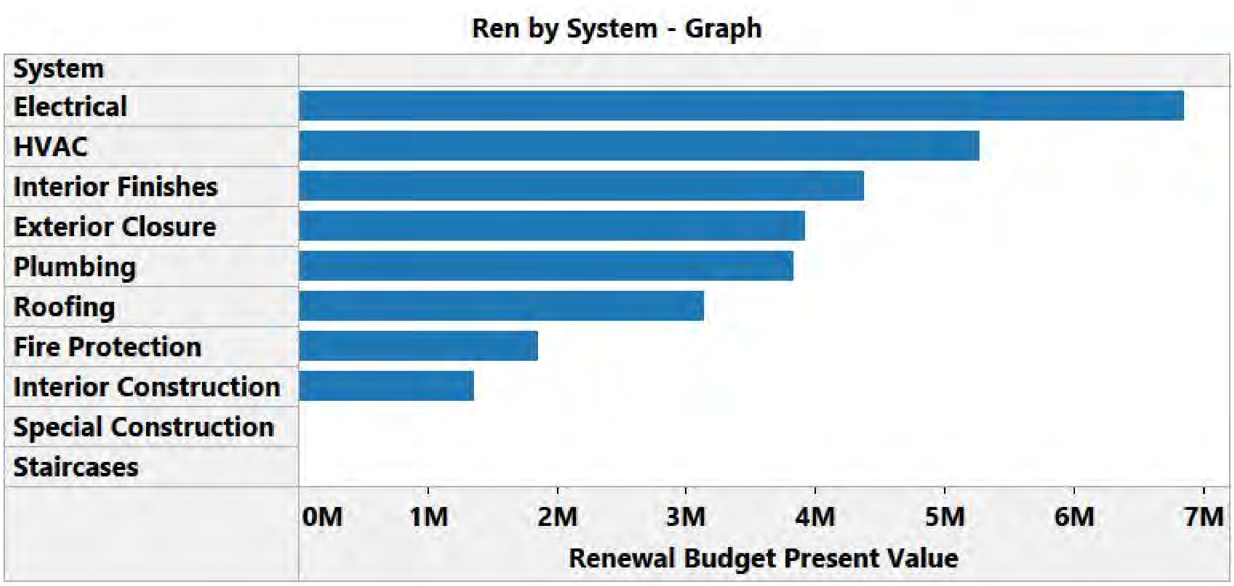


Exhibit 3D. Predicted Renewal by System – Graph

Predicted Renewals by Subsystem

The top three subsystem categories projected for PRs include Lighting and Branch Wiring, Terminal and Package Units, and Roof Coverings.

Ren by Subsystem		
System	Subsystem	
Electrical	Electrical Service and Distribution	2,459,343
	Lighting and Branch Wiring	4,091,153
	Low Voltage Fire Alarm	308,243
Exterior Closure	Exterior Doors	911,297
	Exterior Walls	2,093,840
	Exterior Windows	921,190
Fire Protection	Fire Protection Sprinkler Systems	1,725,211
	Other Fire Protection Systems	127,153
HVAC	Controls and Instrumentation	1,344,199
	Cooling Generating Systems	0
	Energy Supply	24,471
	HVAC Distribution Systems	613,632
	Heat Generating Systems	254,307
	Other HVAC Systems and Equipment	53,515
	Terminal and Package Units	2,985,170
Interior Construction	Fittings	169,538
	Interior Doors	491,461
	Partitions	694,658
Interior Finishes	Ceiling Finishes	2,151,431
	Floor Finishes	1,463,440
	Wall Finishes	766,407
Plumbing	Domestic Water Distribution	792,164
	Plumbing Fixtures	611,776
	Rain Water Drainage	149,886
	Sanitary Waste	2,288,046
Roofing	Projections	45,883
	Roof Coverings	2,903,778
	Roof Openings	195,768
Special Construction	Integrated Construction	4,989
	Special Construction Systems	4,989
Staircases	Stair Finishes	0
Grand Total		30,646,936

Exhibit 3F. Predicted Renewal by Subsystem – Table

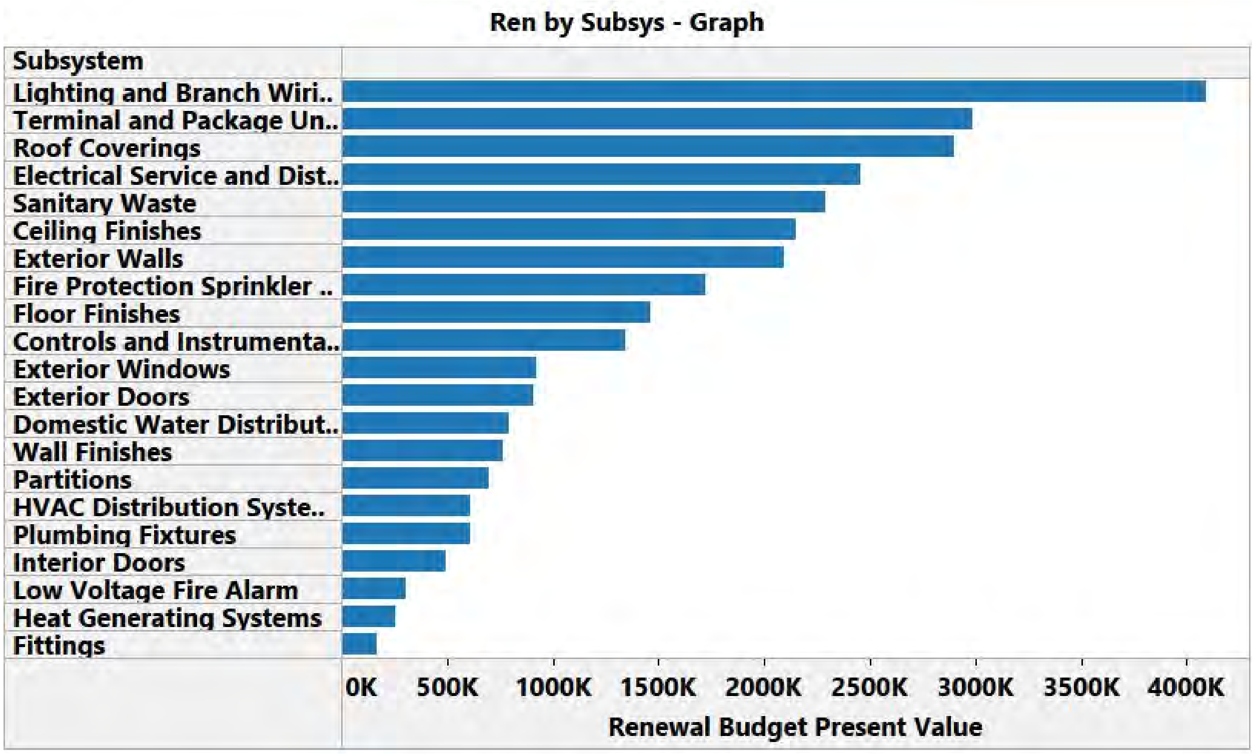


Exhibit 3G. Predicted Renewal by Subsystem – Graph

IV. SUMMARY REPORTS - OPPORTUNITIES

4.1 Opportunities for Building Systems

An FCA documents system or subsystem deficiencies that may prevent a facility or system from performing as originally designed and permitted at the time of construction. However, many systems which may not be determined to be deficient during the FCA may benefit from upgrades to meet current code requirements or the specific objectives of an asset manager (e.g., energy efficiency, improved security, etc.). Consequently, Opportunities are reported as an Enhanced Facility Condition Assessment scope of work, but are non-condition related system upgrades that are recommended for a number of reasons, including:

- ADA
- Appearance
- Code Compliance
- Energy and Sustainability
- Life Safety
- Program – Additional Amenity
- Program – Space Efficiency

The survey team noted just under $10 million of Opportunities. The largest cost opportunity is for replacing the entire building HVAC system to a new energy efficient system. This is estimated to cost $7.7 million. Other Opportunities are included in the Facility Reports in **Section 5.**

V. FACILITY REPORTS

5.1 Facility Reports

The four primary reports documenting current facility system conditions and costs include:

a) **Facility Summary** – The overall facility condition, including Facility Condition Index (FCI), systems and sub-systems condition scores and remaining useful life. Also includes qualitative assessments with system descriptions and condition comments from field surveys.

b) **Observed Deficiency Cost with Markups** – Break down of Observed Deficiencies by Uniformat system with markups. For repair cost planning purposes, the following project mark-ups are used:

Design Scope Contingency	25%
General Contractor Mark-ups (overhead & profit)	20%
Project Soft Costs	55%

Project Soft Costs include:

Consultant Fees	12%
Permitting	3%
Art	0%
PSE Internal PM/Admin Costs	6%
PSE Internal OH Costs	14%
Project Contingency	10%
Sales Tax	10%

All cost figures in this report include project soft costs, with the exception of the Detailed Observed Deficiencies reports.

Observed system deficiencies for each facility include a detailed itemization of facility system components that are in need of major maintenance or repair in order to maintain functionality. All building systems (e.g. exterior shell, mechanical systems, electrical systems, etc.) are evaluated and estimates presented for noted deficiencies.

This report used a 3% annual cost escalation for both ODs and PR current replacement values.

Deficiency costs are escalated from the subsystem survey date (year) to the projected deficiency budget year. Renewal costs are escalated from the present value (PV) base year to the projected renewal budget year. For this 2016 update, that PV base year has been reset to 2016 and all CRV costs updated to 2016 dollars.

c) **Detailed Assessment – Observed Deficiency Report** – Qualitative assessments and costs including condition score, remaining useful life, and cost estimates of Observed Deficiencies.

d) **Opportunities Report** – Recommended improvements to systems or current facility program designed to reduce operating cost or extend useful life and cost estimates of opportunities.

Facility Summary

Puget Sound Energy
South King Complex Site
South King Complex Facility

6905 S. 228th Street
Kent, WA 98032

Facility Code	
Facility Size - Gross S.F.	279,166
Year Of Original Construction	1967
Facility Use Type	Maintenance Shop
Construction Type	Medium (Masonry, protected steel frame, tilt up, heavy timber)
# of Floors	2
Energy Source	Gas
Year Of Last Renovation	2007
Historic Register	No

			Total Project Cost	Total Project Cost - Present Value
Weighted Avg Condition Score	**2.7**			
Facility Condition Index (FCI)	0.12			
Current Replacement Value (CRV)	$92,683,000	**Predicted Renewal Budget (6 yrs)**	$5,427,000	$5,305,000
Beginning Budget Year	2016	**Predicted Renewal Budget (20 yrs)**	$36,286,000	$30,647,000
		Observed Deficiencies (6 yrs)	$19,473,000	$18,331,000
		Observed Deficiencies (ALL)	$19,473,000	$18,331,000
		Opportunity Total Project Cost	$22,757,000	N/A

Facility Condition Summary

Facility Components

Systems	Original System Date	Last Major System Renew.	Cond. Scores	Subsystem Remain.Useful Life - Yrs	Surveyor/ Survey Date		Comments
A Substructure			**2.5**				
Foundations							
A1010 Standard Foundations							
	1967	1967	2		CS	04/28/16	The foundations appear to be concrete spread and continuous footings, supporting the steel columns and exterior concrete walls. Where observed reinforced concrete in good condition with minor deterioration and weathered stem walls.
A1030 Slab On Grade							

Puget Sound Energy
South King Complex Site
South King Complex Facility

6905 S. 228th Street
Kent, WA 98032

Facility Components

Systems	Original System Date	Last Major System Renew.	Cond. Scores	Subsystem Remain.Useful Life - Yrs	Surveyor/ Survey Date		Comments
A Substructure			**2.5**				
Foundations							
A1030 Slab On Grade	1967	1967	3		CS	04/28/16	Overall the concrete slab is in fair to good condition, with minimal cracking. There are some areas of minor differential settlement.
B Shell			**2.3**				
Superstructure							
B1010 Floor Construction	1967	1997	2		CS	04/28/16	The mezzanine floor system is framed with structural steel beams supporting a composite concrete & metal floor deck. The system appears to be in good condition.
B1020 Roof Construction	1967	1967	2		CS	04/28/16	The roof system is framed with steel columns and beams supporting open web steel joists and metal deck. The exterior walls are primarily tilt-up concrete, however they do not support vertical load. There were no signs of deterioration in the interior of the building. Exterior concrete panels showed very minimal cracking. Some exterior steel ledger angles that support elevated precast concrete panels show early signs of rusting (<$5K). Overall the system appears to be in good condition.
Exterior Closure							
B2010 Exterior Walls	1967	1967	3		JG	04/28/16	Mix of pre-cast concrete panels and load-bearing and non-load bearing CMU. Generally in fair shape with some efflorescence and deteriorating finishes (<$5K).
B2020 Exterior Windows	1967	1998	3		JG	04/28/16	The windows are a mix of single-pane aluminum frame and double-pane insulated aluminum frame units. Most of the administrative and office areas have double-pane units but some heated & occupied interior spaces have single-pane units. All windows are in fair condition with no observed or reported issues with water intrusion. The weather sealant is deteriorating in several locations (<$5K).

Facility Components

Systems	Original System Date	Last Major System Renew.	Cond. Scores	Subsystem Remain.Useful Life - Yrs	Surveyor/ Survey Date		Comments
B Shell			**2.3**				
Exterior Closure							
B2030 Exterior Doors							
	1967	1967	3		JG	04/28/16	Painted HM doors with painted HM frames. Accessible (panic) hardware, typical. Exterior doors in fair shape with functioning hardware. Many steel roll-up service doors in service areas mostly in good condition. Original wood overhead sectional doors in warehouse in fair condition - operable but some are damaged. Aluminum storefront door and frame at vacated Icon sub-tenant space in good condition.
Roofing							
B3010 Roof Coverings							
	1967	2012	2		JG	04/28/16	2012 re-roof project covered virtually entire roof area with TPO, with the exception of one small roof strip over the North Dock area, dating from 1988 and has served beyond its normal useful life. New TPO assembly includes recover board over existing built-up roofing over entire complex. Newer coping installed throughout.
B3020 Roof Openings							
	1998	1998	3		JG	04/28/16	Roof has several older roof skylights in fair condition and approximately 12 new roof monitors in good condition. Mechanical curbs and penetrations in fair condition.
B3030 Projections							
	1967	1967	3		JG	04/28/16	Painted steel frame roof canopy projection at original warehouse loading dock area with metal roof deck; assembly in fair condition.
C Interiors			**3.0**				
Interior Construction							
C1010 Partitions							
	1967	1998	3		JG	04/28/16	Partitions consist of metal stud and drywall assemblies in the administrative and office areas. These are in fair to good condition - some original and others refit in 1998 and 2014. The remaining partitions are mostly in the warehouse areas and are CMU and cast-concrete; generally in fair condition.

Facility Components Systems	Original System Date	Last Major System Renew.	Cond. Scores	Subsystem Remain.Useful Life - Yrs	Surveyor/ Survey Date		Comments
C Interiors			**3.0**				
Interior Construction							
C1020 Interior Doors							
	1967	1998	3		JG	04/28/16	Interior doors are mostly painted HM doors with painted HM frames. Most doors have newer accessible compliant hardware. The interior doors in general are in good condition. Some doors in the warehouse and service areas are more worn and will require maintenance sooner than the more newly renovated areas (<$5K).
C1030 Fittings							
	1967	1998	3		JG	04/28/16	The interior fittings throughout are in fair to good condition. The toilet partitions are newer in the administrative/office areas; older and worn but functional in the warehouse and service areas. Whiteboards and tackable surfaces are mostly newer.
Staircases							
C2010 Stair Construction							
	1967	1998	2		JG	04/28/16	Most stair construction in the warehouse and service areas are steel frame with steel treads with painted steel handrails or concrete with no finish. These are generally in serviceable condition. The one interior stair at the office area is steel frame with steel pan and concrete treads with decorative steel and aluminum panel railings; this stairway is in good condition.
C2020 Stair Finishes							
	1967	1998	2		JG	04/28/16	Most stair are unfinished concrete or painted steel. Stair finishes are generally in good condition.
Interior Finishes							
C3010 Wall Finishes							
	1967	1998	3		JG	04/28/16	Wall finishes are almost entirely paint. The wall finish is generally in fair condition at the warehouse and service areas and fair to good condition in the office and administrative areas. There is some amount of wall finishes in the service areas that need maintenance (<$5K).
C3020 Floor Finishes							
	1967	1998	3		JG	04/28/16	Floor finish in interior, occupied areas are mostly carpet and VCT with some ceramic tile in the

Facility Components

Systems	Original System Date	Last Major System Renew.	Cond. Scores	Subsystem Remain.Useful Life - Yrs	Surveyor/ Survey Date		Comments
C Interiors			**3.0**				
Interior Finishes							
C3020 Floor Finishes							
							restrooms. The carpet is mostly in fair to good shape. The VCT is generally in fair shape, with some areas of cracking and wear (<$5K). Toilet room floors in good condition. The remaining facility (warehouse & service) has concrete floors in good shape. Some areas of specialty floor finished - epoxy coating in good condition.
C3030 Ceiling Finishes							
	1967	1998	3		JG	04/28/16	Ceilings in the interior, occupied areas are ACT and some GWB hard lid. Ceilings are generally in good condition. The warehouse and service areas are mostly open to structure above with paint finish. These areas are in fair condition.
D Services			**3.2**				
Vertical Transportation							
D1010 Elevators and Lifts							
	1997	1997	2		BW	04/29/16	Two-stop elevator between main floor and mezzanine in fair to good condition.
Plumbing							
D2010 Plumbing Fixtures							
	1997	1997	3		BW	04/29/16	There are multiple restroom groups spread throughout the facility dating from original 1967 construction to 1998, mezzanine in 2014. Fixtures are vitreous china in the restrooms with stainless steel sinks in the breakrooms.
D2020 Domestic Water Distribution							
	1967	1998	3		BW	04/29/16	6" main is ductile iron to the building entry and changes to galvanized steel inside the building. Most of the admin areas have been upgraded to copper. However, the fleet service and Icon areas still have the original galvanized steel. Areas with copper piping appear to be in good condition. However, the galvanized steel sections are in poor condition past their expected lifespan. There are no dielectric fittings at galvanized to copper connections which is causing the piping to corrode and leak. One gas-fired domestic hot water heater was replaced in 2013 and is in good condition. Others are in fair

Facility Components Systems		Original System Date	Last Major System Renew.	Cond. Scores	Subsystem Remain.Useful Life - Yrs	Surveyor/ Survey Date		Comments
D Services				**3.2**				
Plumbing								
D2020	**Domestic Water Distribution**							condition.
D2030	**Sanitary Waste**	1967	1994	3		BW	04/29/16	Waste piping appears to be cast iron throughout; in fair condition with no issues noted. Multiple alterations and improvements have occurred but much of the Sanitary Waste (below slab) is from 1967. 1994 new waste (and CW/HW) for new north restrooms w/POC to existing systems. 1997-98 new waste (and CW/HW) for the central & mezzanine, and shop and hazmat restrooms with POC to existing systems. Average renewal date has consequently been estimated at 1994.
D2040	**Rain Water Drainage**	1967	1967	3		BW	04/29/16	Roof drains and rain-leader piping are cast iron. Horizontal roof drain piping is Transite asbestos pipe with mudded fittings. Roof drains and rain-leader piping appear to be in good condition. There are no roof overflow drains, which may not comply with current code.
HVAC								
D3010	**Energy Supply**	1994	1998	3		BW	04/29/16	Natural gas piping exposed on roof is rusted; should be cleaned and painted (<$5K). Fuel oil piping at generator fuel tank is also rusted and should be cleaned and painted (<$5K).
D3020	**Heat Generating Systems**	1967	2014	3		BW	04/29/16	The two primary boilers are two years old and in good condition; however, maintenance personnel report that the two primary boilers provide inadequate heating for the building needs during winter. The back-up boiler is original 1967 construction and has exceeded expected lifespan.
D3030	**Cooling Generating Systems**	1967	2010	3		BW	04/29/16	Chiller is seven years old and assumed in fair to good condition.
D3040	**HVAC Distribution Systems**	1967	1997	4		BW	04/29/16	Heating hot water and chilled water hydronic

Puget Sound Energy
South King Complex Site
South King Complex Facility

6905 S. 228th Street
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Facility Components

Systems		Original System Date	Last Major System Renew.	Cond. Scores	Subsystem Remain.Useful Life - Yrs	Surveyor/	Survey Date	Comments
D Services				**3.2**				
HVAC								
D3040	**HVAC Distribution Systems**							
								piping throughout in poor condition. Central station air handlers at mezzanine in poor condition. Distribution duct from 1997 remodel in good condition.
D3050	**Terminal and Package Units**							
		1994	1997	4		BW	04/29/16	Most packaged rooftop HVAC equipment is in poor to fair condition, at the end of their expected lifespan. Indoor terminal units appear to be in good condition for their age.
D3060	**Controls and Instrumentation**							
		1967	1997	4		BW	04/29/16	Building control system approaching end of useful life.
D3090	**Other HVAC Systems and Equipment**							
		1967	1997	4		BW	04/29/16	General warehouse exhaust ventilation appears to be original 1967 construction, in poor condition and past its expected lifespan. Other exhaust systems appear to vary in age from 1994 to 2014 and are in varying condition from fair to good.
Fire Protection								
D4010	**Fire Protection Sprinkler Systems**							
		1967	1997	3		BW	04/29/16	The sprinkler actuation valves and piping system are in fair condition at the end of their expected lifespan. Most sprinkler heads are an older style and may not comply with current code requirements. No coverage at Fleet and Icon entry canopies.
D4090	**Other Fire Protection Systems**							
		1994	1994	3		BW	04/29/16	Foam system protecting hazardous material storage areas in the warehouse appears to be in fair condition, but near the end of its lifespan.
Electrical								
D5010	**Electrical Service and Distribution**							
		1967	1998	3		AH	04/29/16	1500 kVA PSE transformer serves exterior 480/277V 3-phase switchboard with two 1600A service breakers with bus ducts to distribution switchboards at the mezzanine with dry type transformers, motor control centers, branch

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South King Complex Facility

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Facility Components

Systems		Original System Date	Last Major System Renew.	Cond. Scores	Subsystem Remain.Useful Life - Yrs	Surveyor/	Survey Date	Comments
D Services				**3.2**				
Electrical								
D5010	**Electrical Service and Distribution**							panels, and exterior disconnects. 1967 equipment is aged. Transformers do not comply with energy standard. Exterior disconnects rusted.
D5020	**Lighting and Branch Wiring**	1967	1998	3		AH	04/29/16	Existing inside lighting consists primarily of fluorescent lighting fixtures (T8, T12, or compact) with some HID. Mezzanine area has several LEDs. Branch wiring is in good condition and about 20 years old, except in ICON area where the wiring was installed in 1967. Exterior building-mounted light fixtures also at end of life.
D5037	**Low Voltage Fire Alarm**	1998	1998	4		AH	04/29/16	Fire alarm system consists of non-addressable detectors and pull stations, alarm horns, and remote annunciator for the main PSE office and warehouse, with an added fire alarm panel for the fleet area which does not fully communicate with the main fire alarm panel. There is a voice evacuation system.
F Special Construction				**3.0**				
Special Construction								
F1020	**Integrated Construction**	1967	1967	3		JG	04/28/16	Facility contains specific structures and assemblies for hazardous material handling such as aerosol spray containers and oil containment and clean-up. These structures appeared to be operational and with no issues reported.
F1030	**Special Construction Systems**	1967	1967	3		JG	04/28/16	The facility has dock leveling equipment at the loading areas and overhead cranes. All special construction systems were in fair to good condition with no issues reported.

Facility Summary

Puget Sound Energy
South King Complex Site
South King Complex Infrastructure

6905 S. 228th Street
Kent, WA 98032

Facility Condition Summary

Facility Components Systems	Original System Date	Last Major System Renew.	Cond. Scores	Subsystem Remain.Useful Life - Yrs	Surveyor/ Survey Date		Comments
G Sitework							
Site Improvements							
G2010 Roadways	1967	1990	3		MK	04/28/16	The site access driveways function as roads and are asphalt pavement in poor to fair condition. Access road extending along south side of building is Portland cement concrete in good condition. Except for south yard areas (see below), pre-1994. North parking lots seal coated in 2013. Average renewal date estimated at 1990.
G2020 Parking Lots	1967	1997	2		MK	04/28/16	Parking lots are both asphalt and concrete and vary in condition from poor to good. Older 1967 asphalt lots have been seal coated. Lots south of the building built in 1997 are in good condition.
G2030 Pedestrian Paving	1967	1994	3		MK	04/28/16	Pedestrian walkways, ramps and stairs vary in condition from poor to good. Concrete walk between ADA parking areas at front of building is in poor condition with cracking and holes and should be replaced (<$5K to remove and replace). 1994 new north business office entry & ramp, and crew entry stair. 1997 new sidewalk at NW frontage and at West Valley Hwy (68th Ave S). Otherwise pre-1994. Therefore, on average, the renewal date is estimated at 1994.
G2040 Site Development	1967	1998	3		MK	04/28/16	Minimal site improvements are present, primarily seating benches and a picnic table. Chain-link fencing with motorized gates in fair condition. 1997-98 created and paved and fenced south storage yard (which was not already asphalt paved, and added detention pond and built SE wetland). Pre-existing existing asphalt pavement seal coated.
G2050 Landscaping							

Facility Components

Systems	Original System Date	Last Major System Renew.	Cond. Scores	Subsystem Remain.Useful Life - Yrs	Surveyor/ Survey Date		Comments
G Sitework							
Site Improvements							
	1967	1994	3		MK	04/28/16	Landscape areas are concentrated at building entries and lawn areas and are in fair to good condition. Some areas have limited plantings and are barked. Tree cover is limited except at wetland and detention sites. 1994 new north business office entry & ramp, and crew entry landscaping and 1997-98 south storage yard perimeter & parking areas, detention pond, and new wetland landscaping. Otherwise pre-1994. Therefore, on average, the renewal date is estimated at 1994.
Site Civil / Mechanical Utilities							
G3010 Water Supply							
	1967	1967	3		MK	04/28/16	Domestic service line and fire supply are from City of Kent system in S 228th St. Pinhole leaks have been reported.
G3020 Sanitary Sewer							
	1967	1967	3		MK	04/28/16	Sanitary sewer service line connects to City of Kent system. No known issues with service.
G3030 Storm Sewer							
	1967	1997	2		MK	04/28/16	Site is served with catch basin and ditch system, generally in fair to good condition. It appears roof area may drain by pipe to wetland at SE corner. Low area of the site at north loading dock experiences flooding during large rain events. Detention/water quality pond needs maintenance.
G3060 Fuel Distribution							
	1967	1994	3		MK	04/28/16	Natural gas supply line extend to two meters at north loading area. Small propane tank at east loading area supplies forklifts. Diesel fuel oil storage tank for standby generator. Self-contained Propane fueling for forklifts installed prior to 1997, perhaps 1994. Therefore, the average renewal date has been estimated at 1994.
Site Electrical utilities							
G4010 Electrical Distribution							
	1967	1998	2		AH	04/29/16	Underground primary feeder serves the utility 1500 kVA pad-mount transformer located approximately 60 feet south of the NEMA 3R

Facility Summary

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South King Complex Site — **6905 S. 228th Street**

South King Complex Infrastructure — **Kent, WA 98032**

Facility Components

Systems	Original System Date	Last Major System Renew.	Cond. Scores	Subsystem Remain.Useful Life - Yrs	Surveyor/ Survey Date		Comments
G Sitework							
Site Electrical utilities							
G4010 Electrical Distribution							
							main switchgear on the south side of the building. This transformer was installed about 1998.
G4020 Site Lighting							
	1967	1998	3		AH	04/29/16	North parking lighting consists of poles with HID luminaires installed in 1967 and showing signs of aging. Lighting in south storage lots consists of high mast HID luminaires and poles with HID luminaires installed in 1998 or later. East paved area is illuminated from building.

Detailed Assessment - Observed Deficiencies 2016 - 2021

Puget Sound Energy — **Total Observed Deficiency Repair Direct Cost : $8,473,500**

Site: South King Complex Site — **Total Observed Deficiency Repair Cost (Marked Up Present Value): $18,538,910**

Material	Cond.	Material Useful Life	Survey Year	Condition Notes	Qty	Unit Cost	Unit	Direct Constr. Cost	Marked Up Cost
Deficiency				Action					

Facility: South King Complex Facility	**Total System Deficiency Repair Cost (Undiscounted/Unescalated): $72,000**
System: Roofing	**Total System Deficiency Repair Cost (Marked Up): $167,400**

Roof Coverings

Material	Cond.	Material Useful Life	Survey Year	Condition Notes	Qty	Unit Cost	Unit	Direct Constr. Cost	Marked Up Cost
Roofing	4	1	2016		6,000	$12.00	SF	$72,000	$167,400

Original 1967 roofing has exceeded normal useful life.

Overlay existing built-up roof with rigid insulation to current code and TPO membrane.

This original 1967 roof area is a strip on the north side of the building that was not addressed when the rest of the entire building was re-roofed reportedly in 2012. While there are no leaks or failures reported in this area, the roofing has far exceeded its normal useful life and should be planned/budgeted for replacement per current energy code, etc. requirements.

Detailed Assessment - Observed Deficiencies 2016 - 2021

Puget Sound Energy — **Total Observed Deficiency Repair Direct Cost : $8,473,500**

Site: South King Complex Site — **Total Observed Deficiency Repair Cost (Marked Up Present Value): $18,538,910**

Material	Cond.	Material Useful Life	Survey Year	Condition Notes	Qty	Unit Cost	Unit	Direct Constr. Cost	Marked Up Cost
Deficiency				Action					

Facility: South King Complex Facility	**Total System Deficiency Repair Cost (Undiscounted/Unescalated): $547,600**
System: Plumbing	**Total System Deficiency Repair Cost (Marked Up): $1,273,170**

Domestic Water Distribution

Material	Cond.	Material Useful Life	Survey Year	Condition Notes	Qty	Unit Cost	Unit	Direct Constr. Cost	Marked Up Cost
Galvanized pipe	4	3	2016	Galvanized pipe and missing dielectric fittings.	80,000	$4.50	SF	$360,000	$837,000

Galvanized piping throughout building is in poor condition and past its useful lifespan.

Remove galvanized pipe and replace with copper.

Detailed Assessment - Observed Deficiencies 2016 - 2021

Puget Sound Energy — **Total Observed Deficiency Repair Direct Cost : $8,473,500**

Site: South King Complex Site — **Total Observed Deficiency Repair Cost (Marked Up Present Value): $18,538,910**

Material	Cond.	Material Useful Life	Survey Year	Condition Notes	Qty	Unit Cost	Unit	Direct Constr. Cost	Marked Up Cost
Deficiency				Action					
Facility: South King Complex Facility								Total System Deficiency Repair Cost (Undiscounted/Unescalated):	$547,600
System: Plumbing								Total System Deficiency Repair Cost (Marked Up):	$1,273,170
Rain Water Drainage									
Overflow roof drains	4	2	2016	Overflow roof drains missing.	280,000	$0.67	SF	$187,600	$436,170
There are no provisions for roof overflow drainage				Add roof overflow drains and/or roof scuppers					

Detailed Assessment - Observed Deficiencies 2016 - 2021

Puget Sound Energy | **Total Observed Deficiency Repair Direct Cost : $8,473,500**
Site: South King Complex Site | **Total Observed Deficiency Repair Cost (Marked Up Present Value): $18,538,910**

Material	Cond.	Material Useful Life	Survey Year	Condition Notes	Qty	Unit Cost	Unit	Direct Constr. Cost	Marked Up Cost
Deficiency				Action					
Facility: South King Complex Facility						Total System Deficiency Repair Cost (Undiscounted/Unescalated):			**$6,159,000**
System: HVAC						Total System Deficiency Repair Cost (Marked Up):			**$14,319,675**
Heat Generating Systems									
Boiler	4	1	2016	The back-up boiler is needed to provide both back-up and peak load capacity.	1	$303,600.00	EA	$303,600	$705,870
Backup boiler is original and past expected lifespan.				Replace back-up boiler with new.					

Puget Sound Energy | **Total Observed Deficiency Repair Direct Cost : $8,473,500**

Site: South King Complex Site | **Total Observed Deficiency Repair Cost (Marked Up Present Value): $18,538,910**

Material	Cond.	Material Useful Life	Survey Year	Condition Notes	Qty	Unit Cost	Unit	Direct Constr. Cost	Marked Up Cost
Deficiency				Action					
Facility: South King Complex Facility				**Total System Deficiency Repair Cost (Undiscounted/Unescalated):**					**$6,159,000**
System: HVAC				**Total System Deficiency Repair Cost (Marked Up):**					**$14,319,675**
HVAC Distribution Systems									
Central station air handlers	4	2	2016	Most distribution ductwork appears to be from 1997 remodel and is in good condition relative to its age. Original construction (1967) central station air handlers located in the mechanical mezzanine are in poor condition and are past their expected lifespan.	4	$86,250.00	EA	$345,000	$802,125
Central station air handlers are past their expected lifespan.				Replace original air handlers with new.					

Puget Sound Energy | **Total Observed Deficiency Repair Direct Cost : $8,473,500**

Site: South King Complex Site | **Total Observed Deficiency Repair Cost (Marked Up Present Value): $18,538,910**

Material	Cond.	Material Useful Life	Survey Year	Condition Notes	Qty	Unit Cost	Unit	Direct Constr. Cost	Marked Up Cost
Deficiency				Action					

Facility: South King Complex Facility — **Total System Deficiency Repair Cost (Undiscounted/Unescalated): $6,159,000**

System: HVAC — **Total System Deficiency Repair Cost (Marked Up): $14,319,675**

HVAC Distribution Systems

Material	Cond.	Material Useful Life	Survey Year	Condition Notes	Qty	Unit Cost	Unit	Direct Constr. Cost	Marked Up Cost
Hydronic piping	4	2	2016	All original hydronic piping past useful life.	280,000	$6.72	SF	$1,881,600	$4,374,720

Original heating hot water and chilled water hydronic piping past expected lifespan.

Replace hydronic piping with new.

Detailed Assessment - Observed Deficiencies 2016 - 2021

Puget Sound Energy — **Total Observed Deficiency Repair Direct Cost : $8,473,500**

Site: South King Complex Site — **Total Observed Deficiency Repair Cost (Marked Up Present Value): $18,538,910**

Material	Cond.	Material Useful Life	Survey Year	Condition Notes	Qty	Unit Cost	Unit	Direct Constr. Cost	Marked Up Cost
Deficiency				Action					

Facility: South King Complex Facility — **Total System Deficiency Repair Cost (Undiscounted/Unescalated): $6,159,000**

System: HVAC — **Total System Deficiency Repair Cost (Marked Up): $14,319,675**

Terminal and Package Units

Material	Cond.	Material Useful Life	Survey Year	Condition Notes	Qty	Unit Cost	Unit	Direct Constr. Cost	Marked Up Cost
Packaged rooftop units	4	2	2016	Packaged units at end of life.	14	$98,500.00	EA	$1,379,000	$3,206,175

Most packaged rooftop HVAC equipment is in poor to fair condition, at the end of their expected lifespan.

Remove old equipment and replace with new.

