

Dealing with Deferred Maintenance

League of California Cities
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Presented by Dean M. Leonard *BSc (Hons), MRICS, ACIOB*

Agenda

- › Introductions
- › Preface
- › What is Deferred Maintenance?
 - › *the extent of the Issue*
- › Deferred Maintenance Process
- › OpEx vs CapEx
- › Consequences
- › Solutions
- › Software Tools
- › Capital Planning Dashboards
- › Q&A

Deferred Maintenance Preface

Building owners and local government agencies are facing a Deferred Maintenance Crisis! The deferred maintenance practice is exacerbated by the “pay as you go” policy employed by many state and local governments to fund ongoing and capital maintenance. Without proper funding and a policy correction, the cost of deferred maintenance will double every five years.

Dean Leonard, BSc (Hons), MRICS, ACIOB Vice President – Strategic Asset Management at Faithful+Gould, will discuss methods and techniques to create knowledge and insight about your facilities to make strategic decision to tackle the growing deferred maintenance and develop a prioritized capital needs plan

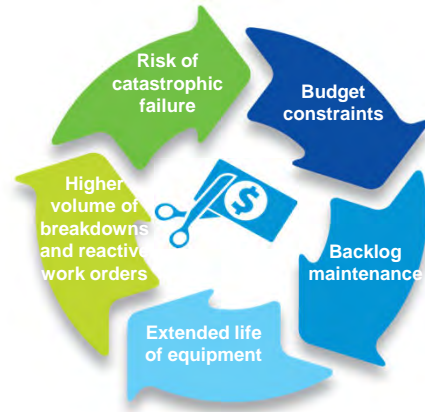
What is Deferred Maintenance?

“Maintenance, repair, or renewal of assets that are critical or end of useful life that should have been addressed but due to lack of funding or resources have not”

Issues Municipalities Face



- How do we prioritize the reduced funding allocation?
- How can we reduce the growing deferred maintenance list?
- What assets do we have? What condition are they in?
- Are those assets being used to their full potential?
- Are they compliant with applicable codes and/or standards?
- How much funding do we need in order to maintain or improve the current conditions?
- When do we need to complete recommended capital projects?
- What will the condition be as a result of a given funding level?
- Where can we achieve cost savings?



Deferred Maintenance is a Serious Issue



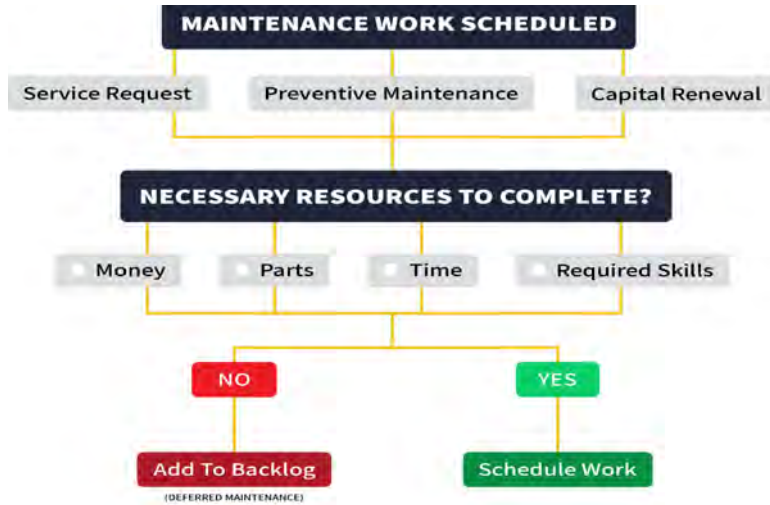
(In billions of dollars)	2019	2018
Asset category:		
General property, plant, and equipment.....	161.4	147.3
Heritage assets.....	20.9	18.9
Stewardship land.....	0.5	0.4
Total deferred maintenance and repairs.....	182.8	166.6



Deferred Maintenance and Repairs: Amending Statements of Federal Financial Accounting Standards 6, 14, 29, and 32. These amounts were all measured using the condition assessment survey method for individual financial statements of DOD, DOI, VA, DOE, USDA, NASA, HHS, GSA, DHS, and DOT



