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Building knowledge

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Cost Data Standards for Asset Management: Supporting Planning and Lifecycle Delivery

RSMeans Data Support of Federal Asset Management

- Work stems from federal mandates and executive orders
- Every federal agency required cost data to calculate:
  - Deferred Maintenance
  - Current Replacement Values
- Application of RSMeans data not consistent among agencies
- Alignment under ISO 55000 is consistent with the need for a more consistent costing standard

A Brief History of Federal Guidelines and Mandates

- Standard Number 6, Accounting for Property, Plant, and Equipment enacted by Federal Accounting Standards Advisory Board (FASAB), 1996
- "Capital Asset Management: Tools and Strategies for Decision Making," FFC (2000)
- **EO 13327 (2004)**
- "Guidance for Improved Asset Management," FRPC (2004)
- "Investments in Federal Facilities—Asset Management Strategies for the 21st Century," NRC (2004)

From Federal Asset Management: 10 Years of Progress" by Col. Michael Hutchinson in The Military Engineer

$$FCI = \frac{DM}{CRV}$$

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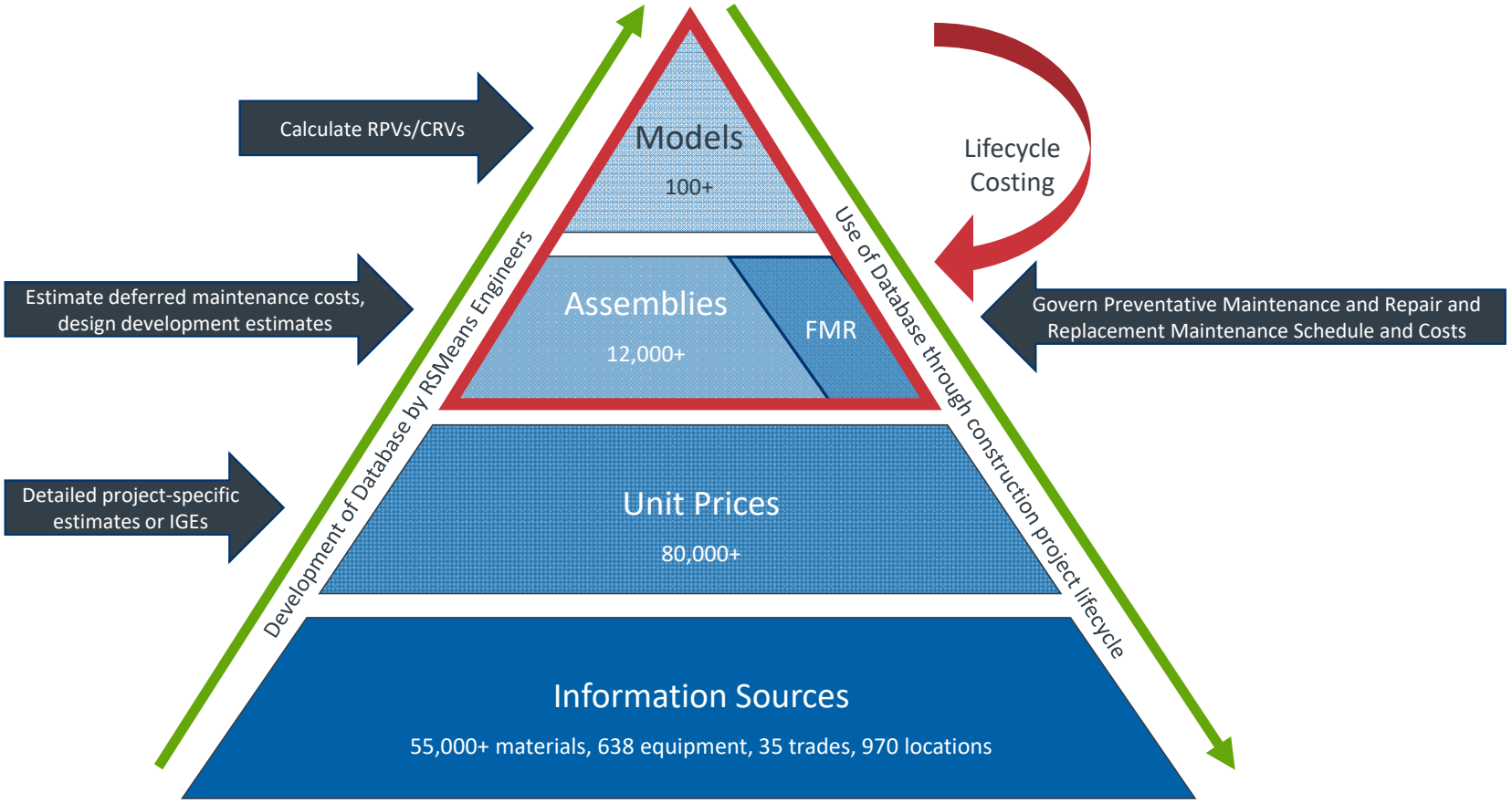
Review of RSMeans Database Structure



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Best Practice Case Study: Department of Energy

- Initiated in 2002, driven by Executive Order 13327 in 2004, as well as agency-specific DOE Order 430.3b Real Property Asset Management
- 127M SF at 50+ sites
- DOE developed two in-house computer systems to meet mandates:
  - CAIS (condition assessment information system)
  - FIMS (facility information management system)
- Standard and custom RSMeans data plus estimating tools to support unique DOE facility and infrastructure types
- Facility Maintenance and Repair cost data was mapped to models to project sustainment costs in a Lifecycle Cost Module.

Suite of Whole Building Models

- **35 Standard Models Enhanced for DOE Building Standards**
- **34 Custom Models, e.g.**
  - Process Bldg w/Pool
  - Records Storage/Vault
  - Explosives Handling
  - Accelerator - Ring
  - Component Staging Facility
  - High Explosive Subassembly Facility

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RSMeansOnline - Square

https://www.rsmeansonline.com/SquareFootEstimate/Index/788240

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RSMeans data from GORDIAN

Guide Me | Welcome Neil Tuck

Search Data | Manage Estimates | Square Foot Estimator | Life Cycle Cost | Cost Alerts and Trends | Reference Items | My Favorites

Creating quick conceptual estimates is easy with RSMeans Online's powerful Square Foot Estimator

With more than 100 commercial and residential models available, you can develop cost estimates and reports in minutes for virtually any location in the U.S. and Canada

Square Foot Estimator

Calculate Building Cost | Quick View | Save Estimate | Customize/View Report | Clear All | Life Cycle Cost | Create Alert

Model: Library (Green) with Precast Concrete Panels / R/Conc. Frame

Default Building Image

$5,345,545.51	GREENVILLE, SC	2	Yes
Building Cost	Location	Stories (Ea.)	Basement
$213.82	25,000	14.00	$449,731.36
Cost per S.F.	Floor Area	Story Height	Additive Cost