Detailed Assessment - Observed Deficiencies 2016 - 2021

Puget Sound Energy — **Total Observed Deficiency Repair Direct Cost : $8,473,500**

Site: South King Complex Site — **Total Observed Deficiency Repair Cost (Marked Up Present Value): $18,538,910**

Material	Cond.	Material Useful Life	Survey Year	Condition Notes	Qty	Unit Cost	Unit	Direct Constr. Cost	Marked Up Cost
Deficiency				Action					

Facility: South King Complex Facility — **Total System Deficiency Repair Cost (Undiscounted/Unescalated): $6,159,000**

System: HVAC — **Total System Deficiency Repair Cost (Marked Up): $14,319,675**

Controls and Instrumentation

Material	Cond.	Material Useful Life	Survey Year	Condition Notes	Qty	Unit Cost	Unit	Direct Constr. Cost	Marked Up Cost
Controls	4	5	2016	Building is controlled by a mixture of pneumatic, electric and several different electronic (DDC) systems. Some pneumatic and electric controls are original 1967 construction and past their expected lifespan. According to building maintenance personnel the systems are not integrated with each other so there is no central control of the building.	250,000	$7.00	SF	$1,750,000	$4,068,750

Deficiency: Parts of the building control system are in poor condition past their expected lifespan. There is no centralized control of the building systems, therefore is difficult to manage energy efficiency and comfort.

Action: Remove all controls and replace with new centralized electronic (DDC) control system.

Detailed Assessment - Observed Deficiencies 2016 - 2021

Puget Sound Energy | **Total Observed Deficiency Repair Direct Cost : $8,473,500**
Site: South King Complex Site | **Total Observed Deficiency Repair Cost (Marked Up Present Value): $18,538,910**

Material	Cond.	Material Useful Life	Survey Year	Condition Notes	Qty	Unit Cost	Unit	Direct Constr. Cost	Marked Up Cost
Deficiency				Action					

Facility: South King Complex Facility — **Total System Deficiency Repair Cost (Undiscounted/Unescalated): $6,159,000**
System: HVAC — **Total System Deficiency Repair Cost (Marked Up): $14,319,675**

Other HVAC Systems and Equipment

Material	Cond.	Material Useful Life	Survey Year	Condition Notes	Qty	Unit Cost	Unit	Direct Constr. Cost	Marked Up Cost
Warehouse exhaust ventilation	4	5	2016	Warehouse exhaust near end of life.	210,000	$2.38	SF	$499,800	$1,162,035

Most of the exhaust ventilation system is in poor condition and past its expected lifespan.

Remove warehouse rooftop fans and replace with new.

Detailed Assessment - Observed Deficiencies 2016 - 2021

Puget Sound Energy — **Total Observed Deficiency Repair Direct Cost : $8,473,500**

Site: South King Complex Site — **Total Observed Deficiency Repair Cost (Marked Up Present Value): $18,538,910**

Material	Cond.	Material Useful Life	Survey Year	Condition Notes	Qty	Unit Cost	Unit	Direct Constr. Cost	Marked Up Cost
Deficiency				Action					

Facility: **South King Complex Facility** — **Total System Deficiency Repair Cost (Undiscounted/Unescalated): $548,500**

System: **Fire Protection** — **Total System Deficiency Repair Cost (Marked Up): $1,275,263**

Fire Protection Sprinkler Systems

Material	Cond.	Material Useful Life	Survey Year	Condition Notes	Qty	Unit Cost	Unit	Direct Constr. Cost	Marked Up Cost
Dry pipe system	5	0	2016	No protection at canopies.	9,000	$6.50	SF	$58,500	$136,013

Deficiency: Canopies at Fleet Entry and Icon Entry have no fire sprinkler coverage. This may not meet current code requirements.

Action: Add dry sprinkler system to exterior canopies

Puget Sound Energy | **Total Observed Deficiency Repair Direct Cost : $8,473,500**

Site: South King Complex Site | **Total Observed Deficiency Repair Cost (Marked Up Present Value): $18,538,910**

Material	Cond.	Material Useful Life	Survey Year	Condition Notes	Qty	Unit Cost	Unit	Direct Constr. Cost	Marked Up Cost
Deficiency				Action					
Facility: South King Complex Facility								**Total System Deficiency Repair Cost (Undiscounted/Unescalated):**	**$548,500**
System: Fire Protection								**Total System Deficiency Repair Cost (Marked Up):**	**$1,275,263**
Fire Protection Sprinkler Systems									
Fire sprinkler heads	4	2	2016	Obsolete fire sprinkler heads.	280,000	$1.75	SF	$490,000	$1,139,250
Sprinkler heads may not meet current code requirements.				Remove all sprinkler heads and replace with new complying with current codes.					

Detailed Assessment - Observed Deficiencies 2016 - 2021

Puget Sound Energy | **Total Observed Deficiency Repair Direct Cost : $8,473,500**

Site: South King Complex Site | **Total Observed Deficiency Repair Cost (Marked Up Present Value): $18,538,910**

Material	Cond.	Material Useful Life	Survey Year	Condition Notes	Qty	Unit Cost	Unit	Direct Constr. Cost	Marked Up Cost
Deficiency				Action					

Facility: South King Complex Facility — **Total System Deficiency Repair Cost (Undiscounted/Unescalated): $1,048,400**

System: Electrical — **Total System Deficiency Repair Cost (Marked Up): $2,437,530**

Electrical Service and Distribution

Material	Cond.	Material Useful Life	Survey Year	Condition Notes	Qty	Unit Cost	Unit	Direct Constr. Cost	Marked Up Cost
Electrical service equipment	4	5	2016	Original 1967 electrical service equipment and distribution at end of life.	250,000	$2.20	SF	$550,000	$1,278,750

Deficiency: 1967 equipment beyond useful economic life. 1998 service breakers ok.

Action: Wiring in motor control centers (MCC#1, #2, #3 and PDP#2) and two 500 kva stepdown transformers id original and should be replaced.

Puget Sound Energy — **Total Observed Deficiency Repair Direct Cost : $8,473,500**

Site: South King Complex Site — **Total Observed Deficiency Repair Cost (Marked Up Present Value): $18,538,910**

Material / Deficiency	Cond.	Material Useful Life	Survey Year	Condition Notes / Action	Qty	Unit Cost	Unit	Direct Constr. Cost	Marked Up Cost
Facility: South King Complex Facility								**Total System Deficiency Repair Cost (Undiscounted/Unescalated):**	**$1,048,400**
System: Electrical								**Total System Deficiency Repair Cost (Marked Up):**	**$2,437,530**
Low Voltage Fire Alarm									
Fire alarm control panel and devices	4	5	2016	Obsolete fire alarm system.	280,000	$1.78	SF	$498,400	$1,158,780
Detectors and pull stations are not addressable.				Remove fire alarm control panel and associated devices and replace with new addressable fie alarm system. Extend voice evacuation to ICON space.					

Puget Sound Energy — **Total Observed Deficiency Repair Direct Cost : $8,473,500**

Site: South King Complex Site — **Total Observed Deficiency Repair Cost (Marked Up Present Value): $18,538,910**

Material	Cond.	Material Useful Life	Survey Year	Condition Notes	Qty	Unit Cost	Unit	Direct Constr. Cost	Marked Up Cost
Deficiency				Action					

Facility: South King Complex Infrastructure — **Total System Deficiency Repair Cost (Undiscounted/Unescalated): $12,000**

System: Site Improvements — **Total System Deficiency Repair Cost (Marked Up): $27,900**

Roadways

Material	Cond.	Material Useful Life	Survey Year	Condition Notes	Qty	Unit Cost	Unit	Direct Constr. Cost	Marked Up Cost
Asphalt	4	4	2016	Access drives need repairs soon.	400	$30.00	SY	$12,000	$27,900
Two access drives will require resurfacing within five years.				Remove and replace portions of asphalt.					

Detailed Assessment - Observed Deficiencies 2016 - 2021

Puget Sound Energy — **Total Observed Deficiency Repair Direct Cost : $8,473,500**

Site: South King Complex Site — **Total Observed Deficiency Repair Cost (Marked Up Present Value): $18,538,910**

Material	Cond.	Material Useful Life	Survey Year	Condition Notes	Qty	Unit Cost	Unit	Direct Constr. Cost	Marked Up Cost
Deficiency				Action					

Facility: South King Complex Infrastructure — **Total System Deficiency Repair Cost (Undiscounted/Unescalated): $6,000**

System: Site Civil / Mechanical Utilities — **Total System Deficiency Repair Cost (Marked Up): $13,950**

Storm Sewer

Material	Cond.	Material Useful Life	Survey Year	Condition Notes	Qty	Unit Cost	Unit	Direct Constr. Cost	Marked Up Cost
Detention pond	4	2	2016	Detention pond needs service.	1	$6,000.00	LS	$6,000	$13,950

Deficiency: Water level in detention pond is high and appears system may not be draining and needs maintenance. Vegetation is overgrown. Ditches at north parking lot should be deepened to increase storage.

Action: Clean pond outlet system and remove vegetation. Deepen ditches at north parking lot.

Puget Sound Energy | **Total Observed Deficiency Repair Direct Cost : $8,473,500**

Site: South King Complex Site | **Total Observed Deficiency Repair Cost (Marked Up Present Value): $18,538,910**

Material	Cond.	Material Useful Life	Survey Year	Condition Notes	Qty	Unit Cost	Unit	Direct Constr. Cost	Marked Up Cost
Deficiency				Action					

Facility: South King Complex Infrastructure — **Total System Deficiency Repair Cost (Undiscounted/Unescalated): $80,000**

System: Site Electrical utilities — **Total System Deficiency Repair Cost (Marked Up): $186,000**

Material	Cond.	Material Useful Life	Survey Year	Condition Notes	Qty	Unit Cost	Unit	Direct Constr. Cost	Marked Up Cost
Site Lighting									
Poles, luminaires and bases	4	5	2016	North parking lighting consists of poles with HID luminaires installed in 1967 and showing signs of aging. Lighting in south storage lots consists of high mast HID luminaires and poles with HID luminaires installed in 1998 or later. East paved area is illuminated from building.	20	$4,000.00	EA	$80,000	$186,000

Deficiency: Area lights in North Parking lots exceed economic life. East paved area illuminated from building mounted flood lights.

Action: North Parking - remove area pole lights and provide new. East paved area - add pole lights.

Deficiency Repair Cost Markups By System 2016 - 2021

Puget Sound Energy
Site: South King Complex Site

Facility	System		Direct Construction Cost	Contingency 25%	Contractor's OH & P 20%	Project Soft Cost 55%	Total Project Cost	Total Project Cost (Present Value)
South King Complex Facility	Roofing		$72,000	$18,000	$18,000	$59,400	$167,400	$164,212
	Plumbing		$547,600	$136,900	$136,900	$451,770	$1,273,170	$1,209,788
	HVAC		$6,159,000	$1,539,750	$1,539,750	$5,081,175	$14,319,675	$13,510,368
	Fire Protection		$548,500	$137,125	$137,125	$452,513	$1,275,263	$1,232,276
	Electrical		$1,048,400	$262,100	$262,100	$864,930	$2,437,530	$2,214,060
		Facility Total	**$8,375,500**	**$2,093,875**	**$2,093,875**	**$6,909,788**	**$19,473,038**	**$18,330,705**
South King Complex Infrastructure	Site Improvements		$12,000	$3,000	$3,000	$9,900	$27,900	$25,835
	Site Civil / Mechanical Utilities		$6,000	$1,500	$1,500	$4,950	$13,950	$13,425
	Site Electrical utilities		$80,000	$20,000	$20,000	$66,000	$186,000	$168,948
		Facility Total	**$98,000**	**$24,500**	**$24,500**	**$80,850**	**$227,850**	**$208,208**
		Site Total	**$8,473,500**	**$2,118,375**	**$2,118,375**	**$6,990,638**	**$19,700,888**	**$18,538,913**

Opportunity Summary By Subsystem

Puget Sound Energy
Site: South King Complex Site

Total Site Opportunity Cost: $9,891,800
Marked up Cost: $22,998,435

Subsystem		Opportunity	Action	Qty	Unit Cost	Unit	Cost	Marked Up Cost
Facility:	**South King Complex Facility**							
System:	**Interior Construction**	**Total Cost: $8,800**						
C1010	**Partitions**							
		The existing restrooms at the fleet offices area are not fully accessible. Renovate restrooms at the fleet offices area to be ADA compliant.	Demolish and reconfigure existing spaces.	400	$22.00	SF	$8,800	$20,460
Facility:	**South King Complex Facility**							
System:	**Plumbing**	**Total Cost: $210,000**						
D2010	**Plumbing Fixtures**							
		Opportunity to decrease water usage by replacing fixtures with low-consumption type.	Replace plumbing fixtures throughout.	280,000	$0.75	SF	$210,000	$488,250
Facility:	**South King Complex Facility**							
System:	**HVAC**	**Total Cost: $7,700,000**						
D3040	**HVAC Distribution Systems**							
		Opportunity to increase energy efficiency by replacing entire building HVAC system with new energy efficient system.	Replace HVAC system throughout building.	280,000	$24.50	SF	$6,860,000	$15,949,500
D3060	**Controls and Instrumentation**							
		Opportunity to increase energy efficiency and building comfort.	Replace all building controls with new DDC type.	280,000	$3.00	SF	$840,000	$1,953,000

Opportunity Summary By Subsystem

Puget Sound Energy
Site: South King Complex Site

Total Site Opportunity Cost: $9,891,800
Marked up Cost: $22,998,435

Subsystem		Opportunity	Action	Qty	Unit Cost	Unit	Cost	Marked Up Cost
Facility:	**South King Complex Facility**							
System:	**Electrical**	**Total Cost: $1,869,000**						
D5020	**Lighting and Branch Wiring**							
		Existing lighting is fluorescent and HID.	Replace existing luminaires with LED luminaires.	280,000	$4.80	SF	$1,344,000	$3,124,800
D5037	**Low Voltage Fire Alarm**							
		Existing system is obsolete & non-addressable.	Replace existing fire alarm system with addressable system and extend voice evac system.	300,000	$1.75	SF	$525,000	$1,220,625
Facility:	**South King Complex Infrastructure**							
System:	**Site Improvements**	**Total Cost: $24,000**						
G2010	**Roadways**							
		Opportunity to provide durable curbing. Replace extruded concrete curbs at entry drives with 8" wide vertical curb.	Existing extruded curbs are broken by truck traffic.	400	$60.00	LF	$24,000	$55,800
Facility:	**South King Complex Infrastructure**							
System:	**Site Electrical utilities**	**Total Cost: $80,000**						
G4020	**Site Lighting**							
		Existing lighting is HID. The east paved area is lit from the building only with flood lights.	Replace HID area lights and add area lights. Replace flood lights with wall packs.	20	$4,000.00	EA	$80,000	$186,000

VI. SEISMIC REPORT

STRUCTURAL EVALUATION
FOR

PUGET SOUND ENERGY
SOUTH KING COMPLEX
KENT, WASHINGTON

PREPARED BY
PCS STRUCTURAL *SOLUTIONS*

June 2, 2016
16-424

TABLE OF CONTENTS

I. PREFACE

The structural evaluation of the Puget Sound Energy South King Complex (PSE SKC) is only one component of the overall Facility Condition Assessment. The focus of this structural evaluation was to perform a condition assessment as well as a preliminary structural design review. The ASCE 41-13 "Seismic Evaluation and Retrofit of Existing Buildings" Tier 1 methodology and checklists, addressing Risk Category IV (Essential Facility), were used as a guideline. Additionally, the ASTM E2026-07 Standard Guide for Seismic Risk Assessment was utilized as a guide to provide additional assessment parameters to the buildings as well as the supported systems.

This report identifies the major structural concerns for the facility evaluated. Assumptions were made where building information was limited.

II. EXECUTIVE SUMMARY

The Puget Sound Energy South King Complex (PSE SKC) is a large warehouse, approximately 276,135 square feet in size, located in the Kent Valley, south of Seattle. Included in that square footage is a 3,215 SF mechanical penthouse, a 22,585 SF office and a storage mezzanine. The facility was originally constructed in 1967. The mezzanine addition occurred in 1997.

The structural framing system is a steel framed roof and mezzanine, with exterior concrete tilt-up walls. As-built drawings for the original construction were not available for review. Accordingly, many assumptions were made, based on typical practices during that era of construction, along with our knowledge of similar buildings.

The structural concerns noted for the buildings are common for their age and type of construction. From a gravity load standpoint, the building appears to have performed well over the years. We did not observe significant signs of structural distress or differential settlement. The majority of the structural concerns identified relate to the buildings' global lateral resisting systems, details of construction not consistent with current seismic detailing and the general deterioration of the structural elements due to age and environmental factors.

Building codes and construction methods have changed over the years, incorporating lessons learned from past experience in relation to vertical and lateral (wind and seismic) design. While the current design methodology of vertical support systems remains similar to codes in use when this facility was built, the approach to lateral design has changed dramatically. For instance, there is an increased emphasis on detailing requirements at critical connection points. Additionally, the magnitude of design forces has increased significantly. Since 1967, seismic design forces have more than doubled for a facility similar to PSE SKC, when based on a Life/Safety approach (damage would occur to the facility, but occupant safety wouldn't be compromised). Design forces will more than triple if this structure is to be considered as a Risk Category IV facility (Immediate Occupancy, where functionality is required after a seismic event). The increase in design forces, as well as an improved understanding to how structural elements respond to earthquake forces, have a significant impact to the evaluation of the seismic resisting capabilities of the building.

The recommendations provided in this report are intended to preserve the safety of the building occupants, limit the potential for loss of life due to structural failure, and enhance the strength and ductility of the building to meet Risk Category IV requirements. They are consistent with currently accepted strengthening methods, and while not intended to bring the buildings into full compliance with current building codes, should greatly improve the performance of the facility.

III. INTRODUCTION

A) SCOPE OF WORK

a) Field Investigation

- Walked through the complex, looking for signs of structural distress, differential settlement or deterioration.
- Visually verified vertical and lateral systems.
- Reviewed structural concerns identified in the ASCE 41-13 Checklist along with field observations identified in the checklists.
- Viewed structure wherever visible.
- Testing or selective demolition was not completed at this time.

b) Initial Review of Construction Drawings

- Reviewed available construction drawings. The only drawings available were those that addressed work performed on interior mezzanines during the late 1990s. Drawings for the original construction were not available for review.
- Utilized the ASCE 41-13 Building Checklists as a guideline to help identify common structural deficiencies for the building.
- Where no drawings were available, or the drawings did not adequately describe as-built conditions, recommendations were based on field investigation and observations.

c) Report Preparation and Further Construction Drawing Review

- Brainstormed conceptual ideas to mitigate structural concerns identified.
- Structural Report
  - Described vertical and lateral load resisting system for each building.
  - Summarized visual observations of building condition, signs of structural distress, and differential settlement.
  - Identified structural concerns from observations and ASCE 41-13 checklists.
  - Discussed The ASTM E2026 Standard, along with initial assessments.
  - Provided a summary of the structural recommendations.
  - Identified areas where additional analysis is warranted to verify assumptions made beyond the scope of this evaluation.

B) PUGET SOUND SEISMICITY

The Puget Sound is considered a seismically active region. Within this region, there are three basic types of earthquake that can occur:

- Shallow crustal earthquakes
- Benoiff Zone (intra-plate) earthquakes
- Subduction zone (inter-plate) earthquakes

Movement of tectonic plates creates the mechanism that drives all three types of earthquake, as the Juan de Fuca Plate, comprising the bottom of the Pacific Ocean floor several miles off of the Washington and Oregon coasts, is forced into and below the North American Plate. The level of seismic hazard assigned to any particular building is related to the type of earthquake that may occur in the region, and can vary significantly based on the magnitude of earthquake and proximity of a given site to the epicenter.

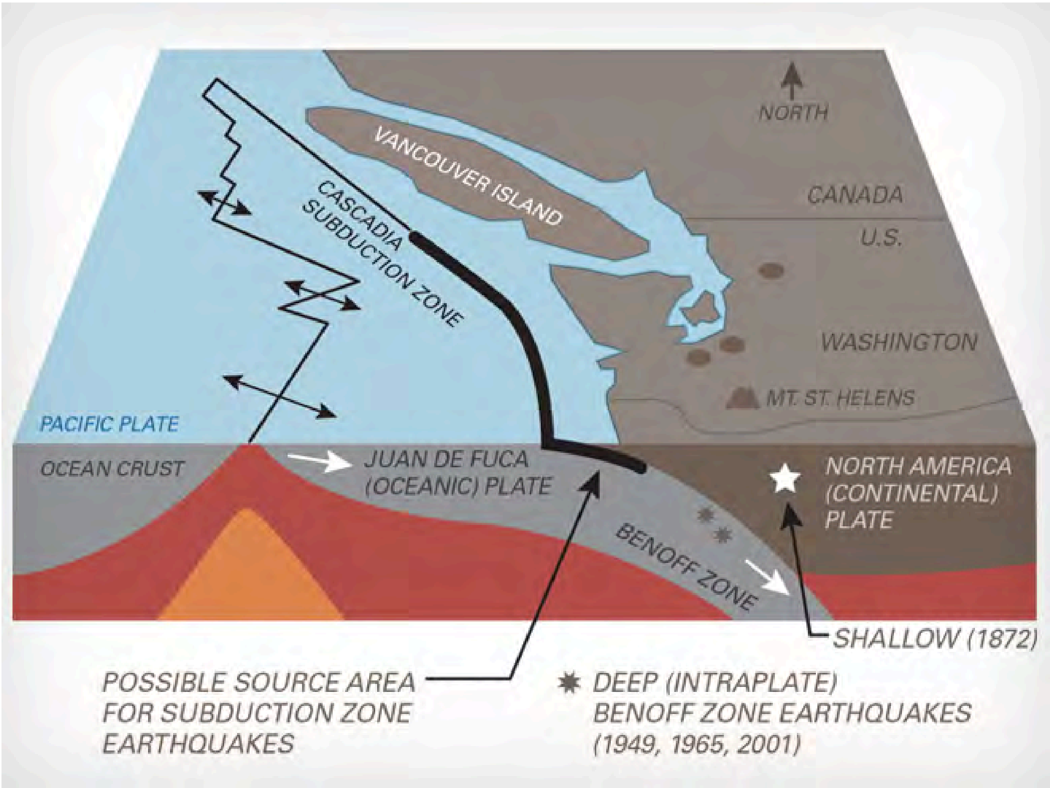


Figure A: Cross Section of the Cascadia Subduction Zone
(Source: Washington State Department of Natural Resources)

B) PUGET SOUND SEISMICITY cont.

Shallow crustal earthquakes occur in the overriding North American plate and are generally at depths less than 25 miles. There are at least six significant faults that have been identified in the Puget Sound region with concentrations in three primary locations; Seattle, Tacoma and South Whidbey Island. These groupings of faults run generally in an east-west orientation and cut across the heavily populated zones of the region. These earthquakes have a relatively long average recurrence interval at approximately 330 years and are capable of generating moderate to large events registering M5.5-M7 on the Richter Scale. This type of earthquake is generally expected to be of shorter duration and more localized as it relates to strong ground motions.

Intra-plate earthquakes occur in the portion of the Juan de Fuca plate that moves beneath the overriding North American plate. This type of earthquake occurs deep below the ground surface (typically 25 to 40 miles) and has the ability to generate moderate to large events of M6-M7 on the Richter Scale. They have a much shorter recurrence interval of approximately 35 to 50 years on average. Earthquakes of this variety tend to have shorter durations, but can still generate significant ground shaking over large areas of land.

Inter-plate earthquakes, also known as subduction zone earthquakes, occur directly at the interface of two plates and are more likely to be large magnitude events. They have the potential of registering upwards of M9 on the Richter Scale, with a relatively long average time of approximately 500 years between occurrences. These earthquakes are generally expected to have long durations, and can generate significant ground shaking over very large areas.

The Kent Valley and surrounding region is susceptible to earthquakes caused by any of the conditions listed above.

C) GEOLOGICAL SITE HAZARDS

Local site conditions can often lead to increased structural damage in the event of an earthquake. Slope failures (ground sliding due to a steep slope), surface ruptures (movement of an at-surface fault), and liquefaction (loose, granular soils that "liquefy" and lose support capacity) should all be considered when evaluating a facility.

While the PSE SKC site does not appear to have issues with slope failures or surface ruptures, it is located in an area that is vulnerable to liquefaction. Figure B is a portion of a map developed by the King County Flood Control District, which indicates the entire Kent Valley is prone to liquefaction. The PSE SKC site is noted on the map, with the coding that a Moderate to High level of susceptibility exists.

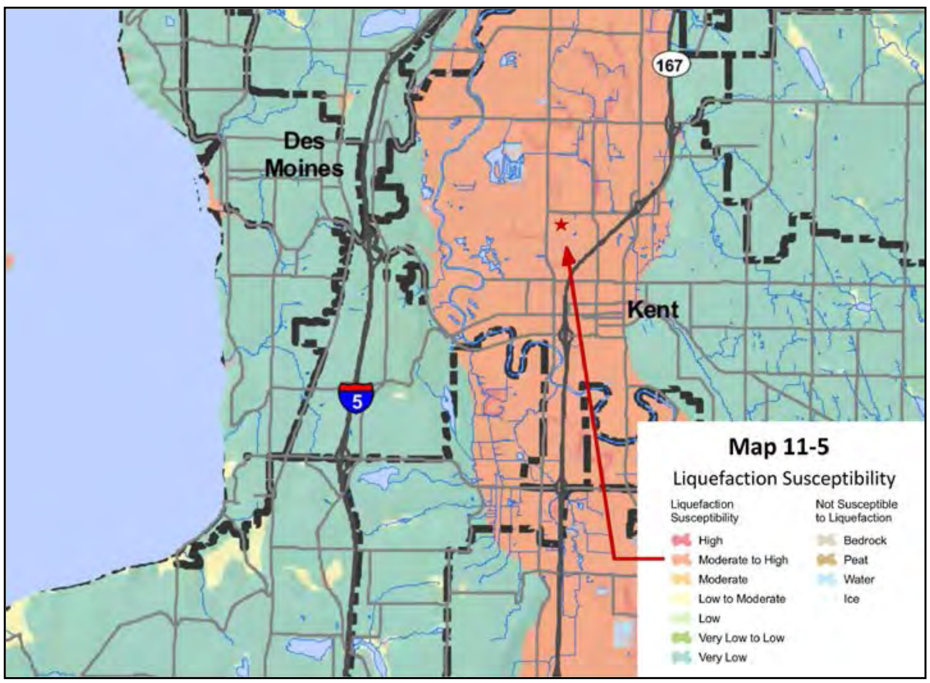


Figure B: Liquefaction Susceptibility – PSE SKC Site

(Source: King County Flood Control District)

D) METHODOLOGY

ASTM 41-13 Evaluation

The Puget Sound Energy South King Complex was evaluated using the methodology of the ASCE 41-13 “Seismic Evaluation and Retrofit of Existing Buildings” Tier 1 evaluation, addressing Risk Category IV (Immediate Occupancy) parameters. The ASCE 41-13 document provides building checklists that identifies common seismic concerns for typical building types (i.e. Concrete Shear Walls Buildings with Flexible Diaphragms, Concrete Shear Walls Buildings with Stiff Diaphragms, Unreinforced Masonry Bearing Wall Buildings with Flexible Diaphragms, etc). Each question on the checklist may be answered by “compliant”, “non-compliant” or “not applicable”. For those items that are non-compliant, additional evaluation or mitigation of the structural concern is recommended. Detailed calculations were not performed for this study.

The ASCE 41-13 is a performance based design/evaluation manual with varying performance objectives. The performance objective is selecting based upon the acceptable level of risk, as well as the tier level used in the evaluation. In general, there are three primary performance levels for existing buildings:

Immediate Occupancy: a higher level performance that focuses on maintaining building functionality after an earthquake. Light damage is anticipated in the event of a major earthquake; however, the building function is expected to be maintained with little to no disruption in service. Fire Stations, Hospitals, Police Stations and other critical facilities are buildings that are designed for this level.

Life Safety: focuses on protecting the occupants of the building. This is the most common level of performance for building design. In the event of a major earthquake, the building may suffer moderate damage with a small margin of total or partial collapse. The facility may be unusable after an earthquake, with low overall risk of injury from structural damage.

Collapse Prevention: a low level of performance, where the damage to the building after a moderate earthquake may be severe. The lateral resisting system would have little residual strength, and large permanent deformations would occur. The building would likely be near collapse.

D) METHODOLOGY cont.

Once the Performance Level is selected it can be determined which procedural tier review to use in the evaluation:

- Tier 1 is a screening process utilizing Building Checklists to help identify common structural deficiencies for typical buildings types. The owner/designer has the option of possibly mitigating the structural concern identified by Tier 1 or performing a more detailed analysis outlined in Tiers 2 and 3.
- Tier 2 is a deficiency based evaluation and renovation procedure. This methodology includes analyzing specific elements or areas within a building to determine if potential deficiencies identified in a Tier 1 review actually require mitigation. Analysis of the entire building may not be necessary. This tier can be used for both evaluation and retrofit.
- Tier 3 is a systematic evaluation and retrofit procedure, and involves a computationally extensive approach towards a complete analysis of the facility. The performance of the building as structural elements begin to yield, also known as a non-linear analysis, is considered. This tier is applicable for both the evaluation and retrofit of a facility.

Local Jurisdiction Requirements

While it is our recommendation that all of the seismic deficiencies identified in this evaluation be incorporated into building renovations, it is understood that only the local jurisdiction has the authority to require seismic improvements. With this in mind, it is important to understand typical “triggers” that many jurisdictions have for requiring seismic strengthening work.

There are a few common circumstances under which a jurisdiction will require upgrades. One is related to the dollar value of planned renovation work as it relates to the overall value of the building. Jurisdictions will often require seismic improvements if the cost of planned renovation work ranges between about 40% and 60% of the value of the building. A second reason is a change of occupancy to a more intensive use will usually cause the jurisdiction to require upgrades. This is related to the number of building occupants and the amount of time they may spend in the building. For example, renovating a warehouse structure to become an elementary school would almost certainly trigger seismic strengthening work to be completed. Another circumstance is when additions or alterations are made to the facility that significantly increases the mass of the facility or decreases its lateral resisting capacity.

While these two conditions are most common, there may be other circumstances that act as triggers in a given jurisdiction, and it is important to communicate directly with the Building Department to understand the specifics of their requirements.
It also should be noted that, many jurisdictions are open to accepting partial implementation of seismic improvements if there are extenuating circumstances which make full implementation impractical.

ASTM E2026-07 Standard

The ASTM E2026-07 “Standard Guide for Seismic Risk Assessment of Buildings” is a guideline that assists the user in assessing a property’s potential for losses from earthquake occurrences. This approach focuses on six different parameters:

1. Building Stability: Includes a walk-through survey of the facility, identifying the vertical and lateral systems, determining if there are any conditions of instability that may lead to damage after a seismic event. It is similar in scope to the ASCE 41-13 Tier 1 evaluation.
2. Site Stability: Site conditions are evaluated, considering local geotechnical knowledge. Items reviewed and considered are whether the facility is in a region susceptible for liquefaction, landslides, or if it’s near an active fault zone.
3. Non-structural Checklist: Includes a detailed review of non-structural items, such as partition walls, parapets, piping support, mechanical unit anchorage, equipment support, ceiling framing, etc. A cursory review during the facility condition assessment found several instances of non-conforming items. A complete evaluation of these items was not completed.
4. Building Damageability Assessment: This evaluation includes considering seismic loads and the capacity of the existing systems. As existing drawings aren’t available to determine system capacities, destructive and non-destructive testing would have been required in order to determine the strength of the metal roof deck, concrete wall reinforcing, the connection of the concrete walls to the foundation, along with many other items. This level of testing was beyond the scope of work for this project, and accordingly our recommendations are based upon the ASCE 41-13 evaluation.
5. Content Damageability Assessment: This assessment would be similar to the non-structural assessment of the ASCE 41-13 study. It would take the analysis completed in the ASCE 41-13 study and develop a generic damage curve, modified based on conditions of the site study. Since a highly detailed evaluation of the building contents was not performed, this assessment was not completed.
6. Building Interruption Assessment: This study would focus on impactive interruptions after a seismic event due to the damage of the building, damage of contents, as well as damage to other facilities/infrastructure not part of this property. This portion of the study focuses on the operations of the facility, rather than the condition of the structure itself, and was not completed.

Structural Recommendations

The recommendations provided are based on our past experience in renovating similar structures in the Puget Sound region, utilizing ASCE 41-13 upgrade guidelines and are similar to those required for the International Existing Building Code (IEBC).

IV. STRUCTURAL EVALUATION

PUGET SOUND ENERGY
SOUTH KING COMPLEX
KENT, WA

The Puget Sound Energy South King complex (PSE SKC) was evaluated using the methodology of the ASCE 41-13 “Seismic Evaluation and Retrofit of Existing Buildings” Tier 1 evaluation, addressing the Risk Category IV (Immediate Occupancy) level. Non-structural checklists were also referenced; however, a detailed evaluation of non-structural items was not performed.

A. TYPE OF CONSTRUCTION/STRUCTURAL SYSTEM

The PSE SKC complex was originally constructed around 1967. Construction documents were not available for review. From visual observations, the roof to the west and north are approximately 20 feet above grade level, and the spaces below are one-story. The roof at the southeast portion of the facility is approximately 30 feet above grade level, and it’s in this portion of the complex that the floor and mechanical mezzanines occur.

In 1997, several interior modifications occurred. Partial documentation was available for reference, denoted as Phase 2 (mezzanine addition near the center of the complex), Phase 2b (interior framed rooms in the south-central portion of the facility, with non-accessible ceiling lids), and Phase 2c (interior framed rooms in the southeast corner of the facility, with non-accessible ceiling lids).

SYSTEM DESCRIPTIONS

<u>Vertical Load Resisting System</u>:

1967, Original Construction:

The roof is a steel framed system, comprised of a metal roof deck supported by open-web steel joists. The steel joists are supported primarily by steel girders, which are supported by tube steel columns. The joists are supported by steel beams at the perimeter of the building as well, with the concrete tilt-up walls provided very little vertical support. The concrete panels appear to be attached to the columns, with minimal attachment to the roof deck. The exterior east wall of the building is primarily infill CMU. Many interior non-structural walls are also framed with CMU. The foundations were not exposed to view, however it appears from design parameters set in the 1997 additions that they are typical spread and continuous footings bearing directly on the ground.

1997, Phase 2:

The mezzanine framing is wide-flange beams supporting a composite metal/concrete floor deck. The beams are supported by steel columns and concrete spread footings. Many office areas are framed with metal stud walls supporting metal stud joists and metal deck. The framing acts as a ceiling, with no access.

1997, Phase 2b:

Large spaces are framed as enclosed office areas, with metal stud walls supporting metal stud joists and metal deck. In some long-span areas, the metal ceiling joists are replaced with open web steel joists. The framing acts as a ceiling, with no access.

1997, Phase 2c:

Large spaces were framed as enclosed work areas. Steel posts and beams support open web steel joists and a metal deck. The framing acts as a ceiling, with no access.

Lateral Force Resisting System:

1967, Original Construction:

The exterior concrete walls act as the lateral system for the majority of the complex. They appear to be attached primarily to the concrete columns, and are minimally attached to the roof deck. The east exterior wall is reinforced CMU that extends to the underside of pre-cast concrete spandrel beams that are supported by the roof structure. There appears to be minimal connection of the spandrel panels to the masonry walls.

1997, Phase 2:

The mezzanine is self-supporting, and does not rely on the original building for lateral support. Lateral forces are resisted by steel moment frames, constructed of wide flange beams and tube steel columns. The metals stud framed offices are laterally supported by metal stud walls sheathed with gypsum wallboard.

1997, Phase 2b:

The metal stud framed offices are laterally supported by metal stud walls sheathed with gypsum wallboard.

