2024

DEPARTMENT OF THE AIR FORCE

# Sustainment Management Systems

CE PLAYBOOKS

# Document Change Log

The table below provides a log of significant changes found in this Playbook.

| Change # | Section # | Description of Change | Date (MM/DD/YY) |
|---|---|---|---|
| 1 | | Inserted Document Change Log | 09/05/2024 |
| 2 | Multiple | Updated various AFCEC program manager information throughout the playbook. | 09/05/2024 |
| 3 | Extracting Value Using AF Institute of Technology Data Analysis Guidance | Inserted link to SMS Playbook Toolbox. | 11/12/2024 |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

## SMS – Overview

Introduction

Base-Level Application

Real Benefits

Good Data Rolls Up

OSD Requirements

Implementation Support

More than a Mandate

Policy Adherence

Playbook Purpose

Operations Flight Labor Reporting for SMS Activities

Frequency of SMS Assessments

### Introduction

We are now sustaining an AF-wide facility condition assessment (FCA) process that follows standard processes throughout the AF for all built infrastructure. The ability to anticipate built infrastructure failures, thereby minimizing emergency response to failures as part of daily operations, has arrived and is changing how we budget, plan, and prioritize built infrastructure requirements. Bases that have embraced this paradigm shift will reap the benefits much earlier than bases that have not. The Air Force Civil Engineer Center Operations Directorate (AFCEC/CO) is actively managing the Air Force-wide sustainment of the Sustainment Management System (SMS), a suite of web-based software applications developed by the Army Corps of Engineers to help leadership, civil engineers, technicians, and Activity Management Plan (AMP) Managers and Sub-AMP Managers influence when, where, and how to best maintain the AF's built infrastructure. Figure 1 below details the different SMS systems and their corresponding applications.

In the near future, the current suite of software applications will be replaced by the Enterprise SMS (ESMS), a modernized software application suite that combines all current SMS software applications into a single integrated suite with modules established for all the categories of infrastructure and facilities.

## Sustainment Management System Applications

| SMS | Background | Current Deployment | How to use in FY17 | End State |
|---|---|---|---|---|
| PAVER™ | 1970s<br>• Airfield Pavements, Pavements<br>• Pavement Condition Index (PCI™) | AF wide implementation | Likelihood of Failure factor from SMS Condition index & Engineering Assessment | Combination of SMS generated requirements and TRIRIGA programmed requirements will…<br><br>Replace FSM & 2% PRV as our primary budget drivers |
| ROOFER™ | 1980s<br>• Roof Condition Index | Limited AF use | Integrated with SMS BUILDER System | |
| RAILER™ | 1980s<br>• AF Rail System | DLA funds railroad inspections for rails used by DLA on AF bases, others inspected in-house or by contract | | |
| BUILDER™ | 1990s<br>• Bldg Envelope, Water System, Mech System, Fire Protection, Electric / Lighting<br>• Vertical Facility Condition Index (FCI) | AF wide implementation | Likelihood of Failure factor from SMS Condition Index | |
| FUELER™ | TBD<br>• Fuel Systems | New module, under development with DLA funding | | |
| UTILITIES | TBD<br>• Utility Distro Sys | New module, under development by CERL | | |

***Figure 1 Sustainment Management Systems***

## *Base-Level Application*

At the installation level, SMS provides scenario, trend, and cost analysis capabilities. SMS automates the means of exploring different action plans under various budget scenarios. SMS's Work Item Cost Analysis tool determines the return and return-on-investment (ROI) for each work activity type (i.e., do nothing, stop gap repair, repair, replace) to identify the most cost-effective options, showing the benefits of repair versus replacement as well as the consequences of deferring work for a given item. This makes multi-year work plans easier to formulate and funding requests easier to justify. Further, base personnel can analyze the total dollar amount attributed to an asset (e.g., an HVAC unit) over its lifespan against its relative condition, perform root cause failure analysis, determine whether a project exists to remedy the current problem, and initiate service requests to best address newly validated requirements.

SMS's condition index trend analysis can search through base inventory to forecast the best time to initiate maintenance or repairs several years in advance, thereby helping bases prepare out-year budgets and lower the total asset lifecycle cost of ownership. Bases can anticipate the optimum time frame (i.e., the "sweet spot") to repair specific components and minimize the penalty cost increases incurred from deferring maintenance, and can later determine whether work performed did actually reduce the number of issues recorded against a given asset resulting in lifecycle cost savings. Work items not completed in one year will be generated the following year at a higher cost due to inflation and additional deterioration. Constrained scenario analysis provides insight into what portion of the inventory will suffer at any given funding level. As a result, bases can achieve optimal facility performance out of the repair dollars invested.

## *Real Benefits*

Even in its early stages, users of an SMS realized the benefits of this powerful tool. To be able to realize the benefits of SMS and implement proactive asset management principles, bases must establish and maintain an updated inventory of their facilities along with current assessments. With the help of AFCEC's Asset Management Team (AMT), installation Operations Engineering personnel worked SMS BUILDER implementation. Prior to SMS implementation, facility assets only gained attention if something broke, while other unidentified issues existed and were left to fester and eventually fail. This drives to the basic principle of SMS: current condition assessments enable proactive corrective maintenance and minimize reactive service requests.

Looking into the future, powerful data visualization tools are currently being developed with early versions already fielded for initial use. These data visualization tools automate graphic presentation of the current and predicted conditions of facilities, systems, and potentially even components within systems, enabling civil engineer leaders from work team, to shop level, to flight, squadron, group and major command levels to quickly understand the current and future condition of critical infrastructure assets. These facility conditions can be aligned visually with current labor efforts to repair assets, and these analyses provide valuable insight on how to invest available resources for the maximum positive impact. With this type of powerful insight, civil engineers will proactively resolve problems before they occur, resulting in highly reliable, right-sized, agile infrastructure that fully supports whatever missions demand.

## *Good Data Rolls Up*

SMS provides enterprise-wide asset visibility of condition and geographic data, enabling higher levels of CE leadership to project long-term built infrastructure requirements. The Installation Health Assessment (IHA) long term analysis developed by HQ IMSC was based on facility BUILDER data and visually illustrated to AF leadership the future impacts over a 50-year time horizon of the various possible levels of built infrastructure funding and clearly demonstrated the tremendous value of accurate, complete, and current SMS data. SMS data can also supplement or validate requirements models for the development of installation Activity Management Plans (AMPs) that feed the Program Objective Memorandum (POM) process and support the development of projects for inclusion in the AF Comprehensive Asset Management Plan (AFCAMP). The Air Force can truly operationalize asset management principles in its real property-built infrastructure portfolio based on refreshed data, which is essential in a highly resource-constrained environment. This can be done for large centrally funded infrastructure investment programs as well as for in-house work task completion targeted at "sweet spot" component replacements.

## *OSD Requirements*

In addition to the urgency in managing CE's built infrastructure portfolio, the DoD mandated that all facilities and components in the Real Property Asset Database (RPAD) be inspected and rated using SMS or alternate data system which generates Facility Condition Index (FCI) by September 2017 to coincide with concurrent Financial Improvement and Audit Readiness (FIAR) requirements. Historically, the Air Force used different methodologies (ex: E-Comet) for assessing the condition of its assets, but with the 2013 DoD mandate, this approach has changed and become consistent across each of the military Services and DoD Agencies. This resulted in the ability to consistently plan, program, and budget work for facilities throughout the DoD. Further, it enabled the connection between asset management best practices and resulting benefits, such as reduced workloads and better-targeted project funding based on more refined future year requirements. There is an ongoing need to provide guidance (i.e., a standard assessment process) to the field to both achieve and sustain the mission of standardizing, collecting, analyzing, validating, and maintaining accurate horizontal and vertical infrastructure data to support resource allocation and operational decisions.

## *Implementation Support*

To deploy and optimize the use of SMS, comply with the DoD mandate, and ultimately operationalize asset management principles across the AF CE Enterprise, AFCEC/CO has developed this SMS Playbook to provide standardized, base-level guidance for sustaining facility inventories and conducting facility condition assessments. This Playbook incorporates input (e.g., successes, best practices, lessons learned) from Operations Engineering Elements at several bases. Sections on SMS-specific guidance (e.g., BUILDER Supplemental Guidance, etc.) describe roles and responsibilities, desired outcomes, data sources, references, prioritization criteria, and practical examples for leveraging the SMS outputs to inform requirements identification, development, and accomplishment.

## *More than a Mandate*

As a primary element of CE Transformation and CE's Asset Management philosophy, SMS represents a shift to a proactive versus reactive asset management strategy. Instead of keeping assets operational throughout their lifecycle by relying primarily on corrective repairs (after a system or component has failed due to significant loss of function), this strategy focuses on predicting and completing condition-based repairs. Anticipating and completing repairs can be accomplished prior to system failure with the support of SMS, resulting in higher performing assets at lower lifecycle costs. Base-level users are operating a powerful, user-friendly tool to support improved daily operations, and AFCEC, IMSC, and Headquarters AF/A4C will achieve enterprise-wide asset visibility to inform wide-scale resource allocation and strategic planning efforts. SMS establishes a knowledge base that makes built infrastructure data more complete, consistent, reliable, and accessible to AF CE personnel at all levels. All CE personnel must strive to fully operationalize asset management.

## *Policy Adherence*

Table 1 below highlights the primary policy drivers of the SMS process. For a more detailed explanation, see the DoD Memorandum, *Standardizing Facility Condition Assessments*, in the References section of this Playbook.

| *POLICY* | *APPLICABILITY* |
|---|---|
| Executive Order (EO) 13327, *Federal Real Property Asset Management* (2004) | • Requires all DoD Components to adopt a common process for conducting FCAs<br>• Requires a Facility Condition Index (FCI) to be recorded for all real property assets. Per Real Property Inventory Reporting guidelines, Condition Index (CI) is a required data element for all real property assets and is defined as, "a general measure of the constructed asset's condition at a specific point in time. CI (also referred to as Facility Condition Index [FCI]), is calculated as the ratio of Repair (and Maintenance) Needs to Plant Replacement Value (PRV)." |
| National Defense Authorization Act (NDAA) 2010 | • Identified September 30, 2017 as date when DoD financial statements shall be audit ready (FCIs for every asset in the RPAD are a necessary metric for audit readiness). |

| POLICY | APPLICABILITY |
|---|---|
| DoD Memorandum, *Standardizing Facility Condition Assessments* (2013) | • Requires all DoD Components to adopt a common process that incorporates the SMS modules developed by the USACE ERDC's CERL.<br>• Requires all DoD Components to properly record an FCI for each Real Property asset on their installations in their respective real property databases |
| AFI 32-1001, Chapter 4 | • Requires Operations Flights to collect, input, maintain, and update data utilizing AF-mandated Information Technology systems.<br>• Requires data be maintained for Sustainment Management Systems (e.g. BUILDER, PAVER, future designated sustainment management products) |

***Table 1 Applicable Policy***

## *Playbook Purpose*

The purpose of this Playbook is to provide standardized and centralized base-level guidance to conduct FCAs, record FCA data into the appropriate SMS or comparable system repository, and utilize the SMS outputs to analyze, plan, and forecast future work requirements for both in-house and contract accomplishment. By adhering to this guidance, base-level civil engineers will comply with EO 13327, NDAA 2010, DoD Memo: *Standardizing Facility Condition Assessments*, and AFI 32-1001. Further, following SMS guidance supports the foundation for operationalizing asset management for the CE Enterprise, which was first articulated in PAD 07-02 and again in PAD 12-03. Executing this transformation will enable the AF and DoD to optimize the service life of all facilities across its entire asset portfolio, thus enabling improved support and resiliency to achieve assigned missions even in the midst of always tightening Congressional budgets.

Note: SMS implementation and sustainment across the Air Force will be an on-going effort for years to come. Portions of the SMS Playbook are still under development as implementation and guidance for several of the systems (e.g., U.SMS and RAILER) are fully defined. This "living" Playbook will incorporate updates as both SMS Implementation and corresponding SMS modules mature, and it will serve as a prime repository for the latest information on implementation strategy and SMS/asset-specific best practices.

## *Operations Flight Labor Reporting for SMS Activities*

Craftsmen assigned to actual time accounting (ATA) cost centers (Workgroups) and who perform asset condition assessments in conjunction with performing Preventive Maintenance (PM) or Corrective Maintenance (CM), will charge their assessment time to the respective PM/CM task. When performing condition assessments in support of R&O (e.g., as members of an installation Built Infrastructure Assessment team [BIAT]) function, but while NOT permanently assigned to them, craftsmen will charge their time to Indirect Work Task, Administrative Task – Condition Assessment. More information is available on the Direct Time or Indirect Time BPL Page.

## *Frequency of SMS Assessments*

Installations will sustain and accurately maintain the SMS database on a regular, recurring, and routine basis. Sub- AMP Managers and working groups (at AFCEC and base) will work within their units to accomplish this. Sustainment includes ensuring timely, accurate, and responsive Real Property Capitalization updates to SMS data as a standard process of work order and project closeouts and new equipment installations made during corrective maintenance activities.

SMS data should be updated each time maintenance or repair work has been completed, that results in a changed condition which should receive an updated assessment. As craftsmen visit a facility, they should include time as part of their standard process to perform and update condition assessments.

After the original September 2017 deadline for completing initial assessments passed, OSD guidance further mandated that installations complete approximately 20% of their SMS reassessment cycle per year (i.e., 20% of total square footage). As most installations assessed the majority of their facilities during one or two years initially, the "leveling out" process to achieve a coherent 20% per year requires thoughtful planning, precise execution, and persistent follow-up over a period of several years to achieve the leveling out of the assessment

workload.

Sub-AMP Managers and working groups must ensure they maintain their assessment data current, which means every facility is reassessed at least once every five years. More frequent assessments may be requested or advisable if needed to validate the probability of failure (PoF) calculation in support of projects competing for centralized funding, or to correct previous ratings or related errors.

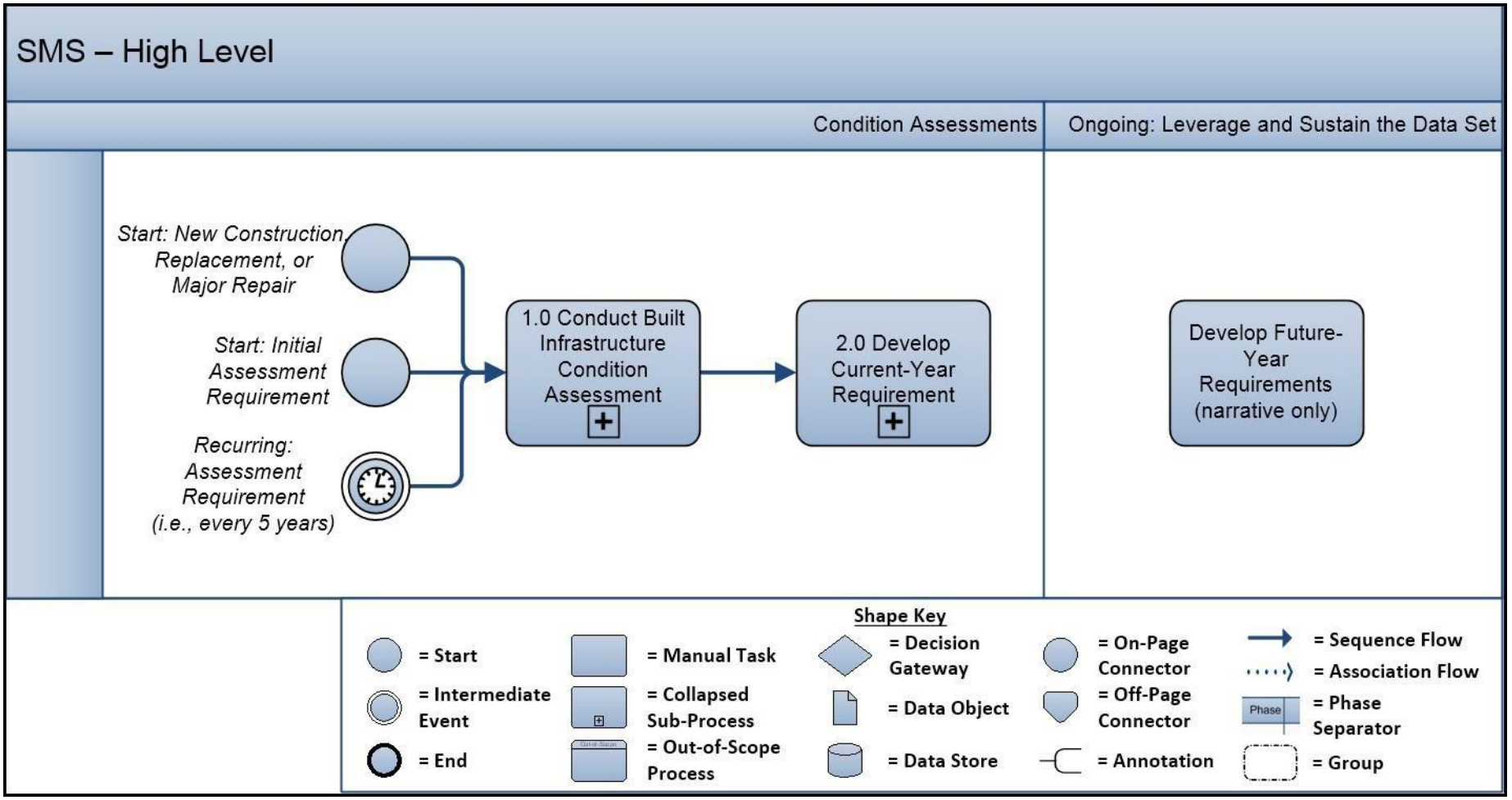



***Figure 2 High Level SMS Process***

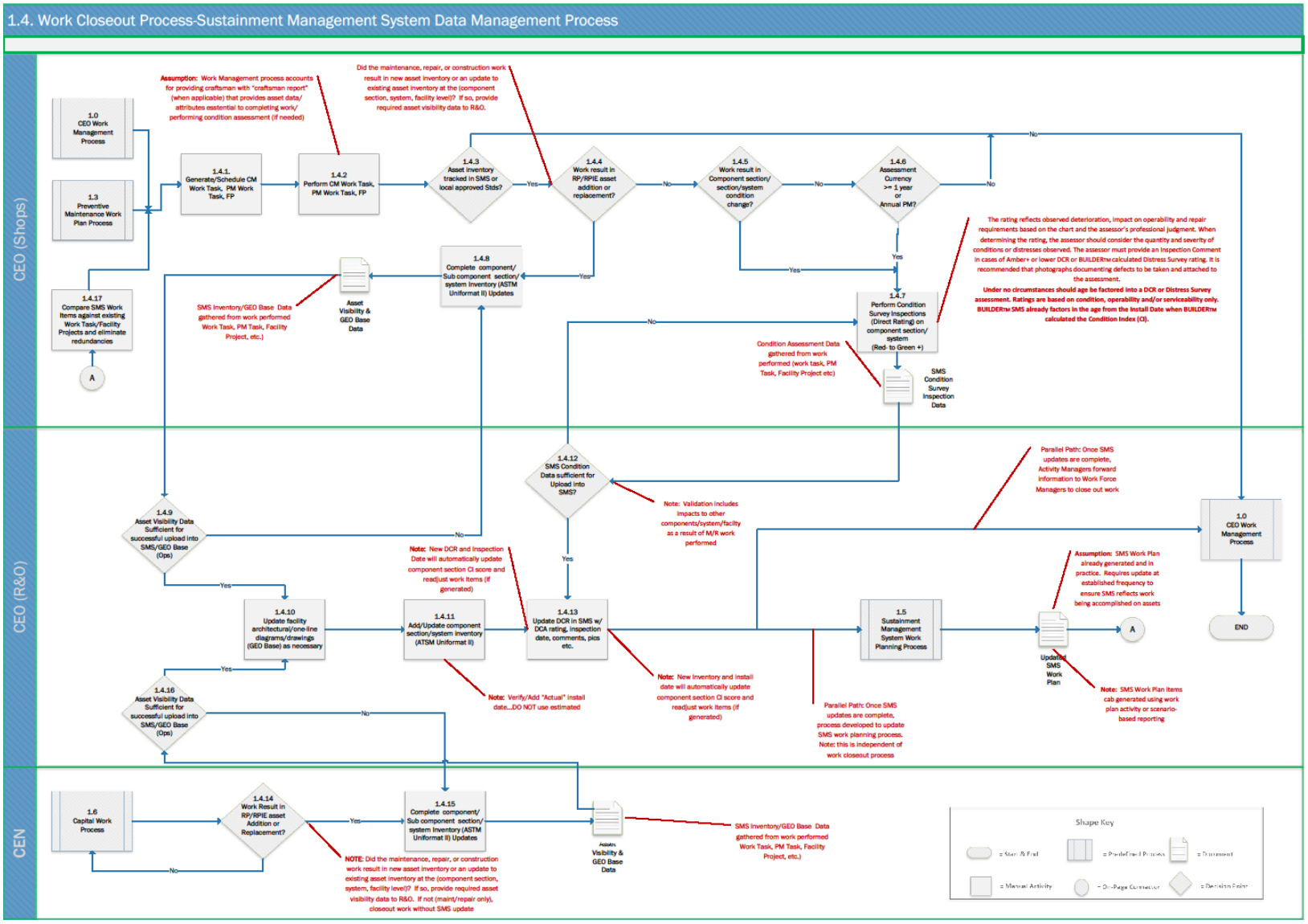



*Figure 3 High Level SMS Work Closeout Process*

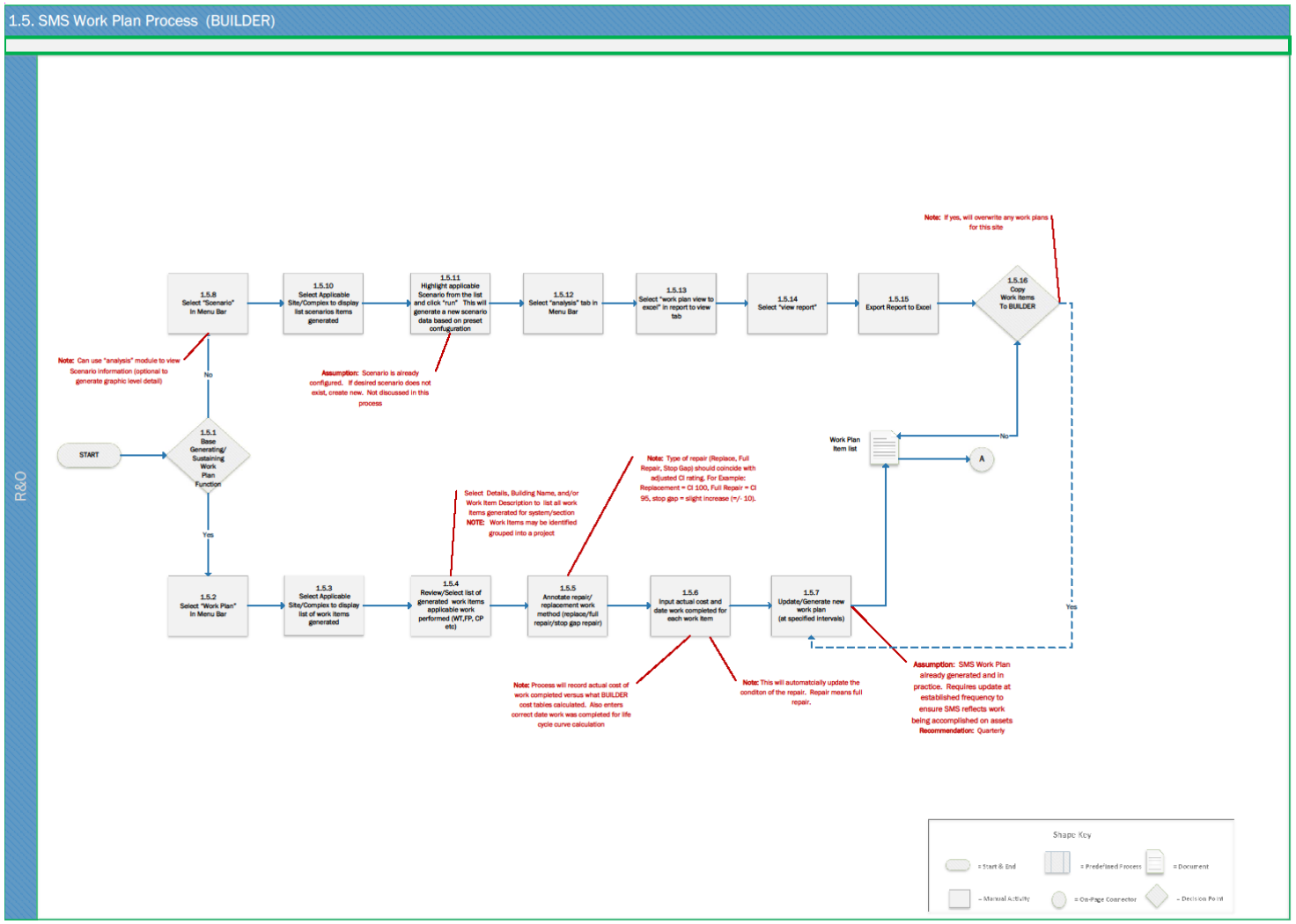



***Figure 4 High Level SMS Work Plan Process***

# SMS – Implementation Plan: Overview

Purpose

Key Milestones

Roles and Responsibilities

## Purpose

Provide guidance and coordinate efforts related to implementing SMS across the Air Force CE enterprise. This implementation plan addresses those issues common to all SMS component systems. Individual implementation plans have been developed to address the specific tasks associated with implementing each of the specific SMS component systems (e.g., BUILDER, PAVER, and those in development such as ESMS). The overall purpose of this plan is to coordinate all SMS efforts to enable all AF personnel to operationalize asset management principles as an integral part of day-to-day business practices. These principles will result in current, accurate and consistent asset data for use across the Air Force portfolio at all levels from the individual shop to the Air Staff.

