How USACE is Implementing Performance Management

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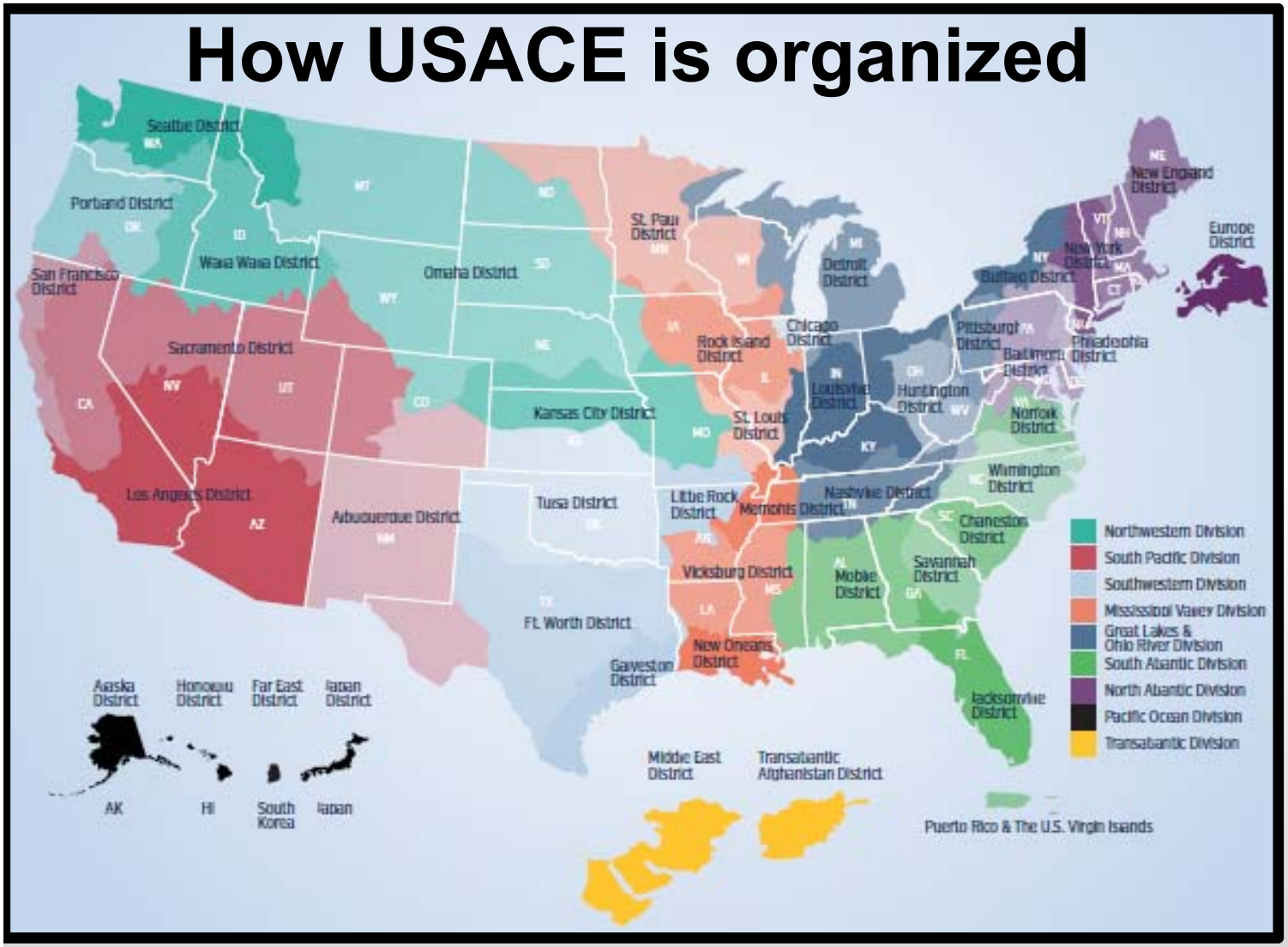
Learning Objectives

- Present background on USACE – how are wer organized and what do we do
- Present a board overview of EVM as an effective performance measurement technique
- Benefits and core concepts
- Describe the benefits and requirements
- Discuss scalability of applying EV principle