Process of Deferred Maintenance



Capital vs. Operating Expenditures



OpEx

Operation expenditures are funds needed to operate a facility daily

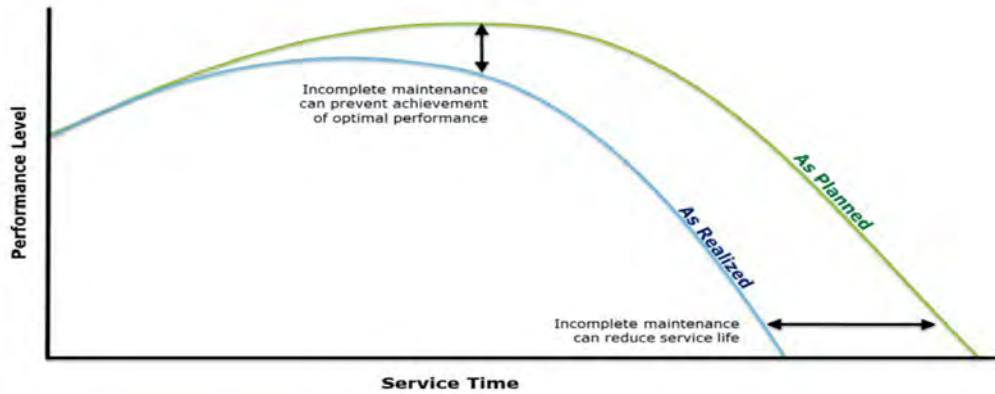


CapEx

Capital Expenditures are purchases made to benefit the facility for years to come, not just to fulfil an immediate need. This can include new equipment, upgrades, or even property purchases



Consequences of Deferred Maintenance



¹ FASAB, SFFAS 42: Deferred Maintenance and Repairs: Amending Statements of Federal Financial Accounting Standards 6, 14, 29 and 32. Report Available at: <https://fasab.gov/accounting-standards/document-by-chapter/>



Consequences of Deferred Maintenance (Continued)



Safety Hazards	Health Hazard	Expensive Emergency Repairs	Reduced Efficiency of Equipment
Compliance Risks	Asset lifecycles will become shorter	Productivity Loss	Failure of the Entire System
Buildings of Poor Quality	Employee Burnout and Stress	Not Meeting Energy & Sustainability Goals	Poor User/Public Experience



The Solution....

Steps to Reduction of Deferred Maintenance



Conduct a Detailed Facility Condition Assessment

Prioritized Lifecycle Capital Improvement Plan

Develop a Defendable Strategic Budget Plan to Reduce the Deferred Maintenance over a Planning Horizon

Conduct an Updated Inventory of Installed Equipment and Systems and Maintain a CMMS

Develop an Industry Standard Preventative Maintenance Program

Conduct an Audit of Current Maintenance Processes and Staffing Needs

Conduct Retro-Commissioning

Develop a Strategic Asset Management Plan (SAMP)

Develop an Asset Management Plan (AMP)

Strategic Asset Management



The Government Accountability Office (GAO):

“At its most basic level, Asset Management involves the systematic collection of key data, the application of analytical tools, and the creation of Business Intelligence (BI), which managers can use to make sound investment decisions about their organization’s physical assets.”



Facility Condition Assessments...
the “Lifeblood” to successful
Asset Management

Facility Condition Assessments: Suggested Methodologies

Facility Condition Assessments



Facility Condition Assessment methods fall into two main categories:



Parametric Model



Developed by US Navy in the 60s
Typically, a desktop exercise
Can include sample visual assessments or RVI
Predicts condition and capital needs

Advantages

- Significant cost savings
- Quick and easy process

Disadvantages

- Metrics behaved illogically
- Not based on actual conditions but theoretical condition
- Does not produce a list of Deficiencies or work items



On-Site Visual Assessment



In 2001 ASTM published a Standard Guide for Property Condition Assessments

- E 2018 – 01
- E 2018 – 08
- E 2018 – 15 (latest version)



Typically falls into two main methods:

1. System Level (High Level)
2. System and Component Level (Comprehensive Detailed)



On-Site Visual Assessment



Advantages

- Based on actual conditions not statistical benchmarks
- Identifies deferred maintenance and future lifecycle renewals
- Provides detailed prioritized list of projects
- Provides defensible budget projections
- Consequences of non-action
- Can populate computerized maintenance management and capital management systems

• Disadvantages

- More expensive methodology
- Time investment required from both the client and assessor