1997, Phase 2c:

A braced frame system provides lateral support for the elevated lid. The braces are framed with steel columns and beam, along with single steel angle tension bracing.

B. OBSERVATIONS AND COMMENTS

- The PSE SKC appears to have been well maintained. We observed no signs of significant structural distress, structural deterioration or differential settlement.
- There were minimal temperature and shrinkage cracks in the floor slabs, but the amount observed is typical for a building of this size.
- The exterior concrete tilt-up walls show some signs of hairline cracking. However, the cracks are not atypical for a building of this type.
- The ledger angle supporting the concrete spandrel panels along the east side of the facility are showing signs of surface rust and water intrusion.
- The exterior masonry wall along the east side of the facility shows signs of efflorescence and water intrusion.
- The building is essentially uninsulated, with a significant amount of exposed concrete (internal and external) acting as a thermal bridge.
- Non-structural masonry walls extend to the underside of the roof structure throughout the complex, and in some cases are built around and tight to the roof joists. This prevents the joists from working as originally designed, and could damage the joists if the walls were to move in a seismic event.

C. RECOMMENDATIONS

The issues and recommendations noted below outline the work anticipated to mitigate structural concerns related to the anticipated seismic performance of the existing building. Recommendations are based on a walk through evaluation; review of available construction drawings when available; and on experience in renovations of similar building types in the Puget Sound Area. While the concerns and recommendations apply to Risk Category IV (Immediate Occupancy) parameters, the majority of the conditions also apply to the Life Safety level as well, although the level of strengthening may not be as significant.

ASCE 41-13 structural checklists were used as guidelines to identify building deficiencies that have historically resulted in damage or collapse of structures under seismic loading. The following issues are a summary of deficiencies identified for different areas of the complex, with the Item Number designated on the overall floor plan contained in Appendix B.

Item	Structural Concern	Structural Recommendation	Cost
1	The majority of the exterior concrete walls are not adequately tied to the roof diaphragm to transmit in-plane loads. The concern is that the connection will not have sufficient capacity to transfer lateral shear forces from the deck into the concrete walls.	To meet Risk Category IV criteria, the connection needs to be capable of exceeding the capacity of the metal deck or the concrete wall. The current connection is minimal, and in some cases it appears the wall may only be attached to the steel columns for support. A connection angle, welded to the roof structure and bolted to the concrete wall, should be provided at all concrete/metal deck interfaces.	$1,225,000
2	The exterior concrete walls do not appear to be adequately anchored to the roof deck to resist out-of-plane forces. The concern is that the wall may pull away for the roof deck in a seismic event. While the structural steel frame supporting the roof would remain intact, the concrete wall could fall over.	Improve the out-of-plane connection between the roof and wall by installing anchors and kick-braces.	Included in Item #1
3	The exterior east wall of the high-bay warehouse consists of steel post-and-beams supporting a concrete spandrel panel. Several of the bays are infilled with minimally reinforced 6” CWU that does not appear to be anchored to the spandrel panels. The concern is that there is insufficient lateral capacity at these locations to support the roof structure in a seismic event. (See Photos 4, 5, and 6)	Remove the masonry walls and provide cast-in-place concrete shear walls that connect to the spandrel panels as well as the roof deck above.	$640,000

Item	Structural Concern	Structural Recommendation	Cost
4	The north end of the high-bay warehouse does not have a lateral system that extends to the foundation. Rather, spandrel panels transfer forces to a low, flexible roof diaphragm that then transfers forces 50 feet across a flexible diaphragm to exterior concrete piers. The concern is that the spandrel panels may fail, and the upper roof would have no direct means of lateral support.	Infill some of the bays below the spandrel panels with concrete walls and foundations.	$570,000
5	The concrete walls/piers/foundations at the loading dock appear to be overstressed when code-level lateral forces are applied. The concern is that this is the primary lateral system for the north end of the high-bay warehouse, and partial or global collapse could occur if the walls were to fail.	Provide interior concrete shear walls and foundations that will relieve the stress to the perimeter walls. See Item #4.	Included in Item #1
6	Per published maps, the facility appears to be located in an area of Moderate to High Liquefaction Susceptibility. In a seismic event, the primary foundation could settle, leading to significant damage or collapse. Additionally, the interior slab on grade could settle and damage equipment, storage racks, piping, or other systems. Exterior settlement could also occur, making it difficult to access the building.	Providing foundation support, as well as support for the interior concrete slab on grade, is challenging and expensive. Steel pin piles could be installed beside and below the existing foundations, around the perimeter of the building as well as beneath all the interior spread footings. Critical spaces of the interior slab could be removed, and interior piles installed prior to placement of a new slab on grade. A detailed geotechnical report is required to develop further solutions.	$12,144,000

Item	Structural Concern	Structural Recommendation	Cost
7	The concrete panels are not adequately connected to each other, or to the foundation, to resist overturning forces. The concern is that the walls may begin to slide and/or tip during a moderate seismic event, which would lead to large displacement and significant damage.	Improve the panel to panel connection with steel plates, as well as the connection of the tilt up wall to the foundation. The wall/foundation connection could occur on the exterior face of the building. Slab may need to be removed/replaced at interior locations.	$1,085,000
8	The strength of the roof diaphragm is unknown. The concern is that the deck may fail at the perimeter as lateral forces are transferred to the concrete walls and/or the deck may pull apart as the exterior wall systems try to pull away from the structure.	Remove the roofing and improve the deck to structure connection with screws or pins	$1,161,000
9	Cross ties do not appear to be adequate. The concern is that the deck may pull apart as the exterior wall systems try to pull away from the structure.	Add cross straps on top, or beneath, the deck.	$170,000
10	The 1997 Mezzanine addition utilizes moment frames to resist lateral forces. While the loads to the frames appear relatively small, the details are unconventional and do not meet many of the baseline ASCE41 checklist standards. The concern is that excess movement or damage may occur, and the mezzanine would not be fully accessible after a seismic event. (See Photo 9)	Perform further analysis of the frames, using the ASCE 41 Tier 3 approach. This approach may show that the frames are acceptable “as is”. If not, improve the strength of the connections and frames.	$110,000

Item	Structural Concern	Structural Recommendation	Cost
11	The condition of non-structural elements was not thoroughly reviewed. However, it appears that there are many instances of elements not properly anchored to meet Risk Category IV (Immediate Occupancy) criteria. Mechanical equipment isn't properly anchored, tall shelving has minimal connections to the slab, interior partition walls and hard-lid ceilings (CMU and metal stud) are not adequately braced, or are braced in such a way that they may damage the primary structure. The concern is that, even if the superstructure performs adequately, interior damage would be significant and the building would be unusable. (See Photos 13 – 19)	An extensive study is required to develop a detailed deficiency list for non-structural elements. However, it should be anticipated that the impact will be costly as it's likely that none of the systems, even in the 1997 upgrade, were installed to meet Risk Category IV criteria.	$3,312,000

D. CONCLUSION

Overall, the building appears to be adequately designed and detailed for the era in which it was constructed. However, the building does not meet the strength and detailing requirements of a building designed to current code standards, and would likely sustain moderate to significant damage in a seismic event. Damage could be localized, contained to specific walls or frames. Or, in the case of an event that causes liquefaction of the soil, the damage could be wide-spread throughout the complex.

The structural system could be strengthened to improve its performance. In some cases, the mitigation work is relatively straightforward, such as improving the connection of the concrete walls to the metal roof deck. In other situations, the upgrades will be difficult and expensive. An example is improving the bearing capacity of all the footings and slabs to prevent settlement if the ground were to liquefy.

The lateral seismic concerns noted are common for buildings of the given age, type of construction, and site conditions. The intent of the ASCE 41-13 Risk Category IV (Immediate Occupancy) approach is to upgrade the building to a minimum standard based on historical performances of similar building types with similar deficiencies and is not intended to upgrade the building for full compliance with current code standards. With the incorporation of the noted recommendations to mitigate the current building deficiencies as identified, the performance of the building during a seismic event will be improved.

V. APPENDIX A – PHOTOGRAPHS

Photo 1: North Exterior Elevation - Office

Photo 2: South Exterior Elevation – High Bay Warehouse

Photo 3: West Exterior Elevation – Vehicle Maintenance

Photo 4: East Exterior Elevation – High Bay Warehouse
(Note: Infill masonry wall below concrete spandrel.)

Photo 5: Concrete Spandrel to CMU Wall Interface

Photo 6: Concrete Spandrel to CMU Wall Interface
(Note: Lack of connection between the masonry below and the ledger angle above.)

Photo 7: Typical Exterior Frame

Photo 8: Typical Interior Frame

Photo 9: Typical Mezzanine Frame

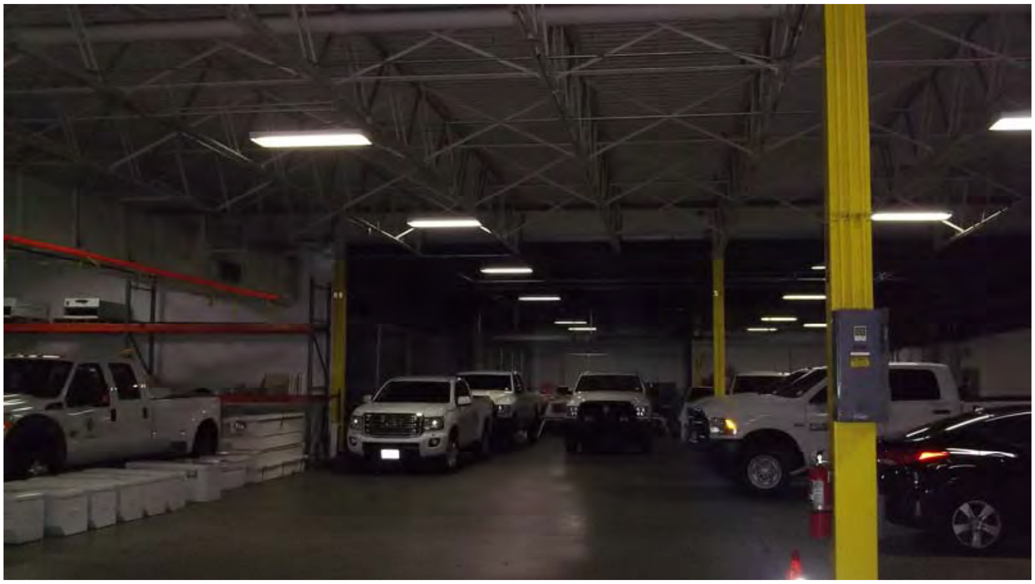


Photo 10: Vehicle Maintenance Bay

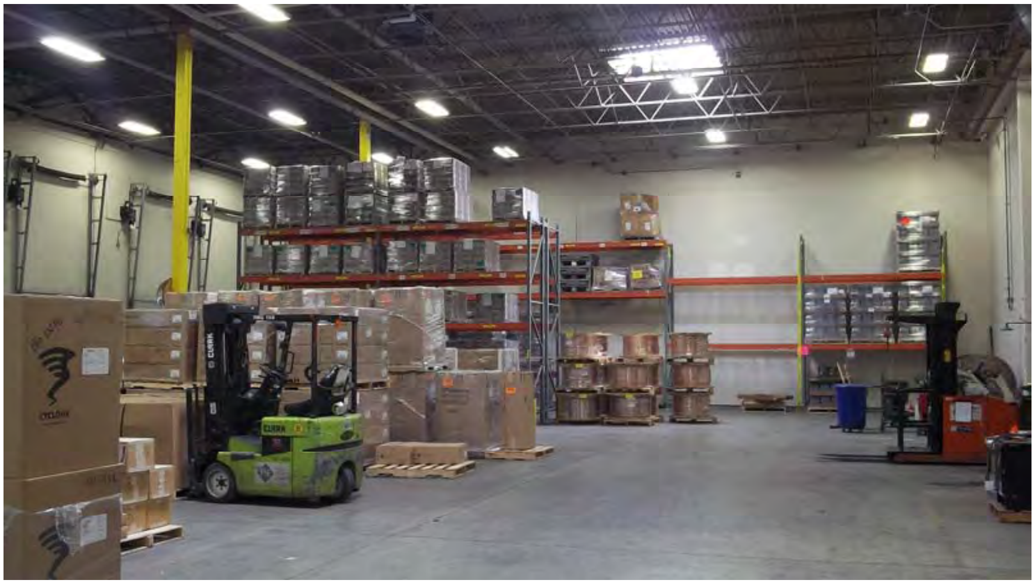


Photo 11: High Bay Storage

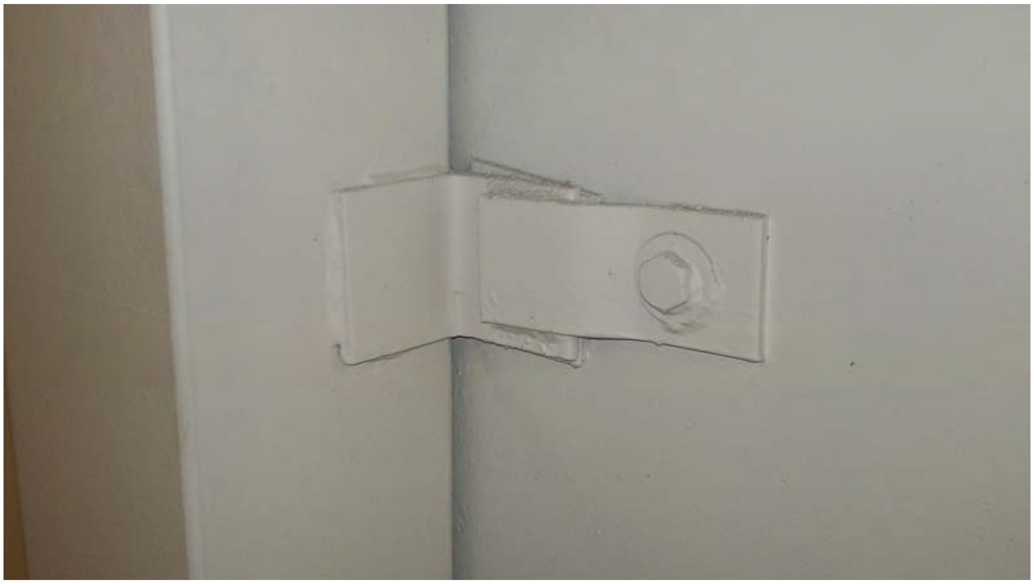


Photo 12: Concrete Wall to Column Clip

Photo 13: Tall Storage Racks w/ Minimal Base Connection

Photo 14: Minimal Clips at Top of Masonry Partition Walls

Photo 15: Masonry Partition Framed Around Joist
(Note: How the Masonry is grouted around the Joist, potentially overstressing the Joist.)

Photo 16: Rooftop Mechanical Equipment

Photo 17: Minimal Equipment Connection

Photo 18: Interior Equipment / Pump

Photo 19: No apparent Lateral Connection of Pump to Base

VI. APPENDIX B – PLANS AND ELEVATIONS

PUGET SOUND ENERGY SOUTH KING COMPLEX
OVERALL FLOOR PLAN
N
See Recommendations for Item Descriptions
FORMER ICON SPACE
FAC. SRV. OFFC
N COMM RM
13-1
FACILITIES
FURNITURE
WAREHOUSE
CENTRAL STORES
GAS/ELECTRIC
METERING
FAC. SERV.
SHOP
ITEMS #4, #5
ITEM #10
ITEM #3
ITEM #6, ALL FOUNDATIONS
AND SLABS
25'
50'
ITEMS #8, #9, ROOF
DIAPHRAGM
ITEMS #1,
#2, #7 -
TYPICAL ALL
CONCRETE
WALLS
COMMOM
LOADING
AREA
GAS AMR
METERING
FLEET OFFICE

VII. APPENDIX C – ASCE 41-13 CHECKLISTS

Appendix C: Summary Data Sheet

BUILDING DATA

Building Name:	Puget Sound Energy South King Complex			Date:	4/29/16
Building Address:	6905 South 228th Street, Kent, WA 98032				
Latitude:	46.39622	Longitude:	122.24716	By:	CDS
Year Built:	1967	Year(s) Remodeled:	1997	Original Design Code:	1964 (assumed)
Area (sf):	276,135	Length (ft):	525	Width (ft):	600
No. of Stories:	1 (interior mezzanines)	Story Height:	20' to 30'	Total Height:	30'

USE ☐ Industrial ☐ Office ☑ Warehouse ☐ Hospital ☐ Residential ☐ Educational ☐ Other: ____________

CONSTRUCTION DATA

Gravity Load Structural System:	Open web steel joists, steel girders, steel columns		
Exterior Transverse Walls:	Tilt up concrete	Openings?	Yes
Exterior Longitudinal Walls:	Tilt up concrete	Openings?	Yes
Roof Materials/Framing:	Metal roof deck supported by open web steel joists		
Intermediate Floors/Framing:	Mezzanines - steel beams supporting a concrete/metal composite deck		
Ground Floor:	Concrete slab on grade		
Columns:	Steel	Foundation:	concrete, spread and cont.
General Condition of Structure:	Generally in good condition, minor deterioration and cracking		
Levels Below Grade?	none		
Special Features and Comments:	Precast concrete walls do not provide vertical support		

LATERAL-FORCE-RESISTING SYSTEM

	Longitudinal	Transverse
System:	Concrete shear walls	Concrete shear walls
Vertical Elements:	Concrete walls	Concrete walls
Diaphragms:	metal deck	metal deck
Connections:	clips and anchors, minimal	clips and anchors, minimal

EVALUATION DATA

BSE-1N Spectral Response Accelerations:	S_{DS}= .811		S_{D1}= .814	
Soil Factors:	Class= Site Class E		F_a= .9	F_v= 2.4
BSE-1E Spectral Response Accelerations:	S_{XS}= .811		S_{X1}= .578	
Level of Seismicity:	High	Performance Level:	Immediate Occupancy	
Building Period:	T= .26			
Spectral Acceleration:	S_a= .811			
Modification Factor:	$C_mC_1C_2$= 1.4	Building Weight:	W= 11,400 kips	
Pseudo Lateral Force:	$V= C_mC_1C_2S_aW$= 13,000 kips			

BUILDING CLASSIFICATION: Precast or Tilt-up Concrete Shear Walls with Flexible Diaphragm

REQUIRED TIER 1 CHECKLISTS

	Yes	No
Basic Configuration Checklist	☑	☐
Building Type PC Structural Checklist	☑	☐
Nonstructural Component Checklist	☑	☐

FURTHER EVALUATION REQUIREMENT: Geotechnical Study; testing to determine wall reinforcing, foundation connections, etc

ASCE 41-13 Tier 1 Checklists

FIRM:	PCS Structural Solutions
PROJECT NAME:	PSE SKC
SEISMICITY LEVEL:	High
PROJECT NUMBER:	16-424
COMPLETED BY:	CDS
DATE COMPLETED:	4/29/16
REVIEWED BY:	CDS
REVIEW DATE:	4/29/16

Legend: C = Compliant, NC = Noncompliant, N/A = Not Applicable, U = Unknown

16.1 Basic Checklist

Very Low Seismicity

Structural Components

RATING				DESCRIPTION	COMMENTS
C ☐	NC ☒	N/A ☐	U ☐	LOAD PATH: The structure shall contain a complete, well-defined load path, including structural elements and connections, that serves to transfer the inertial forces associated with the mass of all elements of the building to the foundation. (Commentary: Sec. A.2.1.1. Tier 2: Sec. 5.4.1.1)	Several deficiencies exist, including but not limited to: *The connection of the roof to the walls appears to be minimal. *On the east side of the facility the exterior masonry walls do not appear to be sufficiently connected to the structure *The north side of the high-bay portion of the warehouse does not appear to have adequate length of wall to resist lateral forces.
C ☐	NC ☒	N/A ☐	U ☐	WALL ANCHORAGE: Exterior concrete or masonry walls that are dependent on the diaphragm for lateral support are anchored for out-of-plane forces at each diaphragm level with steel anchors, reinforcing dowels, or straps that are developed into the diaphragm. Connections shall have adequate strength to resist the connection force calculated in the Quick Check procedure of Section 4.5.3.7. (Commentary: Sec. A.5.1.1. Tier 2: Sec. 5.7.1.1)	The majority of the walls appear to be braced by the columns rather than the roof diaphragm. However the connections at the columns does not appear to be sufficient.

Legend: C = Compliant, NC = Noncompliant, N/A = Not Applicable, U = Unknown

16.1.2IO Immediate Occupancy Basic Configuration Checklist

Very Low Seismicity

Building System

General

RATING				DESCRIPTION	COMMENTS
C ☐	NC ☒	N/A ☐	U ☐	LOAD PATH: The structure shall contain a complete, well-defined load path, including structural elements and connections, that serves to transfer the inertial forces associated with the mass of all elements of the building to the foundation. (Commentary: Sec. A.2.1.1. Tier 2: Sec. 5.4.1.1)	Several deficiencies exist, including but not limited to: *The connection of the roof to the walls appears to be minimal. *On the east side of the facility the exterior masonry walls do not appear to be sufficiently connected to the structure *The north side of the high-bay portion of the warehouse does not appear to have adequate length of wall to resist lateral forces.
C ☐	NC ☐	N/A ☒	U ☐	ADJACENT BUILDINGS: The clear distance between the building being evaluated and any adjacent building is greater than 4% of the height of the shorter building. This statement need not apply for the following building types: W1, W1A, and W2. (Commentary: Sec. A.2.1.2. Tier 2: Sec. 5.4.1.2)	
C ☒	NC ☐	N/A ☐	U ☐	MEZZANINES: Interior mezzanine levels are braced independently from the main structure or are anchored to the seismic-force-resisting elements of the main structure. (Commentary: Sec. A.2.1.3. Tier 2: Sec. 5.4.1.3)	

Legend: C = Compliant, NC = Noncompliant, N/A = Not Applicable, U = Unknown

Project Name PSE SKC
Project Number 16-424

Building Configuration

RATING				DESCRIPTION	COMMENTS
C ☐	NC ☐	N/A ☒	U ☐	WEAK STORY: The sum of the shear strengths of the seismic-force-resisting system in any story in each direction shall not be less than 80% of the strength in the adjacent story above. (Commentary: Sec. A.2.2.2. Tier 2: Sec. 5.4.2.1)	
C ☐	NC ☐	N/A ☒	U ☐	SOFT STORY: The stiffness of the seismic-force-resisting system in any story shall not be less than 70% of the seismic-force-resisting system stiffness in an adjacent story above or less than 80% of the average seismic-force-resisting system stiffness of the three stories above. (Commentary: Sec. A.2.2.3. Tier 2: Sec. 5.4.2.2)	
C ☐	NC ☒	N/A ☐	U ☐	VERTICAL IRREGULARITIES: All vertical elements in the seismic-force-resisting system are continuous to the foundation. (Commentary: Sec. A.2.2.4. Tier 2: Sec. 5.4.2.3)	At the north end of the high-bay space, a roof step of approximately 10' occurs. The lateral forces from the high roof transfer through the concrete spandrel to the low roof, then out to the exterior walls. The spandrel panels do not extend to the foundation and the connection to the supporting columns does not appear to be sufficient to transfer the lateral forces.
C ☐	NC ☐	N/A ☒	U ☐	GEOMETRY: There are no changes in the net horizontal dimension of the seismic-force-resisting system of more than 30% in a story relative to adjacent stories, excluding one-story penthouses and mezzanines. (Commentary: Sec. A.2.2.5. Tier 2: Sec. 5.4.2.4)	

Legend: C = Compliant, NC = Noncompliant, N/A = Not Applicable, U = Unknown

C	NC	N/A	U		
☐	☐	☒	☐	MASS: There is no change in effective mass more than 50% from one story to the next. Light roofs, penthouses, and mezzanines need not be considered. (Commentary: Sec. A.2.2.6. Tier 2: Sec. 5.4.2.5)	
C	NC	N/A	U		
☐	☒	☐	☐	TORSION: The estimated distance between the story center of mass and the story center of rigidity is less than 20% of the building width in either plan dimension. (Commentary: Sec. A.2.2.7. Tier 2: Sec. 5.4.2.6)	While technically not a rigid diaphragm, the lack of adequate shear wall along the east and north sides of the high-bay warehouse could potentially lead to torsion in the diaphragm.

Legend: C = Compliant, NC = Noncompliant, N/A = Not Applicable, U = Unknown

Project Name PSE SKC
Project Number 16-424

Low Seismicity

Geologic Site Hazards

RATING				DESCRIPTION	COMMENTS
C ☐	NC ☒	N/A ☐	U ☐	LIQUEFACTION: Liquefaction-susceptible, saturated, loose granular soils that could jeopardize the building's seismic performance shall not exist in the foundation soils at depths within 50 ft under the building. (Commentary: Sec. A.6.1.1. Tier 2: 5.4.3.1)	Per published maps, the building appears to be located in an area of Moderate to High Liquefaction Susceptibility.
C ☒	NC ☐	N/A ☐	U ☐	SLOPE FAILURE: The building site is sufficiently remote from potential earthquake-induced slope failures or rockfalls to be unaffected by such failures or is capable of accommodating any predicted movements without failure. (Commentary: Sec. A.6.1.2. Tier 2: 5.4.3.1)	
C ☒	NC ☐	N/A ☐	U ☐	SURFACE FAULT RUPTURE: Surface fault rupture and surface displacement at the building site are not anticipated. (Commentary: Sec. A.6.1.3. Tier 2: 5.4.3.1)	

Moderate and High Seismicity

Foundation Configuration

RATING				DESCRIPTION	COMMENTS
C ☒	NC ☐	N/A ☐	U ☐	OVERTURNING: The ratio of the least horizontal dimension of the seismic-force-resisting system at the foundation level to the building height (base/height) is greater than $0.6S_a$. (Commentary: Sec. A.6.2.1. Tier 2: Sec. 5.4.3.3)	

Legend: C = Compliant, NC = Noncompliant, N/A = Not Applicable, U = Unknown

Project Name PSE SKC
Project Number 16-424

C	NC	N/A	U		
☒	☐	☐	☐	TIES BETWEEN FOUNDATION ELEMENTS: The foundation has ties adequate to resist seismic forces where footings, piles, and piers are not restrained by beams, slabs, or soils classified as Site Class A, B, or C. (Commentary: Sec. A.6.2.2. Tier 2: Sec. 5.4.3.4)	Note - foundations were not exposed to view, however it is assumed that continuous footings occur under the exterior concrete tilt up walls.

Legend: C = Compliant, NC = Noncompliant, N/A = Not Applicable, U = Unknown

ASCE 41-13 Tier 1 Checklists

FIRM:	PCS Structural Solutions
PROJECT NAME:	PSE SKC Original Const.
SEISMICITY LEVEL:	High
PROJECT NUMBER:	16-424
COMPLETED BY:	CDS
DATE COMPLETED:	4/29/16
REVIEWED BY:	CDS
REVIEW DATE:	4/29/16

Legend: C = Compliant, NC = Noncompliant, N/A = Not Applicable, U = Unknown

Project Name PSE SKC Original Const.
Project Number 16-424

16.12IO Immediate Occupancy Structural Checklist for Building Types PC1: Precast or Tilt-Up Concrete Shear Walls with Flexible Diaphragms and PC1A: Precast or Tilt-Up Concrete Shear Walls with Stiff Diaphragms

Very Low Seismicity

Foundation System

C	NC	N/A	U	DESCRIPTION	COMMENTS
☐	☐	☒	☐	DEEP FOUNDATIONS: Piles and piers are capable of transferring the lateral forces between the structure and the soil. (Commentary: Sec. A.6.2.3.)	
☒	☐	☐	☐	SLOPING SITES: The difference in foundation embedment depth from one side of the building to another does not exceed one story high. (Commentary: Sec. A.6.2.4)	

Connections

C	NC	N/A	U	DESCRIPTION	COMMENTS
☐	☒	☐	☐	WALL ANCHORAGE: Exterior concrete or masonry walls that are dependent on the diaphragm for lateral support are anchored for out-of-plane forces at each diaphragm level with steel anchors, reinforcing dowels, or straps that are developed into the diaphragm. Connections shall have adequate strength to resist the connection force calculated in the Quick Check procedure of Section 4.5.3.7. (Commentary: Sec. A.5.1.1. Tier 2: Sec. 5.7.1.1)	The majority of the walls appear to be braced by the columns rather than the roof diaphragm. However the connections at the columns does not appear to be sufficient.

Legend: C = Compliant, NC = Noncompliant, N/A = Not Applicable, U = Unknown

Project Name	PSE SKC Original Const.
Project Number	16-424

Seismic-Force-Resisting System

RATING				DESCRIPTION	COMMENTS
C ☐	NC ☒	N/A ☐	U ☐	REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2. (Commentary: Sec. A.3.2.1.1. Tier 2: Sec. 5.5.1.1)	Minimal to no concrete shear wall exists along the east exterior wall. While some bays are infilled with CMU, connections are minimal and the wall would be quickly overstressed in a seismic event.
C ☐	NC ☒	N/A ☐	U ☐	WALL SHEAR STRESS CHECK: The shear stress in the precast panels, calculated using the Quick Check procedure of Section 4.5.3.3, is less than the greater of 100 lb/in.^{2} or $2\sqrt{f'_c}$. (Commentary: Sec. A.3.2.3.1. Tier 2: Sec. 5.5.3.1.1)	Overstressed along the east exterior wall, as well as the piers along the north loading dock.
C ☐	NC ☐	N/A ☐	U ☒	REINFORCING STEEL: The ratio of reinforcing steel area to gross concrete area is not less than 0.0012 in the vertical direction and 0.0020 in the horizontal direction. The spacing of reinforcing steel is equal to or less than 18 in. (Commentary: Sec. A.3.2.3.2. Tier 2: Sec. 5.5.3.1.3)	Unknown, as existing drawings were not available for review. The walls, typically 6" thick, would need a minimum of #4@18"o.c. vertically and #4@16" o.c. horizontally. While this reinforcing level is anticipated, it could not be confirmed at this time.

Diaphragms

RATING				DESCRIPTION	COMMENTS
C ☐	NC ☐	N/A ☒	U ☐	TOPPING SLAB: Precast concrete diaphragm elements are interconnected by a continuous reinforced concrete topping slab with a minimum thickness of 2 in. (Commentary: Sec. A.4.5.1. Tier 2: Sec. 5.6.4)	

Legend: C = Compliant, NC = Noncompliant, N/A = Not Applicable, U = Unknown

Connections

RATING				DESCRIPTION	COMMENTS
C ☐	NC ☐	N/A ☒	U ☐	WOOD LEDGERS: The connection between the wall panels and the diaphragm does not induce cross-grain bending or tension in the wood ledgers. (Commentary: Sec. A.5.1.2. Tier 2: Sec. 5.7.1.4)	
C ☐	NC ☒	N/A ☐	U ☐	TRANSFER TO SHEAR WALLS: Diaphragms are connected for transfer of seismic forces to the shear walls, and the connections are able to develop the lesser of the shear strength of the walls or diaphragms. (Commentary: Sec. A.5.2.1. Tier 2: Sec. 5.7.2)	The connection of the deck to the walls appears to be minimal.
C ☐	NC ☐	N/A ☒	U ☐	TOPPING SLAB TO WALLS OR FRAMES: Reinforced concrete topping slabs that interconnect the precast concrete diaphragm elements are doweled for transfer of forces into the shear wall or frame elements, and the dowels are able to develop the least of the shear strength of the walls, frames, or slabs. (Commentary: Sec. A.5.2.3. Tier 2: Sec. 5.7.2)	
C ☐	NC ☐	N/A ☒	U ☐	GIRDER–COLUMN CONNECTION: There is a positive connection using plates, connection hardware, or straps between the girder and the column support. (Commentary: Sec. A.5.4.1. Tier 2: Sec. 5.7.4.1)	

Legend: C = Compliant, NC = Noncompliant, N/A = Not Applicable, U = Unknown

Low, Moderate, and High Seismicity

Seismic-Force-Resisting System

RATING				DESCRIPTION	COMMENTS
C ☐	NC ☐	N/A ☒	U ☐	DEFLECTION COMPATIBILITY FOR RIGID DIAPHRAGMS: Secondary components shall have the shear capacity to develop the flexural strength of the components. (Commentary: Sec. A.3.1.6.2. Tier 2: Sec. 5.5.2.5.2)	
C ☐	NC ☒	N/A ☐	U ☐	WALL OPENINGS: The total width of openings along any perimeter wall line constitutes less than 50% of the length of any perimeter wall when the wall piers have aspect ratios of less than 2-to-1. (Commentary: Sec. A.3.2.3.3. Tier 2: Sec. 5.5.3.3.1)a	Non-conforming along the east exterior wall, as well as the north loading dock wall.
C ☐	NC ☒	N/A ☐	U ☐	PANEL-TO-PANEL CONNECTIONS: Adjacent wall panels are interconnected to transfer overturning forces between panels by methods other than welded steel inserts. (Commentary: Sec. A.3.2.3.4. Tier 2: Sec. 5.5.3.3.3)	connections appear to provide out-of-plane capacity, but little to no uplift capacity
C ☐	NC ☐	N/A ☒	U ☐	WALL THICKNESS: Thicknesses of bearing walls shall not be less than 1/25 the unsupported height or length, whichever is shorter, nor less than 4 in. (Commentary: Sec. A.3.2.3.5. Tier 2: Sec. 5.5.3.1.2)	Walls do not carry vertical loads. Roof joists are supported by a perimeter steel beam

Legend: C = Compliant, NC = Noncompliant, N/A = Not Applicable, U = Unknown

Diaphragms

RATING C	NC	N/A	U	DESCRIPTION	COMMENTS
☐	☒	☐	☐	CROSS TIES FOR FLEXIBLE DIAPHRAGMS: There are continuous cross ties between diaphragm chords. (Commentary: Sec. A.4.1.2. Tier 2: Sec. 5.6.1.2)	It appears that some interior connections were improved in the 1997 upgrades, however additional work at the girder to column connection, as well as the wall to diaphragm connection, is needed.
☐	☒	☐	☐	PLAN IRREGULARITIES: There is tensile capacity to develop the strength of the diaphragm at reentrant corners or other locations of plan irregularities. (Commentary: Sec. A.4.1.7. Tier 2: Sec. 5.6.1.4)	Although minimal, there are a few locations that would need to be addressed.
☐	☐	☒	☐	DIAPHRAGM REINFORCEMENT AT OPENINGS: There is reinforcing around all diaphragm openings larger than 50% of the building width in either major plan dimension. (Commentary: Sec. A.4.1.8. Tier 2: Sec. 5.6.1.5)	
☐	☐	☒	☐	STRAIGHT SHEATHING: All straight sheathed diaphragms have aspect ratios less than 1-to-1 in the direction being considered. (Commentary: Sec. A.4.2.1. Tier 2: Sec. 5.6.2)	

Legend: C = Compliant, NC = Noncompliant, N/A = Not Applicable, U = Unknown

C	NC	N/A	U	Description	Comments
☐	☐	☒	☐	SPANS: All wood diaphragms with spans greater than 12 ft consist of wood structural panels or diagonal sheathing. (Commentary: Sec. A.4.2.2. Tier 2: Sec. 5.6.2)	
☐	☐	☒	☐	DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 30 ft and aspect ratios less than or equal to 3-to-1. (Commentary: Sec. A.4.2.3. Tier 2: Sec. 5.6.2)	
☒	☐	☐	☐	OTHER DIAPHRAGMS: The diaphragm does not consist of a system other than wood, metal deck, concrete, or horizontal bracing. (Commentary: Sec. A.4.7.1. Tier 2: Sec. 5.6.5)	

Connections

RATING				DESCRIPTION	COMMENTS
C	NC	N/A	U		
☐	☒	☐	☐	MINIMUM NUMBER OF WALL ANCHORS PER PANEL: There are at least two anchors from each precast wall panel into the diaphragm elements. (Commentary: Sec. A.5.1.3. Tier 2: Sec. 5.7.1.4)	Connection of the diaphragm to the exterior concrete walls is minimal.