How USACE is organized



1 **Headquarters**

9 **Division**

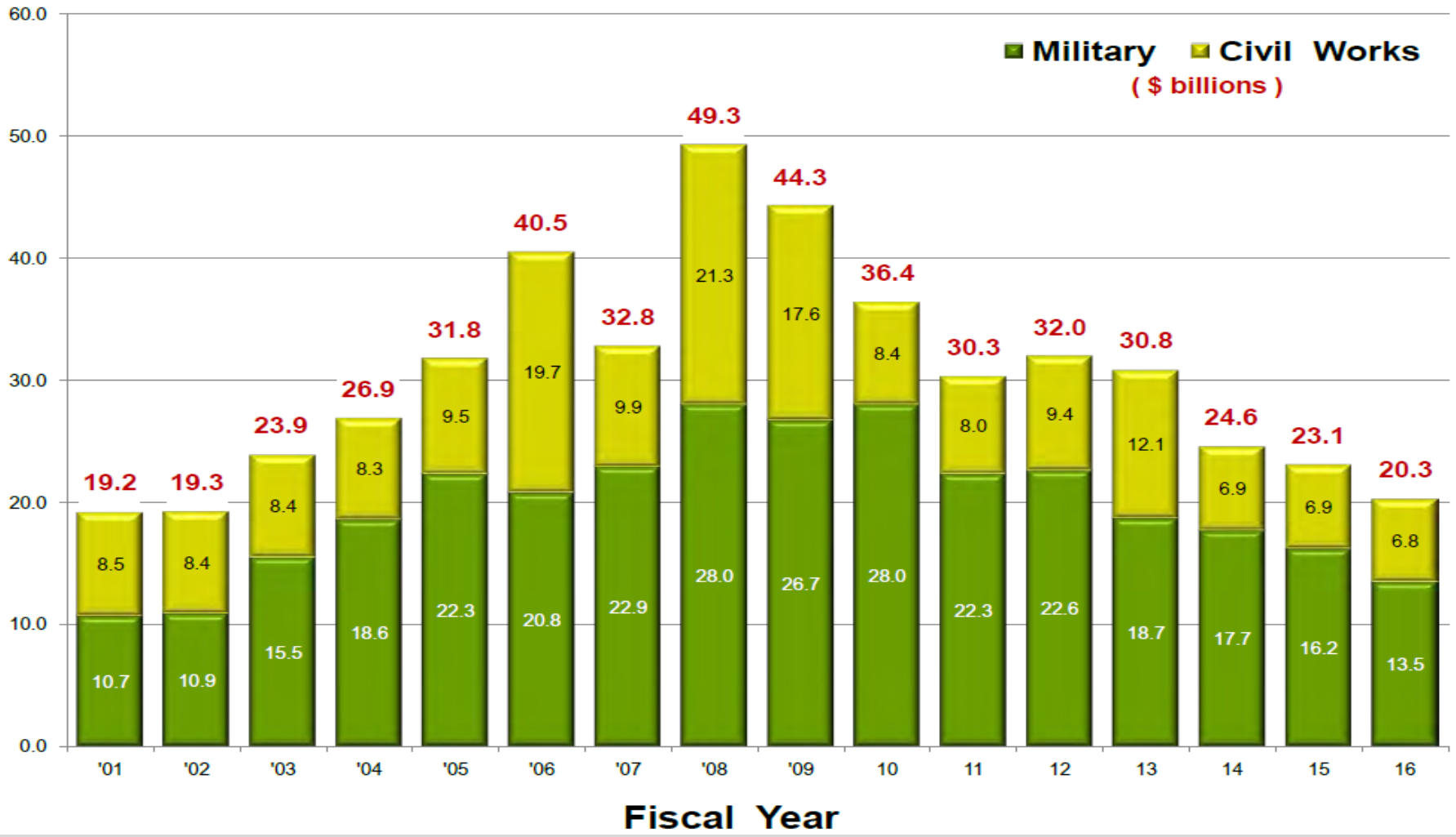
43 **Districts**

9 **Centers**

1 **Active Duty Unit**

2 **US Army Reserve Theater Commands**

The USACE Program



What USACE does

Military Missions

Military Construction

COCOM Support, Overseas Contingency Operations (OCO)

Installation Support, Environmental, Energy and Sustainability

Navigation, Flood Control, Disaster Response, Shore Protection, Hydropower, Water Supply, Regulatory, Recreation, Environmental Restoration

Civil Works

Contingency Operations

...rnment"
...nd Recovery

Life-Cycle Flood Risk Management

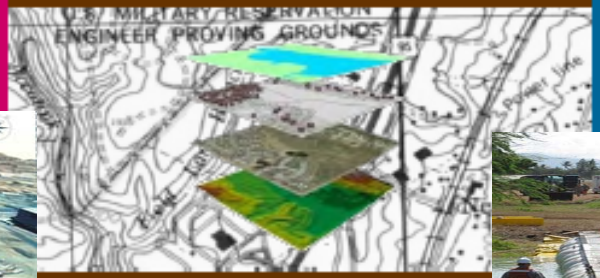
Critical Infrastructure

Federal / State / Local

"Whole of USACE" Capabilities

Capacity Development

Geospatial Support



Common Operating Picture / Enviror

Civil Works Programs

Military Programs

Emergency and Contingency Operations

Warfighter

Installations and Energy

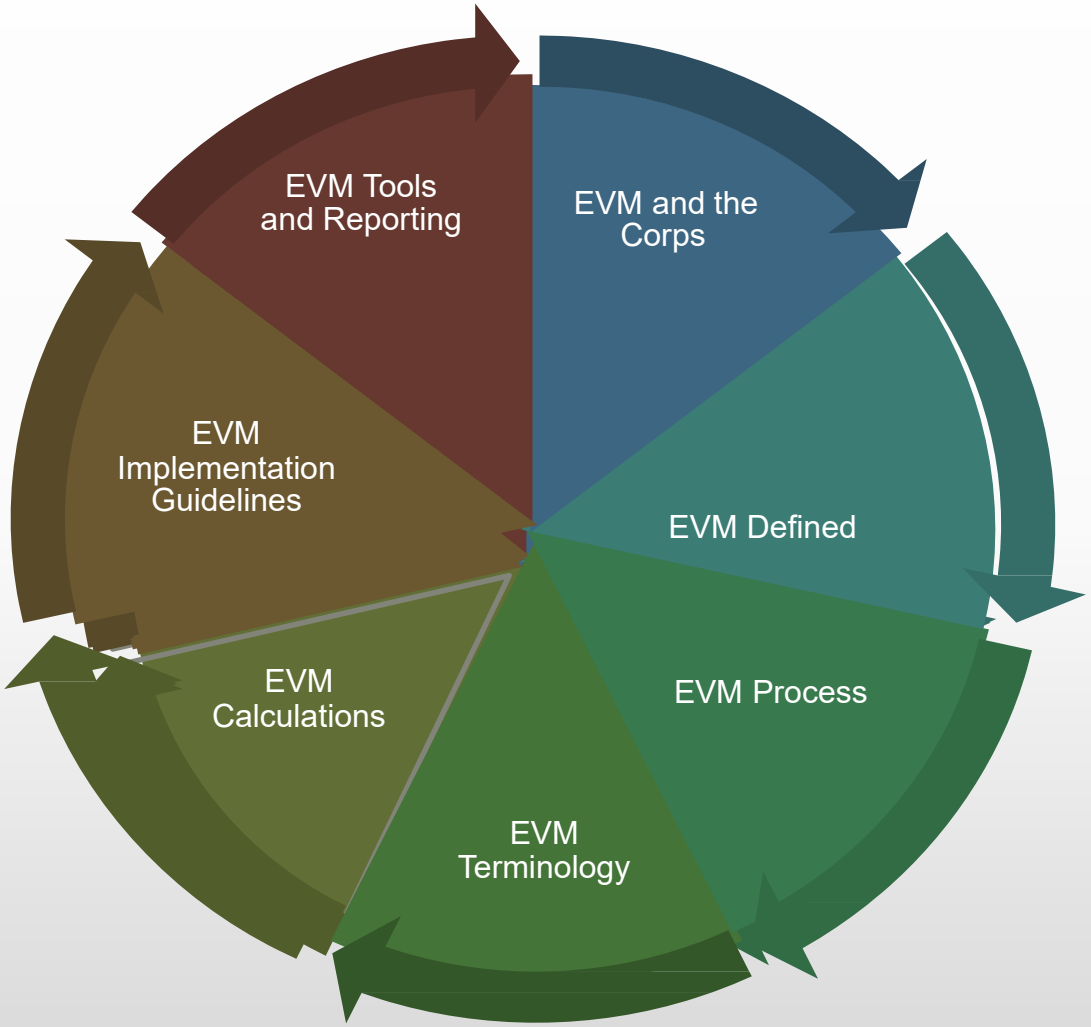
Environment

Water Resources

International and Interagency

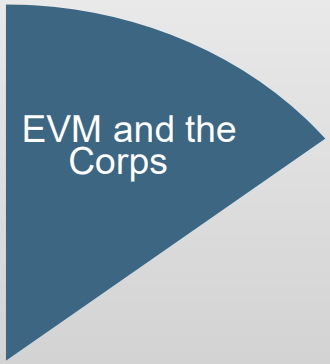
Research and Development

Real Estate — Acquire, Manage and Dispose / DoD Recruiting Facilities / Contingency Operations