### Data Sources and Data Exchanges

- ***Real Property Data:*** Real property accountability information required for SMS modules will be sourced only from an authoritative system (e.g., ACES-RP, NexGen IT, and DRRS-AF). All real property information must be Real Property Information Model (RPIM) compliant.
- ***Geospatial Data:*** When GIS data is used to represent DoD real property assets, the SMS community/users will use GIS data from the component's designated authoritative source. In most cases, this should be the component Installation Geospatial Information & Services (IGI&S) program of record. DoDI 4165.14 will clarify the requirement for GIS data representing the location and extent of real property assets, and references the applicable DoD standards for developing and maintaining such data. All geospatial data shall be compliant with the Spatial Data Standards for Facilities, Infrastructure, and Environment (SDSFIE) in its most current version.
- ***Real Property Facility Quality Rate:*** SMS modules will become the only authoritative data sources to populate the FCI into the real property inventory system's "Real Property Facility Quality Rate" data field.
- ***System Reconciliations:*** Before October of each year, DoD Components shall reconcile data between SMS modules and their real property database.

### Condition Index Reporting

SMS-computed FCI will be entered in the "Facility Physical Quality Rate" data field for all assets on an installation's real property database. This includes the CIs for facilities occupied/used by tenant organizations per DoDI 4165.70, "*Real Property Management*." CI data validation is to be annotated by the Real Property Office (RPO) who codes an "Asset Review Type Code" with "INSP" and enters the corresponding review date into the real property asset's record. No recorded inspection data shall be older than five years.

***Real Property Assets Not Supported by a SMS Tool***: Currently, there are SMS modules for Transportation Networks and Airfield Pavements; buildings; roofs; and railways. Modules for other built infrastructure (e.g., utilities and liquid fuel systems) are under various phases of investigation and development by CERL. For assets not presently supported with a SMS module, assessments shall be conducted with qualified personnel to determine existing physical deficiencies, estimate the cost of maintenance and repairs, and/or restore the assets to dependable operation using established industry cost guides to derive the FCI (e.g., Defense Logistics Agency [DLA]) use of the American Petroleum institute's standard or assessing liquid fuels systems).

***Inspection and Data Update Frequency***: Installations will follow the user manual for each SMS tool to perform BIA. The SMS tools are designed to allow facility maintenance technicians the ability to update facility data as they are performing their normal preventive maintenance rounds or responding to service

requests. However, the condition data of each asset shall undergo a comprehensive validation on no less than a five-year cycle at minimum (an average of 20% of installation assets should be reassessed annually). It is recommended that condition validation coincides with the real property physical inventory requirement described in DoDI 4165.14, *Real Property Inventory and Forecasting*, Enclosure 3, para. 6.

## *Key Milestones*

Implementation of SMS across Air Force assets will be an on-going effort for years to come since the various SMS components are at differing levels of maturity and it will take some time to fully work through the process changes.

- Ongoing During Annual Cycle:
  - SMS Facilities data are adequately populated to enable generation of infrastructure requirements to support development of the FY XX Integrated Priority List (IPL), the FY XX – XX POM submission, the FY XX – XX Air Force Comprehensive Asset Management Plan (AFCAMP) and the FY XX – XX Air Force Activity Management Plan (AFAMP)
- In Progress, Ongoing:
  - Linear segmentation will be completed for horizontal systems in accordance with the guidance provided in the AF/A7C memo dated 1 Apr 13, Subject: *Air Force Linear Segmentation Implementation Guidance.*
  - Each asset in the Air Force built infrastructure portfolio (i.e., Facilities, Utilities, and Transportation Networks Airfield Pavements (TNAP)) will have a facility condition index properly recorded in the real property data base based on inspections conducted using the SMS standard process completed for all facilities and facility components as required by the Office of the Under Secretary of Defense, Acquisition, Technology and Logistics (OUSD[AT&L]) memo dated 10 Sep 13, Subject: *Standardizing Facility Condition Assessment.*
  - Sustaining, managing, and refining of SMS data will be fully incorporated into daily facility maintenance and repair activities. R&O normally accomplishes sustainment, management and refining of SMS data; which includes feedback from the facility maintenance and repair activities (known as Actual Time Accounting (ATA) Workgroups) as issues are identified and/or warranted during the corrective or preventive maintenance visits. Review the AFCEC/COO series of Playbooks for further information.

### *Roles and Responsibilities*

| ROLES | RESPONSIBILITIES |
|---|---|
| AF/A4C | AF/A4C will provide policy and guidance and advocate for resources as appropriate. Additionally, AF/A4C will provide:<br><br>• Sustainment Management System program oversight<br>• Geographic Information System (GIS) program oversight<br>• Real Property program oversight<br>• Integrated information technology solutions |
| AFCEC | AFCEC will ensure that the standard operating procedures contained in this Playbook are compliant with procedures put forth by OSD in addition to the following:<br><br>• Review all proposed changes to the Playbook<br>• Propose revisions to existing AFIs to incorporate SMS<br>• Propose substantive Playbook updates affecting resourcing to the CE Corporate Structure for approval<br>• Provide GIS expertise<br>• Provide Real Property expertise<br>• Track status of program implementation within AFIMSC<br>• Advocate for centralized contract funding<br>• Review and submit proposed changes to business rules and Playbook guidance and directives<br>• Manage centralized contracts as needed<br>• Assist the bases in executing BIA evaluations of real property assets and input data into SMS<br>• Track status of program implementation & compliance with this implementation plan<br>• Manage the centralized pavement evaluation program including programming and budgeting for pavement evaluations and pavement condition index (PCI) surveys<br>• Incorporate language in MILCON project contracts to provide BIA information in the appropriate SMS format at the time of turnover<br>• Obtain, where possible, enterprise-wide authority to operate (ATO) for IT systems associated with SMS |
| Base Civil Engineer Organizations | • Populate and maintain, with support and assistance of AFCEC, SMS with complete, current, and accurate asset data needed to generate sustainment, maintenance and repair requirements for the installation's-built infrastructure<br>• Incorporate ongoing built infrastructure asset data collection, validation, and management into day-to-day operations and maintenance activities<br>• Assist AFCEC, MAJCOM, and IMSC with verifying/addressing SMS data issues<br>• Use requirements identified by SMS to develop and program projects per AFCEC-provided business rules based on gap analysis and risk assessment efforts<br>• Ensure vendors accomplishing maintenance/repair work by contract provide the needed updates to asset inventory/condition, including equipment/components, in the appropriate SMS format<br>• Ensure that Base Maintenance Contracts have the necessary provision to perform BIA and maintain current and accurate data in the SMS databases |

***Table 2 SMS Roles and Responsibilities***

# SMS – High Level

Introduction

Measures of Success

Roles and Responsibilities

Narrative

## Introduction

This narrative describes the standardized and recurring process of conducting Built Infrastructure Assessments, recording assessment data into a SMS tool or comparable information repository, and utilizing the system outputs to analyze, plan, and forecast future work requirements at the base and for Air Force Real Property Assets. The corresponding process map depicts an ongoing process. This process provides the framework for installations to operationalize asset management principles and comply with the DoD Facility Condition Assessment mandate. It also provides a framework to ensure a sustained data set beyond the initial round of assessments.

***Note 1***: This process assumes that installations have a current and accurate inventory of each of their real property assets, and the base is currently addressing the DoD mandate requiring all real property assets be inventoried and assessed.

***Note 2:*** The CE asset class for Built Infrastructure includes airfields, buildings, building improvements, structures, utility systems, linear structures (e.g., roads, sidewalks, railways, etc.), and Real Property Installed Equipment (i.e., equipment attached to and made part of buildings and structures). References to Built Infrastructure Assessments (BIA) include the three categories of Facilities, Utilities, and TNAP:

- Includes vertical, horizontal, and Real Property Installed Equipment (RPIE)
- Includes buildings, structures, utilities systems, improvements, and appurtenances thereto
- Building: A roofed and floored facility enclosed by exterior walls and consisting of one or more levels that is suitable for single or multiple functions
- Structure: A real property facility that is classified as other than a building, linear asset, or land
- Linear Structure: Infrastructure whose function requires that it traverse land (such as roads, rail, pipeline, utilities, fences, guard rails, or pavement)
- RPIE: Government-owned or leased equipment that is permanently attached to and made part of buildings and structures (such as heating systems) but not movable equipment (such as plant equipment)
- Asset Management Programs: Facilities, Utilities, and Transportation Networks and Airfield Pavements (TNAP).

## Measures of Success

AFCEC/CO defined the measures below as indicators of progress towards operationalizing asset management principles, meeting the DoD mandate, and achieving overall data integrity across the SMSs. AFCEC/CO will conduct quarterly base data pulls to monitor and evaluate these measures.

HQ AFIMSC may from time to time establish financial incentives to drive performance towards meeting the established measures. These measures will be publicized separately from this playbook.

| MEASURES | CALCULATION | TARGET | BENEFIT |
|---|---|---|---|
| ***Inventory / assessment completion*** (as a measure of the initial assessment required to meet the DoD mandate); all assessments are considered "current" if performed within the past five years | ***Prerequisite***: A facility is complete when all seven of the applicable key building systems are inventoried/assessed and recorded. If an applicable system is not assessed, then the facility is marked incomplete.<br><br>If a facility does not have all seven key building systems, Data managers will remove the absent system(s) record from the facility and make corresponding comments within the SMS.<br><br>***Facilities***: % of the installation's total square footage (as opposed to # of buildings)<br>***Utilities***: % of total unit of measure (e.g., linear feet)<br>***TNAP***: % of total unit of measure (e.g., linear feet, square yards for pavement) | 100% complete | Operationalizes asset management principles<br><br>Enables informed, data-driven decision-making<br><br>Enables forecasting of work requirements with proactive methodology<br><br>Enables status tracking and advanced analyses of operating and performance problems<br><br>Achieves compliance with DoD mandate to standardize Facility Condition Assessments |
| ***Data integrity (quality/accuracy)*** | Percent of quality/accurate data collected as measured through QC reports/data checks from SMS, Sub-AMP Manager validation, and field surveys.<br><br>***Quality/Accuracy is comprised of***:<br><br>1. Current within five years<br>2. Validity of ratings (percent of ratings within a given set of parameters<br>a. QC5 Report (inventoried but not assessed)<br>b. Major leaps or drops in CI from year to year<br>c. MDI-based spot checks<br>d. Future measures to be developed<br>3. Correlation between SMS data and RPAD data (as an indicator of alignment)<br>a. Percent assets recorded in RPAD vs SMS<br>b. Percent of assets that match CIs | 100% current | Operationalizes asset management principles<br><br>Enables informed, data-driven decision-making<br><br>Enables forecasting of work requirements with proactive methodology<br><br>Enables status tracking and advanced analyses of operating and performance problems<br><br>Identifies data manipulation and other anomalies<br><br>Ensures financial audit readiness |

***Table 3 Measures of Success***

## Roles and Responsibilities

The roles and responsibilities defined here apply to all processes in this Playbook. More specific descriptions are provided in the respective SMS process narratives.

| ROLES | RESPONSIBILITIES |
|---|---|
| ***AMP Manager*** | Each installation will provide a primary and alternate SMS Point of Contact (POC) to work with AFCEC SMS POCs. Installation POCs must be from the Operations and Engineering Flights.<br>• Determines number of data managers, assessors, and read-only users at their installation<br>• Ensures accuracy of SMS data inputs for the installation<br>• Responsible for an asset lifecycle management portfolio containing all planning, design, construction, operation, maintenance, repair, sustainment, restoration, modernization (SRM), and demolition of assigned AMP assets.<br>***Note***: These responsibilities correspond to the AMP Manager role and responsibilities delineated in AFI 32-1001, Chapter 4; AMP managers must be assigned from the Operations or Engineering Flights. |
| ***Sub-AMP Manager*** | • Serves as first line of defense in ensuring data quality for each SMS data set<br>• Manages the Built Infrastructure Assessment Team (BIAT), ensuring data inputs are accurate, consistent, and understandable<br>• Performs quality assurance after the BIAT's quality control efforts<br>• Responsible for the asset lifecycle management portfolio containing all systems consistent with their assigned Sub-AMP area<br>• Develops the overall operation, maintenance, repair, compliance, sustainment, and recapitalization of Sub-AMP portfolio assets<br>***Note***: These responsibilities correspond to the Sub-AMP Manager role and responsibilities delineated in AFI 32-1001, Chapter 4; Sub-AMP managers must be assigned from the Operations or Engineering Flights. |
| ***Installation Built Infrastructure Assessment Team (BIAT)*** | Conducts condition assessments on recurring basis to maintain data currency<br>Initiates updating of real property inventory, as required<br>Updates asset work history, inputs data into the SMS, and performs initial quality control prior to uploading to the SMS |

***Table 4 SMS AMP and Sub-AMP Manager Roles and Responsibilities***

## Narrative

*This section applies to inventory and assessment data entry from:*

- *New construction, replacement, or major repair efforts*
- *Initial Assessment Requirement*
- *Established recurring requirement, such as a minimum of 20% per year*

***Process 1.0 – Conduct Built Infrastructure Assessment***

This process provides guidance and instruction for base-level civil engineers to conduct Built Infrastructure Assessments, record assessment data into the appropriate SMS, and, as required, update the real property inventory (RPI). The following triggers initiate this process:

- ***Facility changes, to include New Construction, Replacement, or Major Repair yielding a change in condition***
- ***Initial assessment to comply with the September 2013 DoD BUILDER mandate to "Standardize Facility Condition Assessments"***

- ***Established recurring requirement,*** as determined by each base to operationalize asset management and maintain compliance (i.e., meet the DoD mandate)

The Built Infrastructure Assessment Team (BIAT) coordinates assessment logistics with the base Asset Manager and conducts the recurring assessments. After conducting an assessment, the BIAT performs quality control (QC) on the assessment data before uploading it into the appropriate SMS tool or comparable information repository. If required, the BIAT coordinates completion of the Department of Defense (DD) Form 1354, *Transfer and Acceptance of DoD Real Property,* or Air Force Form 123, *Request for Changed Use of Real Property* with the base Real Property Office (RPO) to initiate the update of facility inventory data in the Accountable Property System of Record (APSR), either ACES-RP or NexGen IT. For example, updates to facility inventory data would be required following capital improvement, acquisition, or improvement to Real Property that increases an asset or RPIE unit of measure, as well as following major maintenance, repairs, and renovations. Update to the APSR may be needed if previous acquisition or improvement work was never updated for whatever reason.

*Proceed to Process 2.0 Analyze and Plan Work*

***Process 2.0 – Develop Current-Year Requirements***

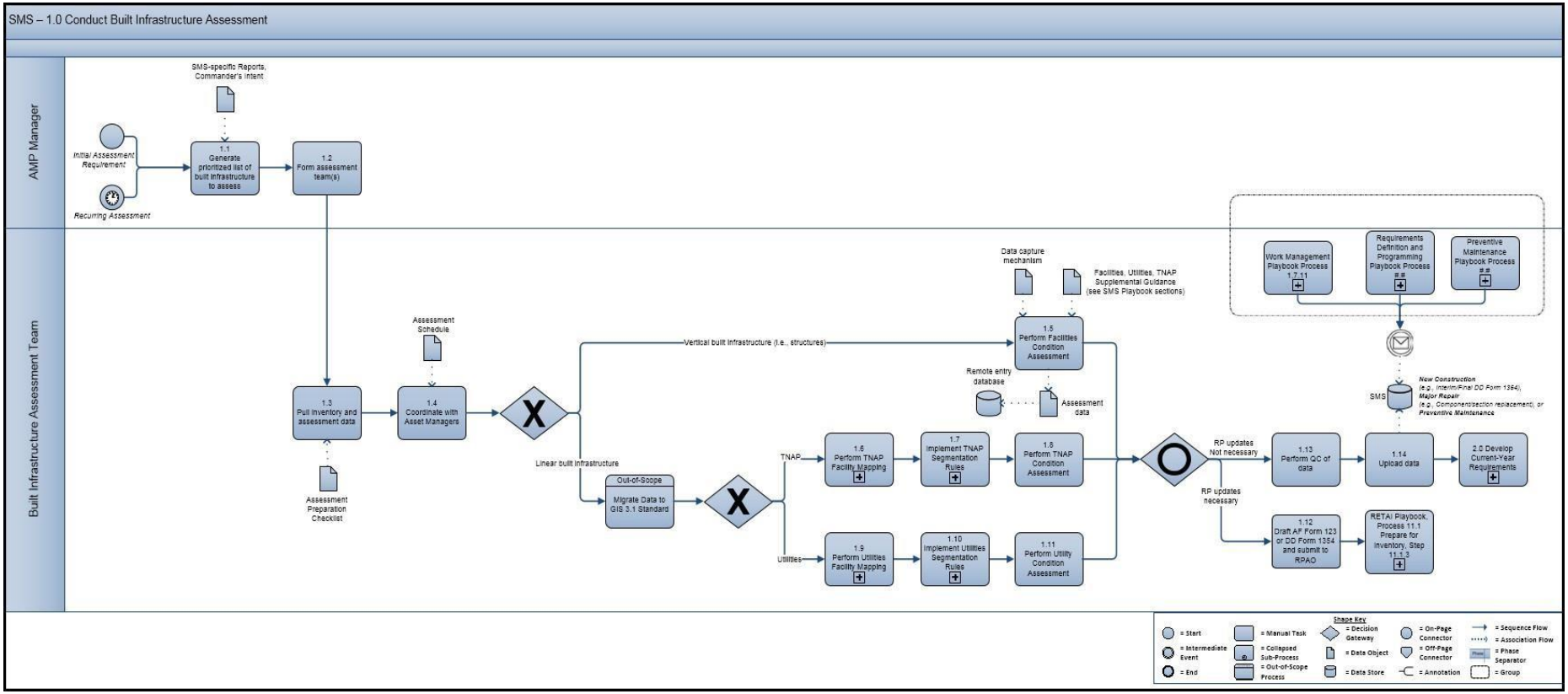
As the BIAT uploads assessment data into the SMS, the SMS generates various reports to document building, utilities, or pavements condition indices (CI), work items, raw score lists, and consequence analysis models. The Sub-AMP Manager conducts a quality and validation check of the SMS outputs and works with the AMP Manager to coalesce those requirements into actionable service requests or into programmed projects that meet the Work Requirement Review Board (WRRB) and/or Facilities Utilization Board (FUB). The AMP Manager presents the prioritized list of requirements to the WRRB and the WRRB determines approval on execution method for work and assigns execution responsibility (i.e., Operations or Engineering). In-house projects are executed via the Work Management Playbook, while Engineering projects are programmed for year of execution and sent to the FUB for approval and prioritization. When a project is approved and funded, it is executed via the Project Execution Playbook. Approved requirements that are not funded remain in the system as “deferred” requirements and are used to inform the Forecast process. Any requirements deemed invalid will be removed from the system.

*Proceed to Work Management Playbook, Process 3.0 Plan Work, Step 3.11 Review Draft Facility Project*

***Process 3.0 – Forecast Out-Year Requirements***

The Forecast process outlines how the Air Force will forecast future budget requirements, leveraging long-term projections enabled by SMSs. Each SMS will also provide a consequence analysis of investment decisions, which will consider impacts of not funding or deferring funding of requirements. These may include impact to remaining service life and total cost of ownership of the assets, to probability of failure, to consequence of failure, and any resulting mission impacts. Forecasting provides visibility of needed work at the right time BEFORE costly and unrecoverable deterioration occurs. In addition, forecasting provides visibility into the scale of future requirements, which is integral to the process of developing future year budgets and procurement strategies.

*End*


SMS – 1.0 Conduct Built Infrastructure Assessment
AMP Manager
Built Infrastructure Assessment Team
SMS-specific Reports, Commander's intent
Initial Assessment Requirement
Recurring Assessment
1.1 Generate prioritized list of built infrastructure to assess
1.2 Form assessment team(s)
1.3 Pull inventory and assessment data
Assessment Preparation Checklist
Assessment Schedule
1.4 Coordinate with Asset Managers
Vertical built infrastructure (i.e., structures)
Linear built infrastructure
Out-of-Scope
Migrate Data to GIS 3.1 Standard
TNAP
Utilities
1.6 Perform TNAP Facility Mapping
1.7 Implement TNAP Segmentation Rules
1.8 Perform TNAP Condition Assessment
1.9 Perform Utilities Facility Mapping
1.10 Implement Utilities Segmentation Rules
1.11 Perform Utility Condition Assessment
Data capture mechanism
Facilities, Utilities, TNAP Supplemental Guidance (see SMS Playbook sections)
1.5 Perform Facilities Condition Assessment
Remote entry database
Assessment data
Work Management Playbook Process 1.7.11
Requirements Definition and Programming Playbook Process ##
Preventive Maintenance Playbook Process ##
SMS
New Construction (e.g., Interim/Final DD Form 1354), Major Repair (e.g., Component/section replacement), or Preventive Maintenance
RP updates Not necessary
RP updates necessary
1.13 Perform QC of data
1.14 Upload data
2.0 Develop Current-Year Requirements
1.12 Draft AF Form 123 or DD Form 1354 and submit to RPAO
RETAI Playbook, Process 11.1 Prepare for inventory, Step 11.1.3
Shape Key
= Start
= Intermediate Event
= End
= Manual Task
= Collapsed Sub-Process
= Out-of-Scope Process
= Decision Gateway
= Data Object
= Data Store
= On-Page Connector
= Off-Page Connector
= Annotation
= Sequence Flow
= Association Flow
= Phase Separator
= Group

# SMS – 1.0 Conduct Built Infrastructure Assessment

Introduction

Roles and Responsibilities

Narrative

## Introduction

The Built Infrastructure CE asset class includes Facilities, Utilities, TNAP (e.g., roads, bridges, sidewalks, and railways), and Real Property Installed Equipment (i.e., equipment attached to and made part of buildings and structures). This process standardizes the collection and assessment of built infrastructure data, which informs a variety of asset management and investment planning work products (e.g., Activity Management Plans). Failure to follow instructions provided within this guidance may prevent requirements from receiving prioritization and/or funding consideration within the Air Force Comprehensive Asset Management Plan (AFCAMP) development and Integrated Priority List (IPL) execution.

Prior to conducting assessments, base AMP Managers should prioritize assets according to their value to the mission and current condition. The Mission Dependency Index (MDI) reflects each asset's value to the mission, while the condition may need to be estimated at the beginning of this effort. From there, AMP Managers identify, train, and equip a Built Infrastructure Assessment Team (BIAT), staffed either internally or by contract to perform the inventory and assessment. AFCEC will centrally manage assessments of bridges, airfield pavements, rails, and dams, in which case the BIAT will be formed by AFCEC Teams/AFCEC Consultants. The BIAT will be comprised of different roles and experts depending on the asset(s) in need of assessment. The BIAT coordinates their approach with the applicable base Sub-AMP Managers and performs the assessments, collecting and cleaning data prior to uploading to the applicable SMS. If at any time, a new asset is identified (e.g., found-on-base or in need of a "change in use" designation), the Sub-AMP Manager provides the Real Property Accountable Officer (RPAO) the Real Property data from the assessments, as doing so will directly affect the base's ability to qualify for sustainment funding and leverage assessment data to make informed decisions in later processes.

## Roles and Responsibilities

Each of the following roles applies to the installation:

| ROLES | RESPONSIBILITIES |
|---|---|
| ***AMP Manager*** | • Prioritizes the built infrastructure to be assessed based on data provided by the Base Sub- AMP Manager<br>• Ensures on-base BIATs are adequately resourced and trained to perform assessments<br>• Coordinates support for centrally-managed assessments |
| ***BIAT*** | • Coordinates with the base AMP Manager and various Facility Managers to arrange logistics and acquire pertinent facility data<br>• Conducts inventory and the initial assessment<br>• Updates work history as available<br>• Performs initial calibration quality control of the inventory and assessment data<br>• Records data in the SMS<br>• Performs a gap analysis of the SMS data and rectifies any issues following data entry. BIATs may be in-house or contracted personnel/consultants<br>• Pavements, bridges, rail networks, and dams assessments are centrally managed; however, local assessment still may be required to comply with guidance. |

***Table 5 Installation Roles and Responsibilities***

## *Narrative*

*This section applies to inventory and assessment data entry from:*

- *New construction, replacement, or major repair efforts*
- *Initial Assessment Requirement*
- *Established recurring requirement, such as a minimum of 20% per year*

***Step 1.1 – Generate prioritized list of built infrastructure to assess***
***Role: AMP Manager***

The AMP Manager pulls reports from the applicable SMS component, NexGen IT, or the Automated Civil Engineering System (ACES) to identify the assets on the installation that are in greatest need for investment. The AMP Manager creates separate, prioritized assessment lists for each type of built infrastructure based on Mission Dependency Index (MDI) or Tactical MDI, Condition Index (CI), work task history, leadership feedback (e.g., facilities on the flight-line may be a high priority), mission changes, project priorities, etc. Refer to the SMS-specific supplements for additional guidance regarding leveraging existing, canned data reports to aid in the prioritization of built infrastructure types (e.g., Final 9, Facility System Quick View for BUILDER). The output of this process is a prioritized assessment list. In accordance with the Activity Management Plan (AMP), it is recommended that AMP Managers provide asset visibility across the Future Years Defense Program (FYDP) +2.