Legend: C = Compliant, NC = Noncompliant, N/A = Not Applicable, U = Unknown

C	NC	N/A	U	Item	Comment
☐	☒	☐	☐	PRECAST WALL PANELS: Precast wall panels are connected to the foundation, and the connections are able to develop the strength of the walls. (Commentary: Sec. A.5.3.6. Tier 2: Sec. 5.7.3.4)	The connection to the foundation is unknown. However, anticipating how walls were typically connected in this area, it is highly unlikely that the connection has the capability to develop the strength of the walls.
☐	☐	☒	☐	UPLIFT AT PILE CAPS: Pile caps shall have top reinforcement, and piles are anchored to the pile caps; the pile cap reinforcement and pile anchorage are able to develop the tensile capacity of the piles. (Commentary: Sec. A.5.3.8. Tier 2: Sec. 5.7.3.5)	
☐	☐	☒	☐	GIRDERS: Girders supported by walls or pilasters have at least two ties securing the anchor bolts unless provided with independent stiff wall anchors with adequate strength to resist the connection force calculated in the Quick Check procedure of Section 4.5.3.7. (Commentary: Sec. A.5.4.2. Tier 2: Sec. 5.7.4.2)	

Legend: C = Compliant, NC = Noncompliant, N/A = Not Applicable, U = Unknown

ASCE 41-13 Tier 1 Checklists

FIRM:	PCS Structural Solutions
PROJECT NAME:	PSE SKC Phase 2 Mezz
SEISMICITY LEVEL:	High
PROJECT NUMBER:	16-424
COMPLETED BY:	CDS
DATE COMPLETED:	4/29/16
REVIEWED BY:	CDS
REVIEW DATE:	4/29/16

Legend: C = Compliant, NC = Noncompliant, N/A = Not Applicable, U = Unknown

Project Name	PSE SKC Phase 2 Mezz
Project Number	16-424

16.4IO Immediate Occupancy Structural Checklist for Building Types S1: Steel Moment Frames with Stiff Diaphragms and S1A: Steel Moment Frames with Flexible Diaphragms

Very Low Seismicity

Seismic-Force-Resisting System

RATING				DESCRIPTION	COMMENTS
C ☒	NC ☐	N/A ☐	U ☐	DRIFT CHECK: The drift ratio of the steel moment frames, calculated using the Quick Check procedure of Section 4.5.3.1, is less than 0.015. (Commentary: Sec. A.3.1.3.1. Tier 2: Sec. 5.5.2.1.2)	
C ☒	NC ☐	N/A ☐	U ☐	COLUMN AXIAL STRESS CHECK: The axial stress caused by gravity loads in columns subjected to overturning forces is less than $0.10F_y$. Alternatively, the axial stress caused by overturning forces alone, calculated using the Quick Check procedure of Section 4.5.3.6, is less than $0.30F_y$. (Commentary: Sec. A.3.1.3.2. Tier 2: Sec. 5.5.2.1.3)a	
C ☐	NC ☒	N/A ☐	U ☐	FLEXURAL STRESS CHECK: The average flexural stress in the moment frame columns and beams, calculated using the Quick Check procedure of Section 4.5.3.9, is less than F_y. Columns need not be checked if the strong column-weak beam checklist item is compliant. (Commentary: Sec. A.3.1.3.3. Tier 2: Sec. 5.5.2.1.2)	Some frames appear to exceed the allowed flexural stress. The concern is that excess deformation could occur, thereby making the mezzanine unusable.

Legend: C = Compliant, NC = Noncompliant, N/A = Not Applicable, U = Unknown

Project Name PSE SKC Phase 2 Mezz
Project Number 16-424

Connections

RATING				DESCRIPTION	COMMENTS
C ☒	NC ☐	N/A ☐	U ☐	STEEL COLUMNS: The columns in seismic-force-resisting frames are anchored to the building foundation. (Commentary: Sec. A.5.3.1. Tier 2: Sec. 5.7.3.1)	

Low Seismicity

Seismic-Force-Resisting System

RATING				DESCRIPTION	COMMENTS
C ☒	NC ☐	N/A ☐	U ☐	REDUNDANCY: The number of lines of moment frames in each principal direction is greater than or equal to 2. The number of bays of moment frames in each line is greater than or equal to 3. (Commentary: Sec. A.3.1.1.1. Tier 2: Sec. 5.5.1.1)	
C ☒	NC ☐	N/A ☐	U ☐	INTERFERING WALLS: All concrete and masonry infill walls placed in moment frames are isolated from structural elements. (Commentary: Sec. A.3.1.2.1. Tier 2: Sec. 5.5.2.1.1)	

Legend: C = Compliant, NC = Noncompliant, N/A = Not Applicable, U = Unknown

Connections

RATING				DESCRIPTION	COMMENTS
C ☒	NC ☐	N/A ☐	U ☐	TRANSFER TO STEEL FRAMES: Diaphragms are connected for transfer of seismic forces to the steel frames, and the connections are able to develop the lesser of the strength of the frames or the diaphragms. (Commentary: Sec. A.5.2.2. Tier 2: Sec. 5.7.2)	
C ☒	NC ☐	N/A ☐	U ☐	STEEL COLUMNS: The columns in seismic-force-resisting frames are anchored to the building foundation, and the anchorage is able to develop the least of the tensile capacity of the column, the tensile capacity of the lowest level column splice (if any), or the uplift capacity of the foundation. (Commentary: Sec. A.5.3.1. Tier 2: Sec. 5.7.3.1)	

Moderate Seismicity

Seismic-Force-Resisting System

RATING				DESCRIPTION	COMMENTS
C ☐	NC ☐	N/A ☐	U ☒	MOMENT-RESISTING CONNECTIONS: All moment connections are able to develop the expected strength of the adjoining members based on the specified minimum yield stress of the steel. (Commentary: Sec. A.3.1.3.4. Tier 2: Sec. 5.5.2.2.1). Note: more restrictive requirements for High Seismicity.	Existing details were not available for review. However, it's expected that some if not most of the connections meet this parameter, but will fail the parameters set for High Seismicity.
C ☐	NC ☒	N/A ☐	U ☐	PANEL ZONES: All panel zones have the shear capacity to resist the shear demand required to develop 0.8 times the sum of the flexural strengths of the girders framing in at the face of the column. (Commentary: Sec. A.3.1.3.5. Tier 2: Sec. 5.5.2.2.2)	

Legend: C = Compliant, NC = Noncompliant, N/A = Not Applicable, U = Unknown

C	NC	N/A	U		
☐	☐	☒	☐	COLUMN SPLICES: All column splice details located in moment frames include connection of both flanges and the web, and the splice develops the strength of the column. (Commentary: Sec. A.3.1.3.6. Tier 2: Sec. 5.5.2.2.3)	
☐	☒	☐	☐	STRONG COLUMN-WEAK BEAM: The percentage of strong column–weak beam joints in each story of each line of moment-resisting frames is greater than 50%. (Commentary: Sec. A.3.1.3.7. Tier 2: Sec. 5.5.2.1.5)	
☐	☐	☐	☐	COMPACT MEMBERS: All frame elements meet section requirements set forth by AISC 341, Table D1.1, for highly ductile members. (Commentary: Sec. A.3.1.3.8. Tier 2: Sec. 5.5.2.2.4)	
☐	☐	☐	☒	BEAM PENETRATIONS: All openings in frame-beam webs are less than one quarter of the beam depth and are located in the center half of the beams. (Commentary: Sec. A.3.1.3.9. Tier 2: Sec. 5.5.2.2.5)	many of the beams were not exposed to view.

Legend: C = Compliant, NC = Noncompliant, N/A = Not Applicable, U = Unknown

C	NC	N/A	U	DESCRIPTION	COMMENTS
☐	☐	☐	☒	GIRDER FLANGE CONTINUITY PLATES: There are girder flange continuity plates at all moment frame joints. (Commentary: Sec. A.3.1.3.10. Tier 2: Sec. 5.5.2.2.6)	Details were not available for review, and many of the connections were not exposed.
☒	☐	☐	☐	OUT-OF-PLANE BRACING: Beam–column joints are braced out-of-plane. (Commentary: Sec. A.3.1.3.11. Tier 2: Sec. 5.5.2.2.7)	
☐	☒	☐	☐	BOTTOM FLANGE BRACING: The bottom flanges of beams are braced out-of-plane. (Commentary: Sec. A.3.1.3.12. Tier 2: Sec. 5.5.2.2.8)	

Diaphragms (Flexible or Stiff)

RATING				DESCRIPTION	COMMENTS
C	NC	N/A	U		
☒	☐	☐	☐	PLAN IRREGULARITIES: There is tensile capacity to develop the strength of the diaphragm at reentrant corners or other locations of plan irregularities. (Commentary: Sec. A.4.1.7. Tier 2: Sec. 5.6.1.4)	

Legend: C = Compliant, NC = Noncompliant, N/A = Not Applicable, U = Unknown

C	NC	N/A	U	DESCRIPTION	COMMENTS
☒	☐	☐	☐	DIAPHRAGM REINFORCEMENT AT OPENINGS: There is reinforcing around all diaphragm openings larger than 50% of the building width in either major plan dimension. (Commentary: Sec. A.4.1.8. Tier 2: Sec. 5.6.1.5)	
☒	☐	☐	☐	OPENINGS AT FRAMES: Diaphragm openings immediately adjacent to the moment frames extend less than 15% of the total frame length. (Commentary: Sec. A.4.1.5. Tier 2: Sec. 5.6.1.3)	

Flexible Diaphragms

RATING				DESCRIPTION	COMMENTS
C	NC	N/A	U		
☒	☐	☐	☐	CROSS TIES: There are continuous cross ties between diaphragm chords. (Commentary: Sec. A.4.1.2. Tier 2: Sec. 5.6.1.2)	
☐	☐	☒	☐	STRAIGHT SHEATHING: All straight sheathed diaphragms have aspect ratios less than 1-to-1 in the direction being considered. (Commentary: Sec. A.4.2.1. Tier 2: Sec. 5.6.2)	

Legend: C = Compliant, NC = Noncompliant, N/A = Not Applicable, U = Unknown

C	NC	N/A	U	Description	Comments
☐	☐	☒	☐	SPANS: All wood diaphragms with spans greater than 12 ft consist of wood structural panels or diagonal sheathing. (Commentary: Sec. A.4.2.2. Tier 2: Sec. 5.6.2)	
☐	☐	☒	☐	DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 30 ft and aspect ratios less than or equal to 3-to-1. (Commentary: Sec. A.4.2.3. Tier 2: Sec. 5.6.2)	
☐	☐	☒	☐	NONCONCRETE FILLED DIAPHRAGMS: Untopped metal deck diaphragms or metal deck diaphragms with fill other than concrete consist of horizontal spans of less than 40 ft and have aspect ratios less than 4-to-1. (Commentary: Sec. A.4.3.1. Tier 2: Sec. 5.6.3)	
☒	☐	☐	☐	OTHER DIAPHRAGMS: The diaphragm does not consist of a system other than wood, metal deck, concrete, or horizontal bracing. (Commentary: Sec. A.4.7.1. Tier 2: Sec. 5.6.5)	

Legend: C = Compliant, NC = Noncompliant, N/A = Not Applicable, U = Unknown

High Seismicity

Seismic-Force-Resisting System

RATING				DESCRIPTION	COMMENTS
C ☐	NC ☒	N/A ☐	U ☐	MOMENT-RESISTING CONNECTIONS: All moment connections are able to develop the strength of the adjoining members or panel zones based on 110% of the expected yield stress of the steel per AISC 341, Section A3.2. (Commentary: Sec. A.3.1.3.4. Tier 2: Sec. 5.5.2.2.1)	Connection details were not available for review, and the majority of the connections were not exposed. However it's expected that some connections may not meet this criteria.

Foundation System

RATING				DESCRIPTION	COMMENTS
C ☐	NC ☐	N/A ☒	U ☐	DEEP FOUNDATIONS: Piles and piers are capable of transferring the seismic forces between the structure and the soil. (Commentary: Sec. A.6.2.3.)	
C ☐	NC ☐	N/A ☒	U ☐	SLOPING SITES: The difference in foundation embedment depth from one side of the building to another does not exceed one story high. (Commentary: Sec. A.6.2.4)	

Legend: C = Compliant, NC = Noncompliant, N/A = Not Applicable, U = Unknown

ASCE 41-13 Tier 1 Checklists

FIRM:	PCS Structural Solutions
PROJECT NAME:	PSE SKC Phase 2b, 2c
SEISMICITY LEVEL:	High
PROJECT NUMBER:	16-424
COMPLETED BY:	CDS
DATE COMPLETED:	4/29/16
REVIEWED BY:	CDS
REVIEW DATE:	4/29/16

Legend: C = Compliant, NC = Noncompliant, N/A = Not Applicable, U = Unknown

16.5IO Immediate Occupancy Structural Checklist for Building Types S2: Steel Braced Frames and S2A: Steel Braced Frames with Flexible Diaphragms

Very Low Seismicity

Seismic-Force-Resisting System

RATING				DESCRIPTION	COMMENTS
C ☒	NC ☐	N/A ☐	U ☐	COLUMN AXIAL STRESS CHECK: The axial stress caused by gravity loads in columns subjected to overturning forces is less than $0.10F_y$. Alternatively, the axial stress caused by overturning forces alone, calculated using the Quick Check procedure of Section 4.5.3.6, is less than $0.30F_y$. (Commentary: Sec. A.3.1.3.2. Tier 2: Sec. 5.5.2.1.3)	
C ☐	NC ☒	N/A ☐	U ☐	BRACE AXIAL STRESS CHECK: The axial stress in the diagonals, calculated using the Quick Check procedure of Section 4.5.3.4, is less than $0.50F_y$. (Commentary: Sec. A.3.3.1.2. Tier 2: Sec. 5.5.4.1)a	While lightly loaded, it appears that several of the tension only braces exceed this limit

Connections

RATING				DESCRIPTION	COMMENTS
C ☒	NC ☐	N/A ☐	U ☐	STEEL COLUMNS: The columns in seismic-force-resisting frames are anchored to the building foundation. (Commentary: Sec. A.5.3.1. Tier 2: Sec. 5.7.3.1)	

Legend: C = Compliant, NC = Noncompliant, N/A = Not Applicable, U = Unknown

Project Name	PSE SKC Phase 2b, 2c
Project Number	16-424

Low Seismicity

Connections

RATING				DESCRIPTION	COMMENTS
C ☒	NC ☐	N/A ☐	U ☐	TRANSFER TO STEEL FRAMES: Diaphragms are connected for transfer of seismic forces to the steel frames, and the connections are able to develop the lesser of the strength of the frames or the diaphragms. (Commentary: Sec. A.5.2.2. Tier 2: Sec. 5.7.2)	

Moderate Seismicity

Seismic-Force-Resisting System

RATING				DESCRIPTION	COMMENTS
C ☒	NC ☐	N/A ☐	U ☐	REDUNDANCY: The number of lines of braced frames in each principal direction is greater than or equal to 2. The number of braced bays in each line is greater than 3. (Commentary: Sec. A.3.1.1.1. Tier 2: Sec. 5.5.1.1)	
C ☐	NC ☐	N/A ☒	U ☐	COLUMN SPLICES: All column splice details located in braced frames develop 100% of the tensile strength of the column. (Commentary: Sec. A.3.3.1.3. Tier 2: Sec. 5.5.4.2)	
C ☐	NC ☐	N/A ☒	U ☐	SLENDERNESS OF DIAGONALS: All diagonal elements required to carry compression shall have *Kl*/*r* ratios less than 200. (Commentary: Sec. A.3.3.1.4. Tier 2: Sec. 5.5.4.3)	

Legend: C = Compliant, NC = Noncompliant, N/A = Not Applicable, U = Unknown

C	NC	N/A	U	Item	Comments
☒	☐	☐	☐	CONNECTION STRENGTH: All the brace connections develop the buckling capacity of the diagonals. (Commentary: Sec. A.3.3.1.5. Tier 2: Sec. 5.5.4.4)	
☐	☐	☒	☐	OUT-OF-PLANE BRACING: Braced frame connections attached to beam bottom flanges located away from beam–column joints are braced out-of-plane at the bottom flange of the beams. (Commentary: Sec. A.3.3.1.6. Tier 2: Sec. 5.5.4.5)	
☐	☐	☒	☐	COMPACT MEMBERS: All brace elements meet compact section requirements set forth by AISC 341, Table B4.1. (Commentary: Sec. A.3.3.1.7. Tier 2: Sec. 5.5.4)	
☐	☐	☒	☐	K-BRACING: The bracing system does not include K-braced bays. (Commentary: Sec. A.3.3.2.1. Tier 2: Sec. 5.5.4.6)	

Legend: C = Compliant, NC = Noncompliant, N/A = Not Applicable, U = Unknown

C	NC	N/A	U	Statement	Comments
☐	☐	☒	☐	TENSION-ONLY BRACES: Tension-only braces do not comprise more than 70% of the total seismic-force-resisting capacity in structures more than two stories high. (Commentary: Sec. A.3.3.2.2. Tier 2: Sec. 5.5.4.7)	
☐	☐	☒	☐	CHEVRON BRACING: Beams in chevron, or V-braced, bays are capable of resisting the vertical load resulting from the simultaneous yielding and buckling of the brace pairs. (Commentary: Sec. A.3.3.2.3.Tier 2: Sec. 5.5.4.6)	
☐	☐	☒	☐	CONCENTRICALLY BRACED FRAME JOINTS: All the diagonal braces frame into the beam–column joints concentrically. (Commentary: Sec. A.3.3.2.4. Tier 2: Sec. 5.5.4.8)	

Legend: C = Compliant, NC = Noncompliant, N/A = Not Applicable, U = Unknown

Diaphragms (Flexible or Stiff)

RATING				DESCRIPTION	COMMENTS
C ☒	NC ☐	N/A ☐	U ☐	OPENINGS AT FRAMES: Diaphragm openings immediately adjacent to the moment frames extend less than 15% of the total frame length. (Commentary: Sec. A.4.1.5. Tier 2: Sec. 5.6.1.3)	
C ☒	NC ☐	N/A ☐	U ☐	PLAN IRREGULARITIES: There is tensile capacity to develop the strength of the diaphragm at reentrant corners or other locations of plan irregularities. (Commentary: Sec. A.4.1.7. Tier 2: Sec. 5.6.1.4)	
C ☒	NC ☐	N/A ☐	U ☐	DIAPHRAGM REINFORCEMENT AT OPENINGS: There is reinforcing around all diaphragm openings larger than 50% of the building width in either major plan dimension. (Commentary: Sec. A.4.1.8. Tier 2: Sec. 5.6.1.5)	

Flexible Diaphragms

RATING				DESCRIPTION	COMMENTS
C ☒	NC ☐	N/A ☐	U ☐	CROSS TIES: There are continuous cross ties between diaphragm chords. (Commentary: Sec. A.4.1.2. Tier 2: Sec. 5.6.1.2)	

Legend: C = Compliant, NC = Noncompliant, N/A = Not Applicable, U = Unknown

C	NC	N/A	U		
☐	☐	☒	☐	STRAIGHT SHEATHING: All straight sheathed diaphragms have aspect ratios less than 1-to-1 in the direction being considered. (Commentary: Sec. A.4.2.1. Tier 2: Sec. 5.6.2)	
C ☐	NC ☐	N/A ☒	U ☐	SPANS: All wood diaphragms with spans greater than 12 ft consist of wood structural panels or diagonal sheathing. (Commentary: Sec. A.4.2.2. Tier 2: Sec. 5.6.2)	
C ☐	NC ☐	N/A ☒	U ☐	DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 30 ft and aspect ratios less than or equal to 3-to-1. (Commentary: Sec. A.4.2.3. Tier 2: Sec. 5.6.2)	
C ☐	NC ☐	N/A ☒	U ☐	NONCONCRETE FILLED DIAPHRAGMS: Untopped metal deck diaphragms or metal deck diaphragms with fill other than concrete consist of horizontal spans of less than 40 ft and have aspect ratios less than 4-to-1. (Commentary: Sec. A.4.3.1. Tier 2: Sec. 5.6.3)	

Legend: C = Compliant, NC = Noncompliant, N/A = Not Applicable, U = Unknown

C	NC	N/A	U		
☒	☐	☐	☐	OTHER DIAPHRAGMS: The diaphragm does not consist of a system other than wood, metal deck, concrete, or horizontal bracing. (Commentary: Sec. A.4.7.1. Tier 2: Sec. 5.6.5)	

High Seismicity

Seismic-Force-Resisting System

RATING				DESCRIPTION	COMMENTS
C	NC	N/A	U		
☒	☐	☐	☐	CONNECTION STRENGTH: All the brace connections develop the yield capacity of the diagonals. (Commentary: Sec. A.3.3.1.5. Tier 2: Sec. 5.5.4.4)	
C	NC	N/A	U		
☐	☐	☒	☐	COMPACT MEMBERS: All column and brace elements meet section requirements set forth by AISC 341, Table D1.1, for highly ductile members. Braced frame beams meet the requirements for moderately ductile members. (Commentary: Sec. A.3.3.1.7. Tier 2: Sec. 5.5.4)	
C	NC	N/A	U		
☐	☐	☒	☐	NET AREA: The brace effective net area is not less than the brace gross area for hollow structural section (HSS) tube and pipes sections. (Commentary: Sec. A.3.3.1.8. Tier 2: Sec. 5.5.4.1)	

Legend: C = Compliant, NC = Noncompliant, N/A = Not Applicable, U = Unknown

Connections

RATING				DESCRIPTION	COMMENTS
C ☒	NC ☐	N/A ☐	U ☐	STEEL COLUMNS: The columns in seismic-force-resisting frames are anchored to the building foundation, and the anchorage is able to develop the least of the tensile capacity of the column, the tensile capacity of the lowest level column splice (if any), or the uplift capacity of the foundation. (Commentary: Sec. A.5.3.1. Tier 2: Sec. 5.7.3.1)	

Foundation System

RATING				DESCRIPTION	COMMENTS
C ☐	NC ☐	N/A ☒	U ☐	DEEP FOUNDATIONS: Piles and piers are capable of transferring the seismic forces between the structure and the soil. (Commentary: Sec. A.6.2.3.)	
C ☐	NC ☐	N/A ☒	U ☐	SLOPING SITES: The difference in foundation embedment depth from one side of the building to another does not exceed one story high. (Commentary: Sec. A.6.2.4)	

Legend: C = Compliant, NC = Noncompliant, N/A = Not Applicable, U = Unknown

VIII. APPENDIX D – COMMON SEISMIC TERMINOLOGY

COMMON SEISMIC TERMINOLOGY – SEISMIC PERFORMANCE GOALS

Major Earthquake: Also known as the "Design" earthquake since its criteria is used for most codes. It is an earthquake that produces ground motions (shaking) at the site under consideration that have a 10% probability of being exceeded in 50 years. A 30% of gravity (0.3g) ground acceleration would be anticipated in the Puget Sound area.

Moderate Earthquake: An earthquake that produces ground motions (shaking) at the site under consideration that have a 50% probability of being exceeded in 50 years. The 1949, 1965 and 2001 earthquakes in the Puget Sound area are classified as moderate earthquakes.

Minor Earthquake: An earthquake that produces ground motions (shaking) at the site under consideration less than a moderate earthquake and would be short in duration. The recent Richter scale 5.5 earthquakes in the Puget Sound area would be considered minor earthquakes.

Probability of Exceedance: The probability that the ground shaking level or damage level will be exceeded.

International Building Code (IBC): The IBC is a comprehensive set of national regulations for building systems consistent with and inclusive of the scope of originally regional legacy codes. The IBC is the current nationally recognized building code and has been adopted by a majority of states and building jurisdictions.

Anticipated Seismic Performance of New Construction Built to Comply with the International Building Code:

1. Resist a minor level earthquake ground motion without structural or nonstructural damage.
2. Resist moderate level of earthquake ground motion without structural damage, but possibly experience some nonstructural damage.
3. Resist a major level of earthquake ground motion having an intensity equal to the strongest either experienced or forecast for the building site, without collapse, but possibly with some structural, as well as nonstructural damage.
4. Essential facilities are designed for force levels 25% to 50% greater than standard buildings. The building is intended to have minimal structural and nonstructural damage after a major earthquake. The repair of the damage that has occurred would generally not be required prior to re-occupancy, or in other words, be in an operable condition after a major earthquake. Hospitals, Police and Fire Stations are common essential facilities.

International Existing Building Code (IEBC): Building Code Standard that addresses older buildings not constructed under current codes and specifically older unreinforced masonry buildings, concrete tilt-up building, wood buildings and concrete buildings. Its provisions for rehabilitation of unreinforced masonry buildings are less stringent requirements than are demanded for new construction, and were developed considering and balancing the expense of retrofit, the value of the existing building stock and the desired reduction in seismic risk.

ASCE 41-13 – Seismic Evaluation and Retrofit of Existing Buildings: A comprehensive standard based on performance based design, it identifies areas of seismic vulnerability with each common building type based on past seismic performance. The performance level design criteria include Collapse Prevention, Life Safety, Immediate Occupancy and Operational (the last for new construction only). ASCE 41-13 has become the accepted standard in the building industry.

Anticipated Seismic Performance of Building Renovated to International Existing Building Code or ASCE 41-13 Life/Safety Performance Level: The seismic performance would be less than that of new construction. The goal is to reduce life/safety hazards as best as possible with available resources. This code is directed at insuring a coherent load path for lateral loads, reduction of out-of-plane wall failures, reduction of loss of support for floors and roofs and reduction of falling parapets or ornamentation. Anticipated post-earthquake condition would be similar to life/safety design performance for moderate earthquakes and near collapse for major earthquakes as described below.

Immediate Occupancy Seismic Performance Level: Post-earthquake condition of the building would be such that only limited structural damage has occurred. The basic vertical and lateral load resisting systems of the building retain nearly all of their pre-earthquake strength and stiffness. The risk of life- threatening injury as a result of structural damage is very low, although some minor structural repairs may be appropriate; these would generally not be required prior to re-occupancy.

Life/Safety Performance Level: The post-earthquake condition of the building would be that the building may suffer significant structural damage with some anticipated margin against either partial, or total structural collapse. Injuries may occur during the earthquake; however, it is expected that the overall risk of life-threatening injury as a result of structural damage is low. It should be possible to repair the structure; however, for economic reasons this may not be practical. While the damaged structure is not an imminent collapse risk, it would be prudent to implement structural repairs or install temporary bracing prior to re-occupancy.

Collapse Prevention Seismic Performance Level: The post-earthquake condition of the building would be such that the building would be on the verge of experiencing partial or total collapse. Substantial damage to the structure has occurred, potentially including significant degradation in stiffness and strength of the lateral force resisting system, large permanent lateral deformation of the structure and to a more limited extent, degradation in the vertical load carrying capacity. The primary vertical gravity load resisting system should still be able to support its load demand. Significant risk of injury due to falling hazards from structural debris may exist. The structure may not be technically practical to repair and is not safe for re-occupancy, as aftershock activity could induce collapse.

Hazard Reduction/Mitigation of Seismic Hazard: Objective is met with the removal or strengthening of elements of the building which have commonly performed poorly in past earthquakes or presents a life/safety threat to the building occupants.

Structural Damage: Damage to the structural elements of the building. A building with structural damage may require evacuation after an earthquake until structural components are repaired.

Nonstructural Damage: Damage to architectural, mechanical, electrical or building components that do not affect the overall structural integrity of the building. Examples are window breakage, shelves overturning, and ceilings falling down. This is the most common and may be the most expensive damage caused by an earthquake.

Lateral Force Resisting System: Those elements of the structure that provide its basic lateral strength and stiffness (to resist lateral forces due to wind or earthquake motion), and without which the structure would be laterally unstable.

Vertical Load Resisting System: Those elements of the structure that provide a load path for the gravity loads to the foundation.

Ductility: A measure of the ability of a material, elements or system to deform beyond yield. (Yielding after material, element, system has exceeded its initial design strength without a significant loss in load-carrying capacity).

Redundancy: The presence of multiple structural support systems, such that if one or several elements have substantial strength or stiffness loss, continuing lateral displacement and vertical loads may be resisted by the other structural or nonstructural elements in the system.

Brittle Systems: Systems that do not have a defined yield phase (ductility) and that have a significant strength degradation immediately after the displacement associated with peak strength. (Unreinforced clay tile and brick masonry bearing wall systems would be considered brittle systems.)

Diaphragm: A horizontal, or nearly horizontal system designed to transmit lateral forces to vertical elements (shear walls, braced frames, etc.) of the lateral-force-resisting system. Common diaphragm types are plywood sheathing, reinforced concrete, metal decking or concrete topping over metal decking.

Shear Wall: A wall designed to resist lateral forces acting in the plane of the wall (parallel to the wall). Common shear wall types are plywood, reinforced masonry or concrete walls.

Braced Frame: An essentially vertical truss, or its equivalent. Two common braced frame types are concentric (members meet at a common point) or eccentric (to resist lateral loads, some members do not meet at common point). Braced frames are most commonly constructed of steel members.

Redundant Load Path: Secondary load path, normally independent of primary load path, to provide vertical support of floors and roof, if bearing walls or vertical frame fail.

Unreinforced Masonry Wall: Masonry walls, such as solid brick masonry, hollow clay tile or concrete masonry unit (CMU), that rely on the tensile strength of masonry units, mortar and grout to provide structural support. (Current code (IBC) requires reinforced masonry walls to resist tensile forces in our seismic risk zone.)

Unreinforced Concrete Wall: Concrete walls lacking reinforcing that rely on the tensile strength of the concrete to provide structural support. Nominally or minimally reinforced concrete walls act in a similar manner. (Current code (IBC) requires reinforcing steel to resist tensile forces in our seismic risk zone.)

Shotcrete: Concrete that is pneumatically sprayed on vertical, or near vertical, surfaces typically with a minimum use of concrete form work.

Re-Entrant Corner: Plan irregularity in a building, such as an extending wing, plan inset or E, T, X, and L shaped configuration, where large tensile and compression forces can develop at “inside corner configurations”.

Strong Back System: A secondary system, such as a wood or steel frame wall or columns, used to provide out-of-plane support to an unreinforced or under-reinforced masonry wall.

Sub-Diaphragm: A portion of a larger diaphragm used to distribute loads between members. Sub-diaphragms are commonly used to distribute tension loads from anchorage of masonry or concrete walls to tension ties (crossties) across the building.

Crosstie: A beam, girder, or other structural member that accumulates tension loads from wall anchorage and distributes them over the entire width of the building (diaphragm).

Richter Scale: A measurement of the amount of energy released in an earthquake. It utilizes a base-10 logarithmic scale, so every magnitude level increase (i.e M6 to M7) corresponds to 10 times the energy released.

Interplate/Subduction Zone Earthquake: An earthquake that occurs directly at the interface of two tectonic plates. They typically have long reoccurrence levels (500 years or more), and have the ability to produce the largest magnitude earthquakes, upwards of M9 on the Richter Scale.

Intraplate Subduction Zone Earthquake: A deep earthquake, with an epicenter typically 25 to 40 miles below the surface, that has the ability to produce large magnitude earthquakes, upward of M6 to M7 on the Richter Scale. They have a short reoccurrence level, often in the 35 to 50 year range.

Shallow Earthquake: An earthquake that occurs at depths less than 25 miles. While they may release less energy than other earthquake (M5.5 to perhaps M7 on the Richter Scale), they shallow nature of the earthquake can often lead to more ground disruption, and therefore more geographically isolated damage.

VII. SITE HAZARD RISK ASSESSMENT REPORT

WR Consulting, Inc.

John W. Rundall, P.E., Civil and Environmental Engineering

Memorandum

To: Joel Davis, Meng Analysis

From: John W. Rundall, P.E., WR Consulting, Inc.

Date: May 26, 2016

Re: Critical Areas Review and Natural/Geologic Hazard Risk Assessment
South King Complex - Facility Condition Assessment
Puget Sound Energy

Executive Summary:

The following critical area and natural/geologic hazard risks were reviewed for the facility and its access.

- Earthquake/Seismic
- Flooding
- Liquefaction
- Steep Slopes/Landslides
- Volcanic
- Wetlands/Aquatic Resources
- Drought

The reviews are based on general site data collected from various published public sources. These sources reflect the risks and hazards typically associated with the site and surrounding community. The review did not include site specific and field investigations such as subsurface soil (geotechnical) exploration, hydrologic/hydraulic analysis or structural evaluation of the buildings and improvements.

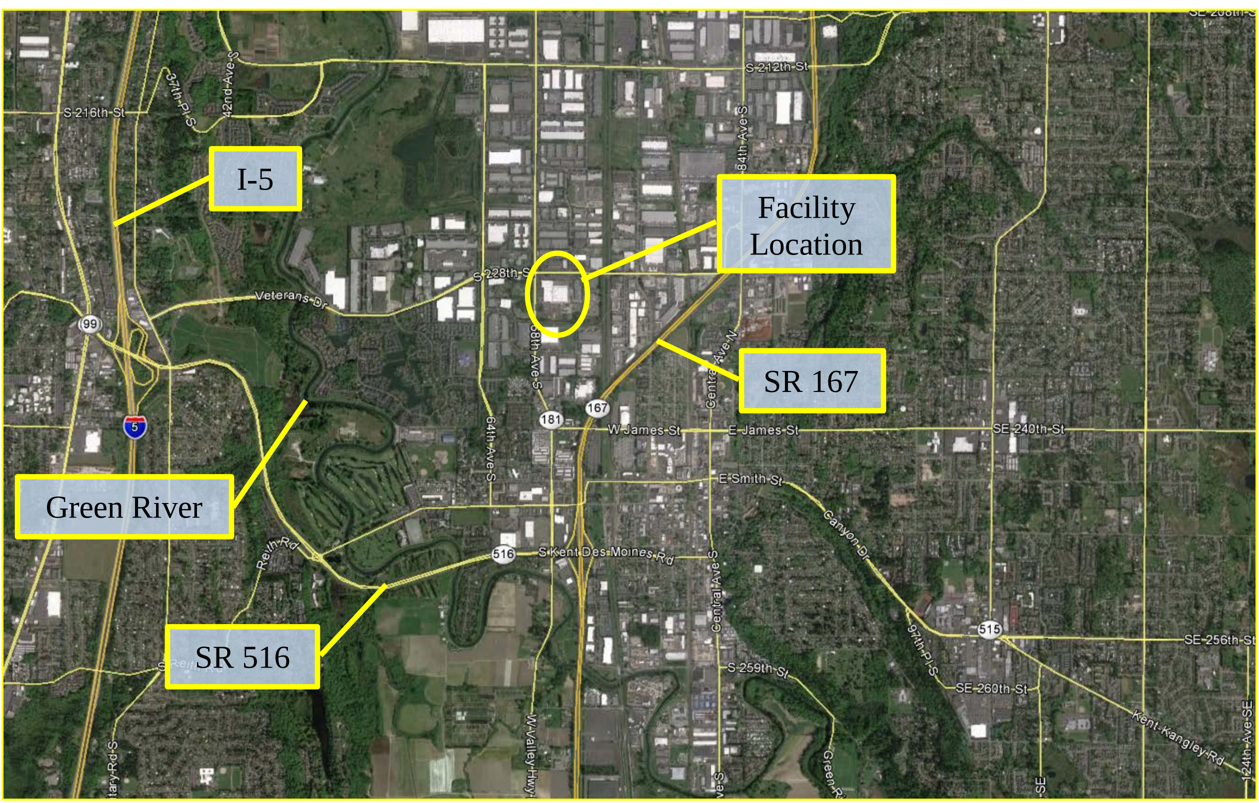
The results of the review provide a general understanding of the type of risks related to the elements listed. Due to the stochastic nature of the factors creating the risk or hazards, numerical risks based on statistical analyses are not included. Our assessment of risk and an estimate of the impact to the facility are based on generally accepted design standards and our understanding of the variability of the factors contributing to these hazards.