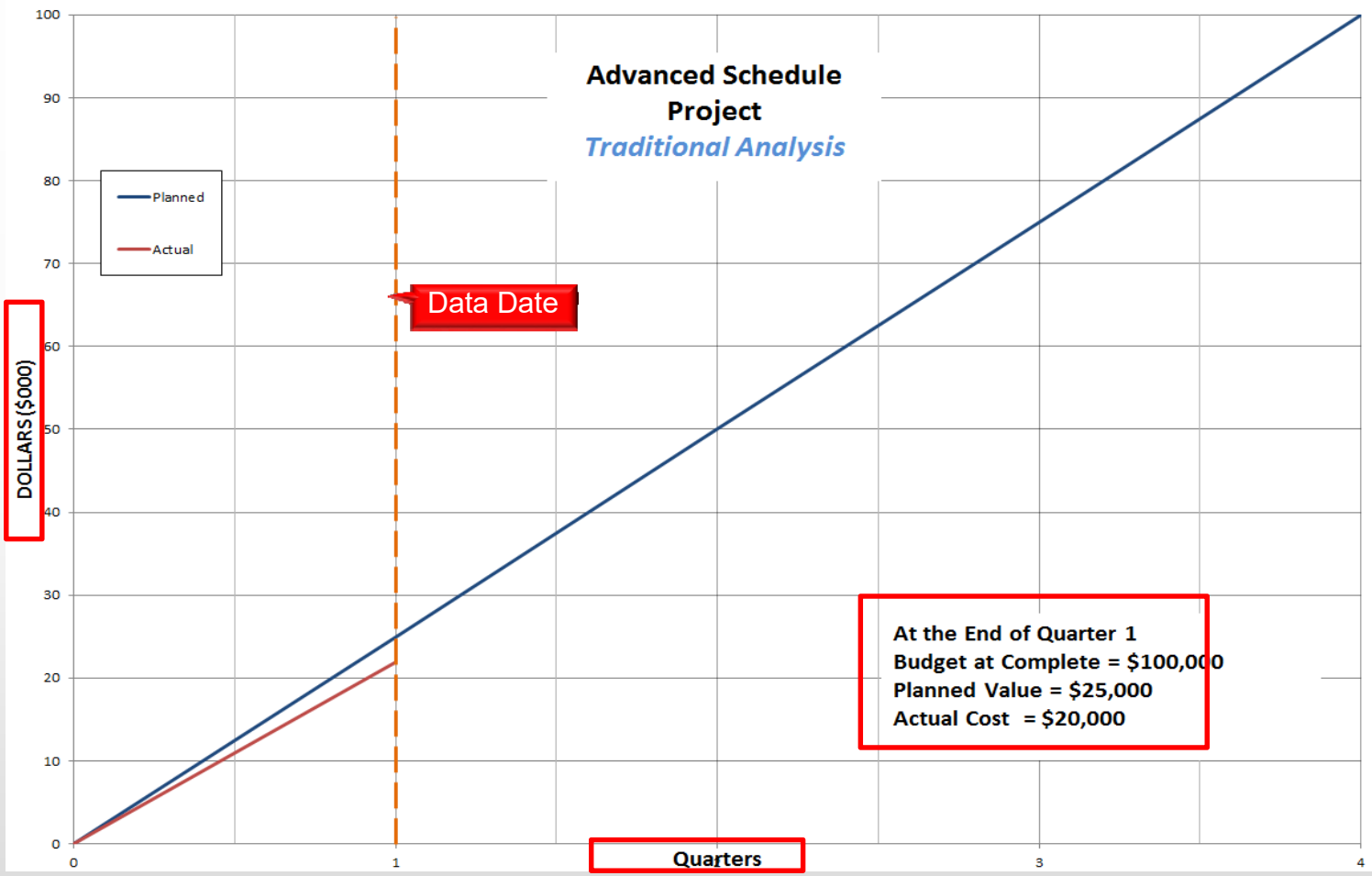

EVM and the Corps
EVM Defined
EVM Process
EVM Terminology
EVM Calculations
EVM Implementation Guidelines
EVM Tools and Reporting

PERFORMANCE MANAGEMENT USING EVM AND USACE

- Why is the Corps of Engineers deploying this method, and why now?
- Why should a PDT apply EVM to a project, even when that project seems to be going well?
- And what about the scaling of efforts and the relative returns?
- Could a PDT end up spending more time and money to track a project with EVM than it would to actually manage it?