Popular Approach (Best Practice): On-Site Visual Assessment

On-Site Visual Assessment



Implemented Through a 6-phase Approach:



Strategic Capital Needs Plan



City of Long Beach Capital Expenditure Plan

Agency	Building	Action ID	Level 4	Action	Unit Cost	Quantity	Unit	Total Estimated Cost	Fiscal Year	Priority	Plan Type	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Total		
City of Long Beach	Admiral Kidd Park	324349	G2021 Bases and Sub-	Crack Repair, Seal Coating and	\$1.75	264	SY	\$462.00	2022	Priority 2	Routine Mainten	\$0	\$0	\$0	\$462	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$462	
City of Long Beach	Admiral Kidd Park	324349	D5022 Lighting	ECM 001 Update Exterior Lighting to Energy Efficient Lighting	\$530.34	16	EACH	\$8,485.44	2020	Priority 1	Energy & Sustain	\$0	\$8,485	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$8,485	
City of Long Beach	Admiral Kidd Park	324343	D5022 Lighting	ECM 001 Update Exterior Lighting to Energy Efficient Lighting	\$530.34	4	EACH	\$2,121.36	2020	Priority 1	Energy & Sustain	\$0	\$2,121	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$2,121	
City of Long Beach	Admiral Kidd Park	324352	G4021 Fixtures & Transformers	ECM 001 Update Exterior Lighting to Energy Efficient Lighting	\$365.75	4	EACH	\$1,463.00	2020	Priority 1	Energy & Sustain	\$0	\$1,463	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$1,463	
City of Long Beach	Admiral Kidd Park	324353	G4021 Fixtures & Transformers	ECM 001 Update Exterior Lighting to Energy Efficient Lighting	\$365.75	31	EACH	\$11,338.25	2020	Priority 1	Energy & Sustain	\$0	\$11,338	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$11,338	
City of Long Beach	Admiral Kidd Park	324345	D5022 Lighting	ECM 002 Update Interior Lighting to Energy Efficient Lighting	\$15.44	4435	SF	\$68,476.40	2020	Priority 1	Energy & Sustain	\$0	\$68,476	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$68,476	
City of Long Beach	Admiral Kidd Park	324324	C3012 Wall Finishes	Repainted Finish - Standard	\$3.18	3326	SF	\$10,576.68	2027	Priority 3	Capital Renewal	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$10,577	\$0	\$10,577	
City of Long Beach	Admiral Kidd Park	324331	C3032 Suspended	Replace Acoustic Ceiling System -	\$14.64	445	SF	\$6,513.46	2028	Priority 3	Capital Renewal	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$6,513	\$6,513	
City of Long Beach	Admiral Kidd Park	324351	G2054 Seeding and	Replace Artificial Turf	\$10.50	58732	SF	\$616,686.00	2020	Priority 3	Capital Renewal	\$0	\$616,686	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$616,686	
City of Long Beach	Admiral Kidd Park	324350	G2043 Terrace &	Replace Basketball Court Surface	\$33,728.28	2	EACH	\$67,456.55	2027	Priority 3	Capital Renewal	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$67,457	\$67,457	
City of Long Beach	Admiral Kidd Park	324338	G2054 Irrigation	Replace Complete Irrigation System	\$5.34	351725	SF	\$849,415.88	2020	Priority 2	Deferred Mainte	\$0	\$849,416	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$849,416	
City of Long Beach	Admiral Kidd Park	324334	D2022 Hot Water	Replace Domestic Hot Water Heater -	\$173.72	75	GALS	\$13,029.23	2023	Priority 3	Capital Renewal	\$0	\$0	\$0	\$0	\$13,029	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$13,029	
City of Long Beach	Admiral Kidd Park	324348	D5092 Emergency	Replace Emergency Lighting Fixtures	\$5,729.90	6	EACH	\$34,379.39	2028	Priority 1	Capital Renewal	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$34,379	\$0	\$34,379	
City of Long Beach	Admiral Kidd Park	324337	D3042 Exhaust	Replace Exhaust Fan	\$5.46	1150	CFM	\$6,273.36	2023	Priority 3	Capital Renewal	\$0	\$0	\$0	\$0	\$6,273	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$6,273	
City of Long Beach	Admiral Kidd Park	324336	D3042 Exhaust	Replace Exhaust Fan	\$5.46	1550	CFM	\$8,455.40	2023	Priority 3	Capital Renewal	\$0	\$0	\$0	\$0	\$8,455	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$8,455	
City of Long Beach	Admiral Kidd Park	324338	D3042 Exhaust	Replace Exhaust Fan	\$5.46	1250	CFM	\$6,818.88	2023	Priority 3	Capital Renewal	\$0	\$0	\$0	\$0	\$6,819	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$6,819	
City of Long Beach	Admiral Kidd Park	324346	D5037 Fire Alarm	Replace Fire Alarm System (Full	\$19.87	4435	SF	\$88,107.93	2023	Priority 1	Capital Renewal	\$0	\$0	\$0	\$0	\$88,108	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$88,108	
City of Long Beach	Admiral Kidd Park	324332	D2018 Drinking	Replace Floor Mounted Drinking Fountain with Cooling System	\$9,241.40	1	EACH	\$9,241.40	2028	Priority 3	Capital Renewal	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$9,241	\$0	\$9,241	
City of Long Beach	Admiral Kidd Park	324339	B2034 Overhead	Replace Interior Rolling Overhead	\$96.01	124	SF	\$11,905.49	2020	Priority 2	Deferred Mainte	\$0	\$11,905	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$11,905	
City of Long Beach	Admiral Kidd Park	324335	D3032 Direct	Replace Outdoor Furnace Unit 151 to	\$25,192.86	1	EACH	\$25,192.86	2028	Priority 3	Capital Renewal	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$25,193	\$0	\$25,193	
City of Long Beach	Admiral Kidd Park	324339	D3052 Package Units	Replace Packaged Outdoor - Cooling	\$8,397.62	5	TON	\$41,988.10	2028	Priority 3	Capital Renewal	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$41,988	\$0	\$41,988
City of Long Beach	Admiral Kidd Park	324341	D3052 Package Units	Replace Packaged Outdoor - Cooling	\$8,397.62	5	TON	\$41,988.10	2028	Priority 3	Capital Renewal	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$41,988	