Estimate Header Information

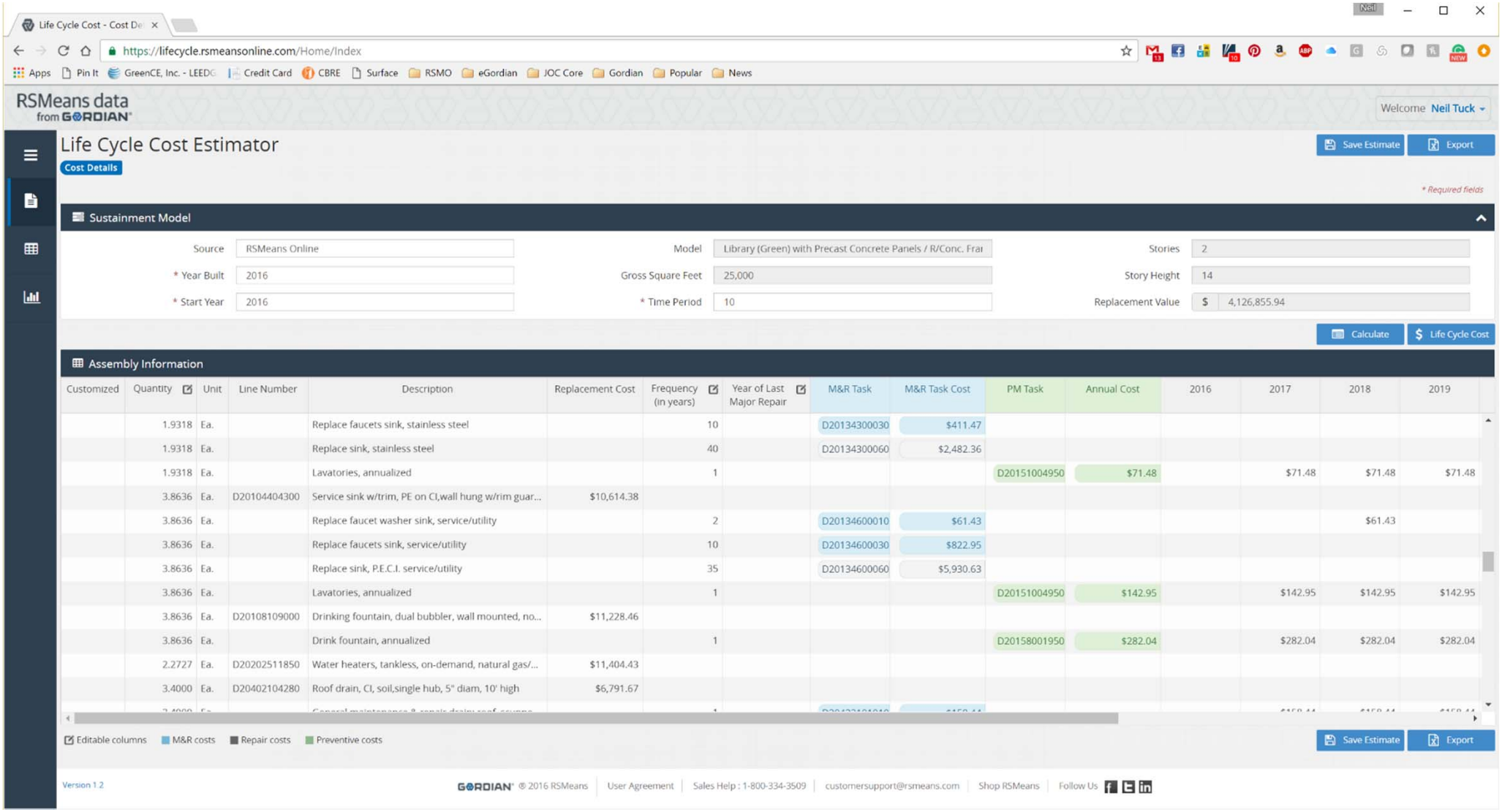
Step 1: Building Type

Step 2: Building Parameters

Step 3: Building Additives (optional)

Calculate Building Cost | Quick View | Save Estimate | Customize/View Report | Clear All | Life Cycle Cost | Create Alert