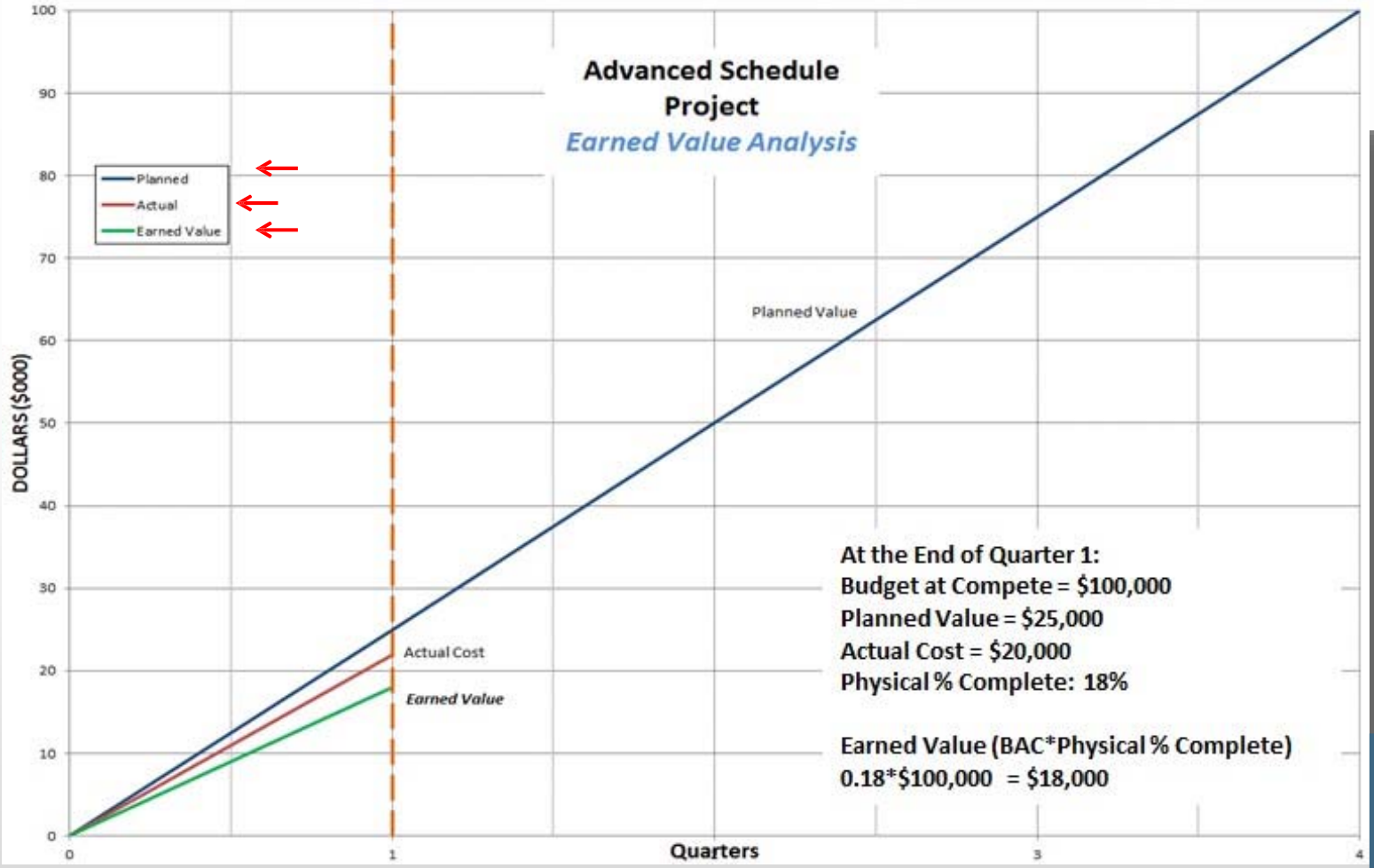


EARNED VALUE ANALYSIS VS. TRADITIONAL ANALYSIS EXAMPLE



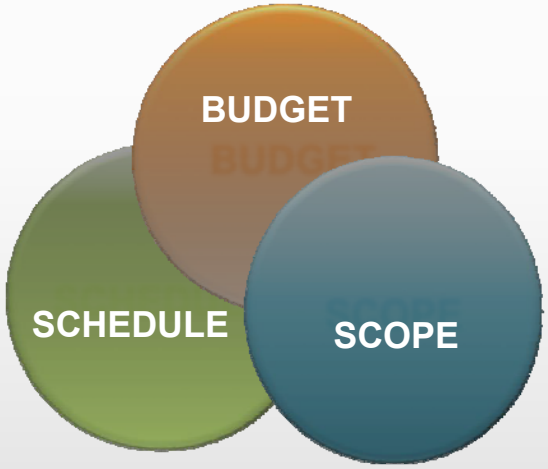
EVM and the Corps

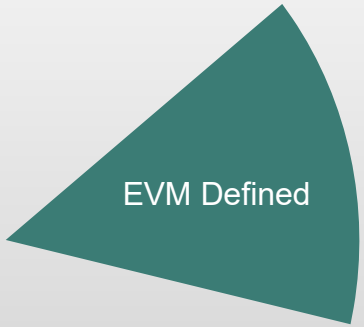
EARNED VALUE ANALYSIS VS. TRADITIONAL ANALYSIS EXAMPLE CONT'D



EARNED VALUE MANAGEMENT – DEFINED

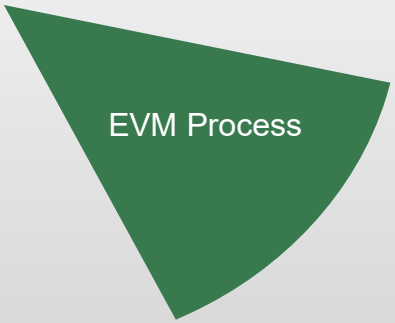
- An industry standard method of measuring a project's progress at any given point in time.
- In most cases, Earned Value warning signals become available to management as early as 15 to 20% into a new project.





As work is completed it is considered "**earned**."

EARNED VALUE MANAGEMENT PROCESS



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Project Management Question	EVM Performance Measure
How are we doing time-wise?	**Schedule Analysis & Forecasting**
- Are we ahead or behind schedule?	Schedule Variance (SV)
- How efficiently are we using time?	Schedule Performance Index (SPI)
- When are we likely to finish work?	Time Estimate at Completion (EACt)
How are we doing cost-wise?	**Cost Analysis & Forecasting**
- Are we under or over budget?	Cost Variance (CV)
- How efficiently are we using our resources?	Cost Performance Index (CPI)
- How efficiently must we use our remaining resources?	To-Complete Performance Index (TCPI)
-What is the project likely to cost?	Estimate at Completion (EAC)
- Will we be under or over budget?	Variance at Completion (VAC)
- What will the remaining work cost?	Estimate to Completion (ETC)

EVM Terminology

#	DESCRIPTION	REF.	FORMULA	COMMENTS
1	Budget At Completion	BAC	SUM(PV)	BAC is the total amount of Planned Value (PV) of the activity. It is pulled from the selected baseline.
2	Planned Value	PV	Taken from the monthly distribution of the baseline	The Planned Value (PV) represents the At Completion Cost field from the project baseline. How the EVM universe was designed, it can handle multiple baselines; however, most reports will require the user to select the baseline type to use for the report generation.
3	Earned Value	EV	BAC * Percent Complete	The Earned Value reflects the amount of work completed on the activity. Percent complete is measured by one of the following methods in the Activity vs performance percent complete section.
4	Actual Cost	AC	Actual cost are posted directly from Corps of Engineers Financial System (CEFMS)	Represents the actual expenditures incurred on the project/activity to date. Actuals are posted nightly.
5	Schedule Variance	SV	EV-PV	Variance in schedule (PV) and what has been earned to date (EV).
6	Cost Variance	CV	EV-AC	Variance in cost (AC) and what has been earned to date.

EVM Calculations

7	Schedule Performance Index	SPI	EV/PV	Measures the schedule efficiency of the team based on the sum of the planned value to how much has been earned on the project to date. SPI over 1.0 indicates ahead of schedule. The team has earned more than scheduled to date. SPI under 1.0 indicates project is behind schedule. The team has not earned what it has planned to date. A SPI score of .70 means that for every hour of estimated work, the team is only completing .70 hours.
8	Cost Performance Index	CPI	EV/AC	Measures the cost efficiency of the budgeted resources. CPI over 1.0 indicates a cost under run. Basically, the team has earned more work than expected cost. CPI under 1 indicates a cost overrun. It is costing more than expected. A CPI score of .9 means that for every dollar spent, 90 cents worth of work is getting completed.
9	Estimate to Complete	ETC	(BAC-EV) / CPI	The remaining amount of work needed to complete the activity.
10	To Complete Performance Index for BAC	TCPI bac	(BAC-EV) / (BAC – AC)	Efficiency that must be maintained in order to complete the project at the original Budget At Completion amount. TCPI greater than 1.0 will be harder to complete TCPI less than 1.0 will be easier to complete.