Strategic Capital Needs Plan



Capital Projects Prioritization Matrix

Building Rating	Score	Asset Rating	Score	FCI Rating	Score	RUL	Score	Priority Score
High Profile	4	Fire/Life Safety	4	VPOOR	4	0-2 years	4	16
Critical to Operation	3	Critical to Operation	3	Poor	3	3-5 years	3	12
Medium Critical	2	Non to Operation	2	Fair	2	6-7 years	2	8
Non Critical/Support	1	Aesthetics/Finishes	1	Good	1	8-10 years	1	4

City of Long Beach Capital Expenditure Plan

Building	Level 4	Action	Unit Cost	Quantity	Unit	Total Estimated Cost	Fiscal Year	Building Rating	Asset Rating	Score	FCI Rating	Score	RUL	Score	Priority Score	Plan Type	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Total
Convention Center	D3041 Air Distribution	Replace AHU - Constant Volume	\$18.38	30280	CFM	\$556,395.00	2020	High Profile	Critical to Operation	4	Vpoor	4	0-2 years	4	15.00	Deferred Maintenance	\$556,395	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$556,395
Fire Station 10	D5012 Low Tension Service & Dist	Replace Transformer - 75 to 500 KVA	\$183.75	400	KVA	\$73,500.00	2024	Critical to Operation	Critical to Operation	3	Poor	3	3-5 years	3	12.00	Capital Renewal	\$0	\$0	\$0	\$0	\$73,500	\$0	\$0	\$0	\$0	\$0	\$0	\$73,500
MacArthur Park	C3012 Wall Finishes to Interior Walls	Replace Painted Finish - Standard	\$6.29	5400	SF	\$33,960.00	2029	Medium Critical	Aesthetics / Finishes	2	Good	1	8-10 years	1	5.00	Capital Renewal	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$33,960	\$0	\$33,960
Maintenance Yard	G2021 Bases and Sub-Bases	Crack Repair, Seal Coating and Restriping	\$2.54	69832	SY	\$177,373.28	2023	Non Critical/Support	Aesthetics / Finishes	1	Poor	3	3-5 years	3	8.00	Routine Maintenance	\$0	\$0	\$177,373	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$177,373

Strategic Capital Needs Plan



Factors that impact the accuracy of the assessment data



Strategic Capital Needs Plan



The Estimated Useful life and Remaining Useful Life are severely impacted by a number of contributing factors:

Age (Calculated), Maintenance Levels, Location, Utilization

Example:

Rapid deterioration of Cooling Tower in a coastal environment

- Exposure to moisture with high salt content.
- The unit was 3 years old when these images were captured



Asset Utilization



Pumps with expected EUL of 15 years Estimated Replacement Cost \$10,000	Pump A	Pump B
Year of Installation	2020	2020
What is the replacement date?	2035?	2035?
Now, consider the operating requirements	Standard Duty	Standby
What are the hours of operation?	24/7	Back-up to Pump A
What is the observed condition today?	Fair	Very Good
What is the maintenance history?	Good	Good
Now, what is the estimated replacement date?	2037	2044
Additional utilization over expected EUL	2 years	9 years
Cost saving opportunity (Net)	\$1,333	\$6,000



Data Structure



ASTM Uniformat II Classification for Building Elements (E1557-97)

Level 1 Major Group Elements	Level 2 Group Elements	Level 3 Individual Elements	Level 3 Elements	Level 4 Sub-Elements
A SUBSTRUCTURE	A10 Foundations	A1010 Standard Foundations A1020 Special Foundations A1030 Slab on Grade	B2020 Exterior Windows	B2021 Windows B2022 Curtain Walls B2023 Storefronts
	A20 Basement Construction	A2010 Basement Excavation A2020 Basement Walls		
B SHELL	B10 Superstructure	B1010 Floor Construction B1020 Roof Construction	B2030 Exterior Doors	B2031 Glazed Doors & Entrances B2032 Solid Exterior Doors B2033 Revolving Doors B2034 Overhead Doors B2039 Other Doors & Entrances
	B20 Exterior Enclosure	B2010 Exterior Walls B2020 Exterior Windows B2030 Exterior Doors		
	B30 Roofing	B3010 Roof Coverings B3020 Roof Openings		
C INTERIORS	C10 Interior Construction	C1010 Partitions C1020 Interior Doors C1030 Fittings	B3010 Roof Coverings	B3011 Roof Finishes B3012 Traffic Toppings & Paving Membranes B3013 Roof Insulation & Fill B3014 Flashings & Trim B3015 Roof Eaves and Soffits B3016 Gutters and Downspouts
	C20 Stairs	C2010 Stair Construction C2020 Stair Finishes		
	C30 Interior Finishes	C3010 Wall Finishes C3020 Floor Finishes C3030 Ceiling Finishes		
D SERVICES	D10 Conveying	D1010 Elevators & Lifts D1020 Escalators & Moving Walks D1090 Other Conveying Systems	B3020 Roof Openings	B3021 Glazed Roof Openings B3022 Roof Hatches B3023 Gravity Roof Ventilators
	D20 Plumbing	D2010 Plumbing Fixtures D2020 Domestic Water Distribution D2030 Sanitary Waste D2040 Rain Water Drainage D2090 Other Plumbing Systems		
	D30 HVAC	D3010 Energy Supply D3020 Heat Generating Systems D3030 Cooling Generating Systems D3040 Distribution Systems D3050 Terminal & Package Units D3060 Controls & Instrumentation D3070 Systems Testing & Balancing D3090 Other HVAC Systems & Equipment		
			C1010 Partitions	C1011 Fixed Partitions C1012 Demountable Partitions C1013 Retractable Partitions C1014 Site Built Toilet Partitions C1015 Site Built Compartments Cubicles C1016 Interior Balustrades and Screens C1017 Interior Windows & Storefronts