***Tips/Reminders:***

- To support assessment training, the AMP Manager may suggest the BIAT assess a Facility, perhaps one with a low MDI rating (e.g., any facility with MDI less than 40), to test the assessment process and allow opportunities for practice, feedback, and baselining

*Proceed to Step 1.2.*

***Step 1.2 – Form assessment team(s)***
***Role: AMP Manager***

After prioritizing the built infrastructure needing assessment, and identifying the resources required to conduct the assessment, the installation AMP Manager (or designated rep) will form the BIAT. If the assets being assessed are centrally managed, the BIAT will be formed by AFCEC. In all cases, the teams will reflect the composition of the installation (military, contractor, civilian, mix) and should be selected according to a required skill level (five level or better), craft, and experience (minimum of two years). As needed, the AMP Manager or designated rep will contact the AFCEC Reachback Center at 850-283-6995, AFCEC.RBC@us.af.mil or through the CE DASH homepage with requests for support needed to perform the assessments in-house. At the end of this process, the AMP Manager will have identified, trained, and equipped a team necessary to conduct the assessments.

***Tips/Reminders:***

- Specific guidance related to identifying, training, and equipping assessment teams is located in the supplemental guidance section of this playbook (e.g., BIATs for pavements, bridges, rails, and dams are formed at the AFCEC level, while BIATs for facilities and utilities are formed at the installation level)
- Refer to the applicable Asset Visibility Workspaces within CE DASH for further information.

*Proceed to Step 1.3.*

***Step 1.3 – Pull inventory and assessment data***
***Role: BIAT***

The BIAT pulls all current data to gather knowledge of the asset prior to conducting the assessments. For initial assessments, the team pulls as-built drawings (from electronic or flat files), GIS information (GeoBase), built infrastructure projects (Automated Civil Engineer System [ACES] – Project Management-[PM]), 7115 inventory report (ACES – Real Property [RP]), or work performed on or scheduled for the asset

(NexGen IT). For recurring assessments, the team uses the SMS to gather information generated since the last assessment.

***Tips/Reminders:***

- Standard Assessment Preparation Checklists have been developed and are organized according to asset type and discipline

*Proceed to Step 1.4.*

***Step 1.4 – Coordinate with Asset Manager***
***Role: BIAT***

The BIAT, or in the case of pavement assessments, works with the asset manager to discuss the current condition of facilities to be assessed, time of last maintenance, and any special considerations, such as security requirements, permits requirements, safety issues, photographic restrictions, entry authorizations, or flight line driver's licenses. The BIAT also provides an agreed upon schedule of assessments and locations prior to arrival. Installation-based (i.e., non-contracted) BIATs will likely already have access to necessary equipment. After reviewing the detailed information of the built infrastructure assessment needs and coordinating with the asset manager, the BIAT adds any missing inventory to the execution schedule to ensure full coverage of assessment needs.

***Tips/Reminders:***

- Asset managers may include Facility Managers, Airfield Manager, Operations Superintendent, Operations Engineering personnel, etc.
- A standard questionnaire may be used to retrieve required information from the asset manager

*If 'vertical facilities,' proceed to Step 1.5.*

*If 'linear facilities,' proceed to Out-of-Scope Process, Migrate Data to GIS 4.0.3.1 Gold Standard.*

***Step 1.5 – Perform Facility Condition Assessment***
***Role: BIAT***

The BIAT conducts a physical assessment of the horizontal assets and records data using standard assessment worksheets and data capture tools/software. See the SMS-specific guidance sections of this Playbook for specific assessment instructions and recommendations for data capture support.

*If 'RP updates necessary,' proceed to Process 1.12, Draft AF Form 123 or DD Form 1354 and submit to RPAO. If 'RP updates not necessary,' proceed to Step 1.13.*

***Out-of-Scope Process – Migrate Data to GIS 4.0.3.1 Gold Standard***
***Role: BIAT***

Data needs migrated to the most current Spatial Data Standard for Facilities, Infrastructure and Environment (SDSFIE) version, which is currently SDSFIE 4.0.2 Gold, prior to conducting assessments and segmentation. ESRI conversion tools, crosswalk software, and implementation videos are accessible on the CE Portal. Refer to the Utilities Guidance section of this Playbook for more information.

*If 'TNAP,' proceed to Step 1.6 Perform TNAP Facility Mapping.*

*If 'Utilities,' proceed to Step 1.9 Perform Utilities Facility Mapping.*

***Process 1.6 – Perform TNAP Facility Mapping***
***Role: BIAT***

Once the RPAO, GeoBase Office, Pavement Engineer, and Airfield Manager have accumulated relevant data from their respective informational sources, the representatives from these offices meet to form the Facility Map Development Team. The Facility Map Development Team conducts a facility-by-facility review of the pavements facility map created by the GeoBase Office. The team updates the map as required to ensure accountability for 100% of the pavements assets in the RP database. The team assigns unassigned assets to a new or existing facility and creates separate pavement facility maps for the airfield, and roads & parking networks. Linear assets are assigned according to usage, or CATCODE; the Real

Property Unique Identifier (RPUID) serves as the linkage between RP and GeoBase records, as opposed to facility identification (FACID).

*Proceed to Process 1.7, Implement TNAP Segmentation Rules.*

***Process 1.7 – Implement TNAP Segmentation Rules***
***Role: BIAT***

This process describes the method of assigning segments to a facility number on the GeoBase map and in the pavement management system. In order to ensure the entire pavement inventory is mapped consistently and accurately, pavement evaluation teams and contractors use this process when conducting a structural pavement evaluation or PCI survey. For pavements, bridges, and, in some cases, rails, this process is typically performed by centrally-managed AFCEC teams or consultants. Processes for other non-pavement assets are under development.

*Proceed to Step 1.8.*

***Step 1.8 – Perform TNAP Condition Assessment***
***Role: BIAT***

The AFCEC Team/AFCEC consultant imports a shape file of the pavement facility map provided by the GeoBase Office into PAVER and makes branch and section assignments on the map from within PAVER. Next, the AFCEC Team/consultant generates field inspection datasheets and conducts the field evaluation. Once the evaluation is complete, the AFCEC Team/consultant updates the PAVER database with the field data, including any updated branch and section information, and incorporates any changes to the pavement facility map using either AutoCAD or ESRI software.

*If 'RP updates necessary,' proceed to Process 1.12, Draft AF Form 123 or DD Form 1354 and submit to RPAO. If 'RP updates not necessary,' proceed to Step 1.13.*

***Step 1.9 – Perform Utilities Facility Mapping***
***Role: BIAT***

Once the team has accumulated relevant data from their respective informational sources, they conduct a facility-by- facility review of the utilities facility map created by the GeoBase Office. The team updates the map as required to ensure 100% accountability of the linear utilities assets in the real property database. Any unassigned linear assets will be assigned to either a new or an existing facility. Linear assets are assigned according to usage, or CATCODE; the RPUID serves as the linkage between RP and GeoBase records, as opposed to FACID.

*Proceed to Process 1.10, Implement Utilities Segmentation Rules.*

***Process 1.10 – Implement Utilities Segmentation Rules***
***Role: N/A***

After identifying and mapping utility systems, the BIAT assigns segments to utility assets on the GeoBase map.

*Proceed to Step 1.11.*

***Step 1.11 – Perform Utilities Condition Assessment***
***Role: BIAT***

The BIAT collects data by physical examination of assets and, if applicable, determines what discrepancies exist in the existing inventory or assessment data. The GeoBase Office incorporates any changes found by the BIAT on the facility map.

***Tips/Reminders:***

- CE Operations provides support to the BIAT in identifying linear segments and essential non- linear components associated with linear assets.

*If 'RP updates necessary,' proceed to Process 1.12, Draft AF Form 123 or DD Form 1354 and submit to RPAO. If 'RP updates not necessary,' proceed to Step 1.13.*

***Step 1.12 Draft AF Form 123 or DD Form 1354 and submit to RPAO***
***Role: BIAT/Sub-AMP Manager***

If the BIAT identifies a change in use (i.e., change in CATCODE) for a built infrastructure asset, the Sub-AMP Manager completes an Air Force Form 123, *Request for Changed Use of Real Property* and submits to the RPAO to initiate an inspection to confirm that observation. Refer to the Appendix Form Guide of the Real Estate Transactions, Accountability, and Inventory Playbook for instructions for completing the AF Form 123.

A Department of Defense (DD) Form 1354, *Transfer and Acceptance of DoD Real Property* form is required to document an inventory adjustment (e.g., Found on Site) in the RP inventory. The Sub-AMP Manager drafts the DD Form 1354 and submits it to the Operations Flight Commander for review, who reviews and submits to the RPAO to initiate an inspection to confirm the observation. The DD Form 1354 is then finalized through a collaborative review process until it is acceptable to make changes within the RPI.

***Note:*** Roles and responsibilities for completing the various types of the DD Form 1354 are found in Chapter 3 of the Unified Facilities Criteria (UFC) 1-300-08, the Criteria for Transfer and Acceptance of DoD Real Property, whereas instructions for completing the form are found in Chapter 4.

*Proceed to RETAI Playbook, Process 11.1 Prepare for Inventory, Step 11.1.3.*

***Real Estate Transactions, Accountability, and Inventory Playbook Process 11.1***
***Prepare for Inventory, Step 11.1.3***

This process illustrates the Installation Real Property Accountable Officer (RPAO) preparing the inventory requirements for a given year. The Installation RPAO first ensures that all updates to ACES or NexGen IT have taken place before retrieving a five-year inventory plan (three years for cultural/historical sites). The Installation RPAO reviews the plan and identifies the Real Property (RP) that requires an inspection given a prescribed timeframe. The Installation RPAO identifies who conducts the actual inspection and coordinates with the Civil Engineer (CE) partners, as applicable. The outcome of this process is a scheduled inspection visit with a designated inspector.

*Proceed to Step 1.14.*

***Step 1.13 – Perform QC of Data***
***Role: BIAT***

The BIAT performs a quality check of the samples according to the process and confidence levels recommended in the corresponding SMS-specific supplement. If using a remote data collection process, (e.g., BRED) this calculation can be determined by running a quality control report (Refer to SMS-specific supplement for additional guidance).

Otherwise, additional, successive collection and analysis processes may be required to reach the level of confidence needed to produce consistent quality in the data. The BIAT corrects any inaccuracies in the data prior to uploading into the SMS.

*Proceed to Step 1.14.*

***Step 1.14 – Upload data to SMS (or current system of record)***
***Role: BIAT***

*Entry from Major Facility Changes (e.g., New Construction, Replacement, or Major Repair)*

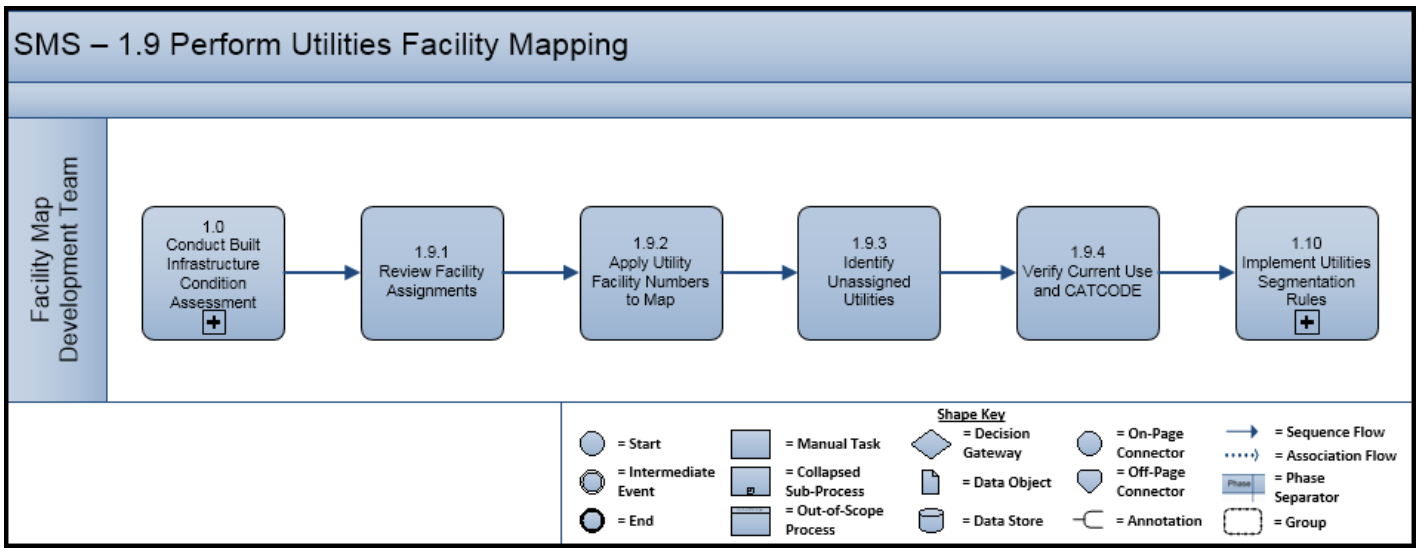
***For initial or recurring assessments,*** the BIAT inputs data into the SMS or current system, either through remote or manual uploads. The Sub-AMP Manager conducts quality checks of the data uploaded to the SMS. Refer to the SMS-specific supplement for specific instructions regarding uploading data and performing quality checks.

***For New Construction, Major Repair, or Preventive Maintenance,*** the Sub-AMP Manager uploads inventory information into the appropriate SMS using the as-built drawings, closeout paperwork, and information derived from the project or other available sources.

***Tips/Reminders:***

- BIAT members should input the data given their familiarity of the assets and knowledge of the system. However, installations may perform data entry in a manner more suitable to the makeup of their team (e.g., use engineering assistants [EA] to support data entry)
- Available sources include Interim/Final DD Form 1354 or AF Form 332, and Shop records.
- For replacement by contract, the 1354 is required; if performed in-house, the need for a 1354 will depend on the nature of the work performed. A field visit may be necessary to confirm the inventory data. The Data Manager updates the condition assessment data as necessary.

***Figure 5 SMS 1.9 Perform Utilities Facility Mapping***



# SMS – 1.6 Perform TNAP Facility Mapping

Introduction

Roles and Responsibilities

Narrative

TNAP Facility Designation Process and Standards

Railway Facility Designation Process and Standards

Bridge Facility Designation Process and Standards

Signage Facility Designation Process and Standards

## Introduction

The objective of the TNAP infrastructure segmentation effort is to ensure we have an accurate accounting of the quantity, location, use, and condition of all TNAP assets. This objective is accomplished in three phases:

1. Creation of a TNAP facility map showing the location of each airfield, road, and parking pavement facility in the RP record. The creation of a TNAP facility map must be a joint effort between the RPO, GeoBase Office, Transportation AMP Manager, Pavement Engineer/sub-AMP Manager, and Airfield Manager. The effort requires relevant data from each of these respective sources. In many cases, available information will be ambiguous or inadequate, which will require the team to make decisions that only the base personnel can make.
2. The second phase is segmentation of these TNAP facilities into branches and sections. This phase is accomplished by the AFCEC Team/AFCEC Consultants for airfield and road and parking networks.
3. The third phase is creation and processing of 1354s to document any changes or updates to the RP record. The base completes this phase of the process by using data generated by the AFCEC Team/AFCEC Consultants.

   ***Note***: The RPO has final authority to change the facility numbers.

To initiate the mapping process, the GeoBase Office will create a map for all paved and unpaved airfield surfaces, and one for all paved and unpaved roads, parking, and driveway surfaces. The RPO will provide a listing of all TNAP facilities in the RP record from ACES-RP or NexGen IT. Other team members will provide additional information, including past pavement evaluation reports or other historical records such as construction drawings. The Facility Map Development Team will meet and conduct a facility-by-facility review of the TNAP assets in the RP record, assigning those facilities to their specific areas on the draft map created by the GeoBase Office. The team updates the map as required to ensure 100% of the TNAP assets in the RP database are accounted for.

When the team encounters unassigned assets or must make changes to the TNAP facilities documented in the RP record, it will follow the recommended standards outlined in this Playbook. If one does not already exist, each TNAP facility will be assigned a FACID by the base RPO. Air Force RP rules require that each of these facilities may only have one CATCODE associated with it. Once a new FACID is entered into ACES or NexGen IT, it will ultimately be assigned a RPUID by OSD. The RPUID serves as the linkage between RP records, PAVER, and GeoBase GIS records.

***Note:*** This Process serves as the Standard Operating Procedure (SOP) for Task 1*: Complete Pavement Facility Maps*, in the memorandum, *Air Force Linear Segmentation Implementation Guidance*, dated 1 April 2013.

## Roles and Responsibilities

TNAP mapping is a collaboration between AFCEC and the installation with the roles and responsibilities defined in Table 6 below.

| ROLES | RESPONSIBILITIES |
|---|---|
| ***AFCEC/COAP*** | • Provides support to the base facility mapping teams<br>• Available as requested by the base for teleconferences or DCSs to assist the base in the facility mapping effort |
| ***Facility Map Development Team*** | • Assigned by the Base Civil Engineer (BCE)<br>• Consists of participants from RPO, GeoBase Office, Base POC and/or Operations Engineer/TNAP AMP Manager, and Airfield Manager. The Airfield Manager participates on an as-needed basis, specifically when airfield assets are involved<br>***Note:*** Ideally, the team described above is led by the RPO since it is ultimately responsible for the RP records. However, manpower or other considerations may dictate that the BCE appoint another person to lead the effort, with the understanding that all offices listed above will need to participate in the activity. |

***Table 6 TNAP Mapping Roles and Responsibilities***

## *Narrative*

*Entry from Process 1.0, Step 1.4.*

***Step 1.6.1 – Review facility assignments***
***Role: Facility Map Development Team***

The team will go down the tabular list of TNAP facilities sequentially, identifying the geospatial extents of each on the map based on the description of the facility in the RP record. For instance, if the description of the facility describes a transient apron, the team will mark the current area of the transient apron on the map. The team may discover a discrepancy between the area described in the RP record and the area identified on the map. In these cases, the team will look at other sources such as the old RP record cards (if they still exist), past pavement evaluation reports, previous imagery, or any other sources available to verify the geospatial extents shown on the map are correct.

When determining the authoritative source of information, explicit descriptions in the RP record, as-built drawings, or documented surveys will take precedence. If these are not available, past pavement evaluations or old master plan tabs (e.g., E7) are the next best source of information. In other words, use the most authoritative, time-relevant document available.

There may be cases where the team does not have enough information to clearly define where a facility is located on the map. In these cases, the team will follow the standards outlined in this Playbook for designating TNAP facilities and use its best judgment to determine the geospatial extents of the facilities on the map. The team makes recommendations, but the RPO, as the process owner, makes the final decision in the event of competing recommendations.

Below are the specific tasks, by role, to be completed during the review of facility assignments:

- ***RPO:*** Recommends facility assignments based on a complete list of TNAP facility numbers and descriptions generated by ACES-RP, NexGen IT, historical RP cards, and any other relevant records
- ***GeoBase Office:*** Provides a draft TNAP facility map, imagery (if the TNAP facility map does not already have imagery in the background), and old master plan tabs (especially E7 Tab for airfields)
- ***Base POC and/or Operations Engineer/TNAP AMP Manager:*** Provides branch and section maps, as well as construction history from current pavement evaluation reports and other reports that may help provide historical context for the team's decisions on the geospatial extents of each facility
- ***Airfield Manager:*** Provides recommendations to the team regarding geospatial extents of each airfield pavement facility and information on current use of airfield facilities

*Proceed to Step 1.6.2.*

***Step 1.6.2 – Apply TNAP facility numbers to map***
***Role: Facility Map Development Team***

The GeoBase Office representative makes any required adjustments to the map polygons and enters the correct TNAP facility numbers and RPUIDs into the appropriate feature classes (Note: this was the Section feature class in Spatial Data Standards for Facilities, Infrastructure, and Environment (SDSFIE) 4.0.2 Gold and will be Linear_Structure_A in SDSFIE 3.1). The Advice and Tips section of this narrative contains an example of a TNAP facility map.

*Proceed to Step 1.6.3.*

***Step 1.6.3 – Identify unassigned TNAP assets***
***Role: Facility Map Development Team***

The GeoBase Office representative identifies any TNAP assets that do not have an assigned facility number and brings the updated map to the Facility Map Development Team to make facility assignment decisions. The team will follow the standards outlined in this playbook for designating TNAP facilities and use their best judgment to determine the geospatial extents of the facilities on the map. The GeoBase Office representative tracks any changes, updates the appropriate polygons and feature classes, and provides updated maps to the team for review.

*Proceed to Step 1.6.4.*

***Step 1.6.4 – Verify current RP Inventory data***
***Role: Facility Map Development Team***

The team verifies the CATCODEs for each TNAP assets facility are accurate based on current use. The team should refer to AFMAN 32-1084, *Facility Requirements,* for CATCODE guidance. RPO guidance is to use the closest six-digit CATCODE available.

The installation will provide the final TNAP asset map to the AFCEC Team/AFCEC Consultants to perform the next step in the effort, which is linear segmentation. They will adjust and/or create branch and section polygons and assign these segments to their respective facilities. Note that substantiating documentation for any facility changes will not be completed until segments are assigned to the facilities and the map is validated with a TNAP condition survey as outlined in Process 1.0. Once Step 1.8 is completed, supporting documentation will be generated and the RP records are updated in Step 1.12.

Below are the specific tasks, by role, to be completed during the verification of current use and CATCODE assignment:

- ***RPO:*** Verifies that the CATCODEs are correct according to the RP records and designated current use
- ***GeoBase Office:*** Ensures that the mapping complies with SDSFIE 4.0.2 Gold
- ***Base POC and/or Operations Engineer/TNAP AMP Manager:*** Identifies any conflicts between the PCI survey/pavement evaluation records and the TNAP facility map. Additionally, the Base POC and/or Operations Engineer/TNAP AMP Manager provides information on current designation/use of TNAP
- ***Airfield Manager:*** Provides information on current designation/use of TNAP

Once the CATCODEs are verified, and the team has no more changes to the TNAP facility map, the team posts the draft TNAP facility map to the GeoBase system of record and sends to the AFCEC PAVER SMS program manager (john.sprouse.2@us.af.mil) in an appropriate format.

*Proceed to Step 1.6.5.*

***Step 1.6.5 – Review facility map and provide feedback***
***Role: AFCEC/COAP***

AFCEC/COAP reviews draft TNAP facility map, provides feedback to the Facility Map Development Team,

and discusses with the installation via teleconference or DCS to adjudicate any issues before the TNAP facility map is finalized.

*Proceed to Step 1.6.6.*

***Step 1.6.6 – Finalize facility map***
***Role: Facility Map Development Team***

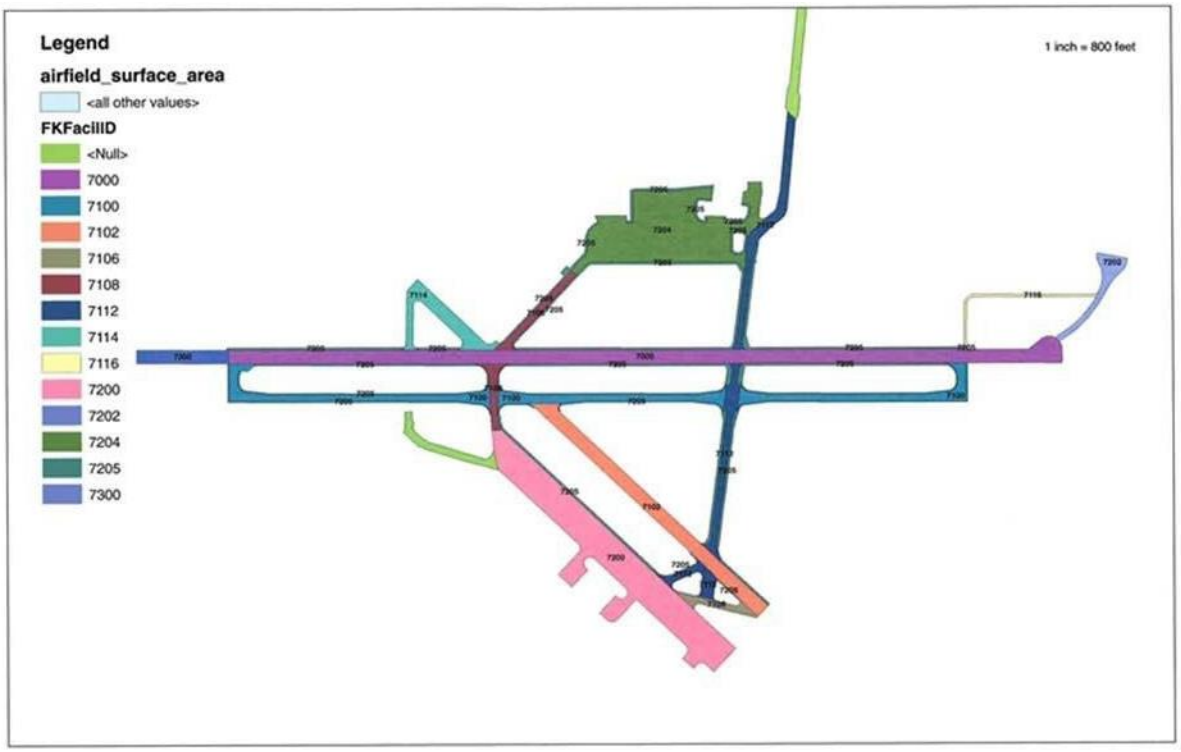
Once the team verifies the CATCODEs and has no more changes to the TNAP facility map, the Team finalizes the map with the RPO enters it in the GeoBase system of record and will then send it to AFCEC PAVER SMS program manager (john.sprouse.2@us.af.mil) in an appropriate format.