EVM Calculations

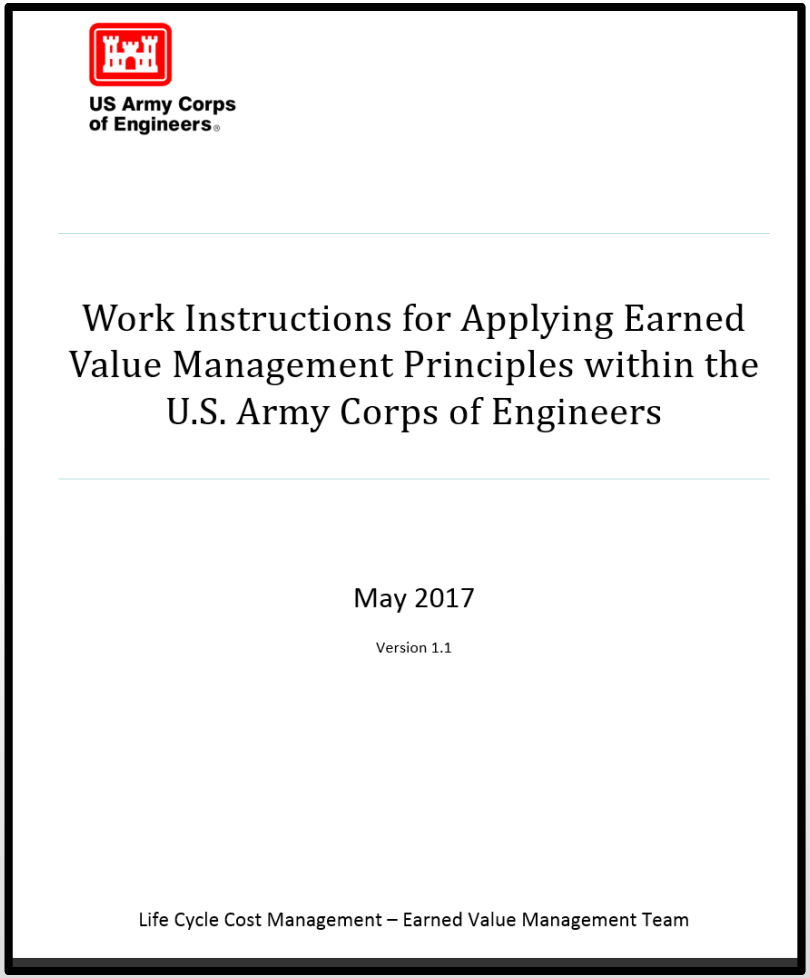
#	DESCRIPTION	REF.	FORMULA	COMMENTS
11	To Complete Performance Index for EAC	TCPI eac	(BAC-EV) / (EAC – AC)	Efficiency that must be maintained in order to complete on plan based on the current Estimate at Completion. TCPI greater than 1.0 will be harder to complete TCPI less than 1.0 will be easier to complete.
12	Variance At Completion	VAC	BAC-EAC	Variance at cost at completion of the project/activity.

EVM Calculations

Performance Management in USACE

Work Instructions Contain "How To's and Best Practices" for EVM

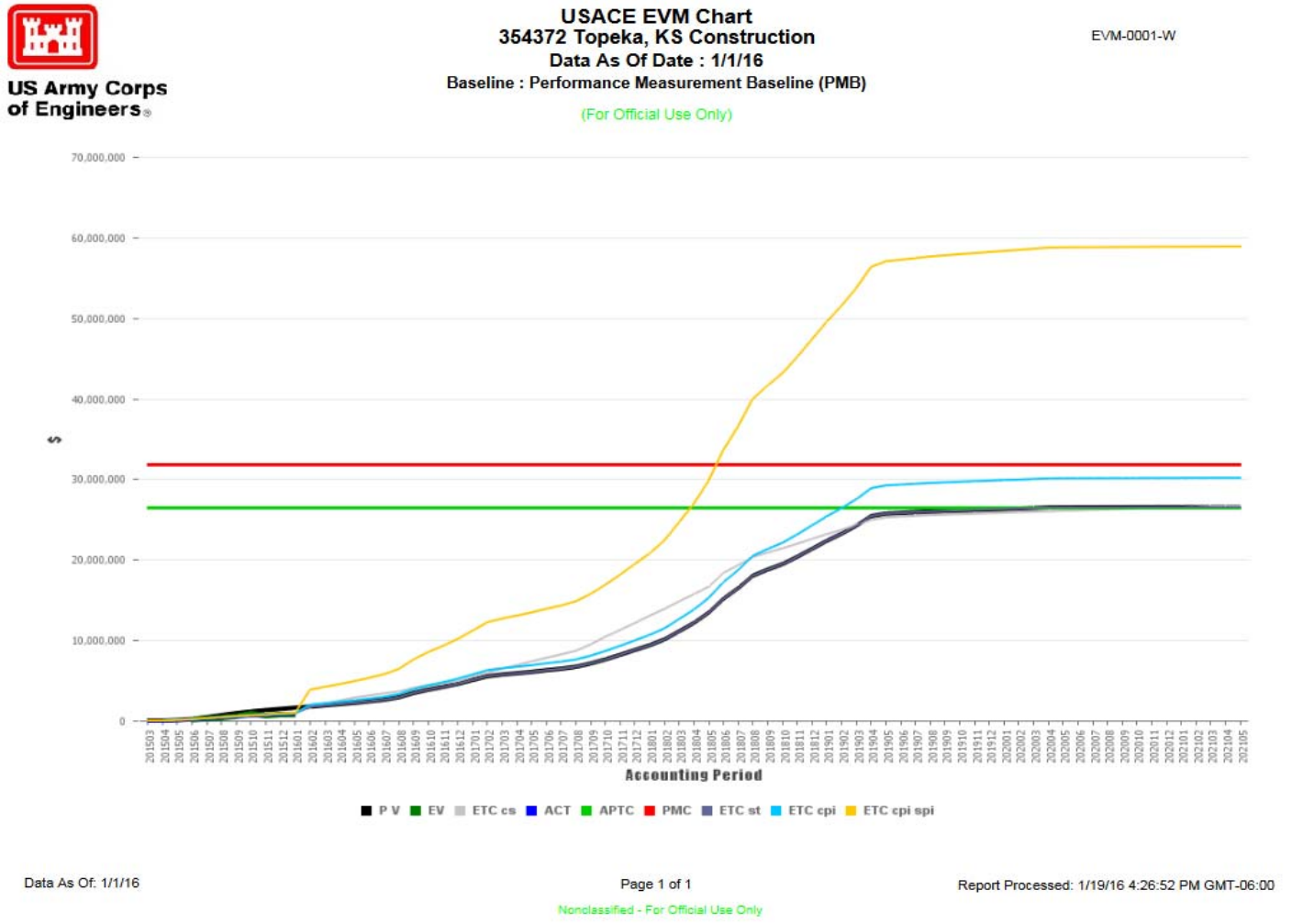
- Activities should represent the work performed
- Activities should have start/finish dates reflecting work being performed
- Activities should not be broken down by types of funds
- Well planned WBS will help with managing cost and potential scope creep
- Projects will need to be scheduled to project completion
- Resource details for Current Fiscal Year +2 budget years
- Utilize "rolling wave" scheduling for future years
- Activities should be logically sequenced
- Activity performance must be measurable



EVM Implementation Guidelines

TREND ANALYSIS CHART

- Primary Report
- Used to track project execution against administrative limits
- Earned Value



EVM Tools and Reporting

PROJECT REVIEW

US Army Corps of Engineers

USACE EVM Project Review (Performance)

Data As Of Date: 201601; Baseline: Performance Measurement Baseline (PMB)

(For Official Use Only)

EVM-0002-W

District	Project Name	Project Number	Project Manager	Total Project Cost	Estimate At Completion	Estimate to Complete	Planned Value	Earned Value	Actual Cost	Schedule Performance Index	Cost Performance Index
NWK	Harlan Salt Cedar Eradication	130768	OSTRANDER, CHRISTINA		1,267,339.95	1,112,648.77	388,083.6	111,788.95	154,691.18	0.29	0.72
NWK	NATIONAL GEOSPATIAL-INTELLIGENCE AGENCY WEST CAMPUS	402164	HALL, STEPHANIE		13,148,569.61	6,757,790.43	9,197,835.28	6,403,595	6,390,779.18	0.7	1
NWK	Topeka, KS Construction	354372	MYERS, KENT N	26,537,000	30,288,875.07	29,352,492.57	1,601,815.35	820,151.76	936,382.5	0.51	0.88

Purpose: Provides a listing of projects to quickly identify which projects are approaching their Total Project Cost estimates.