Version 8.1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Life Cycle Cost Estimator
Cost Details
Save Estimate
Export
* Required fields
Sustainment Model
Source
RSMeans Online
* Year Built
2016
* Start Year
2016
Model
Library (Green) with Precast Concrete Panels / R/Conc. Frar
Gross Square Feet
25,000
* Time Period
10
Stories
2
Story Height
14
Replacement Value
$
4,126,855.94
Calculate
Life Cycle Cost
Assembly Information
Customized
Quantity
Unit
Line Number
Description
Replacement Cost
Frequency (in years)
Year of Last Major Repair
M&R Task
M&R Task Cost
PM Task
Annual Cost
2016
2017
2018
2019
1.9318 Ea. Replace faucets sink, stainless steel 10 D20134300030 $411.47
1.9318 Ea. Replace sink, stainless steel 40 D20134300060 $2,482.36
1.9318 Ea. Lavatories, annualized 1 D20151004950 $71.48 $71.48 $71.48 $71.48
3.8636 Ea. D20104404300 Service sink w/trim, PE on CI,wall hung w/rim guar... $10,614.38
3.8636 Ea. Replace faucet washer sink, service/utility 2 D20134600010 $61.43 $61.43
3.8636 Ea. Replace faucets sink, service/utility 10 D20134600030 $822.95
3.8636 Ea. Replace sink, P.E.C.I. service/utility 35 D20134600060 $5,930.63
3.8636 Ea. Lavatories, annualized 1 D20151004950 $142.95 $142.95 $142.95 $142.95
3.8636 Ea. D20108109000 Drinking fountain, dual bubbler, wall mounted, no... $11,228.46
3.8636 Ea. Drink fountain, annualized 1 D20158001950 $282.04 $282.04 $282.04 $282.04
2.2727 Ea. D20202511850 Water heaters, tankless, on-demand, natural gas/... $11,404.43
3.4000 Ea. D20402104280 Roof drain, CI, soil,single hub, 5" diam, 10' high $6,791.67
Editable columns
M&R costs
Repair costs
Preventive costs
Save Estimate
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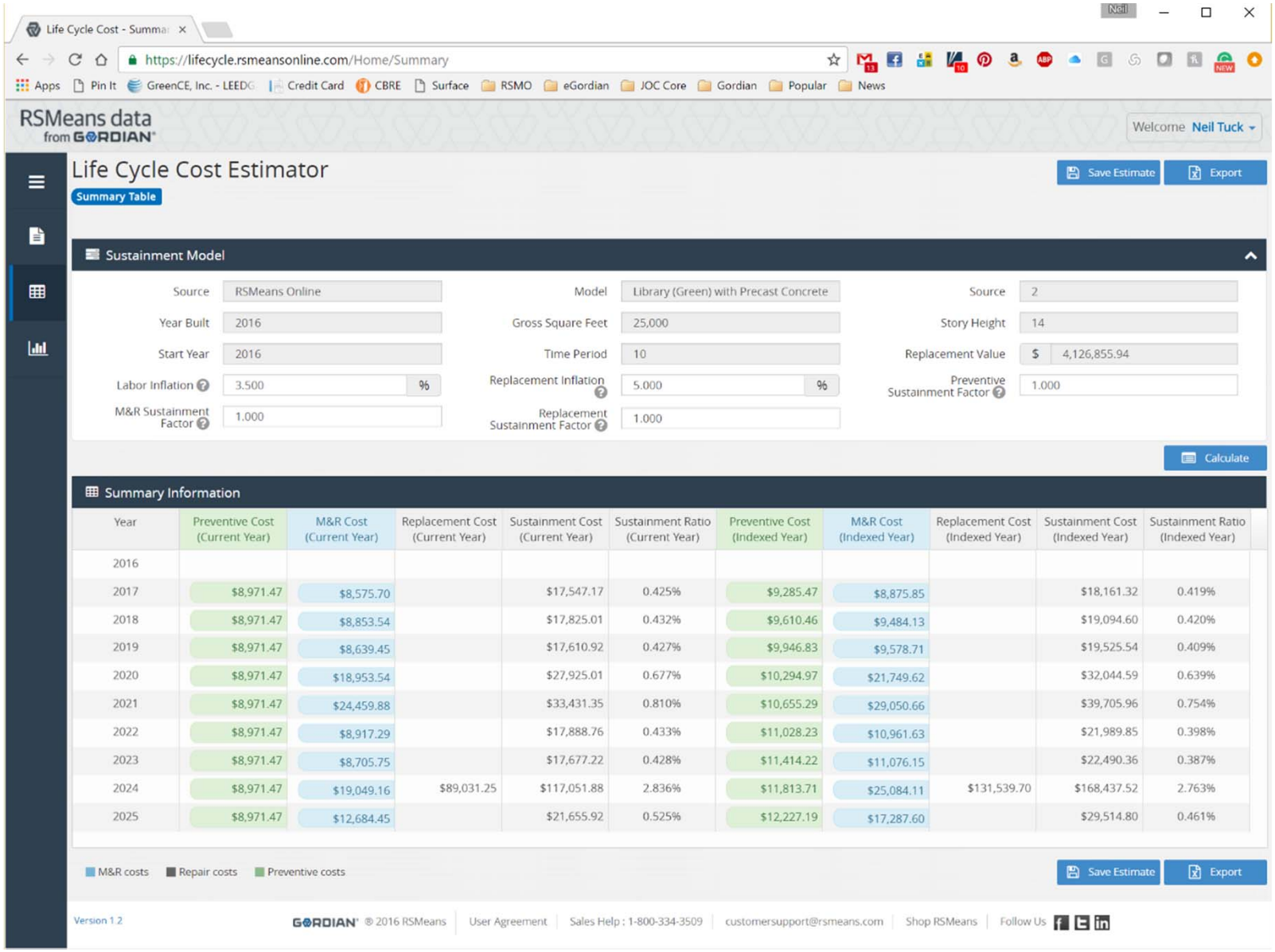
Life Cycle Cost - Summa
https://lifecycle.rsmeansonline.com/Home/Summary
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Life Cycle Cost Estimator
Summary Table
Save Estimate
Export
Sustainment Model
Source
RSMeans Online
Model
Library (Green) with Precast Concrete
Source
2
Year Built
2016
Gross Square Feet
25,000
Story Height
14
Start Year
2016
Time Period
10
Replacement Value
$
4,126,855.94
Labor Inflation
3.500
%
Replacement Inflation
5.000
%
Preventive Sustainment Factor
1.000
M&R Sustainment Factor
1.000
Replacement Sustainment Factor
1.000
Calculate
Summary Information
Year
Preventive Cost (Current Year)
M&R Cost (Current Year)
Replacement Cost (Current Year)
Sustainment Cost (Current Year)
Sustainment Ratio (Current Year)
Preventive Cost (Indexed Year)
M&R Cost (Indexed Year)
Replacement Cost (Indexed Year)
Sustainment Cost (Indexed Year)
Sustainment Ratio (Indexed Year)
2016
2017 $8,971.47 $8,575.70 $17,547.17 0.425% $9,285.47 $8,875.85 $18,161.32 0.419%
2018 $8,971.47 $8,853.54 $17,825.01 0.432% $9,610.46 $9,484.13 $19,094.60 0.420%
2019 $8,971.47 $8,639.45 $17,610.92 0.427% $9,946.83 $9,578.71 $19,525.54 0.409%
2020 $8,971.47 $18,953.54 $27,925.01 0.677% $10,294.97 $21,749.62 $32,044.59 0.639%
2021 $8,971.47 $24,459.88 $33,431.35 0.810% $10,655.29 $29,050.66 $39,705.96 0.754%
2022 $8,971.47 $8,917.29 $17,888.76 0.433% $11,028.23 $10,961.63 $21,989.85 0.398%
2023 $8,971.47 $8,705.75 $17,677.22 0.428% $11,414.22 $11,076.15 $22,490.36 0.387%
2024 $8,971.47 $19,049.16 $89,031.25 $117,051.88 2.836% $11,813.71 $25,084.11 $131,539.70 $168,437.52 2.763%
2025 $8,971.47 $12,684.45 $21,655.92 0.525% $12,227.19 $17,287.60 $29,514.80 0.461%
M&R costs
Repair costs
Preventive costs
Save Estimate
Export
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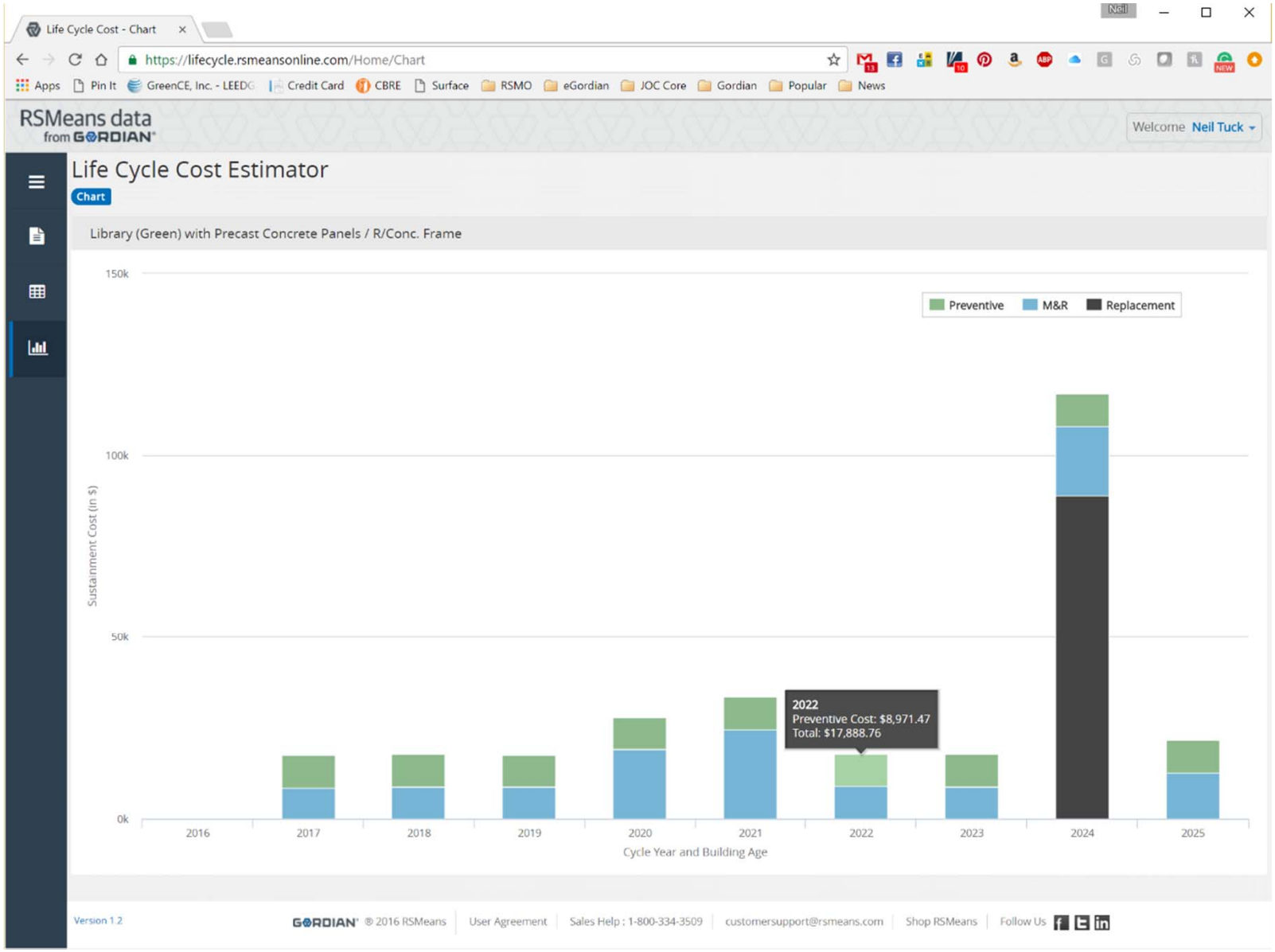
Life Cycle Cost - Chart
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Life Cycle Cost Estimator
Chart
Library (Green) with Precast Concrete Panels / R/Conc. Frame
150k
100k
50k
0k
Sustainment Cost (in $)
Preventive
M&R
Replacement
2022
Preventive Cost: $8,971.47
Total: $17,888.76
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Cycle Year and Building Age
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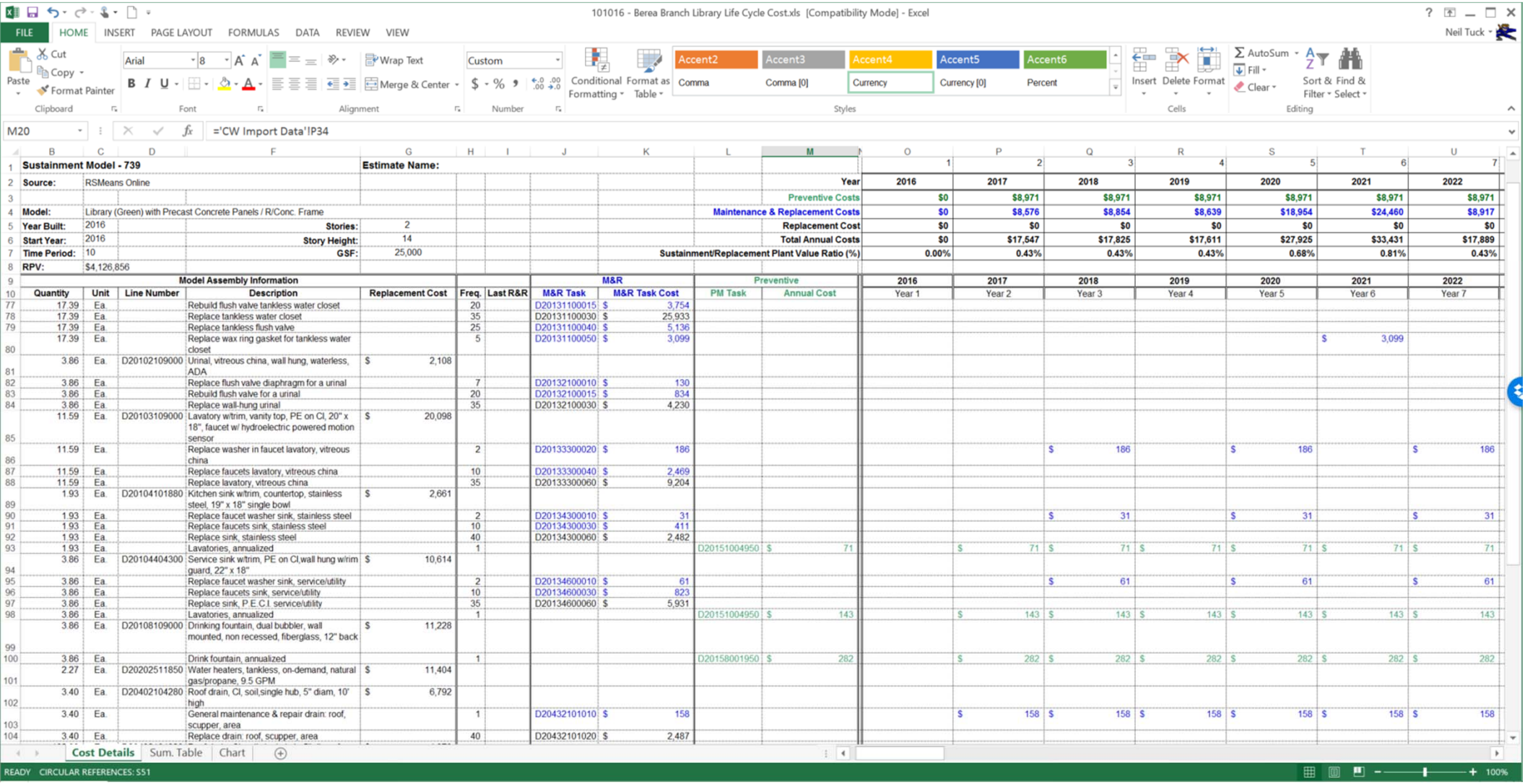