The following table summarizes the risk associated with each area under review and provides a qualitative estimate of the impact to the facility for each risk. More specific conclusions regarding the impact are difficult to quantify because they are directly related to random events and the magnitude of the occurrence which is also highly variable.

Summary of Risks and Impacts		
Critical Area and Natural/Geologic Hazard	Risk of Occurrence	Impact to Facility
Earthquake/Seismic	2	1
Flooding	3	1
Liquefaction	2	1
Steep Slopes/Landslides	3	3
Volcanic	3	1
Wetlands/Aquatic Resources	3	2
Drought	3	3
1 = High		
2 = Medium		
3 = Low		

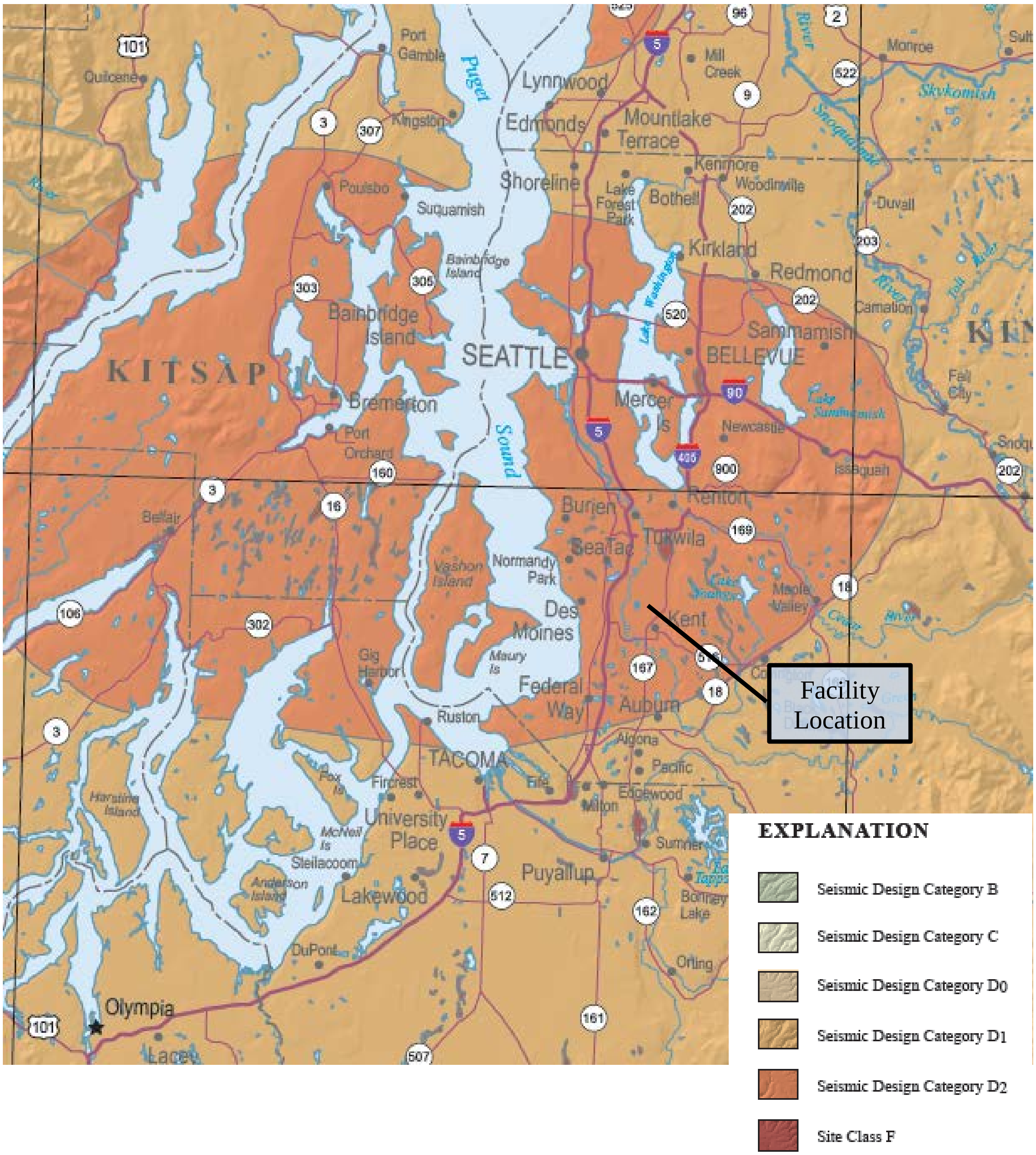
Critical Areas Review and Natural/Geologic Hazard Risk Assessment:

The aerial photograph below shows the location of the site and its proximity to nearby features and highways.

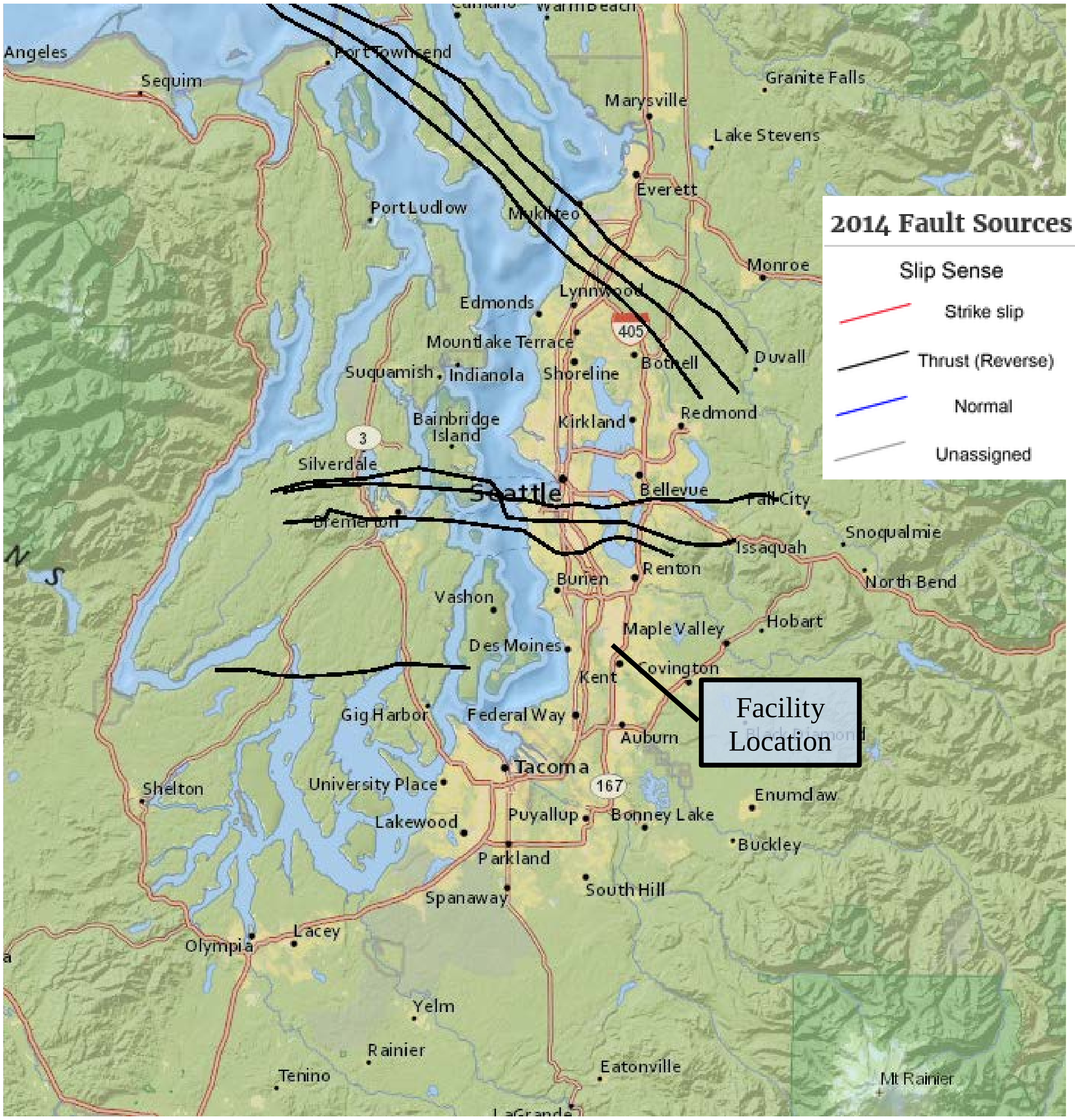


Earthquake/Seismic:

Much of the Puget Sound Basin which includes this site is shown on the following DNR (Department of Natural Resources) Seismic Design Category Map. The project site is located within an area of Seismic Design Category D2.



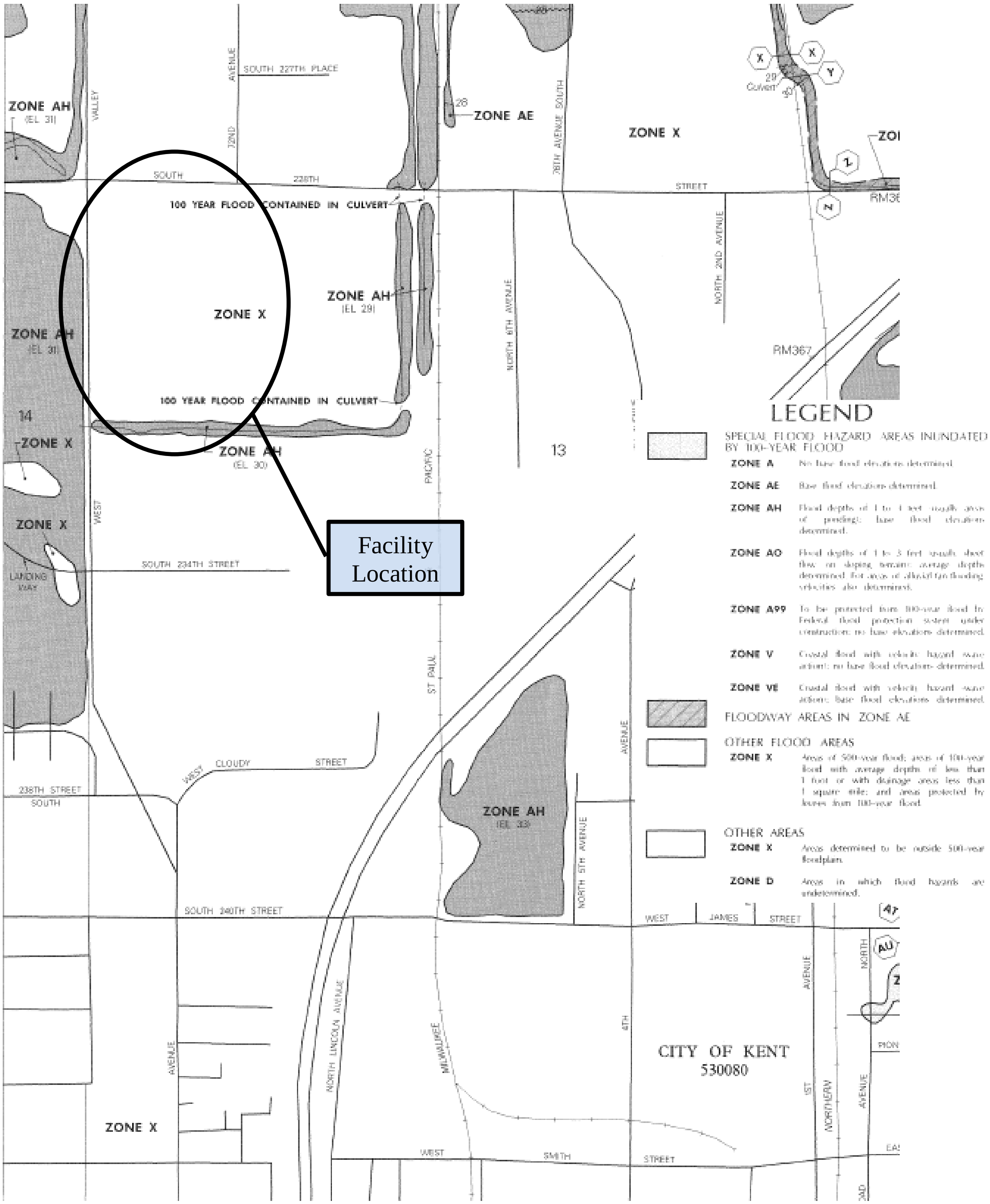
The following is a portion of the 2014 USGS Fault Source Map. It does not show any faults at the project site, but a Thrust (Reverse) fault has been mapped to the west which is more or less in alignment with the site.



In general, the site is vulnerable to major earthquakes that have the potential to be catastrophic. In addition to damage to site improvements, the impact to people (death and injuries), buildings and structures, and utilities in the region would significantly impact the function of the facility on-site.

Flooding:

A portion of FEMA Flood Map 53033C0988F is shown below and it indicates that the site is outside the limits of the 500-year floodplain (Other Areas, Zone X). The site is bordered by Zone AH which is within the 100-year flood hazard and characterized by flood depths of 1 to 3 feet. The based flood elevations for these zones are indicated.



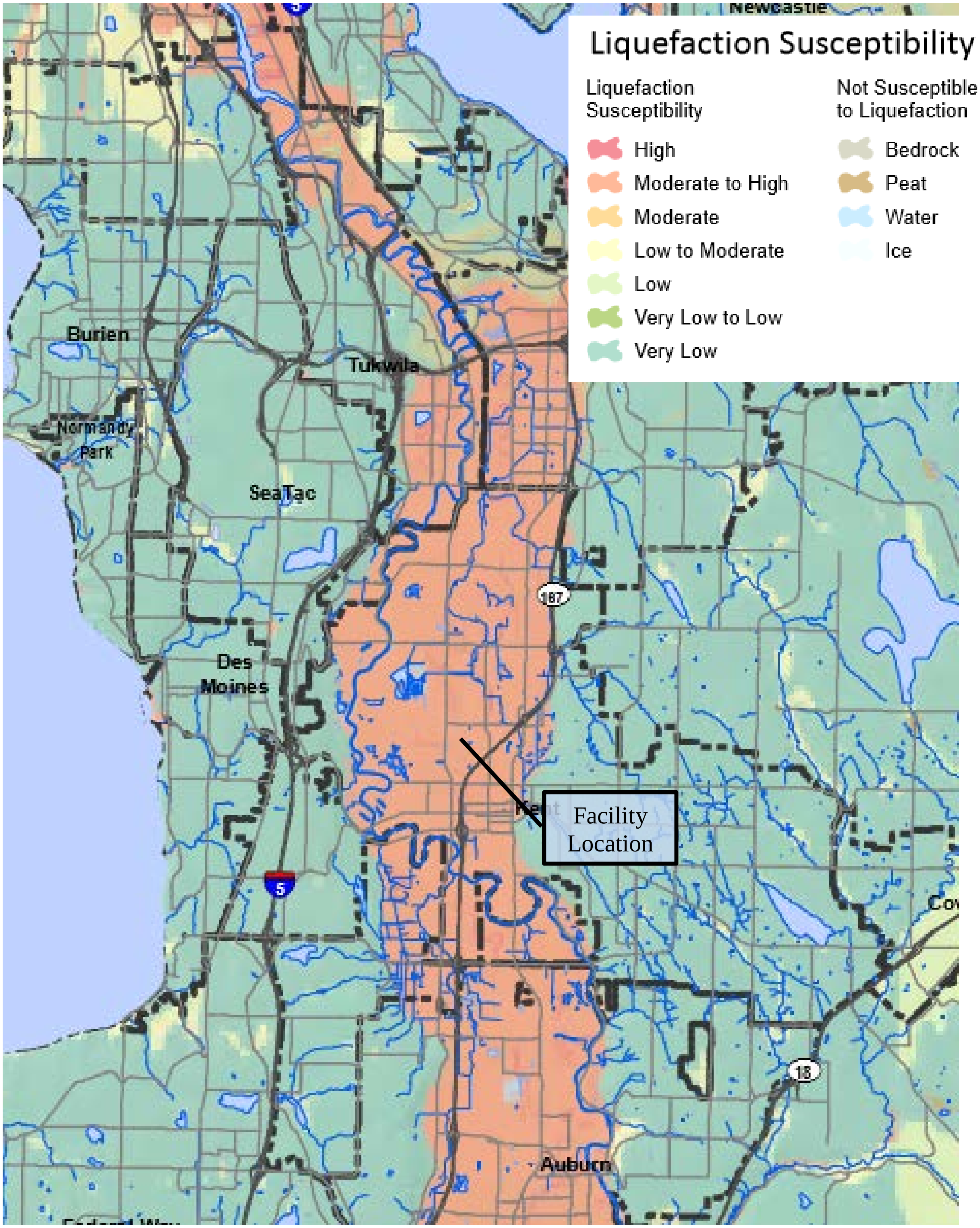
The City of Kent, Washington Hazard Identification and Vulnerability Analysis also identifies dam failure as a hazard to the City of Kent. Although the site is not within a mapped flood plain, similar conditions would be created by the failure of flood control infrastructure. This includes the failure of dikes or levees which would generally be associated with flooding from extreme precipitation events. The damage associated with these failures could result in significant property damage and disruption to daily activities. The economic impact could be significant and could require many days or even weeks to fully restore function of roads and utilities in affected areas.

The failure of Howard Hansen Dam, upstream from Kent on the Green River, would result in what would be characterized as major disaster. The report notes that severe property damage would be caused by the deluge of water throughout the valley floor with a long and costly recovery period. This type of failure is considered remote but still a risk for this site.

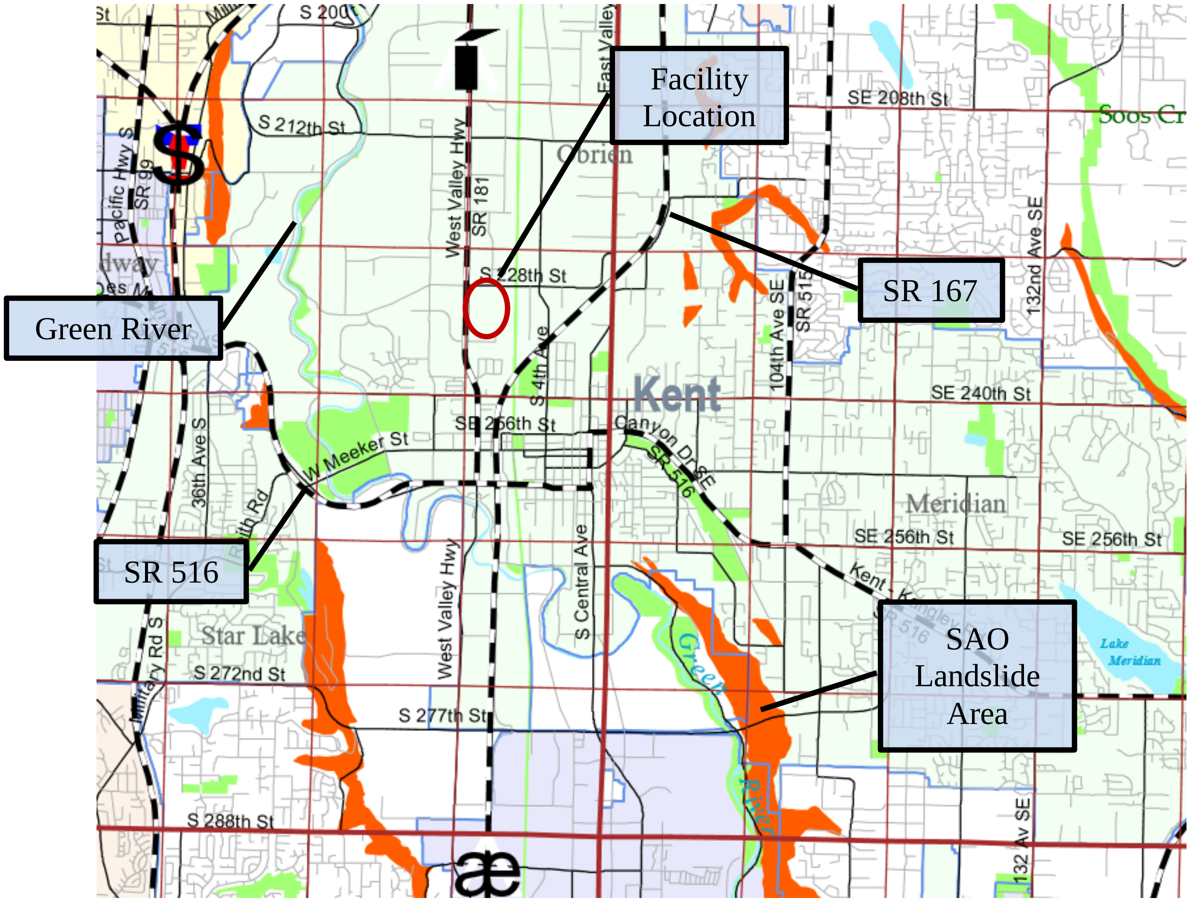
Liquefaction:

The following map (Map 11-5) Liquefaction Susceptibility is from the King County Flood Control District and is based on US Geological Survey and Washington State Department of Natural Resources data, May 2010. It shows that the general vicinity of the site has moderate to high Liquefaction Susceptibility. More specific mapping and characterization of the site geology and subsurface soil conditions would be needed to fully assess the risk of liquefaction at this facility.

If soils were imported and filled on-site prior to the improvements, the risk may be reduced, but the site is within an area of moderate to high risk. Building design and construction also affects the facilities' vulnerability to this risk. Specific design elements such as piles or other special footings to support structures and other utilities can mitigate the risk and reduce damage to improvements when there is sufficient ground motion for liquefaction to occur.


Liquefaction Susceptibility
Liquefaction Susceptibility
High
Moderate to High
Moderate
Low to Moderate
Low
Very Low to Low
Very Low
Not Susceptible to Liquefaction
Bedrock
Peat
Water
Ice
Newcastle
Burien
Tukwila
Normandy Park
SeaTac
Des Moines
Facility Location
Auburn
187
5
18

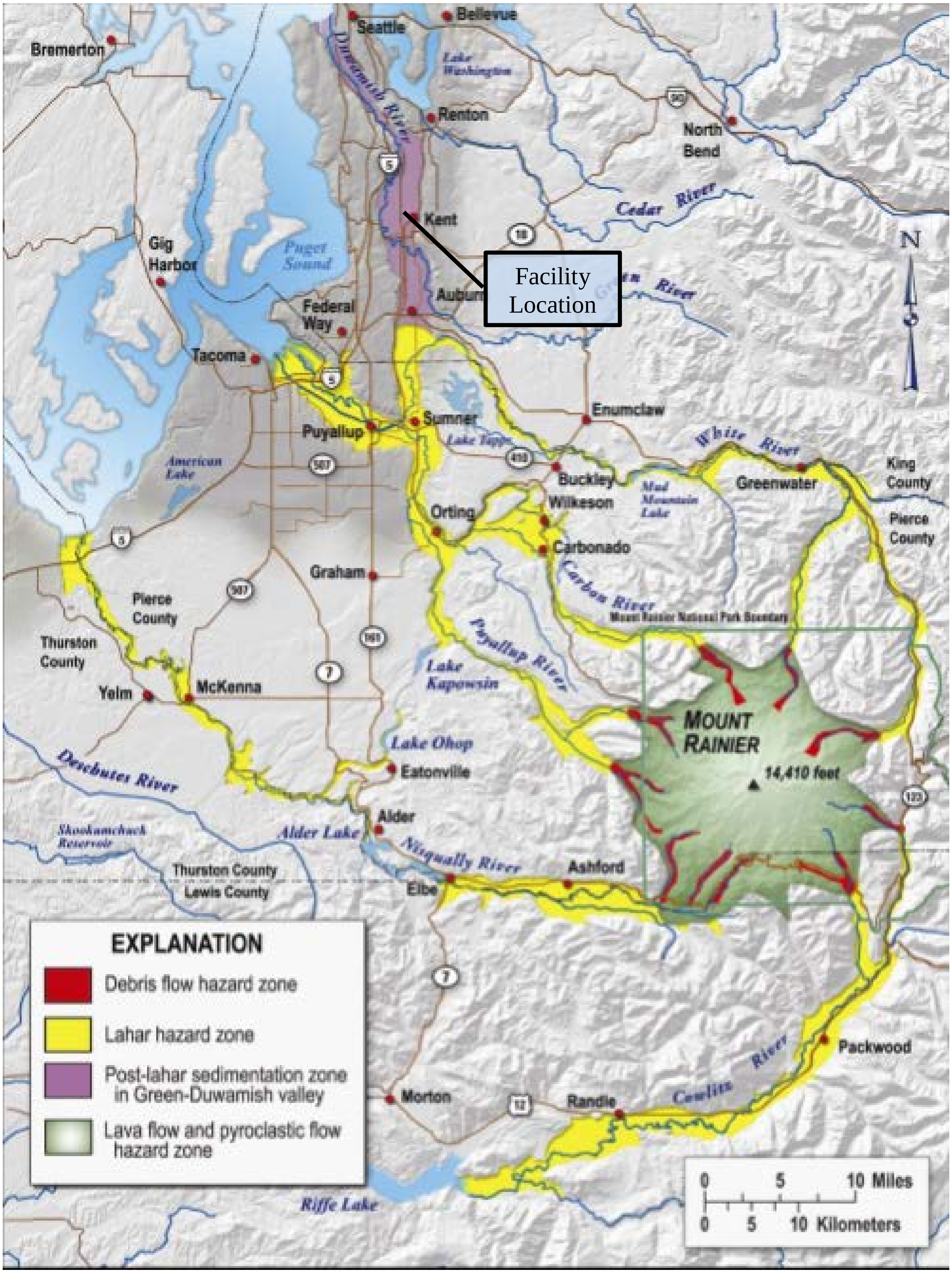
Steep Slopes/Landslides: The King County Landslide Hazard Areas map dated October 31, 2006 showing Sensitive Area Ordinance Designations (SAO) does not indicate any landslide hazards associated with steep slopes (shaded orange areas) in the vicinity of the site.



Volcanic:

Although the timing is uncertain, the Pierce County Mount Rainier Volcanic Hazards Plan has concluded that Mount Rainier will erupt again and that lahars, either eruption related or not, could inundate valley floors that surround the mountain. These flows will cause severe social and economic impacts to communities in their path.

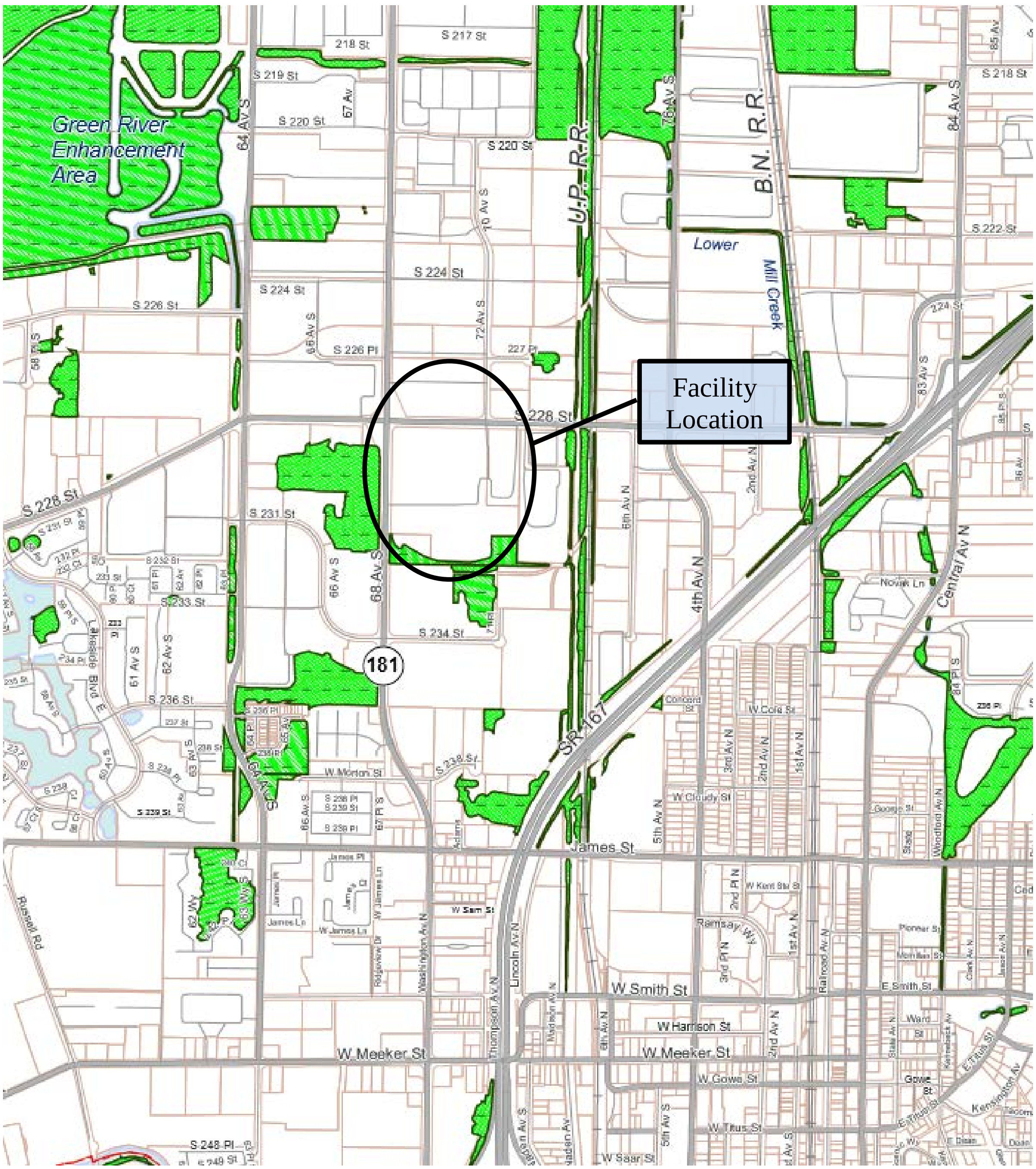
The following map from the report is Figure 2 and is titled “Various Flow Hazard Zones Surrounding Mount Rainier Washington. It shows that the site is within the “post-lahar sedimentation zone in the Green-Duwamish Valley”. Lahars look and behave like flowing wet concrete. They flow down valleys and fill channels and either fill or sweep away forests and structures in their path. The depth and extent of the flow depends on the size but they can flow many tens of miles from Mount Rainier and represent the greatest volcanic associated threat to populated areas. Although additional risks are associated with other volcanic eruption phenomena such as pyroclastic flows, lava flows, and distribution of tephra (pumice and ash), flooding and lahars are more likely to impact the site.



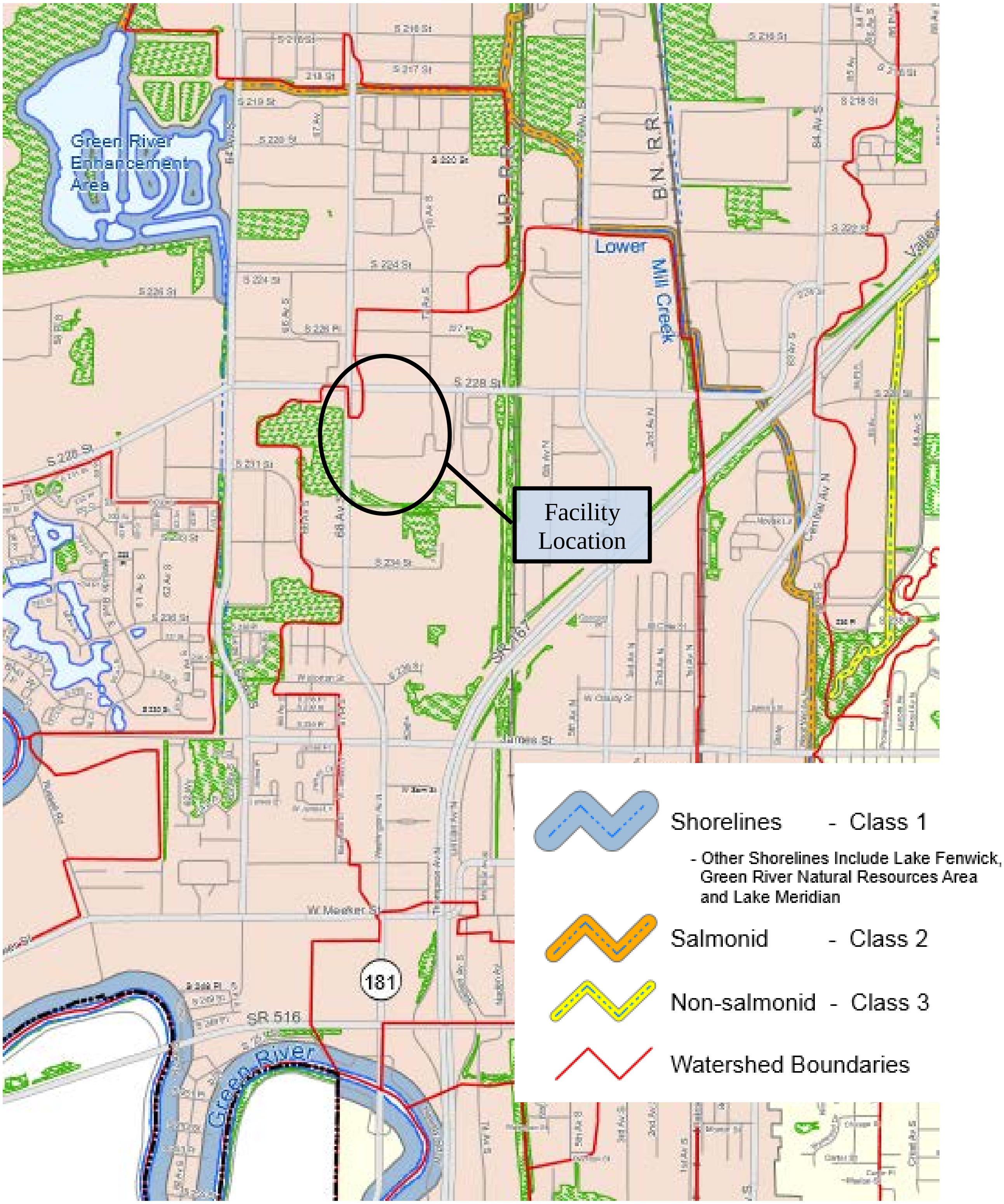
Bremerton
Seattle
Bellevue
Lake Washington
Duwamish River
Renton
North Bend
Cedar River
Kent
Facility Location
Gig Harbor
Puget Sound
Auburn
Green River
Federal Way
Tacoma
Enumclaw
Sumner
Puyallup
Lake Tapps
White River
American Lake
Buckley
Wilkeson
Mud Mountain Lake
Greenwater
King County
Pierce County
Orting
Carbonado
Graham
Carbon River
Mount Rainier National Park Boundary
Pierce County
Thurston County
Puyallup River
Lake Kapowsin
Yelm
McKenna
MOUNT RAINIER
14,410 feet
Lake Ohop
Deschutes River
Eatonville
Alder
Shookumchuck Reservoir
Alder Lake
Nisqually River
Ashford
Thurston County
Lewis County
Elbe
EXPLANATION
Debris flow hazard zone
Lahar hazard zone
Post-lahar sedimentation zone in Green-Duwamish valley
Lava flow and pyroclastic flow hazard zone
Packwood
Cowlitz River
Morton
Randle
Riffe Lake
0 5 10 Miles
0 5 10 Kilometers
N

Wetlands/Aquatic Resources:

The City of Kent Wetland Inventory Map, April; 2016 shows wetlands along the south margin of the site. A portion of the map is shown below and delineates the approximate limits. The wetlands map does not show any classification or associated buffer widths and even indicates that it shows "tentative" mapping. The confirmation of the limits and a determination of the full impact of the wetland area is not known. The map guide suggests that further analysis including mapping and assessment by a qualified wetland biologist or environmental engineer is needed to establish the boundaries and buffers and their impact to site development.