Data Structure



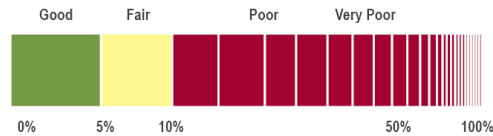
Unifomat Level 1	Unifomat Level 2	Unifomat Level 3	Unifomat Level 4	Level 5 Asset Description	EUL	Unit	Replace Rate		
D Services	D30 HVAC	D3020 Heat Generating Systems	D3021 Boilers	HW/Steam - Electric - 205 to 716 MBH Range	30	MBH	\$52.75		
				HW/Steam - Electric - 1010 to 4505 MBH (30 to 134 BHP)	30	MBH	\$42.40		
				HW - Oil/Gas - 0 to 205 MBH Range	30	MBH	\$0.00		
				HW - Oil/Gas - 205 to 716 MBH Range	30	MBH	\$48.00		
				HW - Oil/Gas - 1010 to 4505 MBH (30 to 134 BHP)	30	MBH	\$36.35		
				Steam Boiler - 0 to 2000 MBH Range	30	MBH	\$28.00		
				Steam Boiler - Over 2000 MBH Range	30	MBH	\$22.65		
				Furnace - Electric	30	MBH	\$52.00		
				Furnace - Gas	30	MBH	\$42.00		
				Furnace - Oil	30	MBH	\$58.00		
				Baseboard Convection Heaters - Electric	20	LF	\$0.00		
				Baseboard Radiation Heaters - Hydronic	20	LF	\$110.00		
				Cast Iron Radiators	50	LF	\$133.00		
				Space Heaters with Fan	15	MBH	\$120.00		
				Cabinet Heaters with Blower	15	EACH	\$1,450.00		
		Fin-Tube Convectors - Wall	20	LF	\$330.00				
		Fiberglass	5	LF	\$12.00				
		Insulation Foam Rubber	5	LF	\$0.00				
		Air Cooled Water Chiller Unit - Outdoor Unit	20	TON	\$0.00				
		Absorption (Steam) Chiller	20	TON	\$1,650.00				
		Centrifugal Chiller (Cooling Tower Additional)	20	TON	\$1,220.00				
		Reciprocating Chiller, Water Cooled (Cooling Tower Additional)	20	TON	\$975.00				
		Reciprocating Chiller, Air Cooled (Cooling Tower Additional)	20	TON	\$933.00				
		Reciprocating Chiller (Cooling Tower Additional)	15	TON	\$1,450.00				
		Scroll Chiller (Cooling Tower Additional)	20	TON	\$1,625.00				
		Screw Chiller (Cooling Tower Additional)	20	TON	\$1,590.00				
				D3030 Cooling Generating Systems	D3031 Chilled Water Systems				

Facility Condition Index (FCI)



Value of Maintenance, Repair, and Replacement of the Asset (DM)

Current Replacement Value of the Facility(s) (CRV)



Condition	Definition	Percentage Value
GOOD	In a new or well-maintained condition, with no visual evidence of wear, soiling or other deficiencies	0% to 5%
FAIR	Subject to wear, and soiling but is still in a serviceable and functioning condition	5% to 10%
POOR	Subjected to hard or long-term wear. Nearing the end of its useful or serviceable life.	Greater than 10%
V-POOR	Subjected to hard or long-term wear. Has reached the end of its useful or serviceable life. Renewal now necessary	Greater than 60%

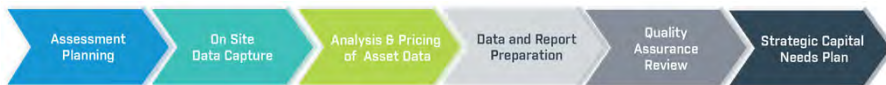
Facility Condition Index



Building Name	Count	Replacement	SqFt	FCI
(3) Generators	1	\$942,655	840	
162 Inf Regiment Readiness Ctr	1	\$37,927,013	157,819	
35-Bldg A - Administration	1	\$1,505,493	8,200	33.33 %
35-Bldg B - Operations	1	\$6,891,686	32,274	43.65 %
35-Bldg C - Education/Medical	1	\$3,087,151	15,447	24.06 %
35-Bldg E - Recreation Building	1	\$971,778	5,067	18.10 %
35-Bldg F - Housing	1	\$9,265,968	50,230	18.50 %
35-Bldg G - Outdoor Religious	1	\$131,111	314	1.64 %
35-Bldg H - Workforce	1	\$1,116,316	5,000	11.57 %
35-Bldg J - Radio Building	1	\$188,325	343	4.99 %
35-Bldg K - Storage Building	1	\$93,997	3,200	7.11 %
35-Bldg L - Equipment Building	1	\$59,549	1,680	17.78 %
35-Bldg M - Greenhouse	1	\$34,029	1,302	26.22 %
3670 Unit Maintenance	1	\$2,365,982	7,706	
41 Infantry Division AFRC	1	\$49,135,728	215,382	
5 Bay Garage/Warehouse (#14)	1	\$87,013	1,800	45.37 %
8323 - SB Gettings Creek RA Shelter	1	\$1,457	114	
A - Administration	1	\$10,555,907	39,030	
AAFES/Transient Barracks	1	\$5,563,057	27,656	
ABC Housing/Mall (Admissions, Behavioral And Corrections Plus Mall)	1	\$48,611,959	135,578	
A-Building	1	\$12,474,894	34,360	9.20 %
Access Control Building AHA	1	\$13,448	48	
Access Control Guard Shack	2	\$116,269	415	
Activities Center	1	\$92,886	5,600	
Admin Building, Main Office	1	\$1,655,330	5,236	3.88 %
Admin Trailer COUTES	1	\$118,412	1,160	