	B	C	D	F	G	H	I	J	K	L	M	O	P	Q	R	S	T	U
1	**Sustainment Model - 739**				**Estimate Name:**							1	2	3	4	5	6	7
2	**Source:**	RSMeans Online									**Year**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
3											**Preventive Costs**	**$0**	**$8,971**	**$8,971**	**$8,971**	**$8,971**	**$8,971**	**$8,971**
4	**Model:**	Library (Green) with Precast Concrete Panels / R/Conc. Frame									**Maintenance & Replacement Costs**	**$0**	**$8,576**	**$8,854**	**$8,639**	**$18,954**	**$24,460**	**$8,917**
5	**Year Built:**	2016		**Stories:**	2						**Replacement Cost**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
6	**Start Year:**	2016		**Story Height:**	14						**Total Annual Costs**	**$0**	**$17,547**	**$17,825**	**$17,611**	**$27,925**	**$33,431**	**$17,889**
7	**Time Period:**	10		**GSF:**	25,000						**Sustainment/Replacement Plant Value Ratio (%)**	**0.00%**	**0.43%**	**0.43%**	**0.43%**	**0.68%**	**0.81%**	**0.43%**
8	**RPV:**	$4,126,856																
9	**Model Assembly Information**							**M&R**		**Preventive**		2016	2017	2018	2019	2020	2021	2022
10	**Quantity**	**Unit**	**Line Number**	**Description**	**Replacement Cost**	**Freq.**	**Last R&R**	**M&R Task**	**M&R Task Cost**	**PM Task**	**Annual Cost**	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
77	17.39	Ea.		Rebuild flush valve tankless water closet		20		D20131100015	$ 3,754									
78	17.39	Ea.		Replace tankless water closet		35		D20131100030	$ 25,933									
79	17.39	Ea.		Replace tankless flush valve		25		D20131100040	$ 5,136									
80	17.39	Ea.		Replace wax ring gasket for tankless water closet		5		D20131100050	$ 3,099								$ 3,099	
81	3.86	Ea.	D20102109000	Urinal, vitreous china, wall hung, waterless, ADA	$ 2,108													
82	3.86	Ea.		Replace flush valve diaphragm for a urinal		7		D20132100010	$ 130									
83	3.86	Ea.		Rebuild flush valve for a urinal		20		D20132100015	$ 834									
84	3.86	Ea.		Replace wall-hung urinal		35		D20132100030	$ 4,230									
85	11.59	Ea.	D20103109000	Lavatory w/trim, vanity top, PE on CI, 20" x 18", faucet w/ hydroelectric powered motion sensor	$ 20,098													
86	11.59	Ea.		Replace washer in faucet lavatory, vitreous china		2		D20133300020	$ 186					$ 186		$ 186		$ 186
87	11.59	Ea.		Replace faucets lavatory, vitreous china		10		D20133300040	$ 2,469									
88	11.59	Ea.		Replace lavatory, vitreous china		35		D20133300060	$ 9,204									
89	1.93	Ea.	D20104101880	Kitchen sink w/trim, countertop, stainless steel, 19" x 18" single bowl	$ 2,661													
90	1.93	Ea.		Replace faucet washer sink, stainless steel		2		D20134300010	$ 31					$ 31		$ 31		$ 31
91	1.93	Ea.		Replace faucets sink, stainless steel		10		D20134300030	$ 411									
92	1.93	Ea.		Replace sink, stainless steel		40		D20134300060	$ 2,482									
93	1.93	Ea.		Lavatories, annualized		1				D20151004950	$ 71		$ 71	$ 71	$ 71	$ 71	$ 71	$ 71
94	3.86	Ea.	D20104404300	Service sink w/trim, PE on CI,wall hung w/rim guard, 22" x 18"	$ 10,614													
95	3.86	Ea.		Replace faucet washer sink, service/utility		2		D20134600010	$ 61					$ 61		$ 61		$ 61
96	3.86	Ea.		Replace faucets sink, service/utility		10		D20134600030	$ 823									
97	3.86	Ea.		Replace sink, P.E.C.I. service/utility		35		D20134600060	$ 5,931									
98	3.86	Ea.		Lavatories, annualized		1				D20151004950	$ 143		$ 143	$ 143	$ 143	$ 143	$ 143	$ 143
99	3.86	Ea.	D20108109000	Drinking fountain, dual bubbler, wall mounted, non recessed, fiberglass, 12" back	$ 11,228													
100	3.86	Ea.		Drink fountain, annualized		1				D20158001950	$ 282		$ 282	$ 282	$ 282	$ 282	$ 282	$ 282
101	2.27	Ea.	D20202511850	Water heaters, tankless, on-demand, natural gas/propane, 9.5 GPM	$ 11,404													
102	3.40	Ea.	D20402104280	Roof drain, CI, soil,single hub, 5" diam, 10' high	$ 6,792													
103	3.40	Ea.		General maintenance & repair drain: roof, scupper, area		1		D20432101010	$ 158				$ 158	$ 158	$ 158	$ 158	$ 158	$ 158
104	3.40	Ea.		Replace drain: roof, scupper, area		40		D20432101020	$ 2,487									