In addition to wetlands, streams or other aquatic resources can impact the use of a site. The following portion of a map is from the City of Kent Stream Classification and Buffers Map, dated December 16, 2013. It shows that there are no Class 1 through Class 3 shorelines on the property. The map also shows the inventoried wetlands indicated on the map above.



Drought:

The City of Kent, Washington Hazard Identification and Vulnerability Analysis identifies drought as a hazard to the City of Kent. It notes that lengthy drought combined with hot dry weather creates cause for concern particularly if severe problems in the event of water shortages requiring water rationing. A severe drought creating rationing could cause businesses to reduce activity or even close depending on their water use. Fire from dry grass and brush could also pose a threat to businesses near susceptible wild land/urban interface areas. The report notes that a major urban fire requiring excessive use of water resources could have significant impact on local water supplies during a drought.

The report indicates that these problems would be experienced in the event of a “lengthy drought” combined with extremely hot weather. A lengthy drought is assumed to correspond to Drought Severity Classification D2 through D4 in Table 1 of the report which defines Severe Drought (D2) as less than 65% of normal precipitation for 6 months to Exceptional Drought (D4) which is less than 65% of normal precipitation for 12 months. The report does not give any probabilistic analysis of these events; it only notes the risk and potential hazards.

VIII. IR INSPECTION REPORT

Introduction

Thermal Trend - Lean DB Report

The Colbert Advantage - Exceptional Execution

30 years of exceeding your expectations!

Colbert Infrared has been providing complete corporate solutions for Infrared Predictive Maintenance Programs, addressing the needs for professional Risk Assessment / Loss Prevention for more then 30 years. From Infrared inspections, Training and Certification, Infrared Camera Sales and installations, or helping you to setup and establish your own Predictive Maintenance programs, we have been right by your side.

We are your global partner for keeping your systems up and running, safely and efficiently. We service national and international companies all over the world, whether they have a single site, or thousands of locations. Our focus has always been on providing the highest quality solutions, with our emphasis on the standardization of services, and highly valuable information. When it comes to the philosophy of our services, we believe that "quality can never be compromised at any price".

Colbert Infrared Services, Inc. pioneered and developed the philosophy of **LEAN IR PREDICTIVE MAINTENANCE** and **LEAN IR Programs** to provide our clients with unsurpassed diagnostic services. This is based on our success with the design and use of the **Thermal Trend - Lean DB** database system. Colbert Infrared Services introduced the Thermal Trend - Lean RDBMS to the predictive maintenance community over 25 years ago to address the concerns of risk managers and maintenance staff - consistency of inspection quality and reporting / problem management. Today this **"Colbert Advantage"** has allows us to be recognized as being the premier IR consulting company word wide, as well as the most influential in the industry.

The Thermal Trend - Lean report that you have in front of you, and the data collection methods that Colbert Infrared has used to gather and analysis your data is the results of over 25 years of development. The following discussions in this Intent section will provide you with an overall understanding of the testing methods that we have developed. Today the principles that Colbert Infrared has developed, are the most studied and followed testing methods in the world! Colbert Infrared Services, Inc. is at the hart of the worlds largest in-house Infrared PdM programs. (Boeing, Ford, Harley-Davidson). We are very proud of the leadership position that we have in our industry and take that responsibility very seriously. We have always been committed to providing the most superior quality services with the highest value possible. Our focus has always been in exceptional execution at exceeding your expectations.

The Colbert Infrared Advantage
We want your business, and weve been working hard for 30 years to earn it!

Fred Colbert

Fred Colbert
President CIS, Inc.
Certified Level III Infrared Thermographer and Instructor

*Table of Contents

***Please Note:** Depending on the type of inspection, and the items that were documented, will determine the specific sections that are included in this report. For example: if no Thermal Items / anomalies were found at the time of the inspection, then there will not be a Prioritized List by Temperature Rise, or a Thermal Item Details section. This also holds true depending on what the scope of work was to be, for example if this inspection was to cover only a thermographic inspection of electrical-mechanical equipment, then there will not be sections covering Ultrasonic or Ultraviolet inspection results. For this reason, the specific report sections and the Table of Contents when compared to each other may seem incomplete, but it is only because of the scope of work and the actual data that was documented at the time of the inspection that defines how much of the inspection results sections are included in this report.

Colbert
Infrared Services

Thermal Trend

Infrared Thermographic Inspection
Of
Selected Electro-Mechanical Equipment

Provided For
South King Complex
04/28/2016

Summary:

An Infrared Electrical / Mechanical inspection was performed on 04/28/2016 for South King Complex

All of the items inspected are listed in the inventory section of this Thermal Trend report. Any anomalies that were found at the time of the inspection (if any) are documented in the Problem Detail section of this report with their appropriate associated data, i.e. Thermograms, Photos, comments, measurements, etc.. They are also listed in the Prioritized list of problems section, in their order of priority based on the components temperature rise, as compared to a similar reference component of equal type, loading, and environmental influences, at the time of the inspection.

The final decision as to the repair priority of any and all problems in this report rests on the owners, management, and/or facilities engineering teams. Colbert Infrared Services, Inc. and the IR Thermographer assumes no liability directly or indirectly as a result of this inspection or the decisions made as to establishing the priority and timeline of repair decisions made by the owners, management, and/or facilities engineering teams. This inspection is not a guarantee or warranty of any kind.

Executive Overview - for Thermal Items:

Total number of locations in the database:		10
Total number of pieces of equipment in the database:		52
Total number of Items (open and closed covering all inspections) in the database		
	Acute Items:	0
	Chronic Items:	0
	Overall total of all acute and chronic:	**0**
Current status of Items, acute and chronic		
	Total closed Items (covering all inspections):	0
	Current total open Items (tested or not tested at the time of this inspection):	**0**

I herby certify that the above project was inspected by myself or under my direction and that the enclosed data is the direct result of this inspection.

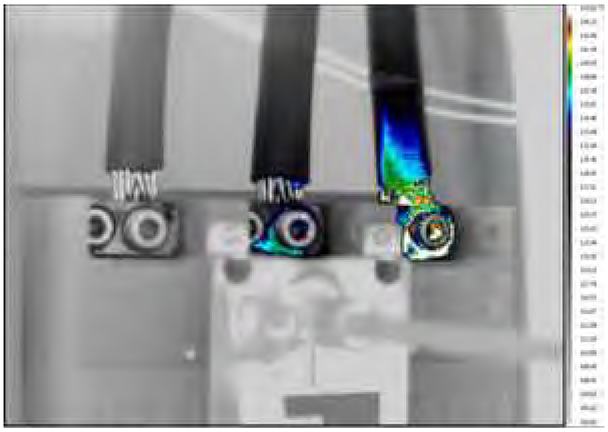
Fred Colbert

President CIS,Inc.

Certified Level III Infrared Thermographer / Instructor: The Professional Thermographers Association

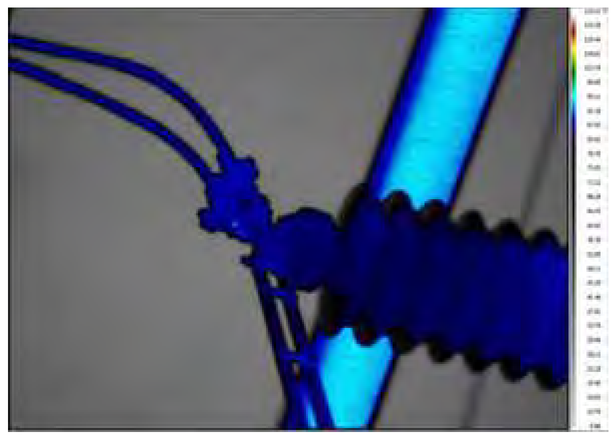
This inspection of your facility found no anomalies. Below are examples of the before and after conditions of thermal anomalies that may be documented.

Before

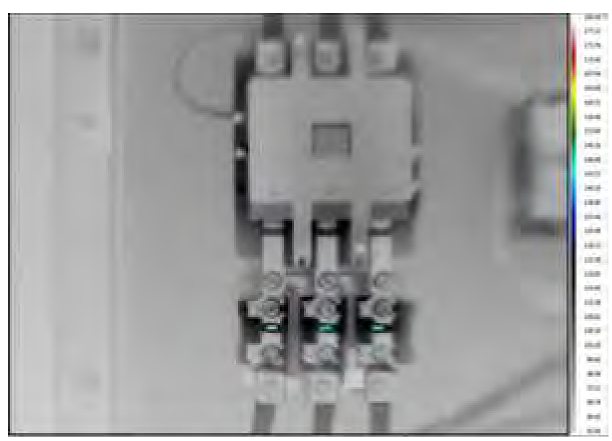


After Repairs

Simple repairs, such as cleaning and tightening connections, reduce the risk of equipment failure.



The heating on this outdoor utility switch is likely caused by resistance from a corroded or loose connection.



This heat signature suggests that an issue lies in the internal components of the contactor.

Colbert Infrared Services

Thermal Trend

Inspection Notes List

Site: South King Complex **Inspection #** 1 **Date:**

Inspection Note: 1	**Date-Time:** Apr 28 2016 10:01AM	**Severity Code:**

Route: Mezanine Main Electrical
Location/Equipment: 120/208V BUS Switchgear
Barcode: Asset ID:
Test Status: Tested
Comment: Panel LS2 was tagged out and in Off Position
Notes:

Professional Thermographers Association

Colbert Infrared Services, Inc 2014-A East Union Street, Seattle, WA 98122 (800-800-8178

Colbert Infrared Services

Thermal Trend

Inventory Report

Site: South King Complex | **Inspection #** 1 | **Date:** 04/28/2016

Open Problem	Status	Barcode	Location\Equipment
No	Tested		Boiler Room
No	Tested		Compressor MCC
No	Tested	109ZTP	Control Panel: Unit 1 (Master)
No	Tested	109ZTQ	Control Panel: Unit 2 (Slave)
No	Tested	109ZTF	Disconnect: MCC1 Air Compressor
No	Tested	109ZTH	Disconnect: Unit 1
No	Tested	109ZTJ	Disconnect: Unit 2
No	Tested	109ZTL	Disconnect: WH2-13,15,17 Air Compressor
No	Tested	109ZTM	Disconnect: WH2-14,16,18 Air Compressor
No	Tested	109ZTK	Disconnect: WH5-38,40,42 Air Dryer
No	Tested	109ZTN	Distribution Panel: PDP 2
No	Tested	109ZTE	Motor Control Center No. 2
No	Not Tested		Boiler No. 1
No	Not Tested		Boiler No. 2
No	Not Tested		Fuel Oil Pump
No	Tested		Hot Water Pump PHW1
No	Tested		Hot Water Pump PHW2
No	Tested		Main Breaker
No	Not Tested		Zone Water Pump SHW1
No	Tested		Zone Water Pump SHW2
No	Tested		Zone Water Pump SHW3
No	Tested		Zone Water Pump SHW5
No	Tested		Zone Water Pump SHW7
No	Tested	109ZTG	Transformer: L5
No	Tested		Mezanine Main Electrical
Yes	Tested		120/208V BUS Switchgear
No	Tested	109ZT0	480V Switchgear
No	Tested		BUS Run
No	Tested	109ZT3	Disconnect: 30 KVA (Unmarked)
No	Tested	109ZTA	Disconnect: Chilled Water Pump #1
No	Tested	109ZTB	Disconnect: S4 MCC 1 Mezz
No	Tested	109ZSZ	Motor Control Center No. 1
No	Not Tested		AC Unit S1
No	Tested		AC Unit S2
No	Tested		AC Unit S3
No	Tested		AC Unit S4
No	Not Tested		AC Unit S5
No	Not Tested		AC Unit S6
No	Not Tested		AC Unit S7
No	Tested		Chiller Water Pump CHWP1
No	Tested		Compressor (Control Air)
No	Tested		Cond. Water Pump CWP1
No	Not Tested		Cooling Tower Fan
No	Tested		Heat Pummp 1.1 O.D.
No	Tested		Main Breaker
No	Tested		R.V. 27
No	Tested		Ret. Air Fan RA-1
No	Tested		Tower Fan 1

Colbert Infrared Services

Thermal Trend

Inventory Report

Site: South King Complex **Inspection #** 1 **Date:** 04/28/2016

Open Problem	Status	Barcode	Location\Equipment
No	Tested		Untitled
No	Tested		Untitled
No	Tested	109ZT9	Panel: 0
No	Tested	109ZT7	Panel: DP2
No	Tested	109ZT2	Panel: L11
No	Tested		Panel: LF
No	Not Tested		Starter Panel: RV 16
No	Tested	109ZT4	Transformer: 30 KVA (Unmarked)
No	Tested	109ZT8	Transformer: 45 KVA (Unmarked)
No	Tested		Outside (Yard)
No	Tested		Main Switchboard
No	Tested		BUS Run
No	Tested	109ZTC	Incomming Lines
No	Tested		Main Disconnect Bus A & B

IX. EQUIPMENT INVENTORY

Building	Asset Name	Asset Type	Manufacturer	Model #	Serial #	Floor/ Space	Room	Install Date	Comments
SKC	AC-1	AC	Trane			Roof		1998	
SKC	AC-2	AC	Trane			Roof		1998	
SKC	AC-3	AC	Trane	TCD090C300BB	J41102071D	Roof			R22
SKC		AC	Liebert			Mezz	Fire Control Room		
SKC		AC	Liebert			Mezz	IDF		No Tag, Serves IDF
SKC	AC-4B	AC Split	Mitsubishi	PK12FK	73G00082B	1st	Communications		
SKC		AC Split	Fujitsu	ASU18RLF	KSA05017	1st	Meter Tech Room	1996	
SKC		AC Split	Trane	TWE036C140F1	N392BPU1V	1st	ICON Data Room	1998	
SKC	ACR-1	ACR	Quincy	108	6203707	1st	Boiler Room		Not Working
SKC	CAC-1	ACR	Ingersol	2475W5-P	CBV302122	1st	Boiler Room	2014	80 Gal
SKC		ACR	Saylor-Beal	CD-91524	9Y-12-X97	Outside	Fleet Yard		Abandoned
SKC		ACR	Quincy	8MQT53QCBST	UTZ452065	1st	Boiler Room	2014	Crated, not yet installed, 30 Gal
SKC		ACR	Quincy	F50-T	1006515311	1st	Boiler Room	1996	50HP

Building	Asset Name	Asset Type	Manufacturer	Model #	Serial #	Floor/ Space	Room	Install Date	Comments
SKC		ACR	Quincy	F25P	980166C	1st	Boiler Room		25HP
SKC		ACR	EMQLO	KN-20	10598063	1st	Fire Riser	1998	Dry System
SKC		ACR	Quincy	F25P	980167C	1st	Boiler Room		25HP
SKC	AHU-1	AHU	Trane	SXHFC7540P67E8AD8 001ABDEJKLRT68	J97M74074	Roof		1998	R-22
SKC	AHU-2	AHU	Trane	YCD150C4LCBA	N37103980D	Roof		1998	
SKC	AHU-3	AHU	Trane	YCD090C4LCBE	N371023979	Roof		1998	Flammable Waste Locker Room, 97200 BTUH
SKC	AHU-3	AHU	Carrier	39BA140A19	67242108	Mezz	Mech	1967	
SKC	AHU-4	AHU	Carrier	39BA140A19	67242109	Mezz	Mech	1967	
SKC	Fan No. 1	AHU	Carrier	39CB130219	67301073HL	Mezz	Mech	1967	Not Operational
SKC	Fan No. 2	AHU	Carrier	39CB1202193	67301045VL	Mezz	Mech	1967	
SKC	Fan No. 6	AHU	Carrier	39BA140A19	67242110	Mezz	Mech	1967	Not Operational
SKC	Fan No. 7	AHU	Carrier	39BA140A19	67242111	Mezz	Mech	1967	Not Operational
SKC		AHU	Carrier	39BA140A19	67242107	Mezz	Mech	1967	Not Operational

Building	Asset Name	Asset Type	Manufacturer	Model #	Serial #	Floor/ Space	Room	Install Date	Comments
SKC	UH-31	Air Curtain	Miniveil			1st	Shipping and Staging		Tag not accessible
SKC		Air Curtain	Miniveil			1st	Receiving		Tag not accessible
SKC		BFA	Wilkins	6"	Y02549	Outside	South		
SKC	B-1A	Boiler	Hydrotherm	KN-20	KN20-2013--12079	1st	Boiler Room		1999999 BTU Nat Gas, Master
SKC	B-1B	Boiler	Hydrotherm	KN-20	KN20-2013--12080	1st	Boiler Room		1999999 BTU Nat Gas, Slave
SKC	B-2	Boiler	ORR& Sembower	3LG	6720032	1st	Boiler Room	1967	Original boiler, 6695000 BTU/hour
SKC	BCP-1	Boiler CP	Bell and Gosset	60 3X5.25	PV5036-2	1st	Boiler Room		120 GPM
SKC	BCP-2	Boiler CP	Bell and Gosset	60 3X5.25	PV5036-1	1st	Boiler Room		120 GPM
SKC	BCP-3	Boiler CP	Bell and Gosset	Seal BRG M01	189-105LF	1st	Boiler Room	1967	
SKC	BP-1	Boiler Pump	Bell and Gosset	3BC8.376BF	PV5460 E41	1st	Boiler Room		505 GPM
SKC	BP-2	Boiler Pump	Bell and Gosset	3BC8.376BF	PH005605	1st	Boiler Room		505 GPM
SKC	South Chiller	Chiller	Carrier	30GT-030---610	4097F99113	Outside			R-22, Abandoned
SKC		Chiller	York	YLAA0090SE46XAASDTXAT ABLXCXX445XXXXHXXXSA	2ETM000778	Roof		2008	Not installed new. Built in 2008, R410

Building	Asset Name	Asset Type	Manufacturer	Model #	Serial #	Floor/ Space	Room	Install Date	Comments
SKC	Chiller 1	Chiller	York	YCWJ88XV0-46PE	YKBM9823401201	Mezz	Mech		Not In Use
SKC	Conv 1	Conv	Thyssen Krupp	ABA21241K1	2539823	1st	Elev Mech	1998	
SKC		Cooling Tower	Dunham	LSBC-4000-ED	C67-5617	Roof		1967	Not In Use
SKC	CP-2	CP	Grundfos	UP26-96-BF	52722336	1st	Foam Suppressant	1996	
SKC		CP	Bell and Gosset	Seal BRGF21	189162LF	1st	Boiler Room	1967	
SKC		Crane	Budgit			Outside	Fleet Yard		2 Ton Crane
SKC		CU	Liebert			Roof		1998	No Tagging
SKC		CU	Liebert			Roof		1998	No Tagging
SKC		CU	Fujitsu	AOU18RLXFW	19301	Roof			R410A, Cooling: 18000 BTU, Heating: 21600 BTU
SKC		CU	Mitsubishi	PU12EK		Roof			Serial Not Legible
SKC		CU	Trane	TTR036C100A3	N445NU8CF	Roof		1998	
SKC		CWP	Paco			Mezz	Mech	1967	Covered by Insulation
SKC		CWP	Paco			Mezz	Mech	1967	Covered by Insulation

Building	Asset Name	Asset Type	Manufacturer	Model #	Serial #	Floor/ Space	Room	Install Date	Comments
SKC	WH-2	DHW	AO Smith	DRE80920	0833M002540	1st	Foam Suppressant	2008	80 Gal, Serves Hazmat
SKC		DHW				1st	Above Men's Fleet	2008	Serves Fleet Bathrooms, 30 Gal, Tag not accessible
SKC		DHW	AO Smith	DVE80917	ME98-0739637917	Mezz	Janitor		80 Gal, Serves Mezz
SKC		DHW	Phoenix	PH199-119	061213D1019510	1st	Boiler Room	2013	119 Gal
SKC		Drum Compactor	Cives Recycling	155DC	0238F	East Bay		1994	10 HP
SKC	EF-01	EF	Penn Ventilator	FX13B		Roof		1998	
SKC	EF-01	EF				Roof		1998	No Tagging
SKC	EF-02	EF				Roof		1998	PSE Bathrooms, No Tag
SKC	EF-03	EF				Roof		1998	No Tagging, Serves Mud Room
SKC	EF-05	EF	Greenheck	CDH-24-5	98718	Roof		1967	Serves Bathrooms
SKC	EF-06	EF	Greenheck	CBH-18-5	98721	Roof		1967	
SKC	EF-06	EF	Greenheck	CBH-18-3	98720	Roof		1967	
SKC	EF-07	EF	Greenheck			Roof		1967	Not Tag

Building	Asset Name	Asset Type	Manufacturer	Model #	Serial #	Floor/ Space	Room	Install Date	Comments
SKC	EF-08	EF	Greenheck	10CBH-24-5	98726	Roof		1967	
SKC	EF-09	EF	Greenheck	CBH-18-5	98717	Roof		1967	
SKC	EF-10	EF	Penn Ventilator	D15		Roof		1998	
SKC	EF-10	EF	Greenheck	CBH-18-5	98727	Roof		1967	
SKC	EF-20	EF	Penn Ventilator	FX10R		Roof		1998	
SKC	EF-22	EF	Greenheck	CUBE-180HP-5	99005980	Roof		1998	
SKC	EF-23	EF	Greenheck	CUBE-100-4	99C08533	Roof		1998	
SKC	EF-3A	EF	Penn Ventilator	FX11Q		Roof		1998	
SKC	EF-3B	EF	Penn Ventilator	FX10R		Roof		1998	
SKC	RV-01	EF	Greenheck	CBH-30-7	98702	Roof		1967	
SKC	RV-02	EF	Greenheck	CBH-30-7	98695	Roof			
SKC	RV-03	EF	Greenheck	CBH-30-7	98710	Roof		1967	
SKC	RV-04	EF	Greenheck	CBH-30-7	98699	Roof		1967	

Building	Asset Name	Asset Type	Manufacturer	Model #	Serial #	Floor/ Space	Room	Install Date	Comments
SKC	RV-05	EF	Greenheck	CBH-30-7	98704	Roof		1967	
SKC	RV-06	EF	Greenheck	CBH-30-7	98698	Roof		1967	
SKC	RV-07	EF	Greenheck	CBH-30-7	98700	Roof		1967	
SKC	RV-08	EF	Greenheck	CBH-30-7	98708	Roof		1967	
SKC	RV-09	EF	Greenheck	CBH-30-7	98696	Roof		1967	
SKC	RV-10	EF	Greenheck	CBH-30-7	98701	Roof		1967	
SKC	RV-11	EF	Greenheck	CBH-30-7	98703	Roof		1967	
SKC	RV-12	EF	Greenheck	CBH-30-7	98706	Roof		1967	
SKC	RV-13	EF	Greenheck	CBH-30-7	98709	Roof		1967	
SKC	RV-14	EF	Greenheck	CBH-30-7	98707	Roof		1967	
SKC	RV-15	EF	Greenheck	CBH-30-7	98697	Roof			Not In Use
SKC	RV-16	EF	Greenheck	CBH-30-7	98705	Roof		1967	
SKC	RV-17	EF	Greenheck	CBH-30-7	98711	Roof		1967	

Building	Asset Name	Asset Type	Manufacturer	Model #	Serial #	Floor/ Space	Room	Install Date	Comments
SKC	RV-18	EF	Greenheck			Roof		1967	Serves Yard Office Restroom, No Tagging
SKC	RV-19	EF	Greenheck	CBH-10-4	98713	Roof		1967	
SKC	RV-20	EF	Greenheck	CBH-18-4	98714	Roof		1967	
SKC	RV-21	EF	Greenheck	CBH-9-11	98724	Roof		1967	Serves Warehouse Office
SKC	RV-22	EF	Greenheck	CBH-14-4	98716	Roof		1967	Not In Use
SKC	RV-26	EF				Roof		1998	
SKC	RV-27	EF	Greenheck	CBH-30-7	98719	Roof		1967	
SKC	RV-28	EF				Roof		1967	No Tagging
SKC	RV-29	EF				Roof		1967	
SKC	RV-34	EF				Roof			No Tagging
SKC	RV-35	EF				Roof		1967	No Tagging
SKC	RV-42	EF	Greenheck	CBH-36-15	98723	Roof		1967	
SKC	SF-02	EF	Penn Ventilator	AF42		Roof		1998	

Building	Asset Name	Asset Type	Manufacturer	Model #	Serial #	Floor/ Space	Room	Install Date	Comments
SKC		EF	Penn Ventilator	FX13B		Roof		1967	Tag Faded
SKC		EF	Penn Ventilator			Roof			
SKC		EF	Penn Ventilator	DX13VSR		Roof			
SKC		EF	Penn Ventilator	DX14B		Roof			
SKC		EF	Penn Ventilator	FX12BH		Roof		1998	
SKC		EF	Penn Ventilator	DX14B		Roof			
SKC		EF	Penn Ventilator	DX14B		Roof		1998	Serves Instructional Test, Calibration, Office, Chemistry
SKC		EF	Penn Ventilator	FX13B		Roof		1998	
SKC		EF	Penn Ventilator	DXXSR		Roof		1967	
SKC		EF	Dayton Electric	4HX87A		Roof		1998	Tag Not Legible
SKC		EF	Jenn-Air	365BCR		Roof		1998	
SKC		EF				1st	Meter Testing Corridor	1996	Serves Bathrooms in Corridor
SKC		EF	Jenn-Air	365BCR		Roof		1998	

Building	Asset Name	Asset Type	Manufacturer	Model #	Serial #	Floor/ Space	Room	Install Date	Comments
SKC	Circ Fan	Fan	Champion Air Movers	9	RA1	Mezz	Mech	1967	Not Operational
SKC	MCC2	Fuel Oil Pump	Worthington	2GUAM		1st	Boiler Room	1967	
SKC		Fume Hood	Labconco			1st	Flammable Waste Handling	1998	
SKC	Crane 00004	Gantry Crane	Yale	2Ton	1-1983-98	1st	Performance		
SKC		Gantry Crane	Gorbel	2 Ton		1st	Paint Room	1998	2 Ton Crane
SKC		Gantry Crane	Gorbel		522163	1st	Meter Testing	1998	
SKC		Gantry Crane	Gorbel		G5254-1	1st	Meter Testing	1998	
SKC		Gantry Crane	Washington Crane	3Ton	2-1983-99	1st	PCB/Oil Waste Storage	1998	
SKC	East Gate	Gate	Hy Security	222-SS-208-10		Outside	East		208V
SKC	NE Gate	Gate	Hy Security	222-35-208-10		Outside	East		Rolling Gate, 208V, Tag Faded
SKC	South Gate	Gate	Hy Security	222EST	022701-1419-405	Outside		2014	
SKC	South Gate 2	Gate	Hy Security	222SST	014200-0820-126	Outside		2008	
SKC		Generator	Cummins/Stanford	BS5000	M14F253982	Outside			

Building	Asset Name	Asset Type	Manufacturer	Model #	Serial #	Floor/ Space	Room	Install Date	Comments
SKC		Generator	Washington			1st	Boiler Room	1967	Not Working
SKC		Generator	Washington			1st	Boiler Room	1967	Not Working
SKC	HP-1	HP	Trane	WSC120A4RGA0YC10 00000003B0		Roof			
SKC	HP-2	HP	Trane	WDC150B40CGA	332101503D	Roof		2003	
SKC	Spilt HP 1	HP CU	Carrier 30GT-030---610	38QN060600SM		Roof			R22
SKC		HP-Split	Fujitsu	AOU18RLFC	LPN002536	Outside	East		Serves Shipping Office, Cooling: 18000, Heating: 21600
SKC	HV-1	HRU/AHU	Reznor			Roof		1998	No Tag, Serves Meter Rooms, Equipment Test, Pump Area, Cleaning Prep, Corridor
SKC	HV-2	HRU/AHU	Heatex	E-5000-1A-9112-1800-EC/IDF	98136-2	Roof		1998	300000 BTU Nat Gas, Serves PCB/Oil Waste Storage
SKC	HV-3	HRU/AHU	Heatex	E-5000-1B-12/16-3800-EC/IDF	98136-3	Roof		1998	3000000 BTU, Serves Transformer Staging and Non-Flammable Waste Handling
SKC	HV-4	HRU/AHU	Heatex	E-5000-1A-9112-1800-EC/IDF	98136-4	Roof		1998	150000 BTU, Nat Gas, Serves Transformer Staging
SKC	HV-5	HRU/AHU	Heatex	E-5000-1A-9112-1800-EC/IDF	98136-5	Roof		1998	Serves Non-Flammable Waste, 150000 BTU Nat Gas
SKC	HV-6	HRU/AHU	Reznor			Roof			Waste Receiving Area, No Tag for Serial and Model
SKC	HWP-1	HWP	Crane Demming	BF 6-1/8	DC-926905	1st	Boiler Room	1967	

Building	Asset Name	Asset Type	Manufacturer	Model #	Serial #	Floor/ Space	Room	Install Date	Comments
SKC	HWP-2	HWP	Peerless Pump	1-610AM	9927080197-10-A	1st	Boiler Room		Replaced, Unsure of date
SKC	HWP-3	HWP	Crane Demming	BF 6-1/8		1st	Boiler Room	1967	No tag
SKC	UH-15	UH				1st	Warehouse	1967	Serves Warehouse
SKC		IRH	Radiant Optics			1st	Shipping and Staging	1998	Serves Receiving Desk
SKC		IRH	Radiant Optics			1st	Warehouse	1998	Serves Warehouse
SKC		IRH	Radiant Optics			1st	Warehouse	1998	Serves Warehouse
SKC		IRH	Radiant Optics			1st	Warehouse	1998	Serves Warehouse
SKC		IRH	Radiant Optics			1st	Warehouse	1998	Serves Warehouse
SKC	WL11-3	Lab Hood	Kewannee Scientific			1st	Standards Lab		No tag
SKC		Lab Hood	Labconco			1st	Standards Lab		No tag
SKC	P4	Oil Pump	ITT	1AOD-ABBB	B01B1100	1st	Oil Tank Storage	1998	
SKC		Pressure Washer	Mi-T-M	HEG-2004-0-E9G	15092458	1st	Meter Testing Corridor	2004	
SKC	S1	Pump	Peerless Pump	F-21025A	MD14781	1st	Boiler Room	1967	9" Diameter

Building	Asset Name	Asset Type	Manufacturer	Model #	Serial #	Floor/ Space	Room	Install Date	Comments
SKC	S2	Pump	Peerless Pump			1st	Boiler Room	1967	No tag on pump
SKC	S3	Pump	Peerless Pump	TT820AN	9150313	1st	Boiler Room	1967	8" Diameter
SKC	OHD	Roll Up Door				1st	Secondary Facility Storage	1980	
SKC	OHD-01	Roll Up Door	Crawford			1st	Warehouse	1967	
SKC	OHD-02	Roll Up Door	Crawford			1st	Warehouse	1967	
SKC	OHD-03	Roll Up Door	Crawford			1st	Warehouse	1967	
SKC	OHD-04	Roll Up Door	Crawford			1st	Warehouse	1967	
SKC	OHD-05	Roll Up Door	Crawford			1st	Warehouse	1967	
SKC	OHD-06	Roll Up Door	Crawford			1st	Warehouse	1967	
SKC	OHD-07	Roll Up Door	Crawford			1st	Warehouse	1967	
SKC	OHD-08	Roll Up Door	Crawford			1st	Warehouse	1967	
SKC	OHD-09	Roll Up Door	Crawford			1st	Warehouse	1967	
SKC	OHD-10	Roll Up Door	Crawford			1st	Warehouse	1967	

Building	Asset Name	Asset Type	Manufacturer	Model #	Serial #	Floor/ Space	Room	Install Date	Comments
SKC	OHD-11	Roll Up Door	Crawford			1st	Warehouse	1967	
SKC	OHD-12	Roll Up Door	Crawford			1st	Warehouse	1967	
SKC	OHD-13	Roll Up Door	Crawford			1st	Warehouse	1967	
SKC	OHD-14	Roll Up Door	Crawford			1st	Warehouse	1967	
SKC	OHD-15	Roll Up Door	Crawford			1st	Warehouse	1967	
SKC	OHD-16	Roll Up Door	Crawford			1st	Warehouse	1967	
SKC	OHD-A	Roll Up Door	Lift Master			1st	Warehouse	1998	Not accessible
SKC	OHD-B	Roll Up Door	Lift Master			1st	Warehouse	1998	Not accessible
SKC	OHD-B4	Roll Up Door	Lift Master			1st	Fleet		Door B4
SKC	OHD-C	Roll Up Door	Lift Master			1st	Warehouse	1998	Not accessible
SKC	OHD-D	Roll Up Door	Lift Master			1st	Warehouse	1998	Not accessible
SKC	OHD-E	Roll Up Door	Lift Master			1st	Warehouse	1998	Not accessible
SKC	OHD-F	Roll Up Door	Lift Master			1st	Warehouse	1998	Not accessible

Building	Asset Name	Asset Type	Manufacturer	Model #	Serial #	Floor/ Space	Room	Install Date	Comments
SKC	OHD-G	Roll Up Door	Lift Master			1st	Warehouse	1998	Not accessible
SKC	OHD-H	Roll Up Door	Lift Master			1st	Warehouse	1998	Not accessible
SKC	OHD-I	Roll Up Door	Lift Master			1st	Warehouse	1998	Not accessible
SKC	OHD-J	Roll Up Door	Lift Master			1st	Warehouse	1998	Not accessible
SKC	OHD-K	Roll Up Door	Lift Master			1st	Warehouse	1998	Not accessible
SKC		Roll Up Door	A.O. Smith			South Yard			
SKC		Roll Up Door	Crawford			1st	Boiler Room	1967	Not accessible
SKC		Roll Up Door	Link			1st	Performance	1998	Not accessible
SKC		Roll Up Door	Lift Master			1st	Meter Testing	1998	Not accessible
SKC		Roll Up Door	Lift Master	GH754SM	1102800000000010	1st	Meter Test Room	1998	
SKC		Roll Up Door	Lift Master	GH5043M	208-A8-44284	1st	Meter Testing	1998	
SKC		Roll Up Door	Lawrence			1st	Non-Flammable Waste	1998	
SKC		Roll Up Door				1st	Non-flammable Waste	1998	Not Accessible