Facility	Buildings	Sum of SqFt
Aviation - Aviation Group	31	16,0
Alkali Lake State Airport (R03)	1	
Aurora Airtraffic Control Tower	1	
Aurora State Airport (UAO) (L...	1	
Bandon State Airport (S05)	1	
Cape Blanco State Airport (5...	1	
Cascade Locks State Airport (...)	1	
Chiloquin State Airport (2S7)	1	
Total	5624	30,371,4

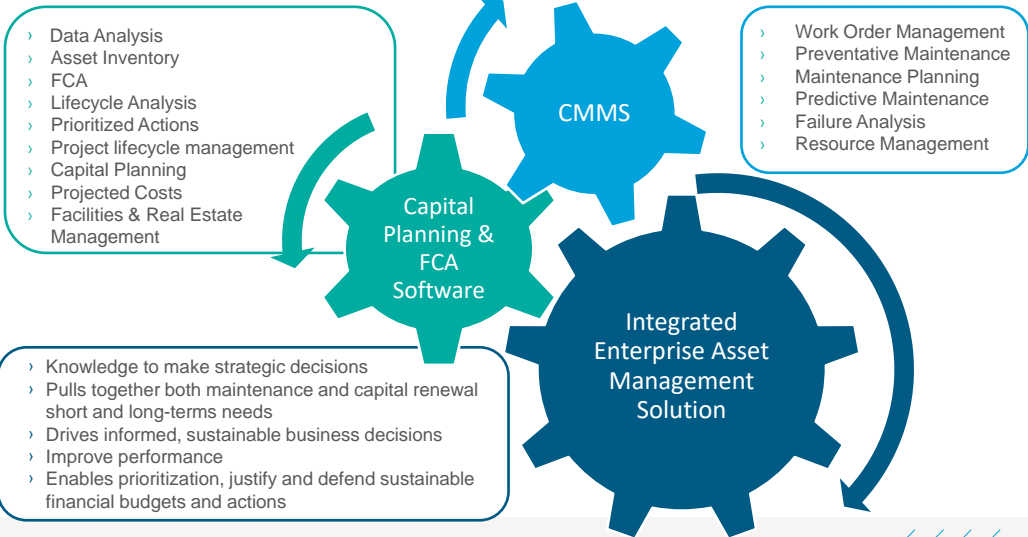
Strategic Capital Plan



- A move from reactive management to proactive asset management
- Upgraded facilities through planned capital improvement projects aligned to strategic priorities
- More reliance on the facility data
- Increased funding
- Reduction in deferred maintenance
- Reduction in risk