Evolution of Federal Asset Management: What's next?

- Federal Asset Management: An exercise in tracking all the things we can't afford to fix?
- GAO Report 14-188 on Deferred Maintenance identified a shortcoming in structuring limited budgets to optimize repair and maintenance activities to avoid deferred backlog maintenance growth.
- Data and technology developments provide more sophisticated ways of tracking assets, budgeting for sustainment, and deploying limited budgets.

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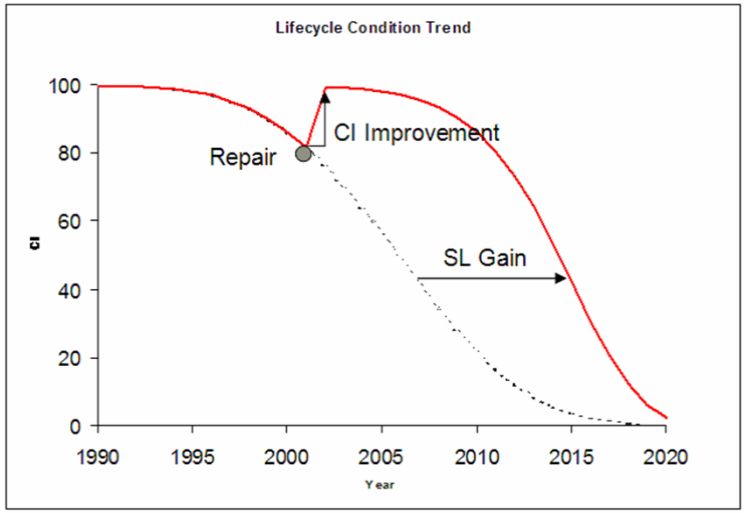
New Technology and Data

- BUILDER and other asset management technology, and application of Reliability Engineering, are introducing more intelligent ways of predicting optimal maintenance schedules and timing and maintaining ongoing condition assessment.
- APIs and cloud deployment connect the ecosystem and provide consistent but dynamic cost inputs through budgeting, planning, and lifecycle delivery.



USACE CERL

Reactive → Calendar based → Usage based → Condition based → Predictive

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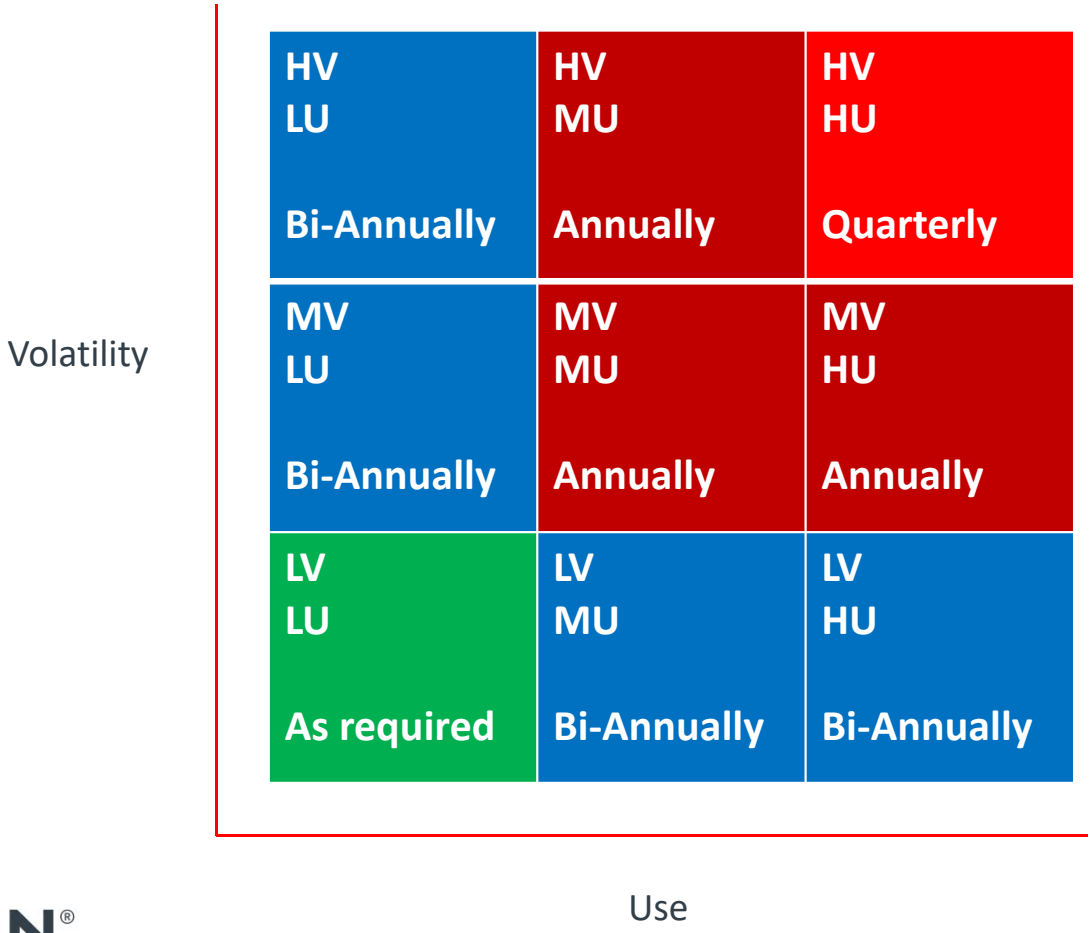
Asset Management Maturity
Adapted from IBM Maximo

COST RESEARCH: SMARTER, NOT HARDER



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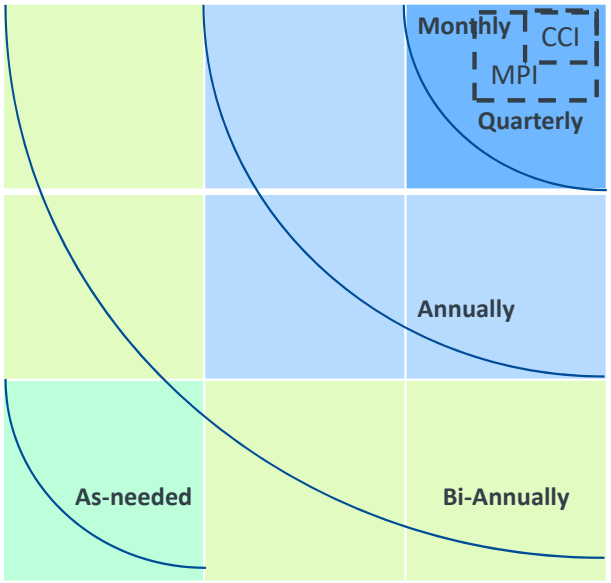
EXAMPLE: CONCRETE