*Proceed to Process 1.7 Implement TNAP Segmentation Rules.*

## *TNAP Facility Designation Process and Standards*

- The GeoBase Office will typically use the common installation picture for the base as the starting point for developing the TNAP facility maps for airfield and roads & parking respectively. The map should show all load bearing pavement, as well as shoulders and any roads or parking areas. Showing all pavements on each respective map provides good reference points and helps the team ensure that they do not double count any pavements. Including any known TNAP facility numbers, as well as any information such as apron, taxiway, or runway names, buildings, and building numbers can be beneficial as RP record cards often reference this information. Ideally, create a draft map so it is laid over imagery for the base. If this is not possible, the team should at least have a digital copy of the most current imagery available
- Other essential information includes a RP report listing all of the TNAP facilities sorted by facility number, facility name, the CATCODE, category name, area, and any descriptions or notes that may be included in the RP database. The team should include a complete list of TNAP CATCODEs with the definition for each category as well as maps and construction history from the last PCI and comprehensive evaluations.
- Installations have interpreted the rules for determining TNAP facilities differently at each base, so there is a lot of variation from location to location. The primary constraint for creating a linear facility is that facilities can only be assigned a single CATCODE. For example, overruns (CATCODE 111115) cannot be combined in a facility with the main load-bearing surface of the runway (CATCODE 111111). The facility may also be created based on other criteria such as construction date as outlined in AFI 32-9005.
- ***Runway and Overrun Standard:*** Create a facility number for the load-bearing surface of each runway. The two overruns for each runway will have one facility number. At a minimum, the shoulders for all runways will have a facility number. Do not create separate facilities for the concrete portions and asphalt portions of the runway, overruns, or shoulders. Overruns can be constructed with a Type A traffic area to increase the takeoff length for mission aircraft. In these instances, the pavement should be marked with a displaced threshold and classified (CATCODE) as a runway rather than an overrun.
- ***Taxiway Standard:*** At a minimum create a facility number for all taxiways on the airfield and create a facility number for all taxiway shoulders. If all taxiways are aggregated in one facility, combine all taxiway shoulders into one facility. If each named taxiway has its own facility number, the shoulders associated with each taxiway will be in a separate facility. Do not create facilities based on pavement type. This level of fidelity will be provided in the segments. For instance, Taxiway A will have only one facility number assigned even though it is constructed of both concrete and asphalt pavement. Use the predominant material type for each taxiway facility to populate the construction material code in ACES / NexGen IT. Note that the only pavements that should be included in a taxiway facility are those on a “named” taxiway such as Taxiway A, B, C, etc. Taxi lanes on aprons, pavements that provide access to aprons from adjacent taxiways, or pavements that provide access to other pads or ramps will be included in the associated apron facility. If the base opts to create multiple taxiway facilities, they should create one facility for each named taxiway while following the other guidance outlined above.

- ***Apron Standard:*** Create a facility for the load-bearing pavement of each large contiguous apron. Group warm-up aprons and arm/de-arm pads with similar CATCODEs into a single facility even though they are not contiguous. Dispersed parking aprons (pads) along a named taxiway will be included in a single facility. At a minimum, include the shoulders for all aprons in a single facility. Do not create separate facilities for the concrete portions and asphalt portions of an apron or pad or the shoulders associated with these facilities.




*Langley Air Force Base FACIDs*

- ***Roads, Streets and Access Road Standard:*** Create a facility for all contiguous roads under the same CATCODE on a site except where specific Real Property Information Model (RPIM) data element values necessitate a separate RPUID. For example, if a site has all contiguous roads but these roads have RPA Interest Type Code values of FEE, LEAS, and GVPV, there will be three separate asset records established. In addition, any access road not associated with a parking area that provides access to a building (for example, the road that goes to the front entrance of the Wing Headquarters building) should be considered part of the road facility. Unsurfaced roads are handled in a manner similar to paved roads. Do not create separate facilities for asphalt and concrete roads.
- ***Driveway Standard:*** Driveways have been a particular issue in linear segmentation efforts to date. UFC 3- 250-01FA, *Design of Roads Streets, Walks, and Open Storage Areas* clearly intend for the term driveway to be associated with a residence in housing areas. Bases will modify any existing TNAP facility designations to ensure that the driveway CATCODE 851145 will be used only to refer to “driveway” pavements in housing. TNAP facilities that access parking areas will be included in the associated parking area facility. Any other TNAP facilities such as those that provide access to dumpsters, loading docks or buildings will be included in the associated road facility. Do not create separate facilities for concrete driveways and asphalt driveways. If warranted, the base can create a separate facility for all driveways in each housing area.
- ***Parking Area Standard***: Current OSD guidance states that each non-contiguous parking lot or open area storage area is a separate RP asset and is assigned a RPUID. This mandate may cause issues and requires significant manpower requirements in order to successfully implement. At a minimum, each

base should create a facility for each given parking category code. There are currently six different category codes for surfaced and unsurfaced parking areas, which would equate to six facilities. As mentioned previously, parking areas include both the parking area itself and the access roads that serve it. Do not create separate facilities for concrete parking areas and asphalt parking areas.

### *Railway Facility Designation Process and Standards*

Refer to the SMS-TNAP Guidance, RAILER section for mapping guidance.

### *Bridge Facility Designation Process and Standards*

Each bridge should have a RPUID and facility number in the RPAD records as well as the appropriate CATCODE for the bridge type (road, rail, pedestrian, etc.). All bridge components (approach pavements, deck, superstructure, substructure, spans, culvert sections, etc.) required to form the bridge structure should be considered a single facility for designation purposes. The installation's GeoBase map should be updated to indicate location, type and deck area (measured in sf). UFC 3-310-08, Non-Expeditionary Bridge Inspection, Maintenance, and Repair, latest edition, should be consulted for the definition of a bridge as it applies to this playbook.

### *Signage Facility Designation Process and Standards*

Installations shall manage and maintain their own signage inventory. Signage inventories and condition assessments will not be required to be input into the enterprise SMS database.

# SMS – 1.7 Implement TNAP Segmentation Rules

***Introduction***

***Roles and Responsibilities***

***Narrative***

***Additional Directions for AFCEC Teams/AFCEC Consultants***

## Introduction

This section of the SMS Playbook outlines general business rules for the linear segmentation of TNAP and provides visual examples of network component identification. UFC 3-270-08, *Pavement Management*, provides more detailed guidance for segmentation of road, parking, and airfield pavements. This portion of the playbook will be used primarily by the AFCEC Team/AFCEC Consultants, but is also provided here to provide a source of information for the bases.

Once the TNAP facility map is generated, the evaluation team or one of its consultants can begin the process of assigning pavement management system segments to the facilities. To ensure the entire TNAP inventory is mapped consistently and accurately, TNAP evaluation teams and contractors will use the process described herein when conducting a structural pavement evaluation or pavement condition index (PCI) survey. The AFCEC Team with consultation of the base POC retains final authority in accepting segmentation assignments; the Real Property Office (RPO) has final authority regarding any changes to the facilities/facility map resulting from this process.

***Note***: This Process serves as the Standard Operating Procedure (SOP) for Task 2: Assign engineering pavement segmentation to real property pavement facilities, in the memorandum, *Air Force Linear Segmentation Implementation Guidance*, dated 1 April 2013.

## Roles and Responsibilities

Each of the following roles applies to the installation:

| ROLES | RESPONSIBILITIES |
|---|---|
| ***Real Property Office (RPO)*** | • Works with the GeoBase Office, Base POC and/or Operations Engineer/TNAP AMP Manager, and AFCEC Team/AFCEC Consultants to conduct a review of the segment assignments on the Pavement Real Property Report and mapping portion of the PCI Reports<br>• Retains final authority regarding any changes to the facilities/facility map resulting from this process |
| ***GeoBase Office*** | • Participates in reviews of segment assignments and PCI Reports provided by the AFCEC Team/AFCEC Consultants to ensure mapping meets Spatial Data Standards for Facilities, Infrastructure and Environment (SDSFIE) requirements |
| ***Base POC and/or Operations Engineer/TNAP AMP Manager*** | • Participates in reviews of segment assignments and PCI Reports provided by the AFCEC Team/AFCEC Consultants prior to publication of the final PCI Report<br>• Retains final authority in accepting segmentation assignments |
| ***Airfield Manager*** | • Works with the Base POC and/or Operations Engineer/TNAP AMP Manager to review segment and TNAP rank assignments as well as PCI Reports provided by the AFCEC Team/AFCEC Consultants |
| ***AFCEC Team/ AFCEC Consultants*** | • Collects the data needed to properly assign the segments by performing a field evaluation.<br>• Retrieves the latest TNAP facility map, and updates the PAVER database to reflect those changes<br>• Participates in the review of the segment assignments and draft the PCI Report<br>• Retains final authority in accepting segmentation assignments |

## *Narrative*

*Entry from Process 1.6 Perform TNAP Facility Mapping.*

***Step 1.7.1 – Retrieve latest facility maps for respective TNAP assets from GeoBase office or AFCEC Team/AFCEC Consultants***

***Pavements:***

The AFCEC Team/AFCEC Consultant will request the current TNAP facility map from the GeoBase Office.

***Railways:***

ERDC/AFCEC Team will request current rail maps from GeoBase office

***Bridges:***

ERDC/AFCEC Team will request current bridge maps from GeoBase office

*Proceed to Step 1.7.2.*

***Step 1.7.2 – Modify PAVER segments to follow segmentation rules***
***Role: AFCEC Team/AFCEC Consultants***

The AFCEC Team/AFCEC Consultant updates segment assignments in PAVER to follow the rules described in UFC 3-270-08, *Pavement Management*.

*Proceed to Step 1.7.3.*

***Step 1.7.3 – Assign segments to facilities***
***Role: AFCEC Team/AFCEC Consultants***

The AFCEC Team/AFCEC Consultant categorizes the segments into branches/sections according to UFC 3-270-08 and the Business Rules for TNAP Segmentation sand then assigns these segments to their respective facility in the mapping and PAVER database.

*Proceed to Step 1.7.4.*

***Step 1.7.4 – Conduct segment assignment review***
***Role: RPO, GeoBase Office, Base POC and/or Operations Engineer/TNAP AMP Manager, Airfield Manager, AFCEC Team/AFCEC Consultant***

The RPO, GeoBase Office, and Base POC and/or Operations Engineer/TNAP AMP Manager collectively review the segment assignments and update any changes required to the TNAP facility mapping identified by the AFCEC Team/AFCEC Consultant. The RPO, GeoBase Office, and Base POC and/or Operations Engineer/TNAP AMP Manager provide feedback to the AFCEC Team/AFCEC Consultants on any issues that may need correction prior to any fieldwork.

- ***RPO:*** Confirms that RP data is assigned correctly and obtains Pavement Real Property Report from AFCEC Team/AFCEC Consultant to determine if assignments affect facility areas on the map
- ***GeoBase Office:*** Provides input during the review
- ***Base POC and/or Operations Engineer/TNAP AMP Manager:*** Provides input during the review
- ***Airfield Manager:*** Provides input during the review
- ***AFCEC Team/AFCEC Consultants:*** Identifies issues with the pavement facility map that must be resolved by Base

The RPO, GeoBase Office, and Base POC and/or Operations Engineer/TNAP AMP Manager provide feedback to the AFCEC Team/AFCEC Consultant, who makes modifications to the segmentation plan prior to the field survey. The process of assigning segments to facilities may prompt a change in the facility map. In this case, the AFCEC Team/AFCEC Consultant will coordinate with the Facility Map Development team prior to conducting a PCI Survey or Comprehensive Evaluation. In particular, any major mapping changes to the TNAP facility map will be sent back to the base for update.

*If 'No Discrepancies,' proceed to Step 1.7.5. If 'Discrepancies,' proceed to Step 1.7.3.*

***Step 1.7.5 – Update GIS mapping***
***Role: GeoBase Office***

The GeoBase Office updates Geographic Information System (GIS) mapping to address any issues with the TNAP facility map identified by the AFCEC Team/AFCEC Consultant. Once updated, the GeoBase Office provides the updated materials to the AFCEC Team/AFCEC Consultant. The RPO, Base POC and/or Operations Engineer/TNAP AMP Manager, and Airfield Manager may be asked to provide input according to Process 1.6 Perform TNAP Facility Mapping.

*Proceed to Step 1.7.6.*

***Step 1.7.6 – Review GIS mapping and conduct field evaluation***
***Role: AFCEC Team/AFCEC Consultants***

The AFCEC Team/AFCEC Consultant imports a shape file of the TNAP facility map provided by the GeoBase Office into PAVER and makes branch and section assignments on the map from within PAVER. Next, the AFCEC Team/AFCEC Consultant generates field inspection datasheets and conducts the field evaluation.

*Proceed to Step 1.7.7.*

***Step 1.7.7 – Update PAVER***
***Role: AFCEC Team/AFCEC Consultants***

Once the fieldwork is complete, the AFCEC Team/AFCEC Consultant updates the PAVER database with the field data, including any updated branch and section information, and incorporates any changes to the TNAP facility map using either AutoCAD or ESRI software.

*Proceed to Step 1.7.8.*

***Step 1.7.8 – Perform analysis and write draft PCI Report***
***Role: AFCEC Team/AFCEC Consultants***

The AFCEC Team/AFCEC Consultants runs PCI computations and generates a TNAP Real Property Report summarizing the area of each TNAP facility. The AFCEC Team/AFCEC Consultant provides the computations, TNAP Real Property Report, and updated TNAP facility map to the RPO, GeoBase Office, and Base POC and/or Operations Engineer/TNAP AMP Manager for the draft PCI Report. These documents include the AFCEC Team/AFCEC Consultant's recommended mapping changes.

A standard report layout is provided in the statement of work (SOW) for each PCI Survey contract. The AFCEC Team/AFCEC Consultant has standard report templates.

*Proceed to Step 1.7.9.*

***Step 1.7.9 – Review draft PCI Report***

***Role: RPO, GeoBase Office, Base POC and/or Operations Engineer/TNAP AMP Manager, Airfield Manager, AFCEC Team/AFCEC Consultant***

The RPO, GeoBase Office, Base POC and/or Operations Engineer/TNAP AMP Manager, and AFCEC Team (without the AFCEC Survey Consultant) determine if any issues exist in the PCI Report regarding correctness and adherence to guidance described in Process 1.6 Perform TNAP Facility Mapping. If any issues exist in the PCI Report, the RPO, Base POC and/or Operations Engineer/TNAP AMP Manager and the GeoBase Office provide recommended corrections to the AFCEC Team/AFCEC Consultant, who incorporates feedback via Step 1.7.8. At this point, changes should be minimal, but the RPO still maintains responsibility to approve facility assignments/facility map changes.

*If 'No changes,' proceed to Step 1.7.10. If 'Changes,' proceed to Step 1.7.8.*

***Step 1.7.10 – Finalize and publish Structural Evaluation / PCI Report***
***Role: AFCEC Team/AFCEC Consultants***

Once issues with the draft PCI Report are resolved, the AFCEC Team/AFCEC Consultant finalizes the

Comprehensive Evaluation/PCI Report and sends the final version to the base points of contact (POCs) and other stakeholders. The AFCEC Team/AFCEC Consultant will also post the report on the Air Force (AF) Airfield Pavement Evaluation Website. The base POC is responsible for distributed all applicable information to the RPO, Operations Engineer/TNAP AMP Manager and the GeoBase office.

*Proceed to Step 1.8 Perform TNAP Condition Assessment*

## *Additional Directions for AFCEC Teams/AFCEC Consultants*

- ***Runway:*** Create a branch for the load-bearing surface of each runway at a base and assign the facility number and RPUID to that branch. At a minimum, create separate sections for the first 1000 feet on each end of the runway and the interior. These sections will have shred-outs where the keel (center 75 feet of the runway) and the outers are further segmented, even though they have the same construction. For example, the keel of section R01A will be designated R01A1 and the outers will be designated R01A2. Ensure that any taxi routes at the end of the runway are included in the keel section segment. Additional sections will be created based on pavement construction as required. In addition, create a branch for the overruns on each runway. Do not break out the keel and outers of the overrun, as done with the load-bearing surface of the runway, but do create sections based on construction. Create a branch for the shoulders on each runway and segment the branch according to changes in condition. Do not assign a traffic area to shoulder pavements as done with load-bearing pavements.

- ***Taxiway:*** Create a branch for the load-bearing surface of each named taxiway and a branch for the shoulders associated with each named taxiway. Create sections for each as appropriate based on construction. If a section crosses over multiple branches or facilities, use shred-outs to distinguish between the segments of the section. For example, the portion of section T01A associated with Taxiway B would be designated T01A1 and the portion of the section associated with Taxiway C would be designated T01A2, as long as the pavement and underlying layers are similar. Ensure that section boundaries align with branch boundaries and that both section and branch boundaries align with facility boundaries. In short, ensure there are no errors. If the base has divided a given named taxiway into multiple facilities, work with them to resolve this issue ensuring each named taxiway has no more than one facility associated with it. Every effort should be made to maintain the segmentation hierarchy.

  Note that taxi lanes on aprons and pavements that provide access to aprons or pads may have been given a ‘T’ section designation in past evaluations. Do not include these pavements in taxiway branches or facilities. These pavement sections should be included in the associated apron branch. Current plans are to allow the ‘T’ designation to remain on these pavements to maintain continuity with past evaluations.

- ***Apron:*** At a minimum, create a branch for each contiguous main apron. If a main apron is divided into multiple facilities, create a separate branch to align with each of these facilities. Create sections for each branch as appropriate based on construction. If a section crosses over multiple branches or facilities, use shred-outs to distinguish between the segments of the section. For example, the portion of section A01B associated with the main apron would be designated A01B1 and the portion of the section associated with the transient apron would be designated A01B2. At a minimum, create a branch for non-contiguous aprons with the same CATCODE combined in a single facility. For example, dispersed parking pads along Taxiway C are all in one facility. Create a branch to align with that facility. Once again, ensure alignment of facility, branch, and section boundaries to eliminate errors.

# SMS – 1.9 Perform Utilities Facility Mapping

Introduction

Roles and Responsibilities

Narrative

## Introduction

Once the Real Property Accountable Officer (RPAO), GeoBase Office, and Civil Engineer (CE) Operations have accumulated relevant data from their respective informational sources, the representatives from these offices meet to form the Facility Map Development Team. The Facility Map Development Team conducts a facility-by-facility review of the utilities facility map created by the GeoBase Office. The team updates the map as required to ensure 100% of the linear utilities assets in the Real Property (RP) database are accounted for. Any unassigned linear assets will be assigned to either a new or an existing facility. Linear assets are assigned according to usage, or category code (CATCODE); the Real Property Unique Identifier (RPUID) serves as the linkage between RP and Geographic Information System (GIS) records, as opposed to facility identification (FACID). For a complete listing of CATCODEs, refer to the Air Force Category Codes document. Reference the following sections of this Playbook for specific guidance related to performing Utilities Facility Mapping:

- SMS Utilities Guidance
- SMS Utilities Guidance: FUELER SMS
- SMS Utilities Guidance: U.SMS
- SMS Utilities Guidance: Linear Segmentation Rules for Utilities

*Note: This Process serves as the Standard Operating Procedure (SOP) for Task 6: Complete utility maps at installations, in the memorandum, "Air Force Linear Segmentation Implementation Guidance," dated 1 April 2013.*

## Roles and Responsibilities

| ROLES | RESPONSIBILITIES |
|---|---|
| **Facility Map Development Team** | The Facility Map Development Team is responsible for bringing all relevant material to the facility map development meeting and assigning facilities on the map. This team includes the RPAO, the GeoBase Office, and CE Operations (including Operations Engineering, Shop, the relevant Activity Management Planning (AMP) Managers, and utility engineers). As CE Transformation continues, the role of the AMP Manager and Sub-AMP Manager will increasingly focus on total system operations and accountability and will therefore become a more substantial role in this process.<br><br>The RPAO provides information pertaining to RPUID data elements, including the total amount of linear feet (LF) reported in RP records and facility number by CATCODE. The GeoBase Office examines existing documentation and assigns RP data to the GIS features. CE Operations provides insight on actual data accumulated in the field and recorded in survey records. |

***Table 7 Facility Map Development Team Roles and Responsibilities***

## Narrative

*Entry from Out-of-Scope Process Migrate to Data to GIS 4.0.2 Gold*

***Step 1.9.1 – Review facility assignments***
***Role: Facility Map Development Team***
***Estimated Completion Time: N/A***

The team may complete this step by sequentially going down the tabular list of utilities CATCODEs

provided by the RPAO and identifying the geospatial extents of each facility on the map. Alternatively, the team may use the map as a guide, going from top to bottom, left to right, and checking off the CATCODEs as each are identified on the map. Below are the specific tasks by role to be completed during the review of facility assignments:

- ***RPAO:*** Provides information pertaining to RPUID data elements, including the total amount of LF reported in RP records and facility number by CATCODE.
- ***GeoBase Office:*** Examines existing documentation and assigns RP data to the GIS features.
- ***CE Operations:*** Recommends appropriate facility assignments for each utility plotted on GeoBase map.

The team should refer to the Linear Segmentation Rules for Utilities when making and evaluating recommendations. The team may need to determine if the utility asset described on the RP records is greater than or less than the data on the map. To investigate discrepancies, the team should examine old RP records, maintenance records, GeoBase data, surveys, or any other sources available to verify the geospatial extents. When making these decisions, explicit descriptions, such as as-built drawings or documented surveys, take precedence. If these are not available, the team should use the most authoritative document available.

*Proceed to Step 1.9.2.*

***Step 1.9.2 – Apply utility facility numbers to map***
***Role: Facility Map Development Team***
***Estimated Completion Time: N/A***

The team associates RP data by CATCODE with the geospatial data elements on the map. The GeoBase Office ensures that points, lines, and polygons exist for the utilities on the installation, and that the points, lines, and polygons can be linked to RP data (i.e., the correct RPUID is associated with the correct point, line, or polygon for that segment of the utility and is reflected in the Spatial Data Standards for Facilities, Infrastructure and Environment (SDSFIE) 3.1 attribute table). In the event of competing recommendations, the RPAO will make an executive decision.

*Proceed to Step 1.9.3.*

***Step 1.9.3 – Identify unassigned utilities***
***Role: Facility Map Development Team***
***Estimated Completion Time: N/A***

The team identifies any utilities that do not have an assigned facility number using the same procedure outlined in Step 9.2 to assign these areas to an existing facility or to make the determination that they should create a new facility. A new facility will only be created if no facility exists with a given CATCODE. Guidance on making these decisions can be found in AFI 32-9005, Real Property Accountability and Reporting.