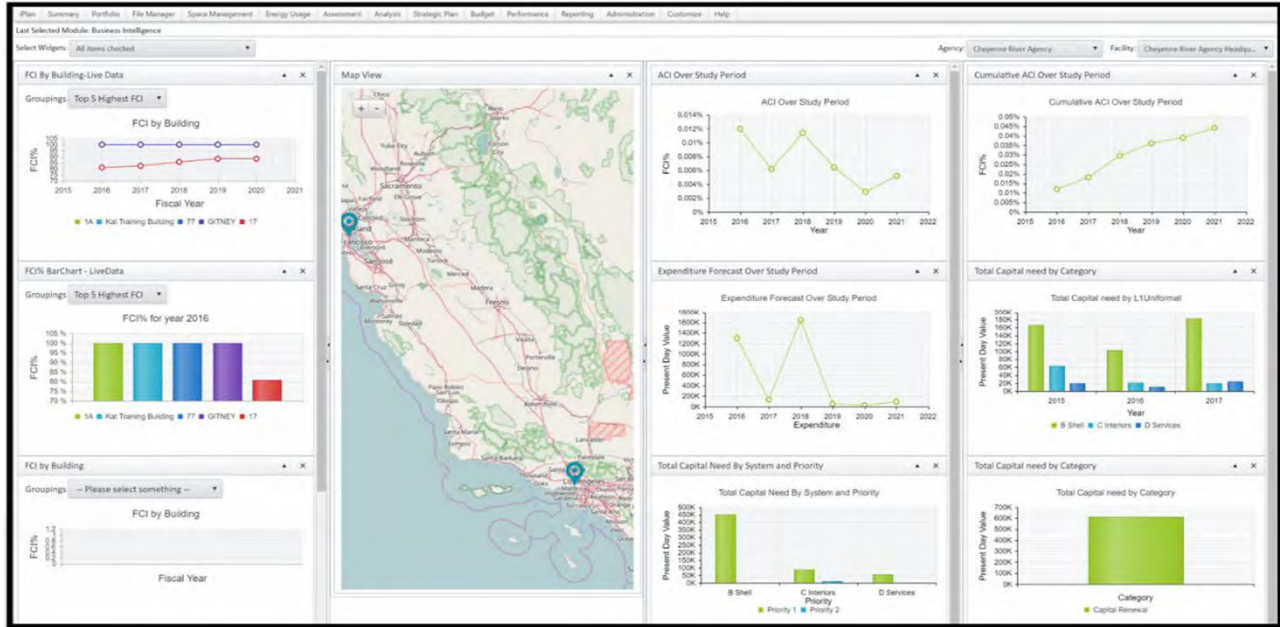


Integrated Enterprise Asset Management Solution



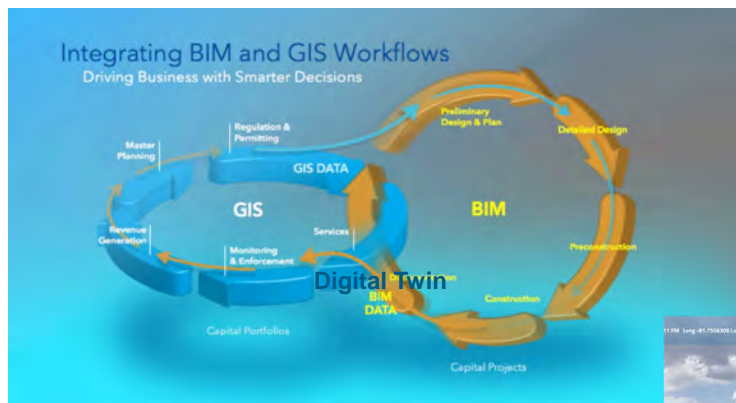
Software Tools: VueAssess

Dashboards

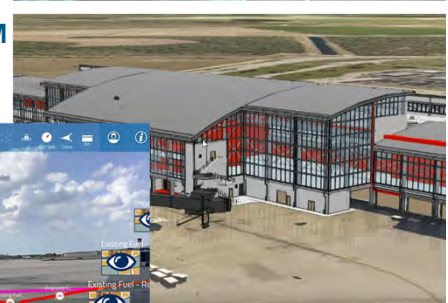


Asset Management The Future

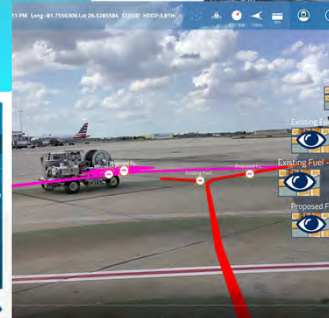
Digital Twin



5D BIM



LEVEL 0	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5
REALITY CAPTURE	2D MAP/SYSTEM/3D MODEL	CONNECTED BIM LEVEL 2	ENRICHED REAL-TIME DATA	2-WAY INTEGRATION	AUTONOMOUS O&M
SURVEY Brownfield (existing) as-built survey	2D - 3D Object-based, with no metadata or BIM approach	4D - 5D Information Models Time Management Budget Management	DIGITAL TWIN Information Integration Near Real-Time Asset Data	DIGITAL TWIN+ Semi-Auto Asset Operations Remote Asset Control	DIGITAL TWIN++ Automatic Asset Control, Operation and Maintenance
ELEMENT SCALE					



Artificial Intelligence Augmented Reality

Questions?

Thank you for your time today.



FAITHFUL+GOULD
Member of the SNC-Lavalin Group