Materials Examples:

3000 PSI Ready Mix Concrete
Reinforcing Steel
Welded Wire Fabric

Synthetic Fibers
Formwork
Expansion Joints

Waterstop
Precast Items
Curing Blankets

Plastic Keyways
Muriatic Acid

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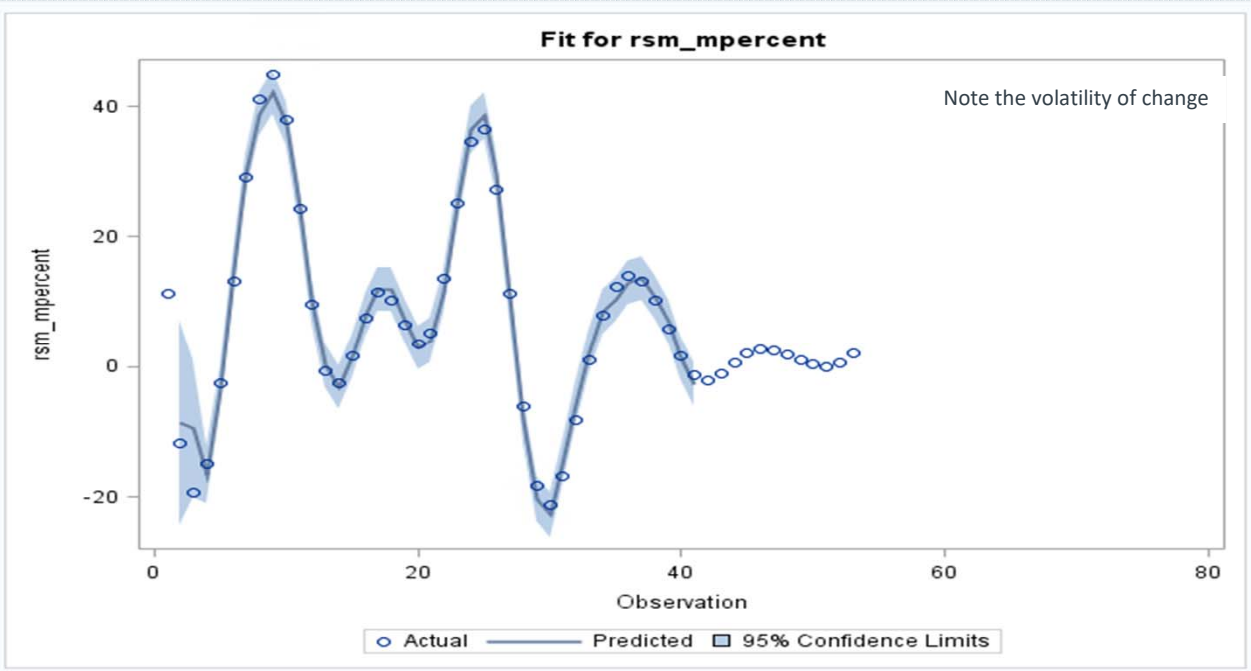
Predictive Cost Model Development

- Predictive costing supports predictive maintenance.
- Helps owners more accurately project maintenance and repair activities, and even informs project timing.

Graphical View of Predictive Model for Cost of Specific Material



Y Axis is Year-over-Year Percent Change in Price of Material
X Axis is the Number of Quarters, Starting with 2002Q1

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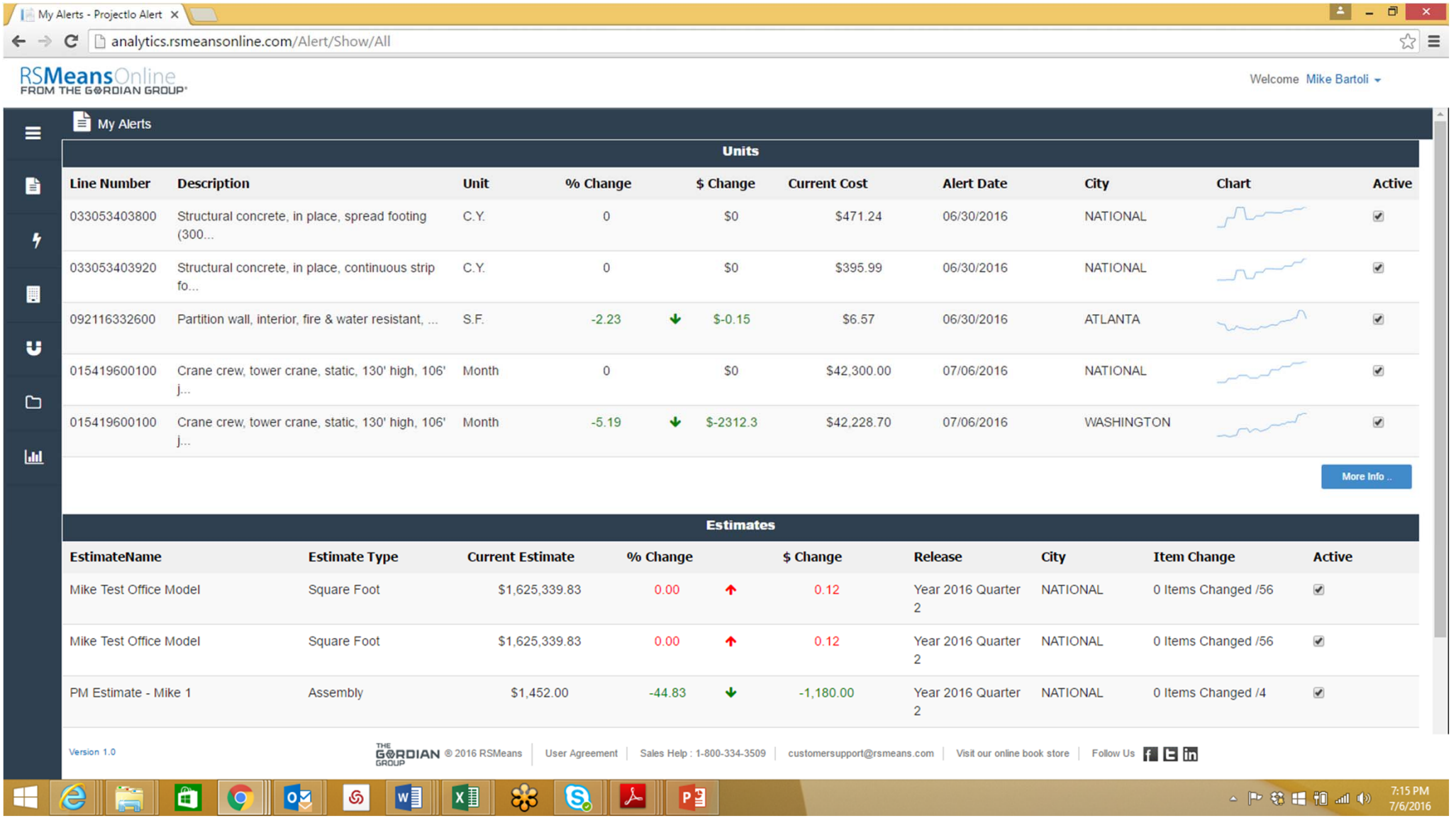
COST FLUCTUATIONS