Will be able to run an entire district or division or program, i.e. DVA Major Construction.

EVM Tools and Reporting

EVM EXCEPTION AND VARIANCE ANALYSIS

US Army Corps of Engineers®

USACE EVM Exception and Variance Analysis - FEATURE

Data As Of Date : 201601

Baseline : Performance Measurement Baseline (PMB)

(For Official Use Only)

EVM-0003-W

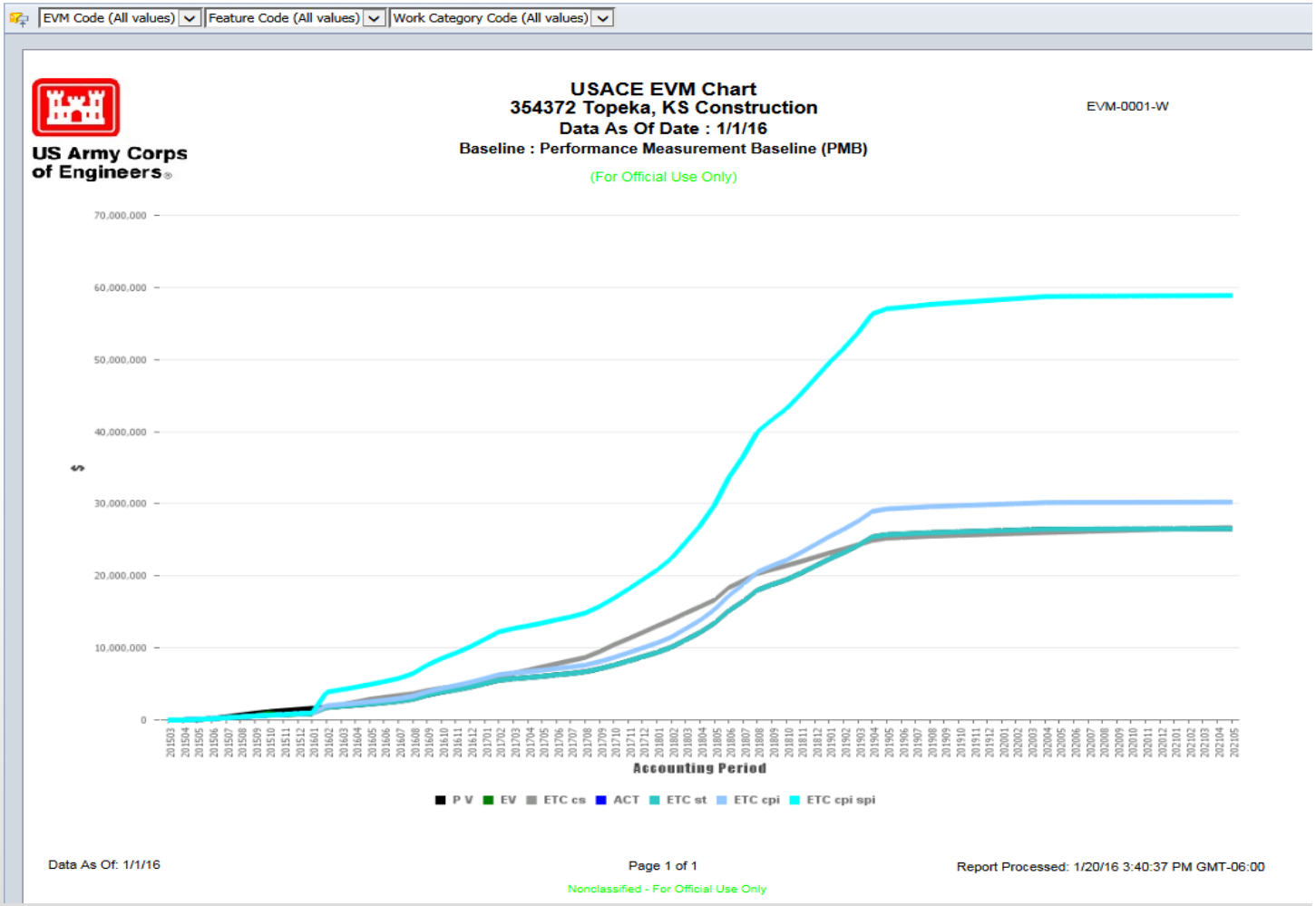
Project No	Project Name	Feature Code	Cost Variance	CV %	Schedule Variance	Variance at Completion	SV %	VAC %	Percent Completion	Percent Spent
354372	Topeka, KS Construction	Contingency	7,994.7	100.00%	-1,433.48	0	-17.93%	0.00%	1.41%	0.00%
		E&D	-6,054.71	-2,147.06%	282	713.29	100.00%	#DIV/0	0.00%	-888.38%
		N Topeka Design	-12,009.88	-3.81%	-636,243.76	-57,241.5	-201.72%	-4.09%	22.51%	22.45%
		Oakland Construction	3,570	23.02%	-10,280.3	357,913.85	-66.28%	23.08%	1.00%	1.00%
		Oakland Design	-17,625.88	-9.29%	-0.01	-17,625.88	0.00%	-9.29%	100.00%	100.00%
		Programmatic	-98,098.57	-115.14%	-5,242.86	-246,937.46	-6.15%	-176.07%	60.75%	47.34%
		S&A	3,186.22	16.96%	-509.71	38,387.72	-2.71%	16.69%	8.17%	8.14%
		S Topeka Design	-4,605.4	-2.51%	-132,431.49	-9,546.07	-72.31%	-2.24%	43.07%	43.18%

EVM Tools and Reporting

Purpose: To show projects with a cost or schedule variance.