Building	Asset Name	Asset Type	Manufacturer	Model #	Serial #	Floor/ Space	Room	Install Date	Comments
SKC		Roll Up Door				1st	Waste Management Loading	1998	
SKC		Roll Up Door				1st	Shipping and Staging		Tag not accessible
SKC		Roll Up Door	Lift Master			1st	Receiving	1967	
SKC		Roll Up Door	Wayne Dalton			1st	Tool Storage	1998	
SKC		Roll Up Door	Wayne Dalton			1st	Tool Storage	1998	
SKC		Roll Up Door	Lift Master			1st	Fleet		Grate Door
SKC		Roll Up Door	Lift Master			1st	Fleet		
SKC		Roll Up Door	Lift Master			1st	Fleet Corridor		
SKC		Roots Proover	Roots	5 Roots	POB2492	1st	Meter Testing	1981	
SKC		Spray Booth Exhaust	JBI	IEFC-187	25259	1st	Paint Room	1998	
SKC		Transfer Fan				1st	Fleet		
SKC		Transfer Fan				1st	ICON Hall		
SKC	UH-1	UH				1st	Meter Testing	1967	Not accessible

Building	Asset Name	Asset Type	Manufacturer	Model #	Serial #	Floor/ Space	Room	Install Date	Comments
SKC	UH-11	UH				1st	Warehouse	1967	Serves Warehouse
SKC	UH-12	UH				1st	Warehouse	1967	Serves Warehouse
SKC	UH-13	UH				1st	Warehouse	1967	Serves Warehouse
SKC	UH-14	UH				1st	Warehouse	1967	Serves Warehouse
SKC	UH-16	UH				1st	Warehouse	1967	
SKC	UH-17	UH	Trane			1st	Warehouse		
SKC	UH-18	UH	Trane			1st	Warehouse		
SKC	UH-19	UH				1st	Warehouse	1967	
SKC	UH-20	UH				1st	Warehouse	1967	
SKC	UH-21	UH				1st	Warehouse	1967	
SKC	UH-22	UH				1st	Warehouse	1967	
SKC	UH-23	UH				1st	Warehouse	1967	
SKC	UH-8	UH				1st	Warehouse	1967	Serves Warehouse

Building	Asset Name	Asset Type	Manufacturer	Model #	Serial #	Floor/ Space	Room	Install Date	Comments
SKC	UH-9	UH				1st	Warehouse	1967	Serves Warehouse
SKC		UH				Mezz	Mech	1967	Hydronic
SKC		UH				1st	Meter Testing Corridor	1967	Serves Meter Test Corridor
SKC		UH				1st	Waste Management Loading	1967	Serves Waste Management Loading
SKC		UH				1st	Warehouse	1967	Serves Warehouse
SKC		UH				1st	Shipping and Staging	1967	Serves Shipping and Receiving
SKC		UH	Dunham/Bush			1st	Secondary Facility Storage	1967	
SKC		Vacuum	Busch	OTMS-1-labMM1144	0971.909.3674	1st	Meter Test Closet	2014	

AC -1 Roof.jpg

AC-2 Roof.jpg

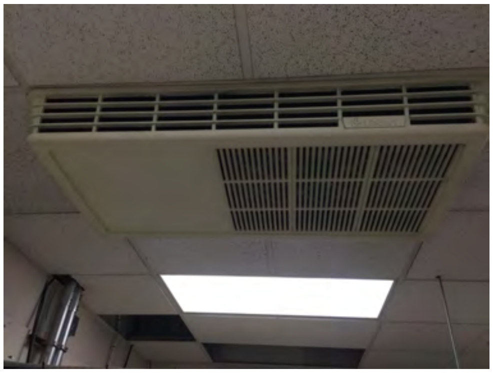
AC-3 Roof.jpg

AC Split Communications.jpg

AC Split Icon Data Room.jpg

AC Split Meter Testing.jpg

AC Split Mezz IDF.jpg



AC Split Mezz Fire Control Room.jpg

ACR-1 Boiler Room.jpg

ACR Boiler Room 1.jpg

ACR Boiler Room 2.jpg

ACR Boiler Room 3.jpg

ACR Boiler Room 4.jpg

ACR Fleet Yard.jpg

ACR Fire Riser.jpg

Air Curtain Receiving.jpg

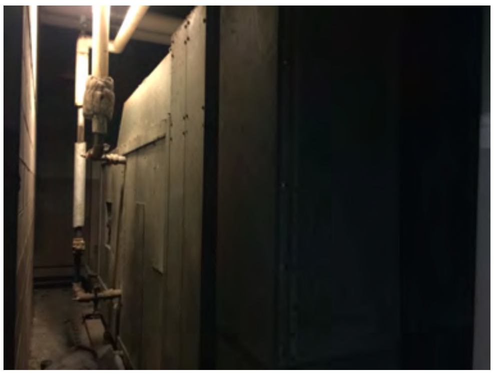
AHU-1 Roof.jpg

AHU-2 Roof.jpg

AHU-3 Roof.jpg

AHU-3 Mech Mezz.jpg

AHU-4 Mech Mezz.jpg



AHU-X Mech Mezz.jpg

Boiler (old) Boiler Room.jpg

Boilers Boiler Room.jpg

BP-2 Boiler Room.jpg

Boiler Circ 1 Boiler Room.jpg

Boiler Circ 2 Boiler Room.jpg

Boiler Circ 3 Boiler Room.jpg

BP-1 Boiler Room.jpg

CAC-1 Boiler Room.jpg

Circ Fan Mech Mezz.jpg

Chiller Abandoned.jpg

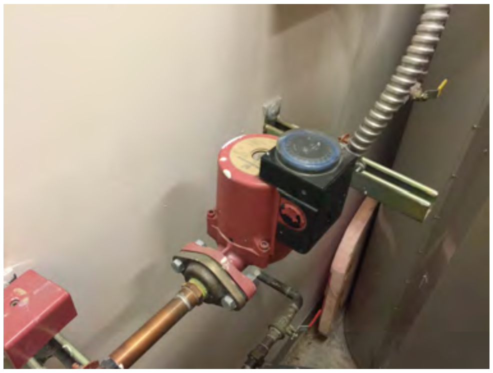
Chiller 1 Mech Mezz.jpg

Chiller Roof.jpg

Conv 1 Elev Mech.jpg

Cooling Tower Roof.jpg

CP Boiler Room.jpg



CP-2 Foam Supressor Room.jpg

Crane Outside Fleet.jpg

CU Roof 1.jpg

CU Roof 2.jpg

CU Roof 3.jpg

CU Roof 4.jpg

CU Roof 5.jpg

CWP Mech Mezz 1.jpg

CWP Mech Mezz 2.jpg

DWH Above Mens Fleet.jpg

DHW Boiler Room.jpg

DWH Mezz Janitor.jpg

Drum Compactor East Bay.jpg

Generator Outside South.jpg

Heat Pump Split Outside East.jpg

HV-1 Roof.jpg

HV-2 Roof.jpg

HV-3 Roof.jpg

HV-4 Roof.jpg

HV-5 Roof.jpg

HV-6 Roof.jpg

East Gate Outside East.jpg

NE Gate Outside East.jpg

South Gate Outside South.jpg

South Gate 2 Outside South.jpg

EF-1 Roof.jpg

EF-2 Roof.jpg **EF-3 Roof.jpg** **EF-3A Roof.jpg**

EF-3B Roof.jpg **EF-5 Roof.jpg** **EF-6 Roof.jpg**

EF-7 Roof.jpg **EF-8 Roof.jpg** **EF-9 Roof.jpg**

EF-10 Roof.jpg

EF-20 Roof.jpg

EF-22 Roof.jpg

EF-23 Roof.jpg

EF Meter Test Coridoor.jpg

EF Roof 1.jpg

EF Roof 2.jpg

EF Roof 3.jpg

EF Roof 4.jpg

EF Roof 5.jpg

EF Roof 6.jpg

EF Roof 7.jpg

EF Roof 8.jpg

EF Roof 9.jpg

EF Roof 10.jpg

EF Roof 11.jpg

EF Roof 12.jpg

EF Roof 13.jpg

EF Roof 14.jpg

EF Roof 15.jpg

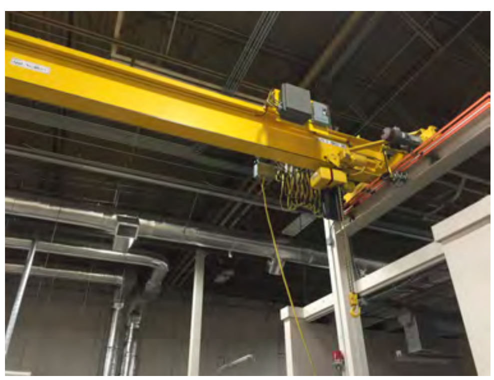
Fan No 1 Mech Mezz.jpg

Fan No 2 Mech Mezz.jpg

Fan No 6 Mech Mezz.jpg

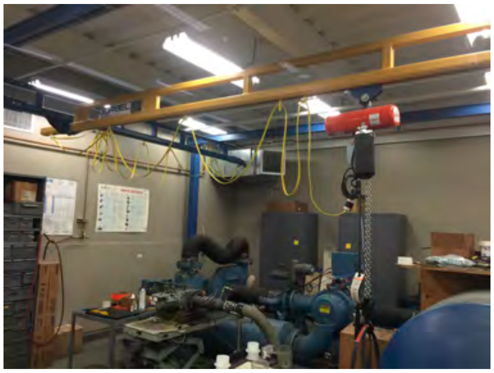
Fan No 7 Mech Mezz.jpg

Fuel Oil Pump Boiler Room.jpg



Gantry Crane 00004 Performance.jpg

Gantry Crane Spray Booth.jpg



Gantry Crane Meter Testing 1.jpg

Gantry Crane Meter Testing 2.jpg

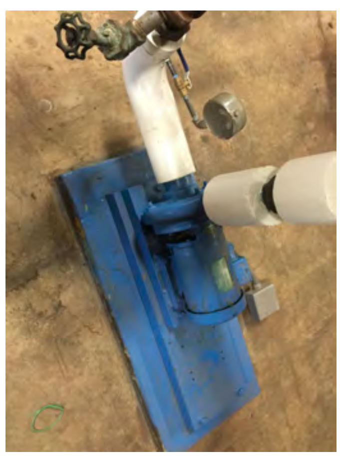
Gantry Crane PCB_Oil Waste.jpg

Generators Boiler Room.jpg

HP-1 Roof.jpg

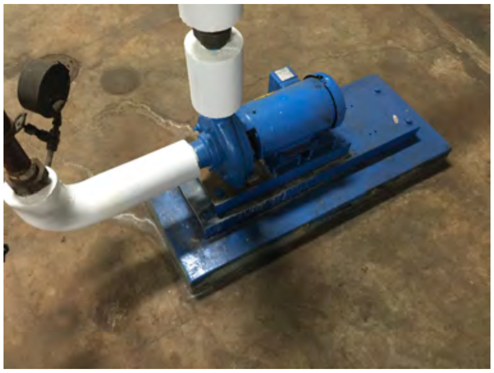
HP-2 Roof.jpg

Heat Pump Roof 1.jpg



HWP-1 Boiler Room.jpg

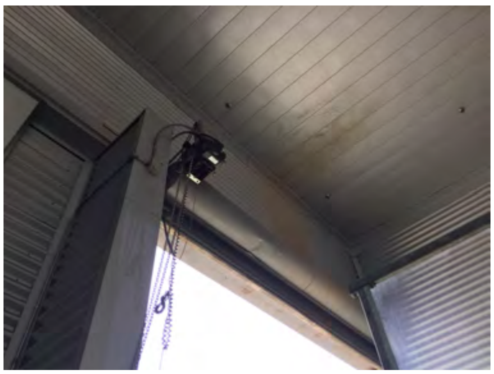
HWP-2 Boiler Room.jpg



HWP-3 Boiler Room.jpg

Lab Hood Standards Lab 1.jpg

Lab Hood Standards Lab 2.jpg



OHD South Yard.jpg

OHD Meter Testing 4.jpg

OHD Performance.jpg

OHD Meter Testing 1.jpg

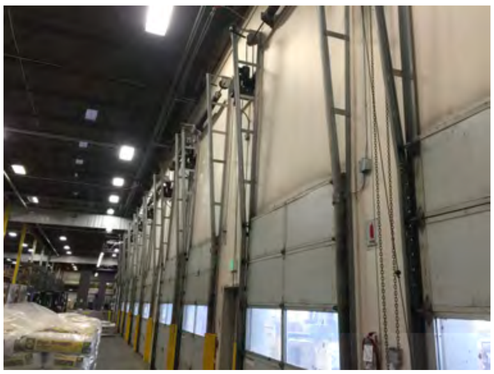
OHD Meter Testing 2.jpg

OHD Non-Flamable Waste 1.jpg

OHD Meter Testing 3.jpg

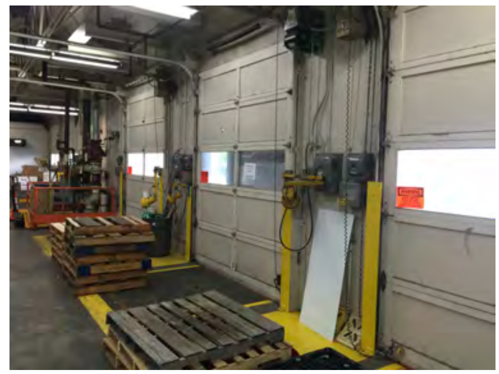
OHD Non-Flamable Waste 2.jpg

OHD Waste Management Storage.jpg



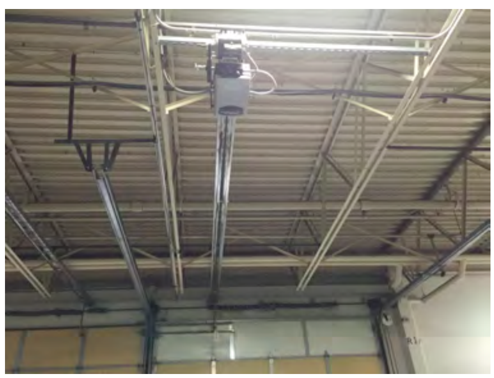
OHD A-K Warehouse.jpg

OHD Shipping and Recieving.jpg



OHD 1-16 Warehouse.jpg

OHD Receiving.jpg



OHD Fleet 1.jpg

OHD Fleet 2.jpg

OHD Fleet 3.jpg

OHD Tool Storage 1.jpg

OHD Fleet Coridoor.jpg

OHD Secondary Facility Storage.jpg

Pressure Washer Meter Test Coridoor.jpg

Pump P4 Oil Tank Storage.jpg

Roots Proover Meter Testing.jpg

RV-1 Roof.jpg

RV-2 Roof.jpg

RV-3 Roof.jpg

RV-4 Roof.jpg

RV-5 Roof.jpg

RV-6 Roof.jpg

RV-7 Roof.jpg

RV-8 Roof.jpg

RV-9 Roof.jpg

RV-10 Roof.jpg

RV-11 Roof.jpg

RV-12 Roof.jpg

RV-13 Roof.jpg

RV-14 Roof.jpg

RV-15 Roof.jpg

RV-16 Roof.jpg

RV-17 Roof.jpg

RV-18 Roof.jpg

RV-19 Roof.jpg

RV-20 Roof.jpg

RV-21 Roof.jpg

RV-22 Roof.jpg

RV-26 Roof.jpg

RV-27 Roof.jpg

RV-28 Roof.jpg

RV-29 Roof.jpg

RV-34 Roof.jpg

RV-35 Roof.jpg

RV-42 Roof.jpg

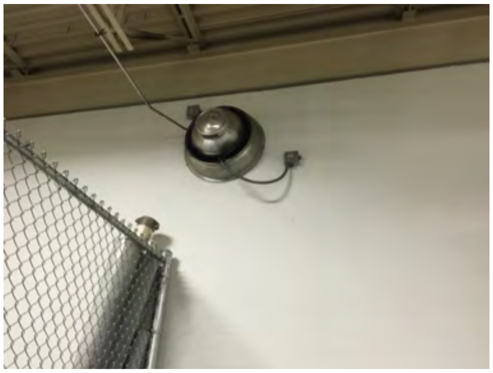
S1 Boiler Room.jpg

S2 Boiler Room.jpg

S3 Boiler Room.jpg

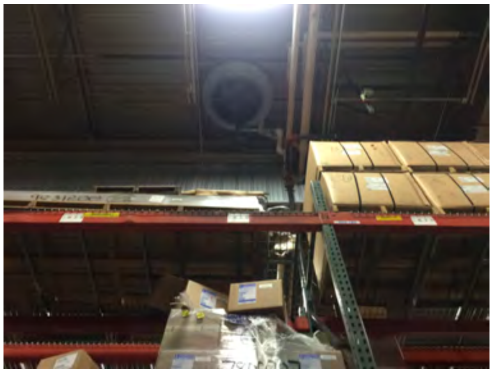
SF-2 Roof.jpg

Spray Booth Exhaust Paint Room.jpg

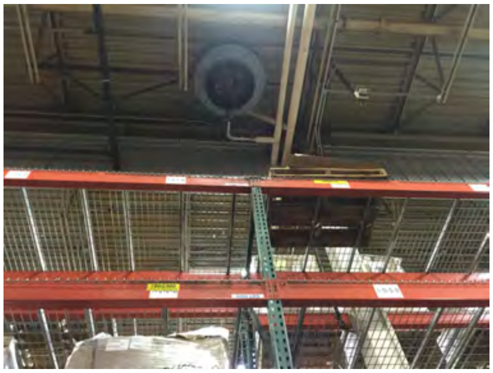


Transfer Fan Fleet.jpg

Transfer Fan Icon Hall.jpg



UH-8 Warehouse.jpg

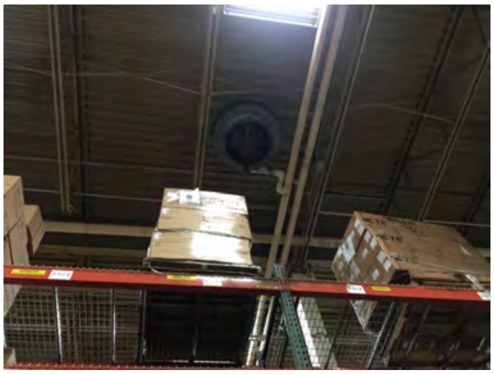


UH-9 Warehouse.jpg

UH-11 Warehouse.jpg

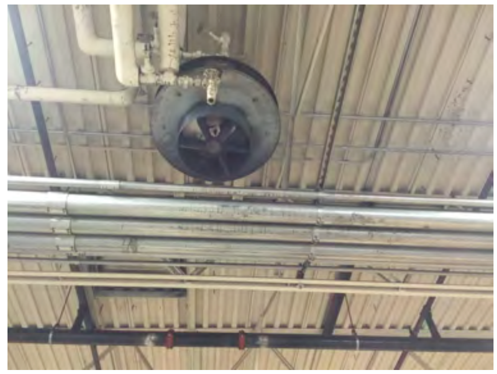
UH-12 Warehouse.jpg

UH-13 Warehouse.jpg



UH-14 Warehouse.jpg

UH-15 Receiving.jpg



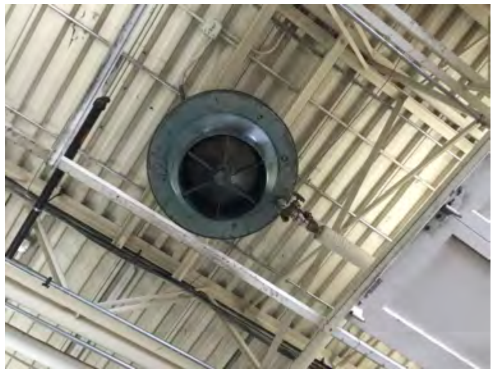
UH-16 Warehouse.jpg

UH-17 Warehouse.jpg

UH-18 Warehouse.jpg

UH-19 Receiving.jpg

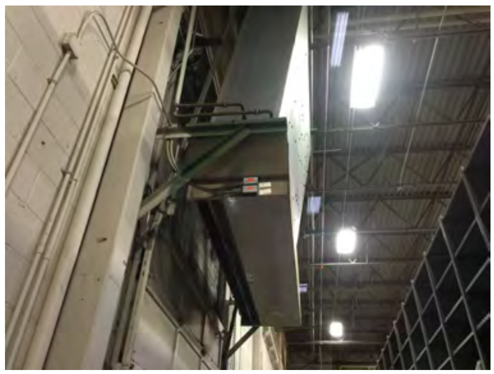
UH-20 Receiving.jpg



UH-21 Receiving.jpg

UH-22 Receiving.jpg

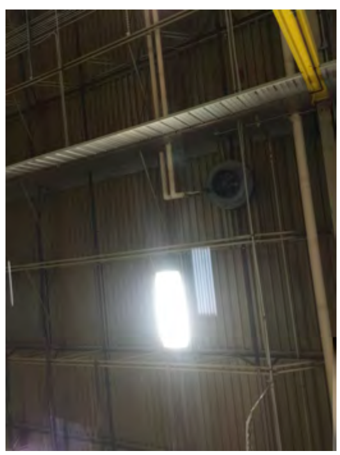
UH-23 Receiving.jpg



UH-31 Shipping and Recieving.jpg

UH Meter Test Coridoor.jpg

UH Mech Mezz 1.jpg

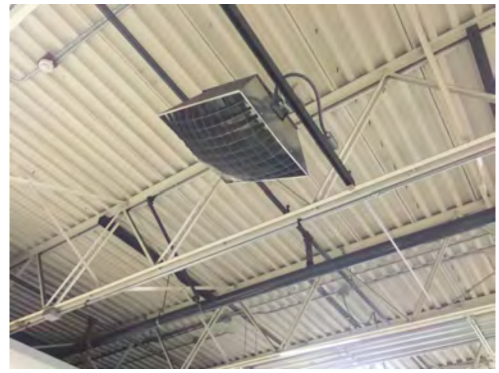


UH Shipping and Recieving 1.jpg

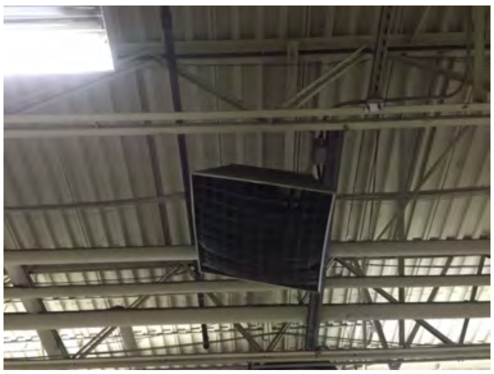
UH Shipping and Recieving 2.jpg

UH Warehouse 2.jpg

UH Warehouse 3.jpg

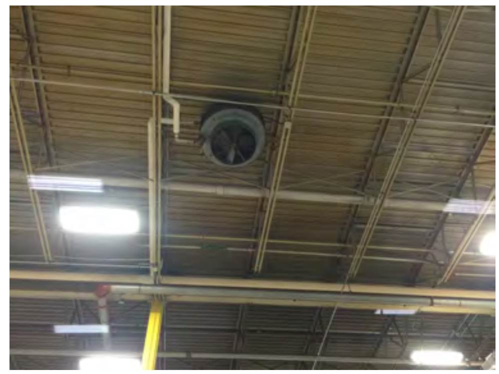


UH Warehouse 4.jpg

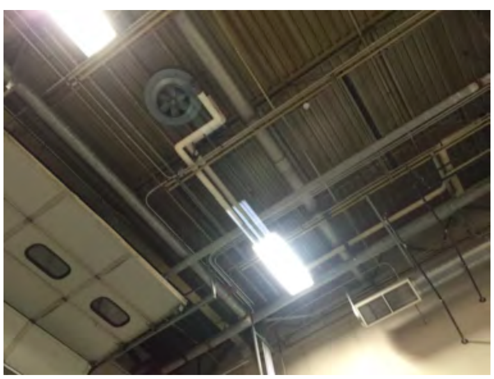


UH Warehouse 5.jpg

UH Meter Testing.jpg



UH Warehouse 1.jpg



UH-7 Waste Management

UH Secondary Facility Storage.jpg

Vacuum System Meter Testing.jpg

WH-2 Foam Supressor Room.jpg

X. APPENDIX

This appendix includes supporting documentation related to the FCA process.

10.1 Contracted Scope of Work

STATEMENT OF WORK
PSE OUTLINE AGREEMENT
No. 4600009117

This Statement of Work ("Statement of Work" or "SOW"), effective as of the date of the last signature below, is made pursuant to and shall be governed by the Terms and Conditions of the Master Service Agreement No. 4600009112 dated as of April 5, 2016, (the "Agreement"), by and between **EGM Inc., P.S. dba Meng Analysis (**"Consultant"), and **Puget Sound Energy, Inc.** ("PSE"). This SOW shall be subject to all the Terms and Conditions set forth in the Agreement, except as may be specifically modified hereby with reference to the section of the Agreement modified. Capitalized terms used but not defined herein shall have the meanings ascribed to them in the Agreement.

1 OVERVIEW – PROJECT SUMMARY

This SOW details the scope of services to be provided by Consultant (the "Services") and deliverables to be created (the "Deliverables") for the **South King Complex Facility Condition Assessment** (the Services and Deliverables constituting the "Project").

1.1 Location

Services will take place at PSE's South King Complex facility at **6905 S. 228th St, in Kent, King County, Washington**, and at MENG Analysis office in Seattle, WA or as otherwise agreed between the parties.

Access, remote or otherwise, to PSE's IT network and computer systems is not required.

1.2 Project Timeline

- Estimated Project Start: April 4, 2016
- Estimated Project Completion: May 31, 2015
- Estimated Project Duration: 8 weeks

2 DESCRIPTION OF WORK

2.1 Project Scope

Under this Statement of Work, Consultant will perform the following Services:

Provide detailed inspections and assessments of the entire South King Complex (SKC) facility by architectural and engineering professionals or other equivalent facility assessment professionals such as building surveyors to report on deficiencies and produce an accurate analysis that identifies visible and discernable (through non-destructive means) condition of components and elements requiring maintenance, repair or other planned action up to and including replacement.

The condition assessment shall, at a minimum, comply with ASTM E2018-15 Standard Guide for Property Condition Assessments: Baseline Property Condition Assessment

Process or equivalent, and ASTM E2026-07 Standard Guide for Seismic Risk Assessment of Buildings to the extent mutually agreed to as needed.

The facility condition assessment will consist of the following phases as detailed below and referenced in “Exhibit A - PSE FCA Schedule Update”, attached hereto:

Phase IA	Facility Assessment Planning
Phase IB	Critical Areas and Natural/Geologic Hazard Risk Assessment
Phase II	On-Site Facility Condition Assessment
Phase III	Analysis of Facility Conditions Assessment Information
Phase IV	Facility Condition Assessment Report Preparation
Phase V	Preparation of Strategic Plan

A. Phase IA Facility Assessment Planning

Review current asset information and establish an access protocol and scheduling. Provide a project memorandum for review and approval by PSE which briefly explains the purpose for the assessment, what is to be included in the assessment and a proposed schedule and tasks to be performed.

B. Phase IB Critical Areas and Natural/Geologic Hazard Risk Assessment

Conduct a critical areas review and a natural/geologic hazard risk assessment for the facility and access to the location. Also see Phase II - On Site Facility Condition Assessment and the ASCE/SEI 41-13 Seismic Evaluation and Retrofit of Existing Buildings, Tier 1, Risk Category IV requirement.

C. Phase II On Site Facility Condition Assessment

Conduct a detailed on-site condition assessment of the facility including an ASCE/SEI 41-13 Seismic Evaluation and Retrofit of Existing Buildings, Tier 1, Risk Category IV and include all necessary information to assign an industry standard building system classification.

The FCA team shall review available “as-built” documentation and shall schedule an appropriate number of workshops or meetings, but at least one, with PSE personnel to collect and document anecdotal information about the facility.

The on-site assessment will be performed using both component-level and system-level inspection methods. The assessment team(s) will evaluate each asset to determine whether there is sufficient evidence to warrant complete replacement of the system, or if repairing only portions of the system is preferable or more cost effective.

The following minimum assessments will be accomplished:

1. Identify maintenance, repair, and replacement requirements including recommendations for sustainable or more efficient operations.
2. Recommend upgrades and improvements where applicable, considering efficiency and environmental improvements.

3. Assess real plant property such as buildings, structures, and utilities and their integral components/systems. (Copies of the building floor plans, other drawings and related documents including maintenance history records where possible will be made available to the FCA team.)

4. Perform a thorough visual assessment of all architectural, civil / structural, mechanical, electrical, fire, plumbing, and sewer components/systems of the facility. Specific in depth work identified and recommended is not included in the initial FCA scope of work, but may be added to the scope of work at additional cost agreeable to PSE.

5. Identify and report all civil, structural, roofs, mechanical and electrical deficiencies and provide recommended upgrades and improvements.

6. Perform an Infrared Thermographic (IRT) survey of: A) the main electrical switchgear and penthouse switchboards to identify any thermal issues and deficiencies, and B) the building envelope in two separate parts - 1) exterior perimeter ground floor walls, and 2) the main roof to identify any thermal and moisture-related issues and deficiencies; analyze the scans and report the results with conclusions and actionable recommendations and estimated costs, if any.

7. Identify and immediately report to PSE components or situations that are considered urgent and potentially endangering life and/or property.

8. The facility condition assessments will focus on the following property elements:

- **a.** Substructure – foundations, basements, tunnels
- **b.** Building Structure – structural systems: types, gravity and lateral; slabs, load-bearing walls, columns, girders, beams, trusses, floor slabs, and roofs
- **c.** Building Envelope – walls, exterior cladding, curtain wall, storefront, windows, exterior doors, roofing
- **d.** Interior Construction – partitions/walls, doors, floors, visible structural components, ceilings and ceiling systems
- **e.** Interior Finishes: general, flooring and floor coverings
- **f.** Lighting
- **g.** Health/Fire/Life Safety systems, emergency egress lighting
- **h.** Disabled Accessibility - ADA requirements
- **i.** Heating, Ventilation and Air Conditioning Systems
- **j.** Plumbing Systems
- **k.** Building Electrical and Service Distribution
- **l.** Site Electrical and Service Distribution
- **m.** Fire Suppression Systems
- **n.** Special Electrical Systems and Emergency Power

o. HVAC Building Control Systems

p. Lighting Control Systems

q. Vertical Transportation – Elevator

r. Special Components – Cranes, Hoists, Dock levelers

s. Site - Roadways, driveways, parking lots, sidewalks, exterior lighting

t. Site - Water (not irrigation), Sanitary and Storm sewers

u. Site – Drainage and Water-quality ponds

v. Site - Fencing and Gates

9. Inventory and provide a spreadsheet of all maintainable equipment and systems within the building, using PSE furnished inventoried equipment information. The spreadsheet shall at a minimum provide the following information:

a. Equipment Type
b. Location
c. Function and area served
d. Manufacturer
e. Model Number
f. Serial Number
g. Capacity if applicable
h. Estimated remaining life

Maintainable equipment includes but is not limited to the following types of items:

a. Building and HVAC Controls

b. Boilers

c. Chillers

d. Cooling Towers

e. Ducts

f. Lighting

g. Package HVAC Units

h. Major Exhaust Equipment

i. Hot Water Heaters

j. Air Handling Units and Controls

k. Commercial Overhead Doors/Sliders

l. Compressors/Refrigeration

m. Fire Alarms and Pumps

n. Pumps

o. Electrical Service Equipment

D. Phase III Analysis of Facility Condition Assessment

1. The consultant shall evaluate, analyze and provide projections for the following areas:

   a. Deficiency costs summarized by building system.

   b. Deficiency costs summarized by Priority.

   c. Deficiency costs summarized by Category type.

   d. Calculation of a Facility Condition Index (FCI) for the facility.

   e. Multi-year annual expenditure forecast for the facility.

2. The consultant shall develop a five-year and ten-year expenditure plan, which is a schedule of any Capital and O&M expenditures and actions required to maintain and repair the facility, including projects developed during the analysis of facility condition information, unconstrained by funding limitations.

3. The consultant analysis will include the calculation of a facility condition index (FCI) for the building. FCI is the ratio of the deficiencies (regular and deferred maintenance, and repair and replacement cost) to the current replacement value.

4. The consultant shall utilize life cycle analysis for component renewal and propose to PSE for approval the standards proposed to develop component renewal costs. Building components will be evaluated based on their individual life cycles, determined by an evaluation of the age. The renewal cost for the components will be computed and identified by renewal year. The consultant will report the life cycle costs at the component-level, and building-level, and will provide a grand total.

Deficiency Priorities

Each deficiency and potential follow-on project shall include the following decision-making classifications, or an acceptable alternative classification, prioritizing each action according to its criticality and classification type:

Priority 1 Currently Critical

Conditions in this category require immediate action to:

- Correct a cited safety hazard
- Stop accelerated deterioration
- Return a facility or equipment to operation

Priority 2 Potentially Critical

- Conditions in this category, if not corrected expeditiously, will become critical within a year. Situations within this category include:
- Intermittent operations
- Rapid deterioration

- Potential life safety hazards

Priority 3 Necessary - Not yet critical
Conditions in this category require appropriate attention to preclude deterioration or potential downtime and the associated damage or higher costs if deferred further.

Priority 4 Recommended
Conditions in this category include items that represent a sensible improvement to existing conditions. These are not required for the most basic function of the facility.

Priority 5 Appearance
Conditions in this category include finishes that have deteriorated and are required to maintain the required aesthetic standards.

Priority 6 Does Not Meet Current Codes/Standards - "Grandfathered"
Conditions in this category include items that do not conform to existing codes, but are "grandfathered" in their present condition. No action is required at this time, but should substantial work be undertaken in contiguous areas, certain existing conditions may require correction to comply with current code standards.

Maintenance & Capital Requirements Classification Categories

Each deficiency identified in the field assessment shall be classified in the following manner or an acceptable alternative manner:

Category 1 – Scheduled Maintenance
Maintenance that is planned and performed on a routine basis to preserve the condition.

Category 2 – Deferred Maintenance
Maintenance that was not performed when it was scheduled or is past its useful life resulting in immediate repair or possible replacement.

Category 3 – Capital Renewal & Replacement
Planned replacement of building systems that have reached the end of their useful life.

Category 4 – Energy & Sustainability
When the repair or replacement of equipment or systems are recommended to improve energy and sustainability performance.

Category 5 – Security
When a system requires replacement due to a security risk or requirement.

E. Phase IV Facility Condition Assessment Report

Using the data collected during the on-site facility condition assessment and analysis phase, the consultant shall provide a separate comprehensive condition assessment report for the facility.

The reports shall contain the following minimum information:

- **a.** Capital requirement costs summarized by building system.
- **b.** Capital requirement costs summarized by Priority across.
- **c.** Capital Requirement costs summarized by Category type across.
- **d.** Calculation of the Facility Condition Index (FCI) for the facility
- **e.** Multi-year annual expenditure forecast for the facility.
- **f.** A detailed description of building assets and equipment detailing the observed condition and deficiency cause providing recommendations to correct the deficiency.
- **g.** A list of the information provided and collected for each asset, such as equipment type, manufacturer, model number, serial number, capacity and year installed.
- **h.** Digital photographs for each facility and each piece of equipment inventoried. Exterior photographs will be used for identification and documentation of structural problems, major deficiencies or special conditions. Interior photographs will be used to document critical or unusual conditions. Photographs will be used to explain and / or justify the prioritization of corrective actions.
- **i.** A schedule of annual forecast expenditures itemizing each deficiency against each asset classification of the total cost for the actions required to correct the deficiencies for each facility by building system.
- **j.** Critical Areas and Natural/Geologic Hazard and Seismic Risk report.
- **k.** Miscellaneous observations and other relevant information.