CHANGES IN NATIONAL DATA 2015-2016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My Alerts
Units
Line Number | Description | Unit | % Change | $ Change | Current Cost | Alert Date | City | Chart | Active
033053403800 | Structural concrete, in place, spread footing (300... | C.Y. | 0 | $0 | $471.24 | 06/30/2016 | NATIONAL
033053403920 | Structural concrete, in place, continuous strip fo... | C.Y. | 0 | $0 | $395.99 | 06/30/2016 | NATIONAL
092116332600 | Partition wall, interior, fire & water resistant, ... | S.F. | -2.23 | $-0.15 | $6.57 | 06/30/2016 | ATLANTA
015419600100 | Crane crew, tower crane, static, 130' high, 106' j... | Month | 0 | $0 | $42,300.00 | 07/06/2016 | NATIONAL
015419600100 | Crane crew, tower crane, static, 130' high, 106' j... | Month | -5.19 | $-2312.3 | $42,228.70 | 07/06/2016 | WASHINGTON
More Info ..
Estimates
EstimateName | Estimate Type | Current Estimate | % Change | $ Change | Release | City | Item Change | Active
Mike Test Office Model | Square Foot | $1,625,339.83 | 0.00 | 0.12 | Year 2016 Quarter 2 | NATIONAL | 0 Items Changed /56
Mike Test Office Model | Square Foot | $1,625,339.83 | 0.00 | 0.12 | Year 2016 Quarter 2 | NATIONAL | 0 Items Changed /56
PM Estimate - Mike 1 | Assembly | $1,452.00 | -44.83 | -1,180.00 | Year 2016 Quarter 2 | NATIONAL | 0 Items Changed /4
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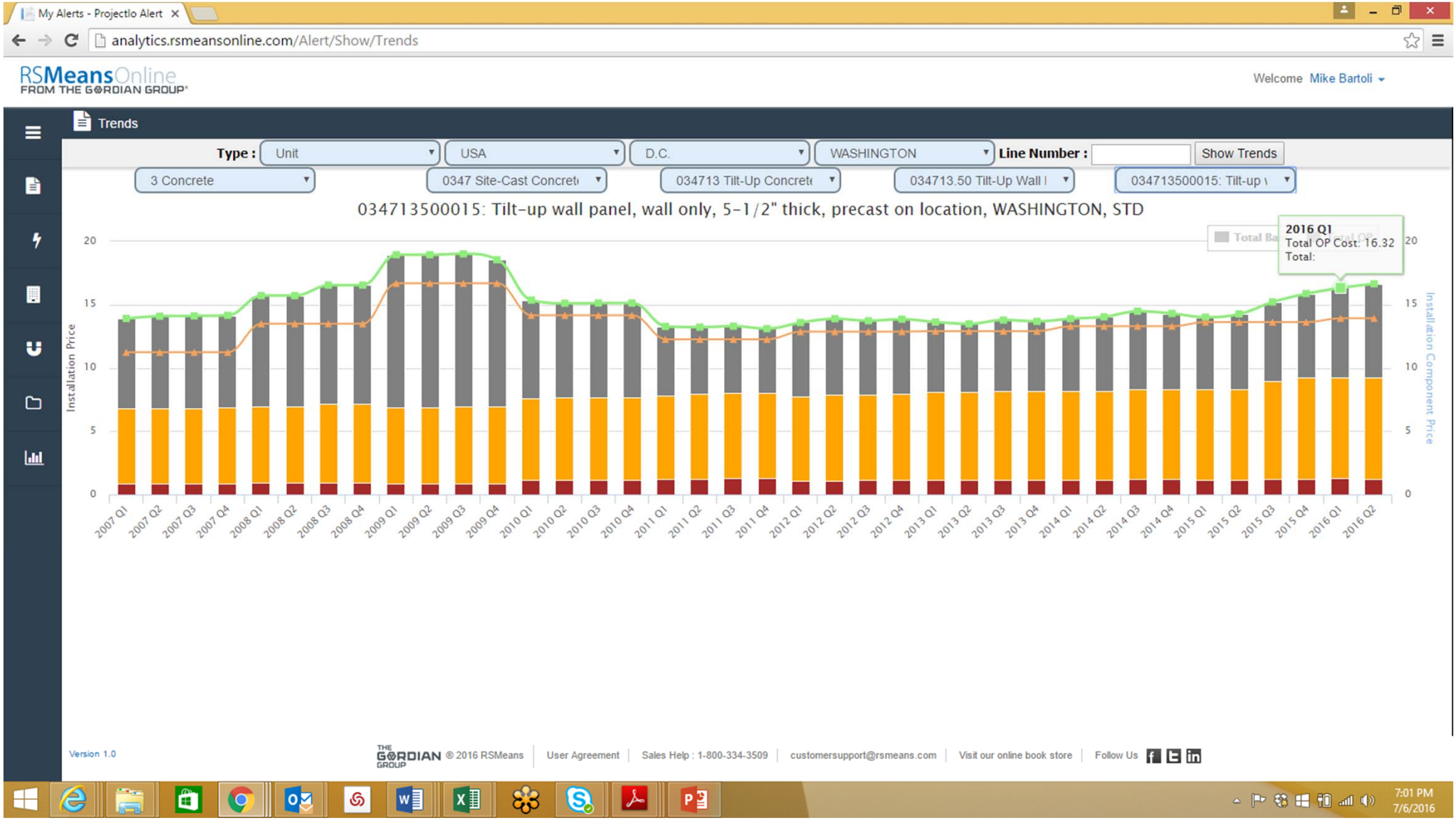
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analytics.rsmeansonline.com/Alert/Show/Trends
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Trends
Type :
Unit
USA
D.C.
WASHINGTON
Line Number :
Show Trends
3 Concrete
0347 Site-Cast Concrete
034713 Tilt-Up Concrete
034713.50 Tilt-Up Wall I
034713500015: Tilt-up
034713500015: Tilt-up wall panel, wall only, 5-1/2" thick, precast on location, WASHINGTON, STD
2016 Q1
Total OP Cost: 16.32
Total:
Installation Price
Installation Component Price
20
15
10
5
0
2007 Q1
2007 Q2
2007 Q3
2007 Q4
2008 Q1
2008 Q2
2008 Q3
2008 Q4
2009 Q1
2009 Q2
2009 Q3
2009 Q4
2010 Q1
2010 Q2
2010 Q3
2010 Q4
2011 Q1
2011 Q2
2011 Q3
2011 Q4
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2015 Q3
2015 Q4
2016 Q1
2016 Q2
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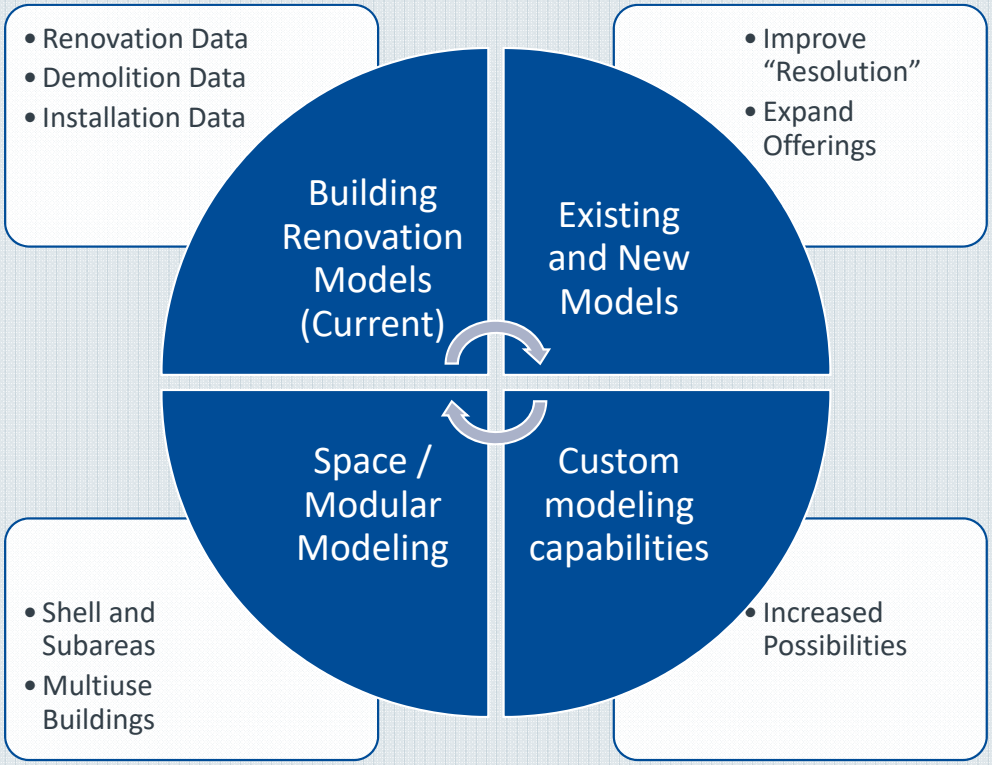
7/6/2016

New Data Variations

- New data rollups provide greater precision in modeling CRVs and sustainment costs
- Technology tools will provide for owner-driven modeling.
- Configuration tools will allow agencies to develop custom mapping of RSMeans data to asset types, supporting BIM and asset management.