*Proceed to Step 1.9.4.*

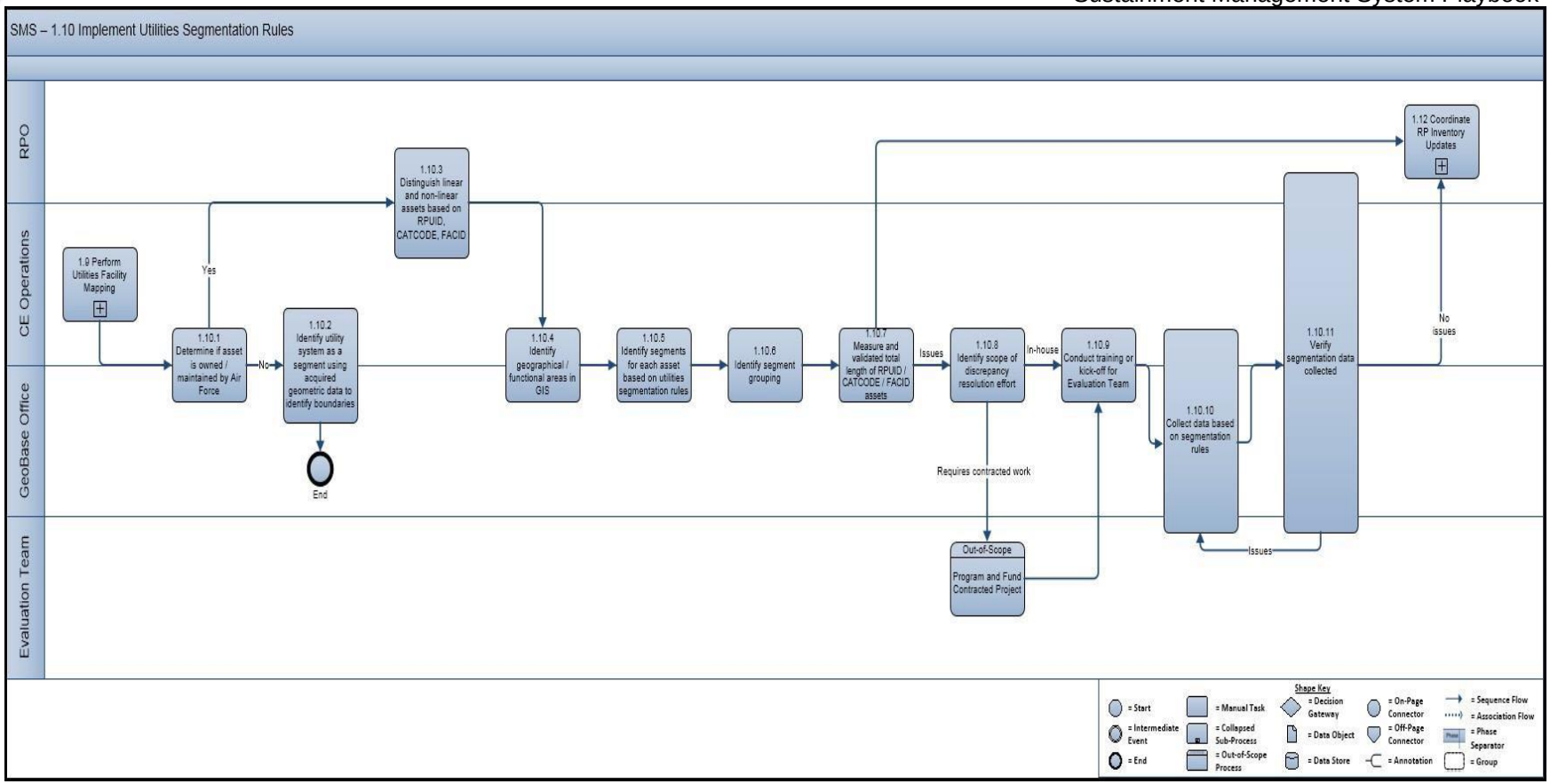
***Step 1.9.4 – Verify current use and CATCODE***
***Role: Facility Map Development Team***
***Estimated Completion Time: N/A***

The team verifies the CATCODEs for unassigned utilities from Step 9.3.

- ***RPAO:*** Verifies that the CATCODEs are correct according to RP records. Additionally, the RPAO should verify with the rest of the team to verify that the assigned CATCODEs correspond to current use.
- ***GeoBase Office:*** Ensures that the mapping complies with current version of SDSFIE.
- ***CE Operations:*** Provides information on current use of the asset.

For further guidance on current use, the team should reference AFMAN 32-1084, *Facility Requirements*.

*Proceed to Process 1.10 Implement Utilities Segmentation Rules.*


SMS – 1.10 Implement Utilities Segmentation Rules
RPO
CE Operations
GeoBase Office
Evaluation Team
1.9 Perform Utilities Facility Mapping
1.10.1 Determine if asset is owned / maintained by Air Force
Yes
No
1.10.2 Identify utility system as a segment using acquired geometric data to identify boundaries
End
1.10.3 Distinguish linear and non-linear assets based on RPUID, CATCODE, FACID
1.10.4 Identify geographical / functional areas in GIS
1.10.5 Identify segments for each asset based on utilities segmentation rules
1.10.6 Identify segment grouping
1.10.7 Measure and validated total length of RPUID / CATCODE / FACID assets
Issues
1.10.8 Identify scope of discrepancy resolution effort
In-house
Requires contracted work
Out-of-Scope
Program and Fund Contracted Project
1.10.9 Conduct training or kick-off for Evaluation Team
1.10.10 Collect data based on segmentation rules
Issues
1.10.11 Verify segmentation data collected
No issues
1.12 Coordinate RP Inventory Updates
Shape Key
= Start
= Intermediate Event
= End
= Manual Task
= Collapsed Sub-Process
= Out-of-Scope Process
= Decision Gateway
= Data Object
= Data Store
= On-Page Connector
= Off-Page Connector
= Annotation
= Sequence Flow
= Association Flow
= Phase Separator
= Group

# SMS – 1.10 Implement Utilities Segmentation Rules

Introduction

Roles and Responsibilities

Narrative

## Introduction

This process describes how a base utilities linear segmentation team, composed of the GeoBase Office and Civil Engineer (CE) Operations (Shop and Operations Engineering), assigns segments to Air Force (AF)-owned facilities on the GeoBase map to ensure that all water and electric utilities are mapped consistently and accurately. The segmentation rules for utilities serve to provide a standardized method in attributing segments to utility facilities to be used across all bases. The Utilities Activity Management Plan (AMP) Manager retains final authority in accepting segmentation assignments; the Real Property Office (RPO) has final authority regarding any changes to the facilities/facility map resulting from this process. Reference the following sections of this Playbook for specific guidance related to implementing Utilities segmentation rules:

- SMS Utilities Guidance
- SMS Utilities Guidance: FUELER
- SMS Utilities Guidance: U.SMS
- SMS Utilities Guidance: Linear Segmentation Rules for Utilities

## Roles and Responsibilities

| ROLES | RESPONSIBILITIES |
|---|---|
| Real Property Office (RPO) | • Determines AF-owned assets and distinguishes between linear and non-linear assets<br>• Has final authority regarding any changes to the facilities/facility map resulting from this process |
| GeoBase Office | • Identifies geographical/functional area of the linear utilities assets as well as the segment assignments<br>• Creates a geometric network of segment groupings if the necessary technology capabilities are available<br>• Supports in-house field evaluations<br>• Incorporates necessary changes to the facility map following linear utilities assets evaluations |
| Civil Engineer (CE) Operations | • Provides input identifying attributes such as ownership, geographical/functional area, and grouping of the linear utilities assets based on maintenance records, and any other knowledge<br>• Supports in-house field evaluations<br>• Comprises of the Utilities AMP Manager, Operations Engineering, and the Shop, wherein the Utilities AMP Manager retains final authority in accepting segmentation assignments<br>• Responsible for designing and/or managing the design of new utilities by ensuring designs meet linear segmentation guidelines and providing as-built drawings of existing utilities (where available) and new facilities upon completion.<br>• The Shop assists in the identification of geographical / functional areas and segment grouping based on the linear segmentation rules for utilities |
| Evaluation Team | • Comprises an in-house team of experts or a team of contractors with the necessary expertise<br>• Collects data points on a facility's current use and compares this information to most recent documentation in order to identify discrepancies |

## *Narrative*

*Entry from Process 1.9 Perform Utilities Facility Mapping.*

***Step 1.10.1 – Determine if asset owned/maintained by AF***
***Role: RPO, CE Operations***

The RPO examines the real property (RP) records, and CE Operations examines maintenance records to determine which assets are owned by the AF or are their responsibility to maintain.

Some overseas facilities are occupied by the AF but are maintained by the Army or Navy, in which case, these assets will be identified but not further segmented according to this process. Privatized assets, or assets owned by a host nation and not maintained by the AF, are not recorded in the Geographic Information System (GIS), or the system of record.

*If 'Yes,' proceed to Step 1.10.3. If 'No,' proceed to Step 1.10.2.*

***Step 1.10.2 – Identify utility system as a segment using acquired geometric data to identify boundaries***
***Role: GeoBase Office, CE Operations***

An entity outside CE that owns the asset in question provides GeoBase data to establish the boundaries of maintenance/construction. These assets are identified on the GeoBase map but are not further segmented at this point. However, the asset's existence in the RP inventory is acknowledged.

- ***GeoBase Office:*** Determines the relevant boundaries and identifies which facilities may affect AF assets
- ***CE Operations:*** Identifies each system as a separate segment

If there are multiple utility systems that are not owned or maintained by the AF, each system is identified as a separate network. This method of identification and documentation will serve to clarify which facilities (e.g., valves, connection points, or backflow assemblies) can affect CE systems, for instance, in maintenance or emergency cases necessitating isolation. These systems identified in this step will not be further segmented at this point.

*End.*

***Step 1.10.3 – Distinguish linear and non-linear assets based on RPUID, CATCODE, or FACID***
***Role: RPO, CE Operations***

The RPO, Operations Engineering, and Shop identify all linear and non-linear assets based on the Real Property Unique Identifier (RPUID), category code (CATCODE), or facility identification (FACID). Linear assets are measured in linear feet (LF). Non-linear assets are measured in various units of measurement and for the most part is not segmented according to this process. If a non-linear component does not have an RPUID, it is accounted for as a non-linear component of an associated linear asset.

*Proceed to Step 1.10.4.*

***Step 1.10.4 – Identify geographical/functional areas in GIS***
***Role: GeoBase Office, CE Operations***

This step is recommended, but not required, and adds value by standardizing communication for referencing segments. Each base may address this in separate ways, as not all bases have established naming conventions.

The utilities linear segmentation team should identify the geographical/functional area for each utility asset on the facility map. The GeoBase Office records this information in the GIS, or system of record. Geographical/functional areas are defined by the base and can be different from base to base. Common naming of areas on base is Flight line, Cantonment, or Housing. However, the base may have other naming systems to aid its management of the segments, such as North-side, Sound-side, Campus, etc. The base areas may already be defined at any particular base, and the geographical/functional area naming serves as a management tool to breakup these base areas.

The geographical/functional area can also be identified by utility. The team should refer to the narrative for

Linear Segmentation Rules for Utilities for further guidance on naming.

*Proceed to Step 1.10.5.*

***Step 1.10.5 – Identify segments for each asset based on utilities segmentation rules***
***Role: GeoBase Office, CE Operations***

The utilities linear segmentation team assigns/modifies/creates segments according to the linear segmentation naming and numbering rules. Non-linear assets associated with a linear utility RPUID will also be mapped by GeoBase. The team should refer to Linear Segmentation Rules for Utilities for further guidance.

*Proceed to Step 1.10.6*

***Step 1.10.6 – Identify segment grouping***
***Role: GeoBase Office, CE Operations***

A grouping is defined as the smallest amount of linear segment that can be isolated. This identification helps the base isolate and repair areas affected by outages or other emergencies.

- ***GeoBase Office:*** Identifies the grouping and marks the facility map accordingly. The GeoBase Office also creates a geometric network based on logical groups identified by the team.
- ***CE Operations:*** Supports the identification of segment grouping.

Not all bases may have the software capabilities to perform this analysis. Most GeoBase offices are working to obtain this functionality. The team should refer to Linear Segmentation Rules for Utilities for grouping details.

*Proceed to Step 1.10.7.*

***Step 1.10.7 – Measure and validate total length of RPUID/CATCODE/FACID assets***
***Role: GeoBase Office, CE Operations***

The GeoBase Office calculates summary statistics of the linear assets comprising a facility and verifies the data with CE Operations.

The GeoBase Office and CE Operations collectively determine if all segment areas have been plotted on the facility map. Non-linear assets associated with a linear utility asset will be included in this discrepancy analysis. If all segments have been identified, the team produces the required documentation to initiate updates to RP records.

*If 'No issues,' proceed to Process 1.12 Coordinate RP Inventory Updates. If 'Issues,' proceed to Step 1.10.8.*

***Step 1.10.8 – Identify scope of discrepancy resolution effort***
***Role: GeoBase Office, CE Operations***

The team compares the total LF documented during the implementation of linear segmentation rules and identifies discrepancies against RP data. The team determines if a discrepancy exists in the quality of the LF data collected or in the accuracy of the RP records. Corrective action may require resurveying the segments if LF data is inaccurate or incomplete or submitting substantiating documentation to adjust the RP records to reflect the actual LF.

Based on manpower, resources, and leadership support, the base determines if an in-house evaluation is feasible. Additionally, the base may not have the expertise to complete an evaluation. If an in-house evaluation is not feasible, a team of contractors performs the evaluation.

*If 'In-House,' proceed to Step 1.10.9.*

*If 'Requires contract work,' proceed to Out-of-Scope Process Program and Fund Contracted Project.*

***Step 1.10.9 – Conduct training or kick-off meeting for Evaluation Team***
***Role: GeoBase Office, CE Operations***

A kick-off meeting is always conducted before the evaluation team begins work. Training is conducted, as needed, in conjunction with the kick-off meeting when substantial base manpower is included in the evaluation

effort or when the evaluation team does not have the knowledge necessary to conduct an evaluation.

If dealing with a contracted team for the evaluation, the relevant Project Manager should be asked to train the evaluation team on the specific methodology and format employed for capturing data. Additionally, the following actors will provide support in the case of a contracted evaluation team:

- ***GeoBase Office:*** Provides necessary information, including existing geometric data, and maps.
- ***Operations Engineering:*** Demonstrates to the Evaluation Team how to properly employ the specific naming conventions for geographical / functional segments.
- ***Shop:*** Attends kick-off meeting and training as necessary to provide support for Operations Engineering.

*Proceed to Step 1.10.10.*

***Step 1.10.10 – Collect data based on linear segmentation rules***
***Role: GeoBase Office, CE Operations, Evaluation Team***

The data collection effort involves the following roles:

- ***GeoBase:*** Provides evaluation team personnel in the case of in-house evaluations.
- ***CE Operations:*** Provides support to the Evaluation Team in identifying linear segments and identifying essential non-linear components associated with linear assets.
- ***Evaluation Team:*** Collects data by physical examination of assets to determine what discrepancies exist. If in-house, the evaluation team members are provided by GeoBase and CE Operations.

*Proceed to Step 1.10.11.*

***Step 1.10.11 – Verify segmentation data collected***
***Role: RPO, GeoBase Office, CE Operations, Evaluation Team***

Once the evaluation is complete, the utilities linear segmentation team and RPO meet with the Evaluation Team to verify the changes discovered. The GeoBase Office incorporates any changes found by the Evaluation Team on the facility map.

The RPO, GeoBase Office, and CE Operations determine whether issues exist with the segmentation data, such as a mismatch of database information and physical features of assets (differences in square yards [SY]/LF) utilities appearing in GeoBase data but not on RP data, assets with incorrect CATCODEs or unassigned RPUIDs, etc.

*If 'No issues,' proceed to Process 1.12 Coordinate RP Inventory Updates. If 'Issues,' proceed to Step 1.10.10.*

# SMS – 2.0 Develop Current-Year Requirements

Introduction

Roles and Responsibilities

Narrative

## Introduction

Based on the data uploaded by the installation's Built Infrastructure Assessment Team (BIAT) following an assessment, the Sub-Activity Management Plan (AMP) Manager, or equivalent role, runs and performs quality control (QC) and validation of the SMS reports to understand maintenance and repair (M&R) requirements within the current-year and submits service requests to CE Customer Service.

## Roles and Responsibilities

| ROLES | RESPONSIBILITIES |
|---|---|
| ***AMP Manager*** | • Coordinates with Air Force Civil Engineer Center (AFCEC) and higher authorities for SMS- related matters (e.g., data calls)<br>• Performs analysis using the facility condition index (FCI), remaining service life (RSL), Mission Dependency Index (MDI), Building Condition Index (BCI), PM/corrective maintenance, and defined condition standards and other functionality factors (non-condition based) to identify requirements that need sustainment, restoration, and modernization (SRM) funding and validates built assets' FCI and lifecycle requirements generated by SMS<br><br>***Note***: These responsibilities correspond to the AMP Manager role and responsibilities delineated in AFI 32-1001, Chapter 4; AMP managers must be assigned from the Operations or Engineering Flights. |
| ***Sub-AMP Manager*** | • Serves as first line of defense in ensuring quality data for each SMS<br>• Manages BIAT<br>• Ensures data inputs are consistent and understandable<br>• Performs quality assurance after the BIAT's quality control efforts<br>• Validates future work requirements generated by each SMS<br><br>***Note***: These responsibilities correspond to the Sub-AMP Manager role and responsibilities delineated in AFI 32-1001, Chapter 4; Sub-AMP managers must be assigned from the Operations or Engineering Flights. |

***Table 8 AMP and Sub-AMP Manager Current Year Requirements Roles and Responsibilities***

## Narrative

*Entry from Process 1.0 Conduct Built Infrastructure Assessment.*

***Step 2.1 – Generate reports Role: Sub-AMP Manager***

The Sub-AMP Manager runs the custom SMS reports (e.g., condition indices, remaining service life, and work items) to understand proposed corrective maintenance work for the next year. These reports produce lists of unconstrained requirements, or repairs based on an asset's condition and lifecycle expectancy independent of the cost to repair.

*Proceed to Step 2.2.*

***Step 2.2 – QC and Validate SMS reports***
***Role: Sub-AMP Manager***

The Sub-AMP Manager conducts QC and validation of SMS outputs to ensure there are no anomalies with

condition data, the data corresponds with field observations, and SMS is presenting legitimate work requirements. The Sub-AMP Manager works with the BIAT to resolve discrepancies, as needed. For example, a Sub-AMP Manager can identify a discrepancy when an asset only has a five-year service life but knows major repair was just performed on that asset; the Sub-AMP Manager can then check to see if the repair was loaded into the system.

*Proceed to Step 2.3.*

***Step 2.3 – Analyze and prioritize requirements and submit work request***
***Role: Sub-AMP Manager***

Analyzing the SMS outputs, the Requirements and Optimization (R&O) section analyzes and prioritizes the unconstrained requirements. Requirements are developed using the minimum programming requirements and standard project titles in the AMP/Comprehensive Asset Management Program (CAMP) NexGen IT or ACES-PM Data Entry Guide, as well as the data standards and IT systems each AMP and Sub-AMP specific business rules identify.

The AMP Manager discusses the R&O's prioritized requirements during the quarterly working group held with the Operations, Engineering, and Installation Management Flights to identify opportunities for in-house execution or contract mechanisms.

Per Air Force Instruction (AFI) 32-1001, *Operations Management*, Section 4.2, refer to AMP Playbook for guidance on analyzing asset data to align and de-conflict current and future investment requirements.

***Tips/Reminders:***

- Consider comparing BUILDER and NexGen IT or ACES data to determine and prioritize near-term requirements
- SMS Cost Analysis module will aid in determining the benefits of repair versus replacement (i.e., ROI), as well as the consequences of deferring work for a given item

*Proceed to Work Management Playbook, Process 2.0 Create Service Request.*

***Work Management Playbook, Process 2.0 Create Service Request***

This process determines whether the request becomes a Work Task or a Facility Project in NexGen IT and proceeds to the subsequent Process 3.0, Plan Work where the need for WRRB review and scope (i.e., Operations/in-house versus Engineering opportunity). For reference:

***Service Request***

The term "Service Request" replaces the AF Form 332, *Base Civil Engineer Work Request*, which is now obsolete. Each incoming requirement is first identified as a "Service Request" before being approved for accomplishment and routed either as a Work Task (to include Service Contracts) or Facility Project.

***Work Task***

The Customer Service Unit within the Operations Flight approves Service Requests denoting small-scale work and creates Work Tasks, similar to work previously known as Direct Scheduled Work. Work Tasks involve only one task and one shop. Work Tasks rarely require capitalization.

***Facilities Projects***

The Customer Service Unit converts Service Requests denoting large-scale work to a Facilities Project, similar to work previously known as Five Digit Work Order or Work Order. Facilities Projects usually involve multiple Work Tasks and shops. Facilities Projects can vary greatly in scale and may or may not result in capitalization.

# SMS – 3.0 Forecast Out-Year Requirements

Introduction

SMS Drivers

Benefits & Practical Applications: What Can You Do with SMS Data?

Best Practices & Success Stories

## Introduction

While asset inventories and assessments are tasks of asset management, the strength of SMS is in the analysis of the assessment data to determine investment or divesture decisions. This is how we extract value from our data. Budget constraints and reduced resources are driving the need for defendable investment choices. A key factor in determining investment decisions is forecasting requirements in the out years. This out year analysis provides visibility of needed work at the right time BEFORE costly and unrecoverable degradation occurs. It also anticipates when assets will be at the end-of-life cycle and need replacement rather than continuing with costly repairs. It also provides the framework to create execution strategies and agile procurement mechanisms by better understanding the magnitude of future work. Forecasting also provides compelling data for budgeting and financial planning (POM) at the Air Force level as forecasted data are based on field-verified asset conditions versus intuitive estimates or historical experience.

## SMS Drivers

### OSD Standardizing Facility Condition Assessments (10 SEP 2013)

OSD/IE mandated standardizing the facility condition assessment process to contribute to a more credible DoD asset management program. This will also support more effective application of buying power by allowing Department leadership to better target fiscal resources to those facilities most in need of investment. Further, adopting a standard process will help ensure that condition data will be audit-ready in accordance with Under Secretary of Defense (Comptroller)'s “Financial Improvement and Audit Readiness guidance" (FIAR).

### OSD Policy for Facility Sustainment & Recapitalization (29 APR 2014)

OSD/IE established “Facility Sustainment and Recapitalization” policy that in part requires the following:

- OSD Goal of FCI of 80 for all facilities
- Mitigation Plans for Facilities less than FCI 60

The Intent of the OSD policy is to support facilities through consistent long-term investment to keep facilities mission capable and in good working order. SMS can help identify which facilities are below FCI 60 and can generate what work is needed in the out years. SMS also can predict what facilities are approaching the end of life and should be replaced or demolished. Bases can run FCI based reports to assist in programming needed work for facilities with an FCI of less than 60. OSD is also requiring “mitigation plans” for each facility below FCI 60. These plans indicate what kind of work is planned to improve FCI (repair, mothball, sell, demo, caretaker, etc.) and what year the work is expected to take place. Annually, HAF/A4 and AFCEC will collect and submit compiled mitigation plans from the bases in a separate tasking.

### PAD 12-03

Program Action Directive 12-03 implements CE Transformation and institutes Asset Management Principles across the Air Force. It specifically states that **“**As CE Transformation evolves over time, the majority of asset “life-cycle requirements” will be identified through the implementation of a sustainability management system (SMS) capability” (para 4.8.2.1, Page 13).

### SMS and the AMP/CAMP Process

SMS provides requirements to develop the Activity Management Plans (AMP) and assists in prioritizing projects for the Comprehensive Asset Management Plans (CAMPs). A primary tenet of Asset Management

is knowing asset condition and the requirements to maintain effective service life. AMPs are the collection of unconstrained requirements needed to maintain assets to meet a set “Level of Service” and maintain asset service life. SMS can systematically produce needed requirements that can be used to forecast needed funding. These requirements are eventually packaged into projects for prioritization, funding, and execution either locally through ExPlan funding or through a centrally funded process (e.g., Integrated Priory List [IPL]). See AFCAMP Playbook for more information.

***AFI 32-1001***

AFI 32-1001, *Civil Engineer Operations*, Chapter 4, *Asset Management*, requires standardized asset data collection and analysis to enable the optimization of current and future resource allocation against RP and RPIE, thereby driving down the life cycle cost of installation and mission support.

## *Benefits & Practical Applications: What Can You Do with SMS Data?*

***Assess risk***

Risk (financial risk) in the SMS context is potential for the increasing cost of maintaining an asset when investment is not made to fulfil the expected remaining service life (RSL). Not investing will result in shortened service life, increased maintenance/service requests and degraded performance which ultimately increase Total Cost of Ownership. Items not completed in one year re-generate the following year at a higher cost due to inflation and for repair work types and the cost for additional degradation.

SMS data can be used to evaluate the magnitude of the financial risk of asset deterioration. Using the scenarios feature, several “what if” simulations can be evaluated to select the best option to pursue execution. It can evaluate the “do-nothing” option to model the projected effect and time of running an asset to failure. It also can assist in evaluating options in constrained and unconstrained budget scenarios.

***Determining requirements to lower lifecycle cost of ownership***

SMSs condition index trend analysis can search through a base’s asset inventory to estimate the best time to initiate maintenance or repairs several years in advance. It is moving from “find and fix” to a “model and predict” strategy. This helps bases prepare out-year budgets and lowers the total asset lifecycle cost of ownership. Bases can anticipate the optimum time frame (i.e., the “sweet spot” zone) to repair specific components, minimize the penalty costs incurred from deferring maintenance, and later determine if work performed did in fact reduce the number of issues recorded against a given asset, resulting in lifecycle cost savings. The figure below illustrates how the SMS predicts future work requirements by analyzing condition levels along the service life of an asset. Work requirements will automatically generate when the condition drops below the enterprise policy level for that asset.

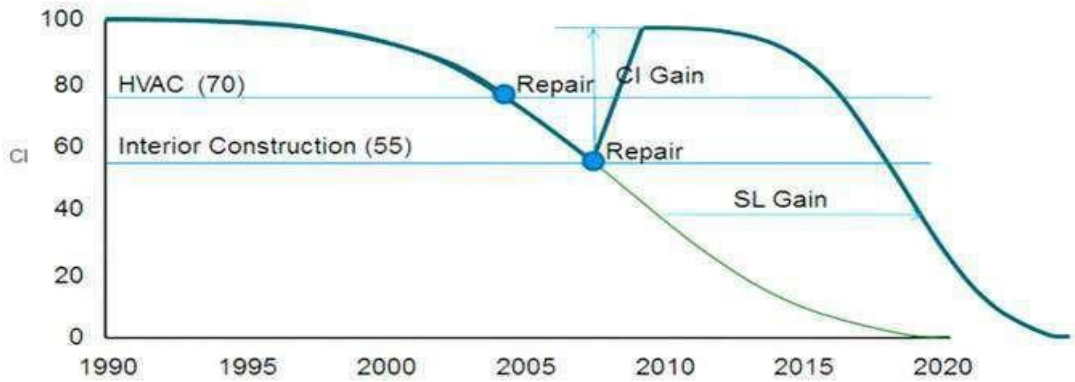



***Figure 6 Condition Index Trend Analysis***

***Inform resource allocation and investment decisions***

SMSs Work Item Cost Analysis tool determines the return and return-on-investment (ROI) for each work activity type (do nothing, stop gap repair, repair, replace) to identify the most cost-effective options, showing the benefits of repair versus replacement as well as the consequences of deferring work for a

given item.

***Auditing or Validating Project Proposals***

Bases can use SMS outputs to evaluate the best project proposals and requests for funding. SMS can provide hard data and analysis to justify funding actions. Specifically, SMS can predict when an asset's condition will fall below an acceptable threshold, triggering repair actions. Base-level users can leverage data outputs such as these to validate funding needs to local leadership.

For example, the AFCEC Project Scoring Worksheet requires all SMS components identified in the scope of each project proposed for centralized funding to be listed on the worksheet. Each component listed includes the component replacement value, remaining service life, and condition data. This enables the generation of a cost-weighted Probability of Failure (PoF) score that is used to compare risks of various project investments across the AF enterprise. This supports the enterprise ability to make data-driven decisions and further operationalize asset management principles. SMS serves as an advocacy tool ensuring intelligent allocation of available resources.

***Local Sustainment Decisions***

Sustainment includes the cyclical maintenance and scheduled repair activities to maintain the inventory of real property assets through their expected service life. It includes regularly scheduled adjustments and inspections, preventive maintenance tasks, and emergency response service requests for unscheduled minor repairs. It also includes major repairs or replacement of facility components (usually accomplished by contract) that are expected to occur periodically throughout the facility life cycle, and any inadequately-sustained components. This work includes regular roof replacement, refinishing of wall surfaces, repairing and replacing heating and cooling systems, replacing tile and carpeting, and similar types of work.

***Note***: Sustainment does not include restoration, modernization, environmental compliance, historical preservation, or costs related to unexpected events, which are funded elsewhere. [See AFI 32-1020, Section 3.4.]

***Out-Year Forecasting***

Targeting work requirements and priorities for current year execution is the responsibility of AMP and sub-AMP managers, but they are also responsible for programming the long-term capital investment strategy of the infrastructure they manage. In developing a future-year capital investment plan, several policy decisions early in the planning process can wield a drastic influence on the overall lifecycle performance and long-term sustainment cost of facilities. The SMS process helps support these decisions by making the consequences of different investment policies clearer and defendable.

By using scenarios-based modeling, effects of varying condition standards, prioritization schemes, and budgets, AMP managers can analyze the lifecycle results to determine the most appropriate course of action for executing infrastructure sustainment, restoration, and modernization. It also provides a more logical means of identifying and justifying long-term budget requests. Finally, it provides an execution strategy that managers can use to match long- term capital budgets with specific inventory assets.

- ***Consequence analysis:*** The SMS framework provides analysis tools to identify facility and component level degradation. This tool allows engineers to explore different investment scenarios and evaluate the consequences over a determined amount of time. Forecasting can mitigate these negative future consequences by identifying candidate repair or replacement work items for inclusion in Preventive Maintenance programs, scheduled work prioritizations, and projects. Forecasting tools help illustrate the asset management impact of funding or not funding future work and the impact to the installation asset portfolio.
- ***Strategic requirement grouping:*** Combining associated requirements leads to scheduling and work efficiencies. Forecasting can identify logically associated work items or projects to promote time and cost savings. The SMS outputs can provide the vision to overlap future requirements for cost savings and resource efficiencies: For example, a road replacement and utilities upgrades sharing the same fiscal completion year, or work items future schedule date falling into a preventive maintenance window for said asset. This information allows completion of the entire scope of work, for example, both road and underlying pipes can be repaired/replaced in an efficient and logical sequence (i.e., the pipes

are fixed prior to road replacement). Having the total picture eliminates the nightmare scenario of repaving the road and later excavating it to complete the utilities project.

- ***Streamline Execution Strategies:*** As SMS generates requirements, Sub-AMP Managers can determine trends in their Activity and can begin to evaluate procurement or strategic sourcing strategies. An example of this is if SMS analysis reveals several roofs to be replaced in the next 5 years; does a roofing IDIQ contract vehicle need to be established? Can similar work (projects) be bundled in a single contract undertaking (streamlining the contracting process)? Can a greater return on investment be realized? Leveraging this insight can relieve "reactionary" procurement risking inability to execute.

***Future Prioritization and Mission Value Visibility***

Bases create mitigation plans based on SMS-generated lists of worst assets in each component type. In addition, bases can have more complete visibility on high mission value assets as well as maintain condition awareness of lesser mission dependent assets. This visibility provides a better context for work prioritization as requirements across all facilities can be seen.

## *Best Practices & Success Stories*

***Minot Air Force Base: Programming Boiler Replacements***

***Scenario:*** Minot Air Force Base has boilers that have significantly reduced service lives due to mineral deposits. The municipal water supply has high levels of Total Dissolved Solids (TDS), or hard water.

***Problem:*** Minot had issues conveying their boilers' deteriorating conditions and future needs.

***Solution:*** SMS permits Minot to show in real time how this hard water is affecting a critical building system (heat generation), and SMS forecasting is projecting how long each boiler will potentially remain in service. This knowledge will allow a broad analysis of options. For example, Minot can decide whether it is best to anticipate funding the premature replacement of boilers or if a project should be funded to pretreat the hard water before it enters the utility grid. Most importantly, any member of the Civil Engineering enterprise with appropriate SMS permissions may log in and learn more about these boilers without ever setting foot in Ward County, North Dakota (Minot's location). SMS has allowed Minot's local knowledge to become enterprise-wide knowledge.

***Go to the Asset Management Page for links to the SMS Workspaces to find additional Best Practices***

https://usaf.dps.mil/teams/CEDASH/SitePages/Service%20Page.aspx?Service=Asset%20Management%20(COA)

# SMS – Facilities Guidance

Introduction
Getting Started
Data Access Authority
Applicable Training
Access Requirements
Equipment Requirements
BRED
Assessments
Metrics
Schedule of Assessment Completion
Accomplishing the Task by Manpower Alignment
BUILDER Outputs
Definitions

## Introduction

This Facilities Supplemental Guidance expounds on the standard process information in the SMS Playbook particular to buildings and vertical facilities. It also includes specific information on leveraging BUILDER™, the authoritative SMS for facilities data, to support asset management efforts. This guidance aims to operationalize asset management principles, ensure effective BUILDER™ inputs, and help installations achieve compliance with PAD 12-03, *SMS Implementation*, OSD SMS mandates, and AFI 32-1001.

## Getting Started

### BUILDER™ POCs

Each organization (IMSC Directorate, AFCEC Directorate, IMSC Detachment, MAJCOM, and unit/installation) appoints a primary and alternate BUILDER™ POC to work with the AFCEC BUILDER™ Program Manager. It is recommended that the installation BUILDER™ POCs be from the Operations and Engineering Flights. At the organization's option a Tertiary Program Manager may be appointed.

Organization level POCs will determine the number of BUILDER™ data managers, assessors and read-only users at their organizational levels. AFCEC BUILDER™ Program Manager distributes enterprise information on BUILDER™ program updates and changes to designated organization POCs for further distribution within their organizations.

NOTE! Organizations will submit their POC list/changes to AFCEC/COAF via email to AFCEC.COAF.SMSBuilder@us.af.mil and include the POC's name, email address, organization/office symbol, and DSN and commercial phone number.

Installation POCs are responsible for ensuring data inputs and changes are accurate and current for all installation inputs. AFRC and ANG units/organizations comply with instructions provided by their headquarters A4C. The AFRC and ANG A4C POCs will disseminate relevant information from the Program Manager to their subordinate organizations.

Organizational BUILDER™ POCs should periodically run the User List report in BUILDER™ - see the BUILDER™ Custom Reports Guide available within the BUILDER software or on the BUILDER ™Workspace. POCs should review the list and request SMS Support, SMSSupport@erdc.dren.mil, to make inactive any personnel listed that no longer require access to BUILDER™ to include separated, retired, PCS, contractor, etc. personnel.

### *Data Access Authority*

- Read-Only: Permission to view BUILDER™ and export reports of inventory and inspection data.
- Assessor: In addition to Read Only, Assessor has permission to add, view, and edit Assessor's own inventory and inspection data. This includes exporting and importing BUILDER™ Remote Entry Date (BRED™) files.
- Data Manager: In addition to the above, Data Manager has permission to view and edit their ENTIRE ASSIGNED ORGANIZATION inventory, inspection data, and perform Work Plan execution. They can create/edit work plans and generate multi-year work plan scenarios. The Data Manager has the highest level of User privileges. Data Manager with Read Only Restriction can only GENERATE work plans and multi-year work plan scenarios.

  It is recommended that installations appoint NO MORE THAN FOUR Data Managers at each installation. Too many data editors increase the difficulty to maintain data accuracy and quality, and also increases the risk of unintentional data loss.

### *Applicable Training*

The training program has transitioned from training located on the legacy AFCEC BUILDER™ SharePoint Site and that given by AFCEC/COAF to training programs provided by Air Force Institute of Technology (AFIT).

AFIT has developed three levels of training for BUILDER™ access training: Level 1 training is required for Read-Only; Level 2 training is required for Assessor; and Level 3 is required for Data Manager. The completion of each previous level of training is required to advance to the subsequent level of training.

The Level 1 Course has been developed and published. Since Jan 2019, all requests for BUILDER™ Read-Only access using the User Account Request Form USAF (see procedures below) have required POC certification of Training Level completed and the Date Completed from the AFIT WMGT 131 SMS BUILDER™ Level 1 Course score sheet documenting completion of the course. A final exam score of 70% is required on the course score sheet to complete the course.

The Level 2 Course has been developed and published. All new Assessors must complete the WMGT 231 SMS BUILDER™ Level 2 (Assessor Access) Course. As a minimum, to complete the course all four Sections of the Level 2 Course must be successfully completed. Students must complete all of the Section 2 Lessons as appropriate for their craft. Structural craftsmen and civil engineers must complete Lessons on B20 Exterior Enclosure, B30 Roofing, C10 Interior Construction and C30 Interior Finishes. Plumbers must complete Lessons on D20 Plumbing and D40 Fire Protection (Fire Suppression). HVAC craftsmen and mechanical engineers must complete D30 HVAC. Electricians and electrical engineers must complete D50 Electrical and D40 Fire Protection (Fire Detection). Those seeking to become Data Managers should take all Craft Specific Lessons. The organization level POC will submit an Assessor access request with POC certification of Level 2 completion and the Date Completed from the AFIT WMGT 231 SMS BUILDER™ Level 2 (Assessor Access) Course score sheet documenting completion of the course. Those personnel currently having Assessor or Data Manager SMS BUILDER™ access are not required to take the Level 2 Course to maintain their current level of access to SMS BUILDER™.

The Level 3 Course has been developed and published. All new Data Managers must complete the WMGT 331 SMS BUILDER™ Level 3 (Data Manager) Course. The organization level POC will submit a Data Manager access request with POC certification of Level 3 completion and the Date Completed from the AFIT WMGT 331 SMS BUILDER™ Level 3 Course score sheet documenting completion of the course. Those personnel currently having Data Manager SMS BUILDER™ access are not required to take the Level 3 Course to maintain their current level of access to SMS BUILDER™.

Here is the link to the AFIT Course List with the BUILDER courses listed.

Course applicants for Level 1 Read Only Course need to select WMGT 131, read the instructions entirely, and select "Apply" at the bottom. Course applicants for Level 2 Assessor Course need to have completed WMGT 131 and need to select WMGT 231, read the instructions entirely, and select "Apply" at the bottom. Course applicants for Level 3 Data Manager Course need to have completed WMGT 231 and

need to select WMGT 331, read the instructions entirely, and select “Apply” at the bottom.

Applicants will be able to start the course on the advertised course start date, but may be able to start sooner if they already have a Canvas account. Currently, there are instructions at the end of the course directing the student to print/save their course score sheet. Information from the score sheet is needed by the unit POC when requesting BUILDER™ access.

Contractors performing work on an AF contract, or on any agency contract performing work in support of the AF, may take the courses at no cost and they follow the same procedures except applicants put their Contracting Officer’s Representative (COR) on the registration form instead of their supervisor (this is explained in the application instructions in red). The application instructions also state tuition fees for contractors are waived for the course. Contractors will have to complete the following form which tells them to provide a memorandum from their company / firm Human Resources department certifying employment by the firm and assignment working on the specified contract. These forms are required of all contractors who take an AFIT CE School course.

The Civil Engineer School

*Contractor Attendance*

*The Civil Engineer School*

*Air Force Institute of Technology*

## Requestor Information

*Name of attendee:* _____

*Name of Company or Firm:* _____

*Contract and Task Order #s with DoD or Air Force:* _____

*Government Contracting Officer’s Name, Phone and email address:* _____

_____

*Must also attach a memo from the Company/Firm Human Resources department or contract/task order manager certifying the employee is employed by the firm and working on the contract/task order specified above.*

## Course Information

*Course Name and Number:* _____

*Course Dates:* _____

*Note: Attendance will be on a space-available basis. The appropriate course cost will be paid prior to admittance into the class.*

## *Access Requirements*

All requests for rights to BUILDER™ data (Read-only, Assessor or Data Manager) must be coordinated through SMS Support to AFCEC's Air Force BUILDER™ Account Verifier for approved access rights to BUILDER™ Controlled Unclassified Information (CUI) data. The BUILDER Access Request Form for USAF is accessible from the SMS BUILDER Workspace here:

https://usaf.dps.mil/teams/10758/BUILDERSMS/SitePages/Home.aspx

(See sub-page titled "Using BUILDER")

Or alternatively the form is available from the CERL SMS website here:

https://support.sms.erdc.dren.mil/downloads/builder-user-request-form

Ensure you use the latest Access Request form as the form has changed to accommodate documentation of Level of training and Date completed data that must be included with the request. The form is self-explanatory. One of the organization's appointed BUILDER™ POCs must originate all requests (as the Requesting POC), complete the majority of the form, and submit through SMS Support Help Desk to AFCEC's Air Force BUILDER™ Account Verifier for approval.

The organizational POC for all AFCENT locations is Mr. Christopher Biddick, christopher.biddick@afcent.af.mil. The organizational POC for Air National Guard are Mr. LaWayne Smith lawayne.smith.1@us.af.mil and MSgt Michael Bowers michael.bowers.8@us.af.mil.

The form is programmed to launch Microsoft Outlook and draft a message to SMS Support once the "Submit" button is clicked. If that feature doesn't work simply send the form through the email of a POC listed for the organization. The Requesting POC submitting the request is certifying the individuals have an access need at the role requested, understand the protection of CUI data, and have completed required training in accordance with this Playbook. For organizationally assigned military, civilian, and contractor personnel holding CAC cards, the Comments section on the form must include a comment stating "Required Training for the requested Role has been completed." If access is being requested for contractor personnel conducting an FCA contract, the task order completion date must be included in the Comment section of the form and the contractor is responsible for assigning roles and ensuring their personnel are adequately trained. Organizations should forward any questions to Mr. Steven Kozielecki and Ms. Janae Ball, AFCEC.COAF.SMSBuilder@us.af.mil, AFCEC/COAF, or via the AFCEC Reachback Center at 850-283-6995, AFCEC.RBC@us.af.mil or through the CE DASH homepage.

## *Equipment Requirements*

***Recommended:***

- Personal safety equipment
- Digital camera
- Flashlights
- Infrared thermometers
- FLIR Infrared/thermal cameras

***Nice to have:***

- Light intensity meter
- Laser distance meter
- Tablets for field data entry
- HVAC inspection scope (to read hidden/obstructed nameplate data safely)

The above equipment lists apply to direct visual assessment, only. It is recommended that installation personnel not invest in more extensive diagnostic equipment for the purposes of infrastructure assessments since

BUILDER™ assessments are visual in nature.

#### *Tablets*

AFCEC highly recommends unit personnel acquire tablet computers for use in conducting facility condition assessments. Experience has shown that tablets are useful to capture and confirm data during field work.

### *BRED™*

BRED™ software is available to help facilitate the condition survey inspection process. BRED™ will help capture field data and observations into a local computer file that can be imported to the web-based BUILDER™ database. This software is compatible with pen-based electronic clipboards, laptop computers, and desktop computers and can be used with or without an internet connection. Use of this electronic method of data collection is optional, but it offers significant advantages over paper forms including time savings, error reduction, on-screen sample tracking, and on-screen condition checklists to speed data collection. However, there are also some challenges to this approach such as the cost of equipment requirements, battery life limitations, and potential for computer/software malfunctions in gathering or downloading data. BRED is a Windows™-based application. BRED download files can be found here:

https://support.sms.erdc.dren.mil/downloads/files/bred-application-version-3-5-3-newest-version.

NOTE: HQ AFSPC/A6S previously certified BRED™ version 3.x software as part of the Software Products Approval Process for Software Products Approved for Reciprocity. BRED™ is approved via reciprocity by Certificate of Networthiness (CoN) through the Army Networthiness program. However, the local Designated Approval Authority (DAA) must still update their Authority to Operate (ATO) to include it on the local system or enclave.

### *Assessments*

Per the DoD Mandate, *Standardizing Facility Condition Assessments*, Military Departments will ensure that the SMS computed FCI for all assets on their installations are entered into the real property database. This includes the FCIs for facilities occupied/used by tenant organizations per DoDI 4165.70, "*Real Property Management*." The host installation is responsible for ensuring the completion of assessments for all built infrastructure on the installation. It is recognized that other tenant units will be conducting condition assessments on their assets. Table 9 below lists examples of AFCEC-confirmed facilities that would need to be assessed by the Base Civil Engineer staff as well as agencies that will conduct their own assessments. Please contact the AFCEC Reach-Back center, DSN 523-6995, with questions regarding assessment responsibilities.

| ***ASSESSED BY CIVIL ENGINEER STAFF (NOT EXHAUSTIVE)*** |
|---|
| • All built infrastructure on the installation (exceptions below)<br>• Army Air Force Exchange Service (AAFES) facilities<br>• Navy Exchange (NEX) facilities<br>• Non-Appropriated Funds (NAF) facilities |
| ***NOT ASSESSED BY CIVIL ENGINEER STAFF*** |
| • Defense Commissary Agency (DeCA) facilities<br>• Defense Health Agency (DHA) facilities<br>• Department of Defense Education Activity (DoDEA) facilities<br>• Defense Logistics Agency (DLA) facilities<br>• Air National Guard (ANG) facilities<br>• Privatized housing |

***Table 9 Civil Engineer Staff Assessment Responsibilities***

#### *Prioritizing Building Systems and Facilities for Assessment*

Facilities to be assessed are “Type B” (buildings), “Type S” facilities (structures) and “Type LS” facilities (linear structures).

In order to optimize manpower efforts, assessment of these facilities should be prioritized based on value to the overall mission as listed in the below Mission Dependency Index (MDI) ranges:

| Priority | MDI |
|---|---|
| High | ***99 to 86*** |
| Med | ***85 to 70*** |
| | ***69 to 45*** |
| Low | ***44 to 26*** |

***Required Building Systems for Assessment***

As a minimum, to have a complete facility assessment for most buildings and structures, the following seven Key Building Systems, if present, are to be assessed to the Component Section Level as defined in BUILDER™ every five years unless required more frequently by other guidance:

B20: Exterior Enclosure

B30: Roofing

C10: Interior Construction

D20: Plumbing

D30: HVAC

D40: Fire Protection

D50: Electrical

A facility assessment is considered complete when all seven of its Key Building systems (or systems applicable to the facility) have been assessed and the data inputted into the SMS.

Dormitories and Military Family Housing facilities additionally require the C30: Interior Finishes system be inventoried and assessed and the data inputted into the SMS to be considered complete.

Building systems not listed above, (such as A10: Foundations) may not require initial assessments, as these systems typically have longer life cycles with minimum repairs/maintenance and degrade very slowly over their lifecycle. The specific enterprise criteria for evaluating all 14 BUILDER™ Facility Systems have been developed as system Inventory and Assessments Manuals. NOTE: The Manuals are considered attachments to the SMS Playbook and are located here: https://www.ceplaybooks.com/playbooks/7c1b3cca-5045-4fc9-bec6-876a29f208c0/.

If systems such as foundations (A10), super structures (B10), or other unlisted systems are found in degraded condition or warrant repairs that are likely project candidates, installation personnel must perform a BUILDER™ condition assessment on those affected systems. Additionally, many buildings and structures like hangars, warehouses, munitions storage facilities and pavilions have systems A10 (foundations) and super structure (B10) that are easily viewable and should be inventoried and assessed in BUILDER™.

Aircraft Arresting System Supports are inventoried and assessed in A10 – foundations.

Facilities not having any of the key systems such as Aircraft Sunshelters, Jet Blast Deflectors, various towers, support structures and reviewing stands are inventoried and assessed using B10 – Super Structures. See the B10 Super Structures Inventory and Assessments Manual for details.

Many facilities are considered G20 Site Improvements and can only be inventoried within the G20 system. These include, but are not limited to, billboards, flag poles, various athletic fields, recreational courts, playgrounds, fences, decorative fountains and ponds, and mechanical security barricades. See the G20 Site Improvements Inventory and Assessments Manual for details. No other G-systems shall be used to document inventory.

Missile Alert Facilities (MAFs) and Launch Facilities (LFs) have unique inventory requirements of the Real Property facilities at these GSUs. The following Real Property facilities at MAFs and LFs must be inventoried and assessed in SMS BUILDER: MAFs: Missile Ops Buildings (MOB), Fences – both boundary and security fences to include ATFP barriers and bollards - if not a separate Real Property facility, ATFP

barriers and bollards - if separate facility, Communications Tower - if present as a separate facility, Vehicle Ops Heated Parking Buildings, Water buildings – structure only, Wells – structure only if the well utility components are protected by a building or structure, and Flag pole - if present. LFs: Electrical Power Station Buildings and Fences and gates. Many components within some of the facilities at MAFs and LFs are considered Weapon System components and are not Real Property to be inventoried in SMS BUILDER. The following details Real Property in the various facilities to be inventoried in SMS BUILDER IAW the HAF/A4C memorandum Request for Real Property Installed Equipment (RPIE) Determination for Intercontinental ballistic Missile (ICBM) dated 10 Feb 16 and AFGSCI 32-1005, *Intercontinental Ballistic Missile (ICBM) Real Property/Real Property Installed Equipment (RP/RPIE) Responsibilities And ICBM Infrastructure And Equipment Responsibilities*:

MAFs include the Missile Ops Building (MOB), Vehicle Ops Heated Parking Buildings, & Water Buildings (if present in Real Property records). Inventory/assess the seven key systems above ground IAW the system Inventory and Assessments Manuals. NOTE: C30 and other systems are optional (E, F, and G systems are not inventoried with Buildings). Use the following guidance:

| ***Missile Facility for Inventory/Assessment:*** | ***Systems:*** |
|---|---|
| MAF: Overhead Doors | B20 |
| MAF: Storage Tank TK123, Water Heaters | D20 |
| MAF: Air conditioners, Energy Management Control Systems – IAW D30 Manual instructions, Oil-Fired Furnaces, Gas-Fired Furnaces, Electric Unit Heaters, Electric Boilers, Heat Pumps, Hydronic Heaters, Evaporators, Roof Exhaust Fans (optional), Condensing Units, Baseboard Heaters, Electric Unit Heaters, Exhaust Fans | D30 |
| MAF: Fire Alarm (FA) Control Panel and Devices, Fire Suppression Systems | D40 |
| MAF: Electric Utility Meters, if only for the MOB or other buildings, otherwise utility, Diesel Electric Units (DEU) (generators), Disconnect Switch (if for Automatic or Manual Electrical Power source Transfer Switch), Power and Lighting Panels, Power System Alarm and Control Panel (if for Automatic or Manual Electrical Power source Transfer) | D50 |
| Elevator Shaft (Considered underground part of MOB): | |
| Elevator Concrete Shaft: Floor, Cast In Place (CIP) Concrete Floor | B101003 |
| Elevator Concrete Shaft: Walls | A202001 |
| Elevator Concrete Shaft: Ceiling (Roof Decks & Slabs-CIP Concrete Slab) | B102003 |
| Launch Control Center (LCC) (Considered underground part of MOB): | |
| LCC Concrete Structure: CIP Concrete Floor | B101003 |
| LCC Walls: Basement Walls Construction, CIP Concrete | A202001 |
| LCC Ceiling: Roof Decks & Slabs CIP Concrete Slab | B102003 |
| LCC Escape Tunnel and Hatch (ETH): | |
| ETH Floor: CIP Concrete Floor | B101003 |
| ETH Walls: Basement Walls Construction, CIP Concrete | A202001 |
| ETH Ceiling: Roof Decks & Slabs CIP Concrete Slab | B102003 |
| ETH Hatch: Doors | B20 |
| Launch Center Electric Building (LCEB)<br>(Considered underground part of MOB) | |
| LCEB Concrete Structure: CIP Concrete Floor | B101003 |
| LCEB Walls: Basement Walls Construction, CIP Concrete | A202001 |
| LCEB Ceiling: Roof Decks & Slabs, CIP Concrete Slab | B102003 |
| Fencing (fence) | G20 |

| *Missile Facility for Inventory/Assessment:* | *Systems:* |
|---|---|
| Vertical Gates (gates) | G20 |
| Crash Barrier: Inventory as separate facility in Real Property or as part of the Real Property Fence, as appropriate. | G20 |
| Barriers and Bollards: Inventory under fences. | G20 |
| Radio Tower (Communications Tower): Inventory as separate Real Property facility or attached to MOB, as appropriate. | A10, B10 |
| Wells: Inventory only the structure, if present, protecting the utility assets. Also inventory key systems present, as required. | Various |
| Flagpole | G20 |
| Launch Support Building (LSB)<br>Usually referred to Electrical Power Station Building (Underground building) | |
| LSB Concrete Structure: Floor (CIP Concrete Floor), | B101003 |
| LSB Concrete Structure: Walls,<br>Basement Walls Construction (CIP Concrete Walls) | A202001 |
| LSB Concrete Structure: Ceiling, Roof Decks & Slabs (CIP Concrete Slab) | B102003 |
| Fences and Gate, HICS Gates | G20 |
| Bollards: Inventory as part of fence facility if not separate facility | G20 |

For other regularly occurring inspection programs, such as fire protection or roofing, data from required forms (e.g., AF Form 1487, Fire Prevention Visit Report) should be copied into the BUILDER™ SMS.

***Standardized Method of Performing Assessments***

Any condition assessment executed by the installation, MAJCOM, AFCEC, or contractor working on their behalf will follow the BUILDER™ SMS methodology. Inventory collected will be entered into the USAF BUILDER™ database utilizing the American Society for Testing and Materials (ASTM) E-1557 UNIFORMAT-II methodology.

Assessments will be carried out using the BUILDER™ SMS Facility Condition Assessment (FCA) methodology that utilizes the Direct Condition Rating criteria. Further details regarding the standardized BUILDER™ methodology can be found in the BUILDER™ Getting Start Guide and BUILDER™ Inventory Guide at the SMS BUILDER Workspace here: https://usaf.dps.mil/teams/10758/BUILDERSMS/SitePages/Home.aspx and at the CERL SMS website here: https://support.sms.erdc.dren.mil/downloads/builder.

Additionally, Air Force specific technical guidance for standardized inventory and assessment criteria is contained in system specific Inventory and Assessments Manuals contained in the FCA Toolbox here https://www.ceplaybooks.com/playbooks/7c1b3cca-5045-4fc9-bec6-876a29f208c0/ and are considered attachments to the SMS Playbook.

The BUILDER™ Direct Condition Rating Assessment Matrix has been rescinded and is no longer valid. Consult the latest AF Comprehensive Asset Management Plan (AFCAMP) Business Rules for instructions on how to treat missing components or systems.

***Installations with Base Operations Support (BOS) Contracts, Base Maintenance Contracts (BMC), or contracted Operations Flights***

These installations will have to evaluate current contract provisions for inclusion of built infrastructure assessments. Installations with contracted operations and maintenance activities can also elect to contract or sub-contract out initial or recurring assessments. However, the long-term objective is to establish the organic assessment capability integrated into the day-to-day shop level activities to complete all FCAs and future reassessments on a five-year cycle. These installations are encouraged to reach out to AFCEC for a technical consultation regarding integrating standard BUILDER™ implementation capabilities into their respective performance work statements. Bases should contact AFCEC/COAF if they require assistance

with incorporating BUILDER™-specific verbiage into their BMC contracts.

AFCEC/COAF POC's are Mr. Steven Kozielecki and Ms. Janae Ball, AFCEC.COAF.SMSBuilder@us.af.mil.

## Metrics

### Calculating Assessment Completion Rates

A facility assessment is considered complete when all of the required systems measured at the Component Section Level that exist in the facility have been inventoried and assessed and the data inputted into BUILDER™.

When determining the assessment completion percentage of an installation, the total number of facilities and the total square footage of facilities, as documented in the Accountable Property System of Record (APSR), which is the authoritative data source for real property records, will be utilized as the baseline. Thus, 50% of the square footage of an installation assessment completed means 50% of the total installation square footage has been assessed (as opposed to the number of buildings or the number of assessed building systems). Similarly, 50% of the facilities complete means that 50% of the total installation facilities by count have been assessed. BUILDER™'s QA 13A Report provides the status of each of the 14 Building Systems for each facility/base and shows base completion according to both number of facilities (count) and square feet (SF).

When determining the assessment currency completion percentage of an installation, the total number of facilities and the total square footage of facilities, again as documented in the APSR, will be utilized as the baseline. The OSD Mandate requires assessments on all real property at least every five years. Thus, for a facility to be current, at least 90% of the inventoried sections of each system must have an assessment within the past five years for the system to be current. All of the required systems must be current for the facility to be considered current. BUILDER™'s QA 13B Report provides the status of each of the 14 Building Systems for each facility/base and shows base currency according to both number of facilities and square feet.

## Schedule of Assessment Completion

Once an installation's facilities have been completely assessed, they must be reassessed at least every five years as they become due. AFCEC recommends that every installation immediately begin their 5-year reassessment cycle if it is not already underway. This means that approximately 20% per year by both count and by SF must be reassessed in order to continue to maintain BUILDER™ condition assessment data current. Routine update inputs should continue as part of ongoing day-to-day business operations for each work center responsible for sustaining inventoried assets. Many bases have developed customized methods for strategically scheduling reassessment work to maximize results while minimizing unnecessary labor effort.

Two primary approaches have developed from experience: The first is the Maintenance-Based Assessment strategy which involves completing annual reassessments in conjunction with every annual preventive maintenance task that is performed across the civil engineer in house work centers. Although this approach does not cover all inventoried assets that require reassessing, it does enable capturing important condition changes for all of the most critical and valuable assets in service because those will be on the preventive maintenance task list. The second strategy requires the work centers to loan personnel to the Requirements and Optimization (R&O) work center to form an assessment team and focus their efforts full time on performing reassessments. In either case the R&O personnel maintain oversight of the assessment data update process as agreed upon between assessors and data managers. Either approach can achieve the required assessment completeness and currency results, and both are therefore deemed acceptable.

## Accomplishing the Task by Manpower Alignment

Every base is different – size, composition, and mission all affect the types of built infrastructure on base and feasible methods of conducting ongoing assessments. The information below reflects the various approaches, results, challenges, and best practices that have occurred at various locations across the AF.

***Typical Team Construct:*** (Facility Condition Assessment [FCA] Team). A full-time FCA team should include at least one each of the specialists listed below. The lead can be "dual-hatted" as one of the assessors.

- Lead – Requirements and Optimization (R&O) Non-Commissioned Officer in Charge (NCOIC)
- Electrical Systems Specialist and/or Electrical Power Production Specialist
- Water/Fuel Systems Specialist
- Structures Specialist
- HVAC Systems Specialist
- Engineering Assistant (Optional)

***Approach:***

As noted above, there are two primary approaches for sustaining complete and current inventory and assessment data. Assuming the Operations Flight has established an R&O work center as a part of the CE transformation, the team approach can be used to focus technicians full time on performing assessments. This manpower alignment allows the capability to rapidly conduct Built Infrastructure inventories and assessments. The R&O engineers and technicians must be trained on BUILDER™ fundamentals to facilitate getting good results. Experience has shown that loaning technicians to the R&O section for at least a one-year duration worked best at developing a competent and trustworthy BIAT team utilizing craftsmen, typically from the four work centers--HVAC, Electrical or Power Pro, Structures, and Water/Fuels. During the inevitable turnover of personnel, the FCA team personnel should be overlapped for at least two weeks during the transition phase allowing for one week of training and one week of shadowing to provide continuity. This teaming concept also supported the base's long-range plan to train shop personnel to conduct inventories and assessments in order to integrate BUILDER™ into day-to-day operations.

At another location, the Facilities AMP Manager led the Facility Assessment Team in conducting the initial assessments. They used as-built drawings, and if a component was not straight forward in terms of its direct rating deficiency, the AMP Manager consulted with the shop supervisors and shop leads (typically retired Air Force craftsmen) to complete the assessment. If the shop supervisors were unsure, the AMP Manager would defer to the organization's engineers as a final reach back resource. The AMP Manager reviewed as-built drawings and entered data into BUILDER™.

As the inventories and initial assessments were completed, the ratings were submitted to the shop supervisors for their input and review. This process was successful and, after a few rounds, the shop supervisors began asking for inventories and would assist in the assessment process as they performed their day-to-day operations. The team grew as time progressed and relationships developed. The monthly AMP meetings where the assessment process was discussed quickly turned into many spirited debates about the importance of the ratings, the quality of BUILDER™ inputs, and how everyone could use the data going forward.

Building assessment schedules and priorities were developed using a weighted system that calculated MDI, Age and M&R data to include backlog work items. The R&O technicians were responsible for oversight of all assessment scheduling and BUILDER™ management to include data quality control and upload. The FCA team conducted inventories and assessments using Real Property Inventory records within BUILDER, building drawings, and computer tablets configured with BRED™ software. The R&O technicians were responsible for collaborating with the RPO and providing RP record updates with any Found on Base (FoB) assets or adjustments by establishing a DD Form 1354 utilizing UFC 1-300-08 guidance.

During the analysis process, the R&O sub-AMP managers continually updated BUILDER™ by generating work items for each assessed building to create work items analysis tools and reports. All reports from BUILDER™ and NexGen IT were analyzed to identify degraded asset conditions, RSL schedules, and backlog work tasks to target "worst-first" systems. Once degraded and at-risk systems were identified, BUILDER™ output data was used to validate projects in NexGen IT while establishing new opportunities, requirements, and service requests. The R&O work center developed stand-alone or bundled requirements for either in-house or Sustainment, Restoration, and Modernization (SRM) contract project execution whether supported by either centralized or decentralized funding.

***Results:***

- Data collected allowed a more straightforward ranking for projects or work orders to undermine the current "I'm the most important thing on this base" issue

- Data collected allowed identification of sections within buildings that were in dire need of repair or replacement that wouldn't have been identified due to the systems still "working"
- Scores allowed direct identification of the truly worst systems in need of repair or replacement
- Data revealed that the current process for identifying projects and opportunities was not sufficient to meet AFCAMP requirements
- Data revealed facilities that were under the radar but in desperate need of attention (e.g., BCIs < 60), resulting in an unexpected amount of project opportunities
- Data-driven model demonstrated to leadership what was common knowledge at the shop: the facility infrastructure was degrading as soon as replacements were completed
- Using the new SMS model allowed to plan development and funding for future large projects in the most mission critical facilities. The SMS system allowed the team to allocate funding where it was truly needed
- Commanders appreciate the data-driven recommendations informed by the trend and root cause analysis enabled by SMS when considering and approving opportunities
- BUILDER™ SMS has "armed" squadron leadership with a site picture of RPIE across the base. This enabled Commanders at the Group level to see immediate funding needs (i.e., ability to prioritize "the needs" over "the wants") during facility boards

***Challenges and Lessons Learned:***

- Leave/TDY/Deployments/Appointments can make it difficult to keep a coherent FCA team functional and productive
- Personnel transitions within the R&O section coupled with the amount of knowledge needed in these positions make for a steep learning curve in an environment that does not slow down. Careful planning of turnover to ensure continuity and detailed turnover procedures are essential.
- Having tablets that cannot connect to either the network or a Wi-Fi signal makes getting information from BUILDER™ and loading the BRED™ files back into BUILDER™ a hassle with several steps needed (download to local computer, move to external hard drive, connect hard drive to tablet, move file to tablet and reverse for getting the file back to BUILDER™).
- Institutional knowledge of the craftsmen that have been on base for a while is extremely valuable.
- Shift the assessment process to maintain the database and have the follow-on assessments completed by the shops as part of their PMTLs. Train the craftsmen on how to assess the components and then "calibrate" the craftsmen so everyone's assessment will be as close to the standard as possible and minimize personal bias.
- Allow all team members to voice their opinions or they may become disenchanted and disengage from the process making completion almost impossible.
- Determination and perseverance are essential especially when starting the process. The shops may hesitate to give all the information needed but upon realization that the program is permanent, they will give the R&O team a wealth of information and data.

***Best Practices:***

- Keeping a list of all shop personnel who have been on the FCA team provides the capability to backfill positions for a short time without having to train a new person.
- Teaching the FCA team members what R&O's mission is provides a keen insight to CE transformation and the importance of SMS. The team understands how the inspection process relates to future requirements and allows communication from the technicians in the field. This collaboration provides key information about Built Infrastructure systems that might have degraded since previous inspections and potentially require re-inspection.
- Using tablets with BRED™ allowed for more accurate data collection and detailed inspections

- Having all the positions filled (AMPs and SUB AMPs) is the only way to truly move forward through CE Transformation and allow for the most efficient use of people and materials
- Coordinating weekly with RPO to ensure RP updates were reconciled in a timely fashion
- Providing BUILDER™ analysis to Engineering to ensure BCIs were legitimate and to validate RPIE replacements (i.e., prove a RPIE item would not be better served with a PM update or funding a project based on an out of date (invalid) SMS entry)
- R&O attends weekly Civil Engineering (CEN) project review meetings to assist in BUILDER™ validation. Its role at the meetings includes tracking completed facilities for assessment; identifying erroneous data used to start projects; reviewing BUILDER™ SMS data and secondary assessments; participating in discussions relevant to the SMS or project processes. R&O also helps CEN find the correct condition indices (i.e., BCI, CSCI, etc.) so CEN can estimate project funding
- Added BUILDER™ SMS validation to the work order closeout process. This provides a documentation trail displaying what work is being completed on base, whether in-house or contract, identifies the need for SMS equipment data updates or new inspections, and updates the SMS inventory and assessment data as work is completed.
- BUILDER™ SMS is a living data base. Maintenance and upkeep are essential when new situations/updates arise to keep accurate and current data. To combat this issue, R&O has integrated into the schedulers' meetings. R&O identifies systems that are called into question and provides BUILDER™ SMS data updates to reflect repairs in the system. Often, this calls for a new assessment, in which case, the squadron has a BUILDER™-trained person in each shop able to assess the repaired RPIE item. Alternatively, R&O can perform an inspection with the AMP Manager, Sub-AMP Managers or planners. The R&O section "triple hats" these duty positions as current staffing levels do not provide the personnel to fill the current P-Plan manpower allocation

### *BUILDER™ Outputs*

Table 10 below shows BUILDER™ outputs and their end use. Please note that this table does not show all possible alignments of BUILDER™ outputs, rather it is intended to illustrate the minimum connections.

***Table 10 BUILDER Outputs***

| FUNCTIONAL AREAS RELYING ON BUILDER OUTPUTS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | ***CONDITION INDEX*** | ***REMAINING SERVICE LIFE*** | ***WORK ITEM*** | ***FUNCTIONALITY INDEX*** | ***FACILITY CONDITION INDEX*** | ***RAW SCORED LIST*** | ***MODELING*** | ***WARRANTY*** |
| OPERATIONS FLIGHT | X | X | X | X | X | X | X | - |
| OPERATIONS ENGINEERING ELEMENT | X | X | X | X | X | X | X | - |
| ENGINEERING FLIGHT | X | X | X | X | X | X | X | - |
| MAJCOM | X | - | - | X | X | X | X | - |
| PLANNING AND INTEGRATION (AFCEC/CP) | X | X | X | X | X | X | X | - |
| ASSET VISIBILITY TEAM (AFCEC/COA) | X | - | - | X | - | - | - | - |
| HAF | - | - | - | - | - | - | X | - |
| WORK PRODUCTS INCORPORATED IN BUILDER OUTPUTS | | | | | | | | |
| INTEGRATED WORK PLAN | - | - | X | - | - | - | - | - |
| BASE IPL | - | - | - | - | - | X | X | - |
| PROJECT | X | X | X | X | X | X | - | - |
| INSTALLATION DEVELOPMENT PLAN | - | - | - | - | - | - | X | - |
| MAJCOM IPL | - | - | - | - | - | - | X | - |

## *Definitions*

***BCI:*** The Building Condition Index (BCI) measures the condition of the building as a whole. It is computed by averaging the condition indices of the building systems, weighted by the replacement costs of the systems.

***FCI:*** The Facility Condition Index (FCI) is the industry standard index calculated by dividing the total cost of necessary repairs in the building divided by the replacement cost of the building. In BUILDER™, the total cost of necessary repairs is estimated by summing the individual section repair costs. This is a financial measure.

***CSCI:*** The component-section condition index (CSCI) is the “management unit” upon which asset management decisions are made, and the CSCI is the fundamental index metric in BUILDER™. As the fundamental condition metric for building assets, the CSCI is aggregated using a bottom-up approach to determine a Building Component Condition Index (BCCI), a System Condition Index (SCI), and a Building Condition Index (BCI). This hierarchy is illustrated in the figure below. Likewise, the BCIs can be average or aggregated for groups of buildings, complexes, or entire installations (or portfolios) to represent an overall condition indicator. BUILDER™ contains the programmed algorithms to compute the CSCI metric and all higher corresponding CI metrics from the condition survey data that is entered.

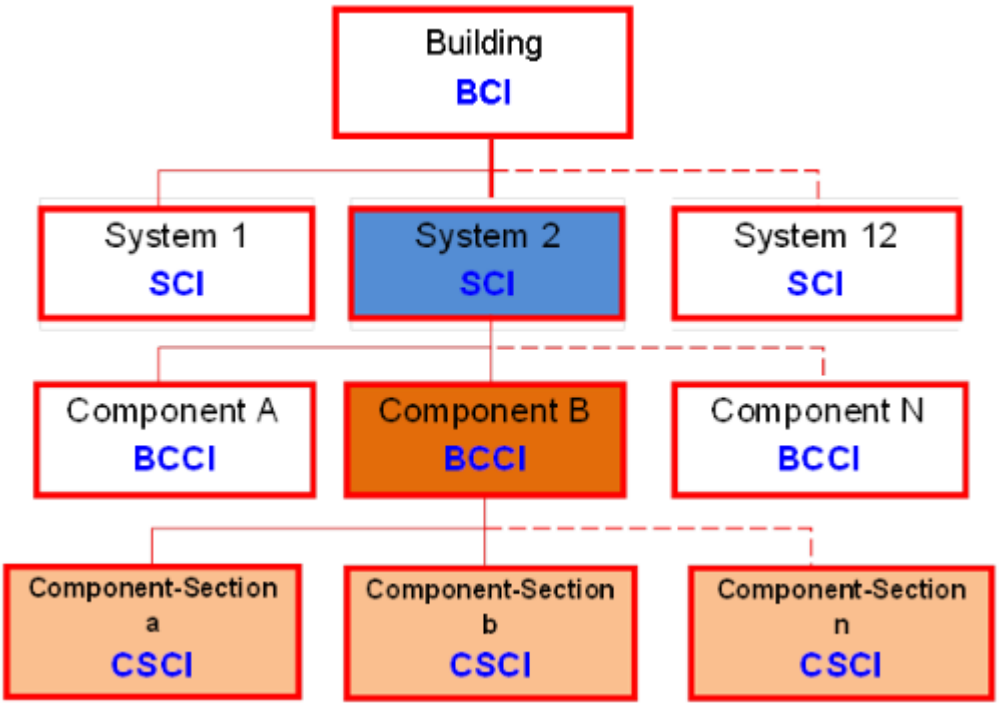



***Figure 7 Condition Index Hierarchy***

# SMS – TNAP Guidance

Overview

Asset Management

TNAP SMS Background and Systems Description

Data Access Authority

## Overview

This TNAP Supplemental Guidance provides an overview of the Air Force Transportation Network and Airfield Pavement (TNAP) Asset Management Program and how Sustainment Management Systems (SMSs) and other pavement and non-pavement evaluation tools are used to meet Air Force operational requirements, manage Air Force TNAP assets, and achieve the standardized facility condition assessment objective outlined in the Under Secretary of Defense, Acquisition, Technology and Logistics 10 Sep 2013 Policy Memorandum for SMS implementation. This memorandum mandates that the Air Force properly record a facility condition index for each asset at each installation.

The Air Force pavement community has collected pavement inventory and condition data by conducting Pavement Condition Index (PCI) Surveys for airfield, road, and parking pavements. Additionally, structural data for airfield pavements has been collected. Currently, the Air Force has PCI and structural data for 100% of airfield pavements and 100% of PCI data for road and parking pavements at our main operating bases. We have limited pavement condition data for road and parking pavements at geographically separated units (GSUs) and ranges which constitute approximately 9% of the entire pavement inventory. The PAVER SMS is available for managing the airfield pavements and the road and parking pavements and is currently being updated to manage other non-pavement TNAP assets as determined by the TNAP AMP community.

The RAIL Enterprise SMS is available for managing rail systems but not used consistently across the AF. There is currently no SMS specifically established for other non-pavement TNAP assets, but there is condition data on bridges, arresting systems and other TNAP assets in disparate decentralized data sources. This document outlines the plan to capture inventory and condition data on TNAP assets where it exists, define criteria to rate the condition of TNAP assets if such criteria does not exist, define procedures and processes for collecting data where they do not exist, and identify the SMS to be used to collect and house this data for use in managing all TNAP assets.

## Asset Management

The Air Force has established a goal to reduce the amount of infrastructure in accordance with AFPD 32-10. AFPD 32-10 states “Provide and retain the minimum number of installations and facilities necessary to effectively support Air Force missions and people at the lowest life-cycle cost and in a sustainable way. The Air Force will inactivate or dispose of installations and facilities that are excess to requirements.” SMSs provide data on funding required to maintain / repair essential infrastructure at a prescribed level of service at the lowest possible life cycle cost to accomplish this goal.

Infrastructure is divided into five activities: Transportation Networks, Utilities, Facilities, Real Estate, and Natural Infrastructure. The transportation networks include asset groups such as airfield pavements, roads and vehicle parking areas, curbs and gutters, culverts, bridges, tunnels, sidewalks, markings, traffic signals, signs, airfield lighting, active vehicle barriers, rail systems, and ports (wharfs and piers).

Activity Management Plans (AMPs) for each of these major CE activities are under development. These plans include information on Real Property Inventory, set portfolio-specific objectives, and consider necessary investments and initiatives needed to meet those objectives.

## *TNAP SMS Background and Systems Description*

### *Air Force TNAP Management Tools History*

The DoD began in the 1940s performing periodic inspections to manage its airfield pavement assets. The Air Force started doing standardized pavement condition index (PCI) surveys over 40 years ago and began using software tools to manage transportation assets in the 1980s. These tools include the Pavement-Transportation Computer Aided Structural Engineering (PCASE) program for structural evaluation and design, PAVER, for determining surface condition and projecting deterioration and maintenance and repair (M&R) requirements for both airfield and road and parking pavements, and RAILER for determining the condition and projecting M&R requirements for rail systems.

***PAVER 7.1 System Description***: The current version of PAVER (7.1) is a desktop application and has the capability to operate in a Windows Communication Foundation (WCF) environment. PAVER is used to maintain pavement asset inventory, calculate the surface condition in compliance with UFC 3-260-16 O&M Manual, and calculate the deterioration rate of the pavement using the work history and PCI inspection data on the type, severity, and quantity of distresses on the pavement surface. Assessors conduct PCI surveys using statistical sampling procedures outlined in ASTM standards. PAVER uses this data to predict the future condition and both the short and long-term maintenance and repair requirements of each pavement asset using cost-by-condition curves developed for each location. It is important to note that PAVER is not only used as asset management tools but perhaps more importantly, as a contingency planning tool. Several functional users use the PAVER analysis results for mission and investment decisions. For example, Combatant Commanders use the information to make mission bed-down decisions; airfield managers use it to make daily operational decisions, and civil engineers use it to prioritize pavement repair requirements at forward operating locations. Since PAVER is used in contingency planning, it will be maintained with both a stand-alone and on-line capability.

***PCASE (PCASE 7.0) System Description:*** PCASE is the DoD mandated software tool for designing all airfield pavements and for designing roads & parking areas under specific circumstances for all DoD installations. PCASE is structured to share inventory with the PAVER program. Inventory includes the pavement network, branch and section data as well as work history, but does not currently share other key data elements such as the traffic, PCI, Pavement Classification Number (PCN), or Friction Index between the applications. In combination with PAVER, it provides a comprehensive set of tools that automates complex pavement design, evaluation, and management calculations for rigid and flexible pavements using both conventional and layered elastic methodologies. PCASE 7.0 is a stand-alone application used by pavement evaluation teams to collect airfield pavement characteristics data and use that data to compute the load bearing capacity of the airfield pavement. In the future, both PCASE and PAVER data will be merged into a single database accessible to other applications such as NexGen IT and GeoBase.

AF engineers and other functional users use PCASE data at all levels as an asset management tool to objectively quantify and prioritize recommended repair requirements and build airfield repair projects. Contingency planners use PCASE reports/data to make bed-down decisions for forward operating locations, and to track the condition and risk as operations progress. The Operations (A3) community uses PCASE data as part of the Airfield Suitability and Restrictions Report (ASRR) process and by airfield managers at both forward operating locations and main operating bases to make daily local airfield operational decisions.

***RAIL System Description:*** RAIL is currently a web-based version of the Enterprise SMS platform. Major features include rail system inventory, defects and deficiencies data, the physical track health/condition of rail system components, and work actions to include associated costs and operational restrictions. RAIL data is used to identify and prioritize repair requirements for the rail network based on the condition and importance of those components. Originally, Army's ERDC CERL developed RAILER, a standalone desktop application to capture data on rail systems on military installations. Over the last several years, rails on AF installations used by DLA have been inspected by the ERDC Geotechnical and Structure Lab (GSL) using the Electronic Railroad Inspection Database System (ERIDS). ERIDS creates an on-the-fly RAILER geodatabase that can be uploaded to ESMS. Bases have used other tools for capturing and analyzing rail condition data. The intent was to aggregate inventory and inspection data on all AF rail assets in a RAILER database. In 2020, CERL migrated legacy RAILER desktop capabilities to the ESMS RAIL platform to ultimately provide a secure, user friendly, cloud-based application for SMS information.

***SMS Support for Other TNAP Assets:*** Other than in real property records, the Air Force has not historically centrally tracked other assets such as bridges, navigational aids (NAVAIDS), sidewalks, curbs and gutters, traffic control devices, airfield lighting, and ports (wharfs and piers) in an SMS. AFCEC Sub-Activity managers have been working to identify the data and IT systems for inventorying and capturing condition of these assets. The objective is to determine which SMS will be used and updated to capture these data elements and make the updates required so the inventories and conditions can be captured. AFCEC is currently investigating a BUILDER solution for ports and waterfront facilities.

# SMS – TNAP Guidance: PAVER and Other

Overview

Roles and Responsibilities

Training

Implementation Support

TNAP Resources

Inventory/Assess

Analyze/Forecast

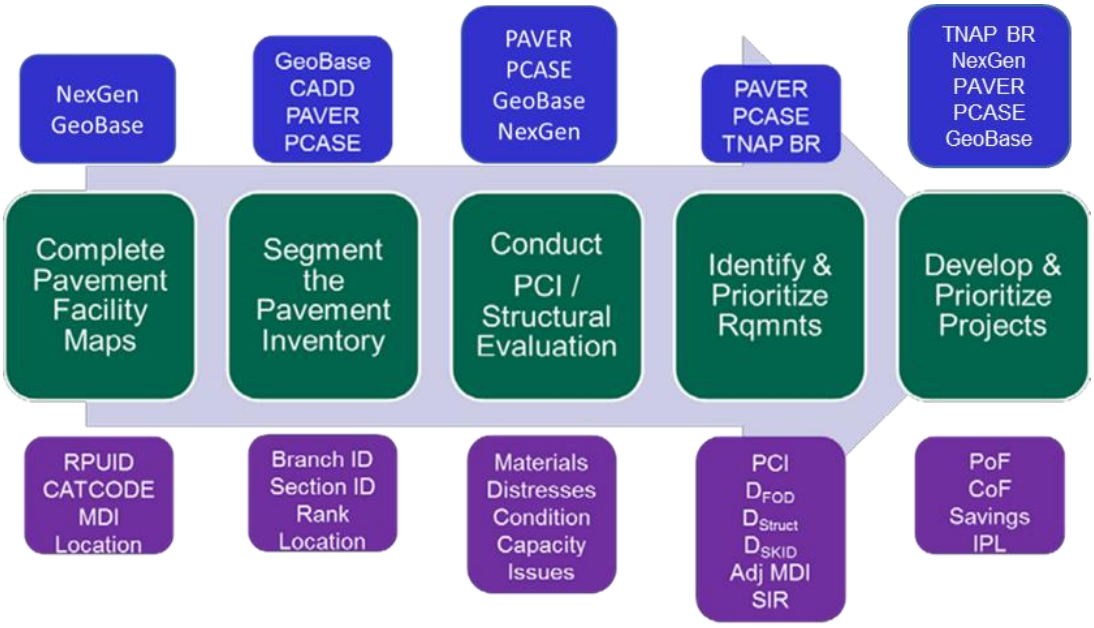
## Overview

### Process Overview

AFCEC centrally manages Pavement Condition Index (PCI) surveys and structural evaluations for airfields and PCI surveys for road and parking areas. PCI surveys are conducted every four years. Every twelve years airfields will receive a comprehensive evaluation to include structural, PCI, and friction characteristics testing by the Airfield Pavements Evaluation (APE) Team.

In between these regularly scheduled evaluations, the base is responsible for maintaining the PAVER database. Base personnel should update the construction history whenever a project or significant in-house work is completed. Installation personnel are also responsible for developing a Pavement Management Plan (PMP), which is part of the TNAP Asset Management Plan (AMP). The PMP is updated annually and involves using the data available from the current PAVER database, structural evaluation report, and Friction Characteristics report. The goal is to translate the requirements in PAVER (network-level planning), and information in these other reports, into executable, prioritized projects to maintain the base's TNAP assets at an optimal level (project-level planning and lowest life cycle cost. Refer to TNAP resources below for a link to the Tri-Service Pavements Working Group (TPSWG) 3-270-08.14-03: Pavement Management Plan (PMP) for Airfield Pavements, which outlines the overall process for generating the PMP.

### Process Overview Map



***Process Steps***

- Complete/Update Pavement Facility Maps - Validate Network Inventory with RPO
- Update Facilities Segmentation (Update Branches and Sections)
- Obtain Structural Evaluation/Pavement Condition Index Survey
- Identity Base-Level Requirements and Parametric Costs
- Rack and Stack Requirements using TNAP Business Rules
- Bundle Requirements into Projects with detailed estimates.
- Prioritize Projects at Base Using TNAP Business Rules
- Validate and Prioritize Projects at MAJCOM/AFCEC using TNAP Business Rules
- Prioritize Projects on Integrated Priority List (IPL) based on the Business Rule scoring process
- Prioritize IPL
- Repeat Process

***Management Overview***

AFCEC/CO is the focal point representing the Air Force on the Tri-Service PAVER User Group and is the lead for the implementation and incorporation of PAVER into Air Force enterprise asset management activities. The PAVER Tri- Service User Group in turn provides information and input to the DoD Installation Support Panel. The Air Force Member of the PAVER Tri-Service User Group is also a member of the Air Force Sustainment Management Systems (SMS) Implementation Working Group (SMSIWG). The Chair of the SMSIWG is the official Air Force Representative to the DoD Installation Support Panel for all SMSs. A similar structure will be used for other non-pavement TNAP assets to manage overall SMS requirements and develop any required SMS tools needed to collect and maintain inventory and condition data on TNAP assets.

***Installation Points of Contact***

Each installation should provide a primary and alternate Point of Contact (POC) to AFCEC for all issues related to PAVER/TNAP data and tools. AFCEC recommends that these POC's be the TNAP AMP and BCAMP Manager. They will be the guardians of the data at the installation and will have overall responsibility for the integrity of the data. The installation POCs will be made aware who at the MAJCOM Detachment (DET) and Field Operating Agency (FOA) has permission to alter the data. All requests for rights to data (Read-Only, Assessor, or Data Manager) must be coordinated with the base POC, whose name will go in the Requesting POC block of the PAVER User Account Request Form. The approval authority at AFCEC is the "Account Verifier" and will typically approve assessor or data manager rights to requests validated by the appropriate base POC.

***MAJCOM DET Points of Contact***

Each MAJCOM DET should provide a primary and alternate POC to AFCEC and to each of their installations for all issues related to PAVER/TNAP data and tools. They should keep the base informed of who at the MAJCOM DET has permission to make changes to data, (i.e., Data Managers). They should inform the base about any changes the MAJCOM DET has made to the database. The approval authority at AFCEC will typically approve assessor or data manager rights to requests validated by the appropriate MAJCOM DET POC, whose name will go in the "Requesting POC" block of the PAVER User Account Request Form.

***AFCEC POCs***

The following are also the Account Verifiers for the PAVER User Account Request Form:

- Mr. Shaun Moya, PAVER SMS Program Manager
  Shaun.moya.1@us.af.mil, DSN 523-6085
- Ms. Sara Bierman, Transportation and Pavements AMP Manager

sara.bierman@us.af.mil, DSN 969-8844
- Mr. Pat Kelly, Chief, Transportation Branch, AFCEC/COAT
  patrick.kelly.26@us.af.mil, DSN 523-6448

The following are also the Account Verifiers for the BUILDER User Account Request Form:

- Mr. Bill Valenti, BUILDER SMS Program Manager
  william.valenti.2@us.af.mil, DSN 523-6698

## *Roles and Responsibilities*

***Pavements (Airfields and Roads/Parking): Base Responsibilities:***

- Create/Maintain a pavement facility map for airfields and for roads & parking
- Validate/Update real property records using DD Form 1354 to reflect recommendations from the RPAD/PAVER validation report from the most recent PCI report
- Develop PMP and generate projects to address requirements in PCI report
- Update PMP annually
- Update work history for projects completed between 4-year evaluations
- Provide support to AFCEC comprehensive evaluation teams and AFCEC PCI consultants performing surveys

***AFCEC Responsibilities:***

- Review facility maps and work with base to make any needed adjustments
- Centrally manage PCI programs for both airfields and roads & parking pavements on a 4-year cycle. This includes implementing linear segmentation and validating actual areas, performing analysis, and generating report that outlines issues, budget scenarios, and requirements
- Provide guidance and assist with completion of PMPs on a 5-year cycle
- Centrally manage comprehensive testing program on 12-year cycle and anchor testing as required

***Other Pavements (Curbs and Gutters, sidewalks, hiking, jogging trails, troop walks, and covered walkways, etc.):***

PAVER module is under development. Continue to use local procedures to collect inventory and condition data until further guidance is established.

***Traffic Control Devices (Signage):***

Installations shall manage and maintain their own signage inventory. Signage shall be defined as all signs used to regulate, warn, or guide traffic, placed on, over, or adjacent to installation streets. The Manual on Uniform Traffic Control Devices (MUTCD), 2009 edition including Revision 1 and 2 updated January 2017 shall be the guiding reference document.

***Traffic Control Devices (Traffic Signals):***

For real property installed equipment (RPIE) assets associated with Traffic Lights use BUILDER (see "22_SMS_Facilities Guidance"). Follow the guidance for direct assessment provided in the current year Facilities Guidance for the electrical system. Use BUILDER Section G204005, Signage, for the pole structure. Do not assess the pole structure twice if it is supporting more than one utility. Assess the foundation in BUILDER Section A102005. Since the foundation is tied directly to the floor slab, it should be assessed by observing the slab, to which the signal pole is bolted. Particular points of observation should be the anchor bolt connection and the slab directly adjacent to those connections.

***Mechanical Security Barricades***

For real property/RPIE assets associated with the Mechanical Security Barricades use BUILDER (see "22_SMS_Facilities Guidance"). Follow the guidance for direct assessment provided in the current year

AFCAMP Facilities Guidance. Use BUILDER Section G204004, Security Structure, for the specific barricade. For Mechanical Security Barricades, follow the CoF section in the Facilities Guidance for justifying repair or replacement of real property.

***Bridges (Includes pedestrian bridges and culverts with width 20' and greater):***

PAVER add-in tool is under development. Continue to use local procedures to collect any additional inventory and condition data not captured in the centralized assessment program until further guidance is established.

***Base Responsibilities:***

- Keep accurate real property records; update real property records using DD Form 1354 to record actual inventory found in Bridge inspections.
- Develop preventive maintenance plans and program projects to address requirements in bridge inspection reports.
- Ensure required inspections are completed IAW guidance; support centralized inspection efforts.
- Review bridge inspection report data for accuracy. Coordinate data corrections with AFCEC.
- Support centralized inspection efforts as required

***AFCEC Responsibilities:***

- Centrally manage the bridge inspection program (reportable bridges) and provide guidance to the Federal Highway Administration (FHWA).
- Analyze inspection data to determine work required to maintain bridge assets throughout the lifecycle.
- Review bridge inspection data. Coordinate adjustments with base and FHWA.

***Aircraft Arresting Systems (AASs):***

For real property assets associated with the AAS use BUILDER (see "22_SMS_Facilities Guidance"). Follow the guidance for direct assessment provided in the current year AFCAMP Facilities Guidance, such as the building envelop, electrical, lighting, etc. Also assess the raft foundation in BUILDER Section102005. Since the foundation is tied directly to the floor slab, it should be assessed by observing the slab, to which the brake is bolted. Particular points of observation should be the anchor bolt connection and the slab directly adjacent to those connections. The equipment associated with AAS includes brake engines, cables, tapes, fairlead beams, etc. AAS equipment inventory and condition database is being developed and will be managed by AFCEC/COAT. The brake engine and associated mechanism (including consumable goods) maintenance schedule will be managed by CEMIRT.

***Navigational Aids (NAVAIDS):***

Navigational Aids is under Facilities in the BUILDER SMS.

***Airfield Lighting:***

Airfield lighting is under Electrical in the Utilities SMS. Follow the current Utilities guidance for this asset.

***Ports (Wharfs and Piers):***

For real property/RPIE assets associated with the Waterfront facilities, AFCEC is working to complete development of BUILDER Sect H to be used for input and management of condition data. AFCEC developed a centrally funded assessment program that assesses waterfront facilities aligned with direct-mission support as well as some complex non-mission support facilities. The program started in FY21 and is on a 5-yr assessment rotation. For the other non-mission support waterfront facilities, bases are to use experienced personnel to assess structures. If experienced personnel are not available, bases are to contract out the assessments or fund a task order through the centrally funded program. In the future, the data from both contracted and base assessments will be loaded into BUILDER Section H.

## *Training*

***Transportation System Center training:***

- ***PAVER I***: offered on-line and on-location throughout the year for learning the fundamentals of pavement management using PAVER software.
- ***PAVER II***: offered on-site throughout the year
- ***PCASE***: offered on-line and 3-day on-site workshop covering pavement design and evaluation

USACE PAVER/PCASE training schedule can be found at:
https://transportation.erdc.dren.mil/tsmcx/training.aspx

Air Force Institute of Technology (AFIT) training:

- WMGT 141 SMS PAVER Level I
- WMGT 241 SMS PAVER Level II
- WMGT 341 SMS PAVER Level III
- WMGT 131 SMS BUILDER Level I
- WMGT 231 SMS BUILDER Level II
- WMGT 331 SMS BUILDER Level III
- WENG 550 Airfield Pavement Design and Maintenance
- WENG 555 Airfield Pavement Construction Inspection
- WMGT 417 Activity Management
- WMSS 301 Intro to Asset Management

AFIT training courses and schedules can be found at: https://www.afit.edu/CE/catalog.cfm

## *Implementation Support*

Websites to assist with implementation:

| *RESOURCE* | *LOCATION* |
|---|---|
| *CE Dash* | https://usaf.dps.mil/teams/CEDASH/Scripts/Homepage/Home.aspx |
| *Points of Contact Site* | https://usaf.dps.mil/teams/10542/pap/Pages/Contacts_Listing.aspx |
| *Tri-service Website* | https://transportation.erdc.dren.mil/triservice/ |
| *AFCEC Portal* | https://portal.afcec.hedc.af.mil/SitePages/Home.aspx |
| *Pavements SharePoint* | https://usaf.dps.mil/teams/CEDASH/SitePages/Service%20Page.aspx?Service=Pavements |
| *PAVER SMS Workspace* | https://usaf.dps.mil/teams/10758/paversms/sitepages/home.aspx |
| *AFCEC Planning and Integration milBook Page* | https://login.milsuite.mil/?goto=https%3A%2F%2Fwww.milsuite.mil%3A443%2Fbook%2Fgroups%2Fafcec-planni |
| *AFCEC Reach Back Center* | DSN: 523-6995<br>COMM: 1-850-283-6995; Toll Free: 1-888-232-3721<br>Email: afcec.rbc@us.af.mil |

## *TNAP Resources*

| *RESOURCE* | *LOCATION* |
|---|---|
| *PAVER SMS Workspace* | https://usaf.dps.mil/teams/10758/paversms/sitepages/home.aspx |
| *Pavements and Airfield Damage Repair* | https://usaf.dps.mil/sites/13072/ADR/Forms/AllItems.aspx?PageView=Shared&InitialTabId=Ribbon.WebPartPage&VisibilityContext=WSSWebPartPage<br>https://usaf.dps.mil/teams/CEDASH/SitePages/Topic%20Page.aspx?Topic=Pavements%20-%20Airfield%20Damage%20Repair%20(ADR) |
| *PAVER and PCASE Downloads* | https://transportation.erdc.dren.mil/paver/Downloads.htm<br>https://transportation.erdc.dren.mil/pcase/software.aspx |

| RESOURCE | LOCATION |
|---|---|
| *USACE PAVER Manual and Training Slides* | https://transportation.erdc.dren.mil/paver/Manuals.htm |
| *APE Gateway* | https://usaf.dps.mil/teams/10758/pavereports/sitepages/apegateway.aspx |
| *AFMAN 32-1041, Pavement Evaluation Program* | http://www.e-publishing.af.mil/ |
| *Unified Facility Criteria* | https://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc<br>• UFC 3-260-03<br>• UFC 3-260-16<br>• UFC 3-270-08 |
| *TSPWG 3-270-08. 14-03, Preventive Maintenance Plan (PMP) For Airfield Pavements* | https://www.wbdg.org/ffc/dod/supplemental-technical-criteria/tspwg_m_3-270-08_14-3 |
| *Tri-Service Transportation: Pavements- Transportation – Community of Practice* | https://transportation.erdc.dren.mil/tsmcx/training.aspx |
| *TNAP Business Rules* | See SMS - TNAP Guidance: Business Rules for TNAP Segmentation for additional information |
| *TNAP AMP Workspace* | https://usaf.dps.mil/teams/10758/tnap/SitePages/Home.aspx |
| *AFCAMP Page* | https://usaf.dps.mil/teams/10542/pap/pages/afcamp.aspx |

## Inventory/Assess

### *Pavement Data Collection and Inspection Approach*

The approach to collecting inventory and condition data for TNAP assets differs from the approach used for vertical facilities. While the main effort of data collection for vertical facilities is by base personnel, historically, the collection of pavement condition data has been centrally accomplished through AFCEC's APE Team, one of its consultants, and/or the USAFR S-Team. AFCEC's intent is for this process to continue in the future with additional support from the bases. In the past, the base's role has been to provide data to the APE team, the USAFR S-Team, or contractor to update work history, provide input on current issues, and provide a point of contact (POC) that coordinates the field survey schedule and access requirements for the evaluation team. In addition, bases will use PAVER to actively maintain the database between PCI surveys/structural evaluations. This includes updating construction history and condition data, but does not require the bases to do PCI surveys. The APE Team will conduct comprehensive evaluations for each airfield on a 12-year cycle. AFCEC will centrally fund and execute PCI surveys for airfields, roads, and parking areas every four years. AFCEC plans to use consultants that specialize in pavement management and PCI surveys to execute this work. The final deliverables include the PCI report, PAVER database, and mapping products, including file geodatabase, as well as all source documents for the report. This report data will be updated in the central database for AFCEC, MAJCOM DETs, and bases to plan and prioritize projects that compete for funds at the enterprise level.

***Airfield PCI and Structural Evaluations:*** PCI Surveys will be conducted on 4-year cycles for all airfield pavements, alternating between COAP/APE team and AFCEC consultants. AFCEC established centralized funding for all Airfield pavement evaluations to standardize processes, manage data, and have a 95% confidence level of condition. The APE Team has established a twelve-year schedule for conducting comprehensive evaluations for 100% of all USAF airfield pavements. These evaluations include PCI inspection, coring, dynamic cone penetrometer (DCP) testing, concrete and soil testing as well as Heavy Weight Deflectometer (HWD) testing, friction testing, and anchor testing as required. PCI surveys by AFCEC contract consultants will provide PCI evaluations between APE comprehensive evaluations. In between these surveys, the base is responsible for maintaining their condition data by ensuring construction history is updated when projects become complete as part of the capitalization process and as outlined in TSPWG 3-270-08.14-03, *Preventive Maintenance Plan for Airfield Pavements*.

***Road and Parking PCI Surveys***: As mentioned above, AFCEC established centralized funding for both airfield and road and parking PCI surveys to eliminate significant inefficiencies with the old process. The

current objective is for AFCEC to conduct a centrally funded and executed, 95% confidence level PCI survey at each base by contract to update linear segmentation implementation process and the condition and deterioration rate baseline. As with airfield PCI surveys, each base is responsible for maintaining their PCI data in between these regularly scheduled surveys by updating construction history and condition data as projects are completed.

***Other Pavement Inspections:*** Other pavements include; curbs and gutters, equipment pads, sidewalks, hiking, jogging trails, troop walks, and covered walkways, etc. Inventory of curb and gutter assets are collected in the AFCEC managed Road and Parking PCI Surveys. Quantities and locations are updated within the GeoBase database. These surveys do not assess condition, only inventory. Installation personnel are responsible for inventory of other pavement including equipment pads, sidewalks, hiking and jogging trails, troop walks, and any other miscellaneous pavement within the GeoBase database. Installation personnel are also responsible for condition assessments using the Condition Index (CI) values described in Table 11.

***Table 11. Definitions of CI Ratings for Other Pavements***

| Rating | Condition Index | Definition |
|---|---|---|
| GOOD | 85 | Pavement has scattered low-severity distresses that need only routine maintenance. |
| FAIR | 65 | Pavement has a combination of generally low- and medium-severity distresses. M&R needs are routine to major in the near future. |
| POOR | 41 | Pavement has predominantly medium- and high-severity distresses that cause considerable maintenance and operational problems. Near-term maintenance and repair needs will be intensive in nature. |

***Traffic Control Device Inspections:*** Data did exist at some MAJCOMs and bases regarding signage and retro reflectivity compliance. There also may be traffic management studies that document the number and, in some cases, condition of other control devices. The intent of these local inspections is to identify tools and procedures currently used to collect and maintain this data; develop standard tools and condition ratings (if there is variability); and determine key data elements for tracking at the enterprise level if needed.

***Bridge Inspections (Includes pedestrian bridges and culverts with length measured down the centerline with the flow of traffic of 20' and greater [reportable bridges]):*** FHWA executes the bridge inspections for the Air Force on a rotating cycle (50% of CONUS bases each year, including Alaska and Hawaii). OCONUS bases will continue to inspect their bridge facilities using current practice. FHWA will provide detailed reports that not only identify condition but also define repair requirements and costs for use by the respective bases to develop projects to compete on the IPL.

Once bridge inspections have been completed, the National Bridge Inventory (NBI) database is updated by FHWA and a spreadsheet containing inspection data is generated for USAF use. This spreadsheet contains the FHWA calculated Sufficiency Rating (SR) used as a condition rating for bridge assets and for project scoring on the IPL. A copy of this spreadsheet will be posted on the CE Dash site for bases to download for tracking their own assets. Any discrepancies should be reported to AFCEC as soon as possible so the NBI database and SR can be corrected. Bridge inspection reports provide requirements and cost estimates to be used for potential projects. Report cost estimates should be adjusted for locality and federal contracting work.

***Drainage Structures (Under pavements; includes culverts with width under 20'):*** Drainage Structures are considered Utilities and guidance is located in the Utilities section of the SMS Playbook.

***Aircraft Arresting Systems (AASs)***. For real property assets associated with the AAS use BUILDER (see SMS Facilities Guidance). Follow the guidance for direct assessment such as the building envelop, electrical, lighting, etc. Also assess the raft foundation in BUILDER Section102005. Since the foundation is tied directly to the floor slab, it should be assessed by observing the slab, which the brake is bolted to. Particular points of observation should be the anchor bolt connection and the slab directly adjacent to those connections. The equipment associated with AAS includes brake engines, cables, tapes, fairlead beams, etc. AAS equipment inventory database and brake engine maintenance schedule is being developed and will be managed by CEMIRT.

***Navigational Aids (NAVAIDS):*** The Communications community owns NAVAIDS. Facilities supporting NAVAIDS are within the BUILDER SMS database. Refer to the Facilities SMS Playbook for further guidance.

***Airfield Lighting:*** Airfield lighting is under Electrical in the Utilities SMS.

***Ports (Wharfs and Piers***): The intention is to use the ERDC's well-defined inspection criteria and guidance from UFC 4-150-07 for port facilities to the maximum extent possible. AFCEC will investigate and define existing data sources (e.g., RPAD) to inventory and assess condition of port assets. Where data exists, AFCEC will consolidate data into a central data repository and define/modify processes for maintaining this data.

## *Analyze/Forecast*

***Pavements Data Analysis and Forecasting Approach: Airfield Pavements/ Roads & Parking Lot Pavements/ Other Pavements*** (Other pavements include; Curbs and Gutters, equipment pads, sidewalks, hiking, jogging trails, troop walks, and covered walkways, etc.)

Asset management requires knowing the inventory, condition, and criticality of the asset to the mission. PCI surveys and pavement evaluations only provide some of the total requirements. Installations and TNAP working groups should meet to determine all of the requirements and formulate cost-effective solutions for PM, minor and major M&R, and reconstruction.

***Assessment Purpose:*** To capture the current inventory and condition of mission required pavements.

***Team Composition:*** The assessment team should consist of experienced personnel from airfield operations (for airfield pavements) and civil engineering. At a minimum civil engineering should be represented by the pavements engineer, community planner, and an Operations pavement/equipment shop person.

***Procedure:*** The assessment process is a three-part procedure that involves relooking at mission requirements, gathering requirements from the various tools, visually assessing the pavements to validate known requirements from data in AFCEC reports, and identifying new requirements. These requirements will be prioritized using the same TNAP business rule processes that are used to evaluate