STANDARD EVM CHART

- Standard EVM chart capable of more detailed earned value analysis.
  - User Defined Fields
  - Work Category Code



EVM Tools and Reporting

Activity Review

US Army Corps of Engineers

USACE EVM Activity Review (Performance)
Project: Topeka, KS Construction
Data As Of Date: 201601; Baseline: Performance Measurement Baseline (PMB)
(For Official Use Only)

EVM-0008-W

District	Activity Name	Activity ID	EVM Code	Feature	Budget At Completion	Estimate At Completion	Estimate to Complete	Activity % Complete	PV	Earned Value	Actual Cost	Schedule Performance Index	Cost Performance Index
NWK	FINAL SCHEDULE CONTINGENCY	A11540		Contingency	54,503.15	54,503.15	54,503.15	0.00%		0	0	0	0
NWK	NORTH TOPEKA - SOIL LAB TESTING AE CONTRACT	A11550		N Topeka Design	75,000	75,000	75,000	0.00%	75,000	0	0	0	0
NWK	NORTH TOPEKA & WW LERRD - LAND	A11370		Land	205,000.01	205,000.01	205,000.01	0.00%		0	0	0	0
NWK	NORTH TOPEKA & WW LERRD - RELOCATIONS	A11400		Relocation	116,000.01	116,000.01	116,000.01	0.00%		0	0	0	0
NWK	NTOPEKA&WW - 65% THRU ISSUE NTP IN-HOUSE LABOR	A1890		N Topeka Design	531,833	1,833,705.65	1,793,560.94	2.20%	115,115.37	11,700.33	40,144.71	0.1	0.29
NWK	NTOPEKA&WW - AREA OFFICE S&A	A1090		S&A	462,344.05	462,344.05	462,344.05	0.00%		0	0	0	0
NWK	NTOPEKA&WW - CONSTRUCTION CONTINGENCY	A11310		Contingency	1,773,000	1,773,000	1,773,000	0.00%		0	0	0	0
NWK	NTOPEKA&WW - CONSTRUCTION CONTRACT	A1190		N Topeka Construction	6,710,000	6,710,000	6,710,000	0.00%		0	0	0	0
NWK	NTOPEKA&WW - E&D DURING CONSTRUCTION	A1380		E&D	127,717.01	127,717.01	127,717.01	0.00%		0	0	0	0
NWK	NTOPEKA&WW - FLAGGER - UPRR	A12110		N Topeka Design	0	0	0	0.00%	0	0	0	0	0
NWK	NTOPEKA&WW - PLANNING THRU 35% DESIGN IN-HOUSE LABOR	A1650		N Topeka Design	734,133	679,417.23	420,087.22	38.20%	734,133	280,438.81	259,330.01	0.38	1.08
NWK	NTOPEKA&WW TELEPHONE POLE & WIRE REMOVAL - SBA SA CONTRACTOR CONTRACT	A3480		N Topeka Design	0	0	0	0.00%	0	0	0	0	0
NWK	NTOPEKA&WW - TRAVEL & SUPPORT	A1900		N Topeka Design	60,000	63,802.11	39,076.6	38.76%	27,402.52	23,268	24,725.51	0.85	0.94
NWK	OAKLAND - AREA OFFICE S&A	A5510		S&A	230,000.01	191,612.29	176,007.51	8.17%	19,300.71	18,791	15,604.78	0.97	1.2
NWK	OAKLAND CONSTRUCTION CONTINGENCY	A11300		Contingency	567,000	567,000	0	1.41%	9,428.18	7,994.7	0	0.85	0
NWK	OAKLAND - CONTRACT (CALENDAR DAY DURATION)	A11090		Oakland Construction	1,551,000	1,193,086.15	1,181,146.15	1.00%	25,790.3	15,510	11,940	0.6	1.3

Data As Of: 201601

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EVM Tools and Reporting

TRACKING SPI AND CPI

US Army Corps of Engineers

USACE - SPI and CPI Tracking

Baseline : Performance Measurement Baseline (PMB)

Project: 354372 - Topeka, KS Construction

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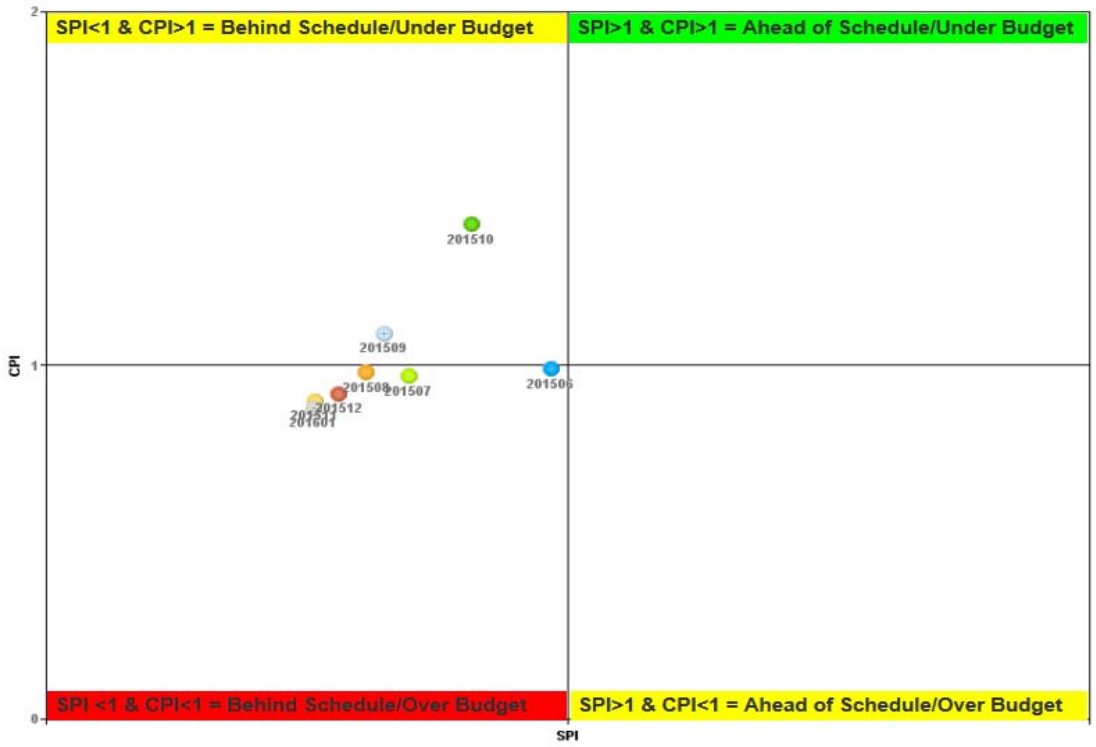

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EVM Tools and Reporting

Used to track performance of schedule and cost over time.

ACTIVITY EARNED VALUE ANALYSIS

US Army Corps of Engineers

USACE - Activity Earned Value Analysis

(For Official Use Only)

Project No.	Project Manager	Activity ID	Activity Name	Measure	201506	201507	201508	201509	201510	201511	201512	201601
354372	MYERS, KENT N	A10160	STOPEKA - AREA OFFICE S&A	PV	0	0	0	0	0	0	0	0
				EV	0	0	0	0	0	0	0	0
				AC	0	0	0	0	0	0	0	0
354372	MYERS, KENT N	A10260	STOPEKA - CONSTRUCTION CONTRACT	PV	0	0	0	0	0	0	0	0
				EV	0	0	0	0	0	0	0	0
				AC	0	0	0	0	0	0	0	0
354372	MYERS, KENT N	A10450	STOPEKA - E&D DURING CONSTRUCTION	PV	0	0	0	0	0	0	0	0
				EV	0	0	0	0	0	0	0	0
				AC	0	0	0	0	0	0	0	0
354372	MYERS, KENT N	A10720	STOPEKA - PLANNING THRU 35% DESIGN IN-HOUSE LABOR	PV	40,729.72	74,790.81	91,723.9	102,029.65	143,761.3	172,107.11	259,413.77	280,885.67
				EV	21,913.68	31,409.61	49,671.01	70,123.78	76,697.88	107,377.03	168,735.34	168,735.34
				AC	21,858.38	31,918.78	51,181.35	97,822.62	119,173.41	137,523.82	164,827.24	179,630.46
354372	MYERS, KENT N	A10820	STOPEKA - TYPE 2 IEPR/SAR EFFORT	PV	0	0	0	0	0	0	0	0
				EV	0	0	0	0	0	0	0	0
				AC	0	0	0	0	0	0	0	0
354372	MYERS, KENT N	A1090	NTOPEKA&WW - AREA OFFICE S&A	PV	0	0	0	0	0	0	0	0
				EV	0	0	0	0	0	0	0	0
				AC	0	0	0	0	0	0	0	0
354372	MYERS, KENT N	A10910	STOPEKA-65% DESIGN THRU 65% ATR IN-HOUSE LABOR	PV	0	0	0	0	0	0	0	0
				EV	0	0	0	0	0	0	0	0
				AC	0	0	0	0	0	0	0	0
354372	MYERS, KENT N	A10920	STOPEKA - TRAVEL & SUPPORT NON-LABOR	PV	2,108.45	4,696.71	4,483.2	6,011.78	7,158.2	6,476.47	9,891.99	13,159.45
				EV	0	0	4,800	7,200	9,600	12,000	14,400	14,400
				AC	0	0	84.86	3,021.98	5,110.29	5,110.29	5,110.29	8,110.29
354372	MYERS, KENT N	A11090	OAKLAND - CONTRACT (CALENDAR DAY DURATION)	PV	0	0	0	1,551,256.77	7,960	7,703.23	67,210.07	195,388.29
				EV	0	0	0	0	0	0	15,510	21,869.1
				AC	0	0	0	0	0	0	11,940	11,940
354372	MYERS, KENT N	A11250	TOPEKA FY16 - PROGRAMMATIC IN-HOUSE LABOR	PV	0	0	0	0	55,038.63	101,384.73	81,049.1	26,152.75
				EV	0	0	0	0	6,114.22	12,235.78	18,350	18,350
				AC	0	0	0	0	28,807.61	50,647.52	73,566.87	78,225.82

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EVM Tools and Reporting

Provides details at an activity level to show PV, EV, and AC units across accounting periods.

DATA QUALITY REPORT

US Army Corps of Engineers

EVM Data Quality Report

(For Official Use Only)

Topeka, KS Construction (354372) - BL 132 Performance Measurement Baseline (PMB)

Activity ID	Activity Name	Issue 1 EVM	Issue 2 EVM	Issue 3 EVM	Issue 4 EVM	Issue 5 EVM	Issue 6 EVM	Issue 7 EVM	Issue 8 EVM	Issue 9 EVM
A10720	STOPEKA - PLANNING THRU 35% DESIGN IN-HOUSE LABOR									X
A10920	STOPEKA - TRAVEL & SUPPORT NON-LABOR						X	X	X	X
A11090	OAKLAND - CONTRACT (CALENDAR DAY DURATION)								X	X
A11250	TOPEKA FY16 - PROGRAMMATIC IN-HOUSE LABOR			X			X	X	X	X
A11300	OAKLAND CONSTRUCTION CONTINGENCY	X					X			
A11450	OAKLAND - NON-LABOR								X	
A1650	NTOPEKA&WW - PLANNING THRU 35% DESIGN IN-HOUSE LABOR					X				X
A1890	NTOPEKA&WW - 65% THRU ISSUE NTP IN-HOUSE LABOR					X	X	X	X	X
A1900	NTOPEKA&WW - TRAVEL & SUPPORT									X
A1920	TOPEKA FY15 - PROGRAMMATIC IN-HOUSE LABOR								X	
A1930	TOPEKA PROGRAMMATIC NON-LABOR								X	
A5510	OAKLAND - AREA OFFICE S&A									X
A5800	OAKLAND - E&D DURING CONSTRUCTION								X	

Issue 1	Activity with a % Complete with no actual cost
Issue 2	Activity with actual expenditures with no % Complete
Issue 3	Activity PV has been fully expended and % Complete is not 100%
Issue 4	Activity flagged as 100% complete with PV still scheduled
Issue 5	SPI outside of defined parameters: < 0.5 or > 1.5
Issue 6	CPI outside of defined parameters: < 0.5 or > 1.5
Issue 7	TCPI EAC Variance > than 0.5 when compared against TCPI BAC
Issue 8	Variance At Completion is outside of a 20% of the original BAC
Issue 9	% Complete has not changed or is < from the last snapshot

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EVM Tools and Reporting

Data Quality Metrics

Issue	Reason added
Issue 1: Activity with a % Complete and no actual Cost	To have something completed on an activity takes expended funds.
Issue 2: Activity with Actual Expenditures with no % Complete	If spending money on an activity, we should be receiving some credit for having work completed.
Issue 3: Activity PV has been fully expended and % Complete is not 100%	Spent what was planned for the activity and still not complete. Would show that the activity is over budget or the PDT forgot to update the % Complete on the activity.
Issue 4: Activity flagged as 100% complete with PV still scheduled	This was to catch issues where an activity was accidently flagged as completed (automatically it 100% complete) while there was still planned dollars left on the task. It may be ahead of schedule, but the PM should at least be made aware of it.
Issue 5: SPI outside of defined parameters: < .5 or > 1.5	Having the SPI outside of these limits would indicate to the PM that attention needs to put on that activity.
Issue 6: CPI outside of defined parameters: < .5 or > 1.5	Having the CPI outside of these limits would indicate to the PM that attention needs to put on that activity
Issue 7: TCPI EAC Variance > than .5 when compared against the TCPI BAC	The TCPI is predictive indicator showing how much level of effort is needed to reach the BAC or EAC. If the variance is greater than .5, it shows that a significant amount of effort would be required to meet the EAC when being compared against the original BAC.
Issue 8: Variance At Completion is outside of a 20% of the original BAC	If the EAC is 20% complete greater than the BAC, it shows a potential significant cost overrun if corrections are not applied as soon as possible.
Issue 9: % Complete has not changed or is < than last monthly snapshot	A check to make sure the PM/PDT entered a new % complete for the current month.

EVM Tools and Reporting

Key Takeaways

- USACE implementing Performance Management through integration of cost, schedule, and technical information
- USACE automated system pulls together the required aspects of performance management through the use of earned value
- In early stages of implementing this process – tools were recently developed to provide accurate reporting
- Large projects are required to report their earned value data and manage the project utilizing this information
- Implementing performance management through use of earned value management data on entire project to include in-house labor and contracts to include firm fixed price contracts

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