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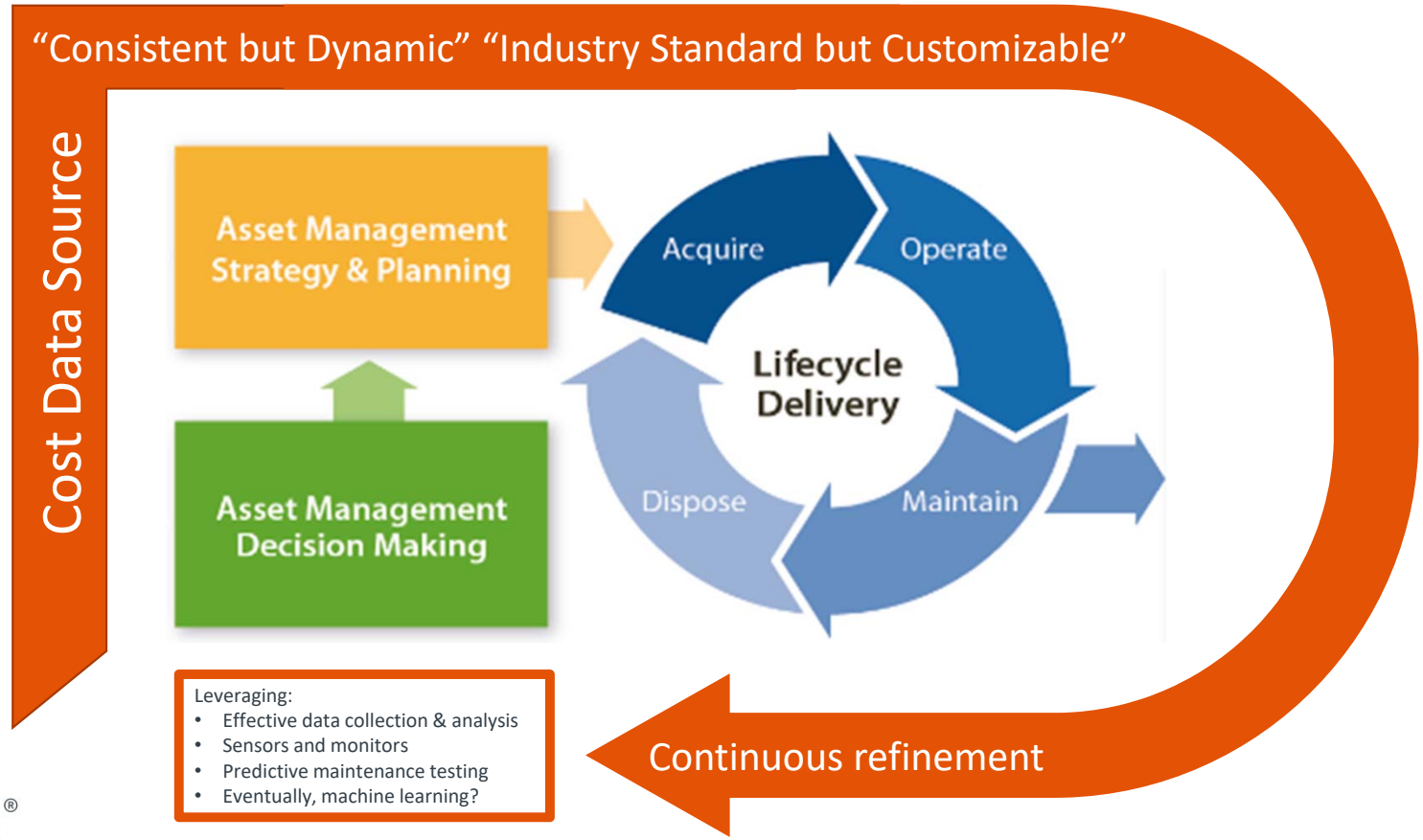
Data Application through IAM Model Planning and Execution



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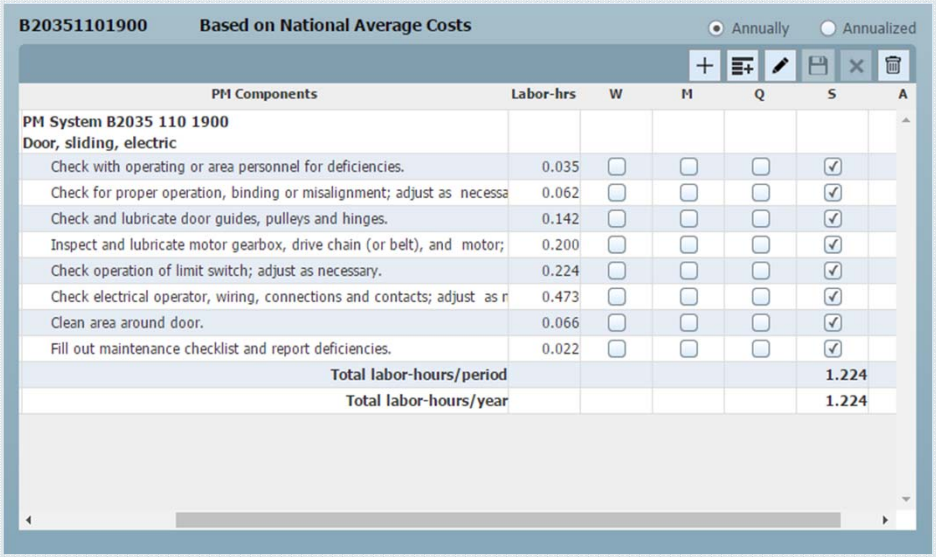
Data Through the Project Lifecycle

Procurement and Operations Solutions

- Leveraging cost data and schedules to procure asset management-related work ensures actual cost-to-budget consistency
- Job Order Contracting and Base Operating Services Contracts have long been used in federal government for efficient acquisition and project execution. Future vision:
  - Create a logical link between these lifecycle delivery mechanisms to planning and decisionmaking data.
  - Leverage data collection and analytics from these contracts to continuously improve the data source.



B20351101900 Based on National Average Costs — Annually / Annualized

PM Components	Labor-hrs	W	M	Q	S	A
PM System B2035 110 1900 Door, sliding, electric						
Check with operating or area personnel for deficiencies.	0.035	☐	☐	☐	☑	
Check for proper operation, binding or misalignment; adjust as necessa	0.062	☐	☐	☐	☑	
Check and lubricate door guides, pulleys and hinges.	0.142	☐	☐	☐	☑	
Inspect and lubricate motor gearbox, drive chain (or belt), and motor;	0.200	☐	☐	☐	☑	
Check operation of limit switch; adjust as necessary.	0.224	☐	☐	☐	☑	
Check electrical operator, wiring, connections and contacts; adjust as r	0.473	☐	☐	☐	☑	
Clean area around door.	0.066	☐	☐	☐	☑	
Fill out maintenance checklist and report deficiencies.	0.022	☐	☐	☐	☑	
Total labor-hours/period					1.224	
Total labor-hours/year					1.224	

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