F. Phase V Preparation and Presentation of Strategic Plan

The consultant shall present the assessment findings through reports, graphs and charts which provide a visual representation of the condition assessment data.

The material prepared shall be clear, detailed and sufficient to reflect the scope of the problems and funding needs.

The consultant shall use the data collected to make two to three presentations, one to staff, one to Management, and one to the Executive Team if required.

Photographic documentation of observed or noted deficiencies shall be included in the FCA report, except where a photograph is infeasible or impracticable to obtain.

All assigned Consultant resources shall be retained throughout the term of the Project. NERC-CIP certification is not required for Project resources.

Consultant shall provide prompt notice of any risk or issue that has the potential to jeopardize the Project's success, and shall participate as appropriate in actions to mitigate.

2.2 Assumptions

The successful completion of the Project may rely in part on the following:

- No unusual (non-typical), unexpected or hidden conditions, or hazardous materials are discovered which could interfere with or delay the field survey work, impact the schedule.
- Coordination of work and sequencing of work with separate PSE contractors and vendors if any.
- Work will occur during normal business hours except that some after-hours and weekend work may be necessary to lessen impacts to and disruptions of the building occupants, or to perform some activities such as Infrared Thermographic (IRT) surveys.
- No Storm or Emergency event such as a seismic event/natural disaster or an electrical or gas system failure occurs which would impact access and ability to work at the SKC facility.

3 DELIVERABLES & MILESTONES

In addition to the Services specified in Section 2.1, Consultant shall provide the following Deliverables: Facility Condition Assessment Report including observations, analyses, recommendations, photographs, and cost estimates incorporating ASCE 41-13 Structural/Seismic Analysis, ASTM E2026-07 investigations and Infrared Thermographic (IRT) Scans, and any exhibits.

Milestones (Preliminary Dates & Durations):

	Task Name	Start Date	Finish Date
	FCA - Phase IA: Project Preparation	**4/6/16**	**4/22/16**
	Documentation Review	4/6/16	4/12/16
	Cost Modeling	4/12/16	4/12/16
	Database Setup	4/13/16	4/18/16
	O&M Workshop	4/21/16	4/21/16
	FCA Team Logistics	4/21/16	4/27/16
	FCA - Phase IB: Critical Areas & Natural Hazards	**4/13/16**	**4/15/16**
	FCA - Phase II: Survey	**4/22/16**	**5/4/16**
	Site/Field Work	4/28/16	4/29/16
	Documentation	5/2/16	5/4/16
	FCA - Phase III & IV:	**5/5/16**	**5/30/16**
	Data Entry & Analysis	5/5/16	5/13/16
	QC/Cost Reviews	5/10/16	5/13/16
	Draft Report / Review & Edits	5/13/16	5/20/16
	Final Report	5/23/16	5/30/16
	FCA - Phase V:	**5/30/16**	**6/1/16**
	Presentations	TBD	TBD

4 PRICING

4.1 Project Pricing Table

Fixed Fee Table

Services & Deliverables	Fixed Fee
Fundamental FCA Services	
Phase I: FCA Project Preparation & Management	7,100.00
Phase II: FCA Field Surveys	16,400.00
Phase III - V: FCA Analysis, Reports & Presentations	22,600.00
Subtotal	46,100.00
Structural/Seismic Analysis: ASCE 41-13 Tasks	
Field Survey/Document Review	2,875.00
ASCE 41-13 Checklist - Building Area 1 & Document Review	3,565.00
ASCE 41-13 Checklist - Building Area 2 & Document Review	3,565.00
Cost Study/Review with Estimator	1,610.00
ASCE 41-13 Report	2,990.00
Subtotal	14,605.00
Structural/Seismic Analysis: ASTM E2026-07 Tasks	
A. ASTM E2026-07 Report: Type 1 & 2 Investigation	2,760.00
B. Non-structural Components Checklist - ASTM E2026-07 Expansion	
Type 3 Investigation	2,990.00
Type 3 Investigation	2,070.00
Type 3 Investigation	2,070.00
Subtotal	8,960.00
Infrared Thermographic (IRT) Scans	
Main Electrical Switchgear & Penthouse Switchboards	8,299.00
Building Envelope – Perimeter Walls & Roof	6,328.00
Subtotal	14,627.00
Subtotal	84,292.00
State & Local Sales Taxes *(N/A)*	*0.00*
Total	84,292.00
Estimated Expenses *(N/A)*	*0.00*
Grand Total (Lump Sum Fee)	**84,292.00**

The fee shall be invoiced monthly upon PSE's written acceptance of the applicable deliverable or upon agreed scope of work progress as a percentage of the project's completion.

4.2 Payment Terms

Payment terms shall be as specified in the Agreement. PSE reserves the right to reject any invoice submitted greater than 90 days after the completion of the applicable Services or acceptance of the applicable Deliverable.

4.3 Expenses

No Consultant expenses (reimbursable or otherwise) are authorized under this SOW.

5 PROJECT CHANGE MANAGEMENT

In the event a change is identified that affects the scope, timeline, or cost of the Project, Consultant shall determine any schedule and cost adjustments and submit a change request to the PSE Project Contact for review. Approved changes will be executed by both parties as a change order to this Statement of Work.

6 CONTACT INFORMATION

PSE Project Contact: Name: Clay Wallace, Facility Services Role: Project Manager Office: 425-456-2863 Mobile Phone: 425-691-7519 Email: clay.wallace@pse.com Address: Puget Sound Energy, Inc. 355 110th Avenue NE, PSE-10S Bellevue, WA 98004	**Consultant Project Contact**: Name: Joel Davis Role: Principal-In-Charge / Project Manager Office: 206-587-3797 Mobile Phone: 206-419-9759 Email: joel@menganalysis.com Address: MENG Analysis 2001 Western Avenue, Suite 200 Seattle, WA 98121

7 AUTHORIZATION

Intending to be legally bound, PSE and Consultant have caused their duly authorized representatives to execute this Statement of Work in the space provided below.

PSE/Accepted and Agreed:
Puget Sound Energy, Inc.

By: DocuSigned by: Cathy Lorentz 98CC0FE82CF643F...

Printed Name: Cathy Lorentz

Title: Senior Buyer

Date: 4/7/2016

Consultant/Accepted and Agreed:
EGM Inc., P.S. dba Meng Analysis

By: ______________________

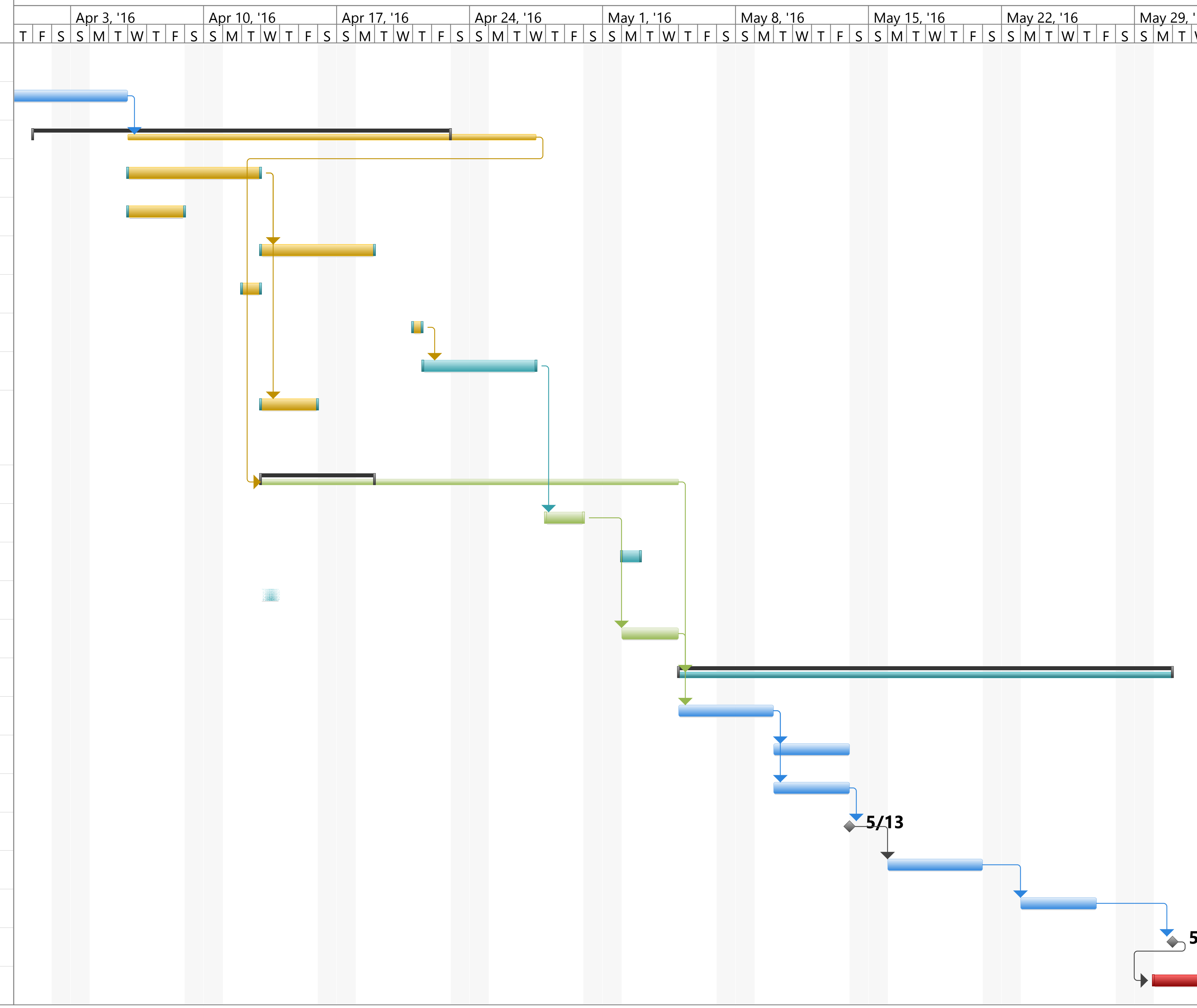
Printed Name: Joel C. Davis

Title: Principal

Date: 4/18/16

DRAFT SCHEDULE
PUGET SOUND ENERGY
SOUTH KING COUNTY COMPLEX FACILITY CONDITION ASSESSMENT SERVICES

ID	Task Name	Start	Finish
1	**CONSULTANT SELECTION**	Mon 3/21/16	Mon 3/21/16
2	**CONTRACTING**	Mon 3/21/16	Tue 4/5/16
3	**Phase IA - Project Preparation/SOW**	**Fri 4/1/16**	**Fri 4/22/16**
4	Documentation Review - O&M Building Reports	Wed 4/6/16	Tue 4/12/16
5	Project Memorandum	Wed 4/6/16	Fri 4/8/16
6	Facilities Database Setup	Wed 4/13/16	Mon 4/18/16
7	Cost Modelling	Tue 4/12/16	Tue 4/12/16
8	O&M Workshop	Thu 4/21/16	Thu 4/21/16
9	Team Logistics - Survey Binders/Forms	Thu 4/21/16	Wed 4/27/16
10	**Phase IB - Critical Areas & Natural/Geologic Hazard Risk Assessment**	Wed 4/13/16	Fri 4/15/16
11	**Phase II - FCA SURVEYS**	**Wed 4/13/16**	**Mon 4/18/16**
12	SKC Site	Thu 4/28/16	Fri 4/29/16
13	Electrical IR Thermography	Mon 5/2/16	Mon 5/2/16
14	Building Envelope IR Thermography	tbd	
15	FCA Documentation Days	Mon 5/2/16	Wed 5/4/16
16	**Phases III & IV - ANALYSIS & REPORTING**	**Thu 5/5/16**	**Mon 5/30/16**
17	FCA Data Entry into Facilities Database	Thu 5/5/16	Mon 5/9/16
18	Analysis	Tue 5/10/16	Fri 5/13/16
19	QC / Cost Reviews	Tue 5/10/16	Fri 5/13/16
20	**Draft Report**	**Fri 5/13/16**	**Fri 5/13/16**
21	Draft Report Review (PSE)	Mon 5/16/16	Fri 5/20/16
22	Final Report Edits	Mon 5/23/16	Thu 5/26/16
23	**Final Report**	Fri 5/27/16	Mon 5/30/16
24	**Phase V - STRATEGIC PLANNING & PRESENTATIONS**	**Mon 5/30/16**	**Wed 6/1/16**



10.2 FCA Project Teams

FCA Project Team – South King Complex

Puget Sound Energy

Clay Wallace
Facilities Project Manager
wallacedesign@comcast.net
425-691-7519 (cell)
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FCA PRIME-Consultant

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10.3 FCA Terminology & Abbreviations

Facility Condition Assessment (FCA): A structured process to document the conditions of site infrastructure and building systems. FCAs are typically performed by a multi-disciplinary team of architects, engineers, construction, and cost specialists. Facility information and condition data should be maintained in a database for ease of updating and reporting. The data should be renewed over time.

Facility Condition Index (FCI): A benchmark used to compare the relative condition of facilities within a portfolio of assets; derived by the following formula:

$$FCI = \frac{\text{Backlog of Maintenance and Repair (BMAR)}}{\text{Current Replacement Value (CRV)}}$$

There are a number of different methods used by various organizations to calculate that backlog. For this reason, using FCIs to compare facilities to other organizations is not always appropriate.

This study uses a parametric method that calculates BMAR based on the assessed condition scores. The statistical basis is a study conducted by NASA on over 10,000 surveyed facilities that evaluated the backlog of repair items relative to qualitative condition scores 1 through 5. The parametric backlog for each system is calculated based on a statistical theoretical percentage of that system that would need repair or replacement for each of the qualitative condition scores. The costs of those systems are the facility use cost models customized for PSE.

Life Cycle Renewal Model: A theoretical forecast of when building systems will exceed their typical lifespan and funding will be required for renewals.

Parametric Costs: Parametric cost estimating is a technique that uses statistical relationships between historical cost data and other program variables such as system condition or age. Historical cost data is typically used at a high level (e.g., cost per square foot) and often represent conceptual, order-of-magnitude costs for initial planning or discussion purposes.

Remaining Useful Life: An estimate of the years that a facility system may remain serviceable or in operation before failure; which would then require system renewal or replacement.

Subsystem: The term “subsystem” in this report refers to a Uniformat Level 3 building systems category (e.g., B3010 - Roof Coverings; or B3020 – Roof Opening; or B3030 – Projections).

System: The term “system” in this report refers to a Uniformat Level 2 building system category (e.g., B3000 – Roofing)

The following terms are used in the MENG Analysis FCA Database:
(See also the database user's manual for more specific definitions.)

Last Major System Renewal: The year in which a system was last renewed (substantially repaired or replaced).

Original System Date: The year a system was originally constructed/installed.

Subsystem Assessed Condition Score: The field surveyors' assessment of condition assigned to each facility subsystem. The rating uses a scale of 1 through 5, where 1=excellent, 2=good, 3=fair, 4=poor, 5=unacceptable. Different subsystem % of CRV's are included in the database for each of the different facility use types (e.g. Maintenance shops vs. police station vs. fire station, etc.)

BMAR (backlog of maintenance and repair): This is an estimated amount that would need to be spent to bring the facility up to good condition.

Subsystem Normal Life: Industry standard subsystem life between renewals or replacement cycles.

System Coverage: The amount of area in a facility containing a specific system, expressed as percent of building or site size.

Certain FCA terms are also expressed as formulas in the MENG Analysis FCA Database, as follows:

Adjusted Current Replacement Value (CRV) ($/SF) = Base CRV * Geographic Adjustment Factor * Construction Type Adjustment Factor * Gross Square Footage Adjustment Factor
Base CRV: is the current replacement cost of the facility, including construction and project cost markups. It is contained in the CRV models for each facility use type. That base CRV is factored by geographic, size, and type of construction specific to each facility to attain the facility specific CRV.

Current Replacement Value (CRV) = Adjusted CRV * Gross Square Footage

Renewal Budget (for Infrastructure) = [Site Area]*[System Coverage]*[Infrastructure Unit Cost]*[Subsystem Renewal Factor]

Renewal Budget (for Building) = ([Facility Size Gross]*[System Coverage]*[Subsystem Unit Cost]*[Subsystem Renewal Factor])

Subsystem Age = Age of system in years since last major system renewal = Year of Survey – Year of Last Major System Renewal

List of Commonly Used Abbreviations

AC = Asphalt Concrete

A/V = Audio/video

AHU = Air handling unit

ASHRAE = American Society of Heating, Refrigeration, & Air Conditioning Engineers

BacNET = Building automation & control network (an ASHRAE standard for DDC systems)

CCTV = Closed circuit television

CFH = Cubic feet per hour (of natural gas)

CFL = Compact fluorescent

CI = Cast iron

CO2 = Carbon dioxide

CU = Condensing unit

Cx = Commissioning

DDC = Direct digital control

DHW = Domestic hot water

DW&V = Drain, waste, & vent

Dx = Direct expansion

EA = Each (measurable unit)

EF = Exhaust fan

EMT = Electrical metallic tubing (conduit)

FDC = Fire department connection

FSD = Fire smoke damper

GFCI = Ground fault circuit interrupter

GI = Grease interceptor

GRD = Grills, Registers, & Diffusers

HID = High intensity discharge (lamps)

HVAC = Heating, ventilating, and air conditioning

IDF = Intermediate distribution frame

IDP = Integrated Data Processing

IES = Illuminating Engineering Society

IT = Information technology

Kva = (kilovolt-amp)

LF = Linear feet (measurable unit)

LED = Light emitting diode

LS = Lump sum (measurable unit)

MAU = Make-up air unit

MDF = Main distribution frame

Min = Minimum

NEC= National electric code

ORD = Overflow roof drain

OWS = Oil/water separator

PA = Public address

POU = Point of use

PRV = Pressure regulating valve

Psig = Pounds per square inch (pressure)

PVC = Polyvinyl chloride

R-22 = Refrigerant No. 22 (generic refrigerant type)

RBPB = Reduce pressure backflow preventer

RD = Roof drain (occasionally Resident Director)

RTU = Roof top unit

SF = Square feet (measurable unit)

SOG = Slab on grade

TAB = Test, adjust, & balance

Ton = One ton of air conditioning = 12,000 Btu/hr (British thermal units per hour)

TU = Terminal unit

UH = Unit heater

UPS = Uninterruptible power supply

VAV = Variable air volume

VFD = Variable frequency drive

VOIP = Voice over internet protocol

WAP = Wireless access point

WiFi = Wireless fidelity

10.4 FCA O&M Workshop Sheets

Site:	South King Complex	**Site Size (acres):**	
Facility (Bldg):	South King Complex	**Bldg Size (sf):**	276135
Number of Buildings	1	**Number of Portables**	0
Site I.D. #		**Building I.D. #**	
Today's Date:	4/21/2016	**Original Construction (yr):** 1967	**Major Renovation (yr):**

LEVEL II UNIFORMAT SYSTEM NAME & CODE		INCLUDES	YEAR OF ORGINAL CONSTRUC-TION	YEAR OF LAST MAJOR RENEWAL	O&M Workshop Pre-survey Input - major work recently completed (last 5 years), current major issues, significant near future (next 5 years) concerns
Foundations	**A10**	A1010 - Standard foundations. A1020 - Special foundations. A1030 - Slab-on-grade (SOG).	1967		
Basements	**A20**	A2020 - Structural walls, water proofing, drainage, exterior surfaces.	1967		
Super-structure	**B10**	B1010 - Floor construction. B1020 - Roof construction.	1967		
Exterior Closure	**B20**	B2010 - Exterior walls. B2020 - Exterior windows. B2030 - Exterior doors.	1967		*Little bit of storefront. Glazing mostly punched, no thermal break, entry door with relites, some original wood roll up doors, some coiling most with electric motor*
Roofing	**B30**	B3010 - Roof coverings. B3020 - Roof openings. B3030 - Roof projections.	1967		
Interior Construction	**C10**	C1010 - Partitions (fixed & moveable). C1020 - Interior doors. C1030 - Fittings (specialties).	1967		*Some interior cage areas several mtl coiling doors inside building, some fire rated from 19??*
Staircases	**C20**	C2010 - Stair construction. C2020 - Stair finishes.	1967		
Interior Finishes	**C30**	C3010 - Wall finishes. C3020 - Floor finishes. C3030 - Ceiling finishes.	1967		*Metal lockers*
Vertical Transport	**D10**	D1010 - Elevators & lifts. D1090 - Other conveying systems.	1967		
Plumbing	**D20**	D2010 - Fixtures. D2020 - Water distribution. D2030 - Sanitary waste. D2040 Rain water drainage. D2090 - Other (special).	1967		*Gas-fired water heater for restroom shower, (10) WH smaller, fixtures-mostly older, mix of gal/copper no dialect protection, some showers/locked rooms, waste piping, cast iron, maybe some clay, older areas may not be sized correctly, internal roof drains mix of cast and transite pipe - except newer areas ABS, no overflows! D2090 - other plumbing, pressure washer system, compressed air system, vacuum pump system.*

HVAC	**D30**	D3010 - Energy supply. D3020 - Heating. D3030 - Cooling. D3040 - Dist. D3050 - Terminal & pkgd. D3060 - Controls. D3090 - Other HVAC.	1967		*Some abandoned mechanical equip in various places, some split systems at roof Original manufacture, AHU large custom units have hot and cold water. Boiler plant, (1) older fire tube boiler, pumps not sized correct, (2) Condensing smaller newer boilers, some gas-fired heating, various exhaust fans - may not meet current code Chiller plant, rebuilt 2012 "failed" last year cooling tower gone, bought used 7 year old chiller - serves warehouse, AHU, ICON AHU, north office AHU. Mezz area with own air cooled chiller vent system at fleet area, exhaust at battery charging at lifts north front office RTU serving with terminal electric heat and chilled water ICON Area has chilled water service, HW heater coil, fintube radiant units below windows No outside for intake Controls: (4) systems, Siemens front end no expansion possible, end of life. Separate Barber/Coleman analog for boiler Johnson controls, 4th system on boiler*
Fire Protection	**D40**	D4010 - Fire protection sprinkler. D4020 - Stand-pipe & hose systems. D4030 - Fire protection specialties. D4090 - Special fire protection.			*Fully sprinklered, dry pipe at canopy - may be original (end of life), foam suppression at oil waste (outside), no pre-action, 2-3 dry risers, 10 risers overall, loop system.*
Electrical	**D50**	D5010 - Electrical service & dist. D5020 - Lighting & branch wiring. D5030 - Low voltage (comm, security & safety). D5090 - Other.	1967		*Pad mount transformer for south, underground, (2) main breakers overhead to mezz. Original 480 V 3 phase. NSW feed from south bus ducts to (2) ATS. Generators south side 250 KW diesel, 277 switch gear at David. Elect furniture systems Lighting: (5) control panels - obsolete. Mostly fluorescent lighting, (6) tube T8 fixtures in warehouse, (1) pilot cell for yard & phase II lights, T-12s in phase I work, T-12 and 8's in south office, ICON area T-12, small amount of LED in Mezz, Elect dock levelers Emergency lighting - mix of battery and wired power Egress communication at area of refuge - near elevation, no data system included racks, wiring, phone=VOIP, access controls: doors, gates, alarm in warehouse Fire Alarm - Gamewell at mezz - main panel, 10 booster sub panels, +240 devices maxed out, end of life, all points ID'd - most addressable, smoke beam in warehouse.*
Equipment	**E10**	E1010 - Commercial (laundry, office). E1020 - Institutional (lab, AV). E1030 - Vehicular (lifts, parking, dock). E1090 - Other.	1967		*Plain casework varies vintages, various window blinds, residential appliances, ice maker. Specialty rooms for flammable storage, some not used.*
Furnishings	**E20**	E2010 - Fixed furnishings (art, casework, window treatments, floor mats, seating). E2020 - Moveable furnishings (tables, chairs, shelves).	1967		
Special Construction	**F10**	F1010 Special structures. F1020 Integrated const. F1030 Special const. F1040 Special facilities. F1050 Special controls & inst.	1967		
Site Improvements	**G20**	G2010 - Roadways. G2020 - Parking lots. G2030 - Pedestrian paving. G2040 - Site development. G2050 - Landscaping.	1967		*Mostly AC paving, Fire lane at south in turf? Random CBs to containment areas, storm water pond needs maintenance, partial permanent fencing - gates, perimeter beam detector at yard, irrigation may not be functional, front parking resealed few years ago, wetland at SE corner.*
Site Wet Utilities	**G30**	G3010 Water supply. G3020 Sanitary sewer. G3030 Storm sewer. G3040 Heating distribution. G3050 Cooling distribution. G3060 Fuel dist.	1967		*Fire main in vault that floods, no backflows.*
Site Dry Utilities	**G40**	G4010 - Site electrical distribution. G4020 - Site lighting. G4030 - Site communications & security.	1967		*Metal halide in yard, site lighting mixed.*
Other Site Construction	**G90**	G9010 - Service & pedestrian tunnels (including utilidors), G9090 - Other site systems (outbuildings, yard racks, etc.).	1967		

10.5 FCA Survey Forms & Methodology

10.5.a Condition Survey Form Development

Survey forms were developed for the facility condition assessments based on the Uniformat Level 3. All Level 3 subsystems are described with evaluation criteria. The evaluation criteria descriptions clearly explain what elements were included and excluded from each Level 3 subsystem.

Each survey form is accompanied by a deficiency report form that is completed when Observed Deficiencies (ODs) are noted. This Observed Deficiency form notes the problem and the recommended action to correct the deficiency. Raw construction costs (i.e., labor and materials) for facility component replacements or repairs are estimated.

Additionally, Opportunity forms are provided to document options that may improve facility performance and that may not necessarily be condition related improvements.

10.5.b Sample Condition Scoring Criteria

The following section provides six examples of the condition scoring definitions that were used during the condition surveys.

Roof Construction **B1020**	Roof structural frame, structural interior walls supporting roof, roof decks, slabs and sheathing, canopies. Excludes insulation and roofing. **1- Excellent:** New; Structure is sound and stable; no evidence of cracking, deflection or separation of framing members. Preventative inspection. **2 - Good:** Structure is sound and stable; no evidence of cracking, deflection or separation of framing members. Minor preventative maintenance: rust proofing and / or sealants and tightening of connections. **3 - Fair:** Minor surface cracking or separation of framing members. Preventative maintenance and minor restorative repairs of isolated items. **4 - Poor:** Structural damage evident; Twisting, cracking, or separation of structural members affecting surrounding finishes or moisture intrusion. Restorative repairs. **5 - Unsatisfactory:** Structurally deficient or damaged beyond repair; major damage to surrounding finishes; jeopardizing occupancy. Replacement.

Exterior Windows **B2020**	Screens, storm windows, exterior louvers, frame, trim, sills, caulking, flashing. Excludes window shades and treatments. **1 -Excellent:** New; doors operating smoothly; no finish degradation. Preventative inspection. **2 - Good:** Functioning smoothly; no finish degradation. Secure hardware and emergency exiting. Minor preventative maintenance. **3 - Fair:** Worn but functional; requires paint or resealing; glass or hardware damage only in isolated doors. Preventative maintenance and minor restorative repairs of isolated items. **4 - Poor**: Damaged or deficient hardware, glass, trim or seals; water intrusion. Restorative repairs. **5 - Unsatisfactory:** Extensive damage, deficient beyond repair; Hardware not operating, moisture intrusion. Replacement.

Exterior Wall Finishes **B2040**	Exterior wall - exterior applied finishes **1 - Excellent:** New; no finish degradation. Preventative inspection. **2 - Good:** no cracking or moisture intrusion. Minor finish degradation. Minor preventative maintenance. Cleaning. **3 - Fair:** Minor undamaged but requires sealing. Preventative maintenance and minor restorative repairs of isolated items. **4 - Poor:** Restorative repairs. **5 - Unsatisfactory:** Damaged beyond repair, Replacement.

Plumbing Fixtures **D2010**	Water closets, urinals, lavatories, sink, showers, bathtubs, drinking fountains. Excludes hot water heaters. **1 – Excellent:** New; All fixtures operating well. Preventative inspection. **2 – Good:** system components operational, free of defect, and of adequate utility service and capacity for intended use. Includes water saving features. Minor preventative maintenance. **3 – Fair:** Some components worn, fixtures stained. Preventative maintenance and minor restorative repairs of isolated items. **4 – Poor:** Many components damaged; limited parts; leaking valves, rust and corrosion. Operating parts > 30 years old. Restoration repairs. **5 – Unsatisfactory:** Many fixtures not operational. Rust, corrosion, and mineral deposits. Leaks causing damage to other finishes and components. Replacement.

Heat Generating Systems **D3020**	Boilers, piping and fittings adjacent to boilers, primary pumps, auxiliary equipment, equipment and piping insulation. **1 - Excellent:** New. Preventative inspection. **2 - Good:** System is fully operational, suitable capacity, efficient utility utilization, integrated energy management controls. Minor preventative maintenance. **3 - Fair:** Equipment worn but reliable, older energy controls; Preventative maintenance and minor restorative repairs of isolated items. **4 - Poor:** Equipment marginal/hard to obtain parts, insulated ext. ductwork, no energy controls. > 40 years old. Restorative repairs. **5 - Unsatisfactory:** System non-functional or seriously deficient, not delivering supply to required spaces. Replacement.

Distribution Systems **D3040**	Supply & return air systems, ventilation & exhaust systems, steam, hot water & chilled water distribution, terminal devices, heat recovery equipment, auxiliary equipment such as secondary pumps, and heat exchangers, piping, duct & equipment insulation. **1 - Excellent**: New. Preventative inspection. **2 - Good:** System is fully operational, suitable capacity, efficient utility utilization, integrated energy management controls. Good insulation. Minor preventative maintenance. **3 - Fair:** Equipment worn but reliable, older energy controls; Insulation. Some joints/ sealants loose. Preventative maintenance and minor restorative repairs of isolated items. **4 - Poor:** Equipment marginal/hard to obtain parts, no energy controls; Many grilles missing or loose. Air leaks and unbalance. Restorative repair **5 - Unsatisfactory:** Non-functional or seriously deficient. Grilles corroded, missing. Replacement.

10.5.c Facility Survey Methodology

The general methodology for recording the PSE FCA surveys started with an initial familiarization tour of the facilities for an initial scope assessment. Site and floor plan drawings were reviewed in advance of the FCA surveys. This was followed by on-site field surveys of architectural, site/civil, mechanical and electrical systems for each facility building and site infrastructure. The facility surveys were facilitated by an FCA Team Leader to maintain consistency in evaluation and on-going training with survey forms, condition ratings and system categorization. Following each facility walk-through, the FCA Team completed condition survey, observed deficiency forms, and opportunity forms.

Each team member used survey forms to document the apparent facility conditions including:

i. Describing the nature of facility systems per UNIFORMAT
ii. Determining the overall condition score and useful remaining life of each system
iii. Identifying major maintenance deficiencies greater than $5,000 (direct cost) that are likely to be required for immediate major maintenance repairs (i.e., 2016), plus the next 5-year period (i.e., 2016-2021)
iv. Documenting specific deficiencies of systems with narrative as well as budgetary level cost estimates to repair or replace deficiencies

10.6 Cost Model and Cost Estimating

10.6.1 Cost Models

The cost models developed for PSE identify general facility use types that were included in the facility condition assessment scope of work. Therefore, the application of the cost model's facility use types to other new types of facilities is not recommended.

10.6.2 Cost Estimating

This report section discusses the basis of cost estimating that was utilized both to develop conceptual cost estimates for Observed Deficiencies and Opportunities during the facility condition surveys as well as the replacement costs that are used as factors in the Predicted Renewals.

10.6.2.a Estimating Methodology

The MENG Analysis team uses the Uniformat II system to organize cost estimates. Depending upon the condition and type of system, cost estimates are based upon square foot area (SF), linear feet (LF), and lump-sum (LS) quantity factors.

For the cost estimating of Observed Deficiencies and Opportunities of building systems, the FCA survey team estimated costs for system repairs or replacements. A proprietary cost model was used for the cost estimating that is used to support the PR costs of building systems. This model is updated on a yearly basis and adjusted to the specific geographical region. It uses a Uniformat II systems categorization for buildings and site infrastructure. The model also provides an overall building cost per square foot ($/SF) for various building types. The team refined SF costs for structural, mechanical, plumbing and electrical sub-systems to reflect the systems typically found in PSE facilities. Specific analysis of similar projects that have been estimated and managed by the team were also referenced against the modeled costs for additional verification of recent costs. Once the basic cost model was established to represent a strong correlation with PSE facilities, the team went through several iterations of independent peer reviews by local cost estimating professionals.

10.6.2.b Estimating Accuracy

Cost estimates made using square foot costs can anticipate 20% to 30% accuracy.[1] Cost estimates that were developed for ODs do consider impacts to related building systems. For example, costs for the demolition and replacement/refinishing of interior walls are considered and included when replacing water piping. Therefore, these cost estimates also include, but do not delineate, contingency costs to address reasonable, unforeseen conditions.

10.6.2.c Estimating Limitations

The cost estimating for the Observed Deficiencies and the cost model used for Predicted Renewals should both be considered useful for PSE project planning purposes. These costs provide planners with a good order-of-magnitude understanding of potential costs. Moving to the next level of accuracy for budgeting actual projects, additional analysis of each specific system deficiency and related systems is recommended. Costs are developed to reflect each system replacement or repair and as such do not make any assumptions relative to project packaging. For example, one should assume that aggregating multiple system deficiencies into a single project, either within a given facility or system-wide, would result in lower costs due to economy of scale.

[1] *Successful Estimating Methods: From Concept to Bid* by John D. Bledsoe

10.7 Renewal Budget by Facility by Subsystem by Year

Ren by Subsys/ Yr

	BudgetYear										
Subsystem	2017	2018	2022	2024	2025	2026	2027	2028	2030	2031	Grand Total
Ceiling Finishes				2,151,431							2,151,431
Controls and Instrumentat..	1,344,199										1,344,199
Cooling Generating Syste..				0							0
Domestic Water Distributi..							792,164				792,164
Electrical Service and Distr..						2,459,343					2,459,343
Energy Supply						24,471					24,471
Exterior Doors								911,297			911,297
Exterior Walls										2,093,840	2,093,840
Exterior Windows							921,190				921,190
Fire Protection Sprinkler S..						1,725,211					1,725,211
Fittings				169,538							169,538
Floor Finishes			1,463,440								1,463,440
Heat Generating Systems				254,307							254,307
HVAC Distribution Systems		613,632									613,632
Integrated Construction					4,989						4,989
Interior Doors						491,461					491,461
Lighting and Branch Wiring				4,091,153							4,091,153
Low Voltage Fire Alarm		308,243									308,243
Other Fire Protection Syst..				127,153							127,153
Other HVAC Systems and ..		53,515									53,515
Partitions								694,658			694,658
Plumbing Fixtures						611,776					611,776
Projections						45,883					45,883
Rain Water Drainage						149,886					149,886
Roof Coverings									2,903,778		2,903,778
Roof Openings						195,768					195,768
Sanitary Waste						2,288,046					2,288,046
Special Construction Syste..					4,989						4,989
Stair Finishes					0						0
Terminal and Package Units	2,985,170										2,985,170
Wall Finishes			766,407								766,407
Grand Total	4,329,369	975,390	2,229,847	6,793,582	9,978	7,991,845	1,713,354	1,605,954	2,903,778	2,093,840	30,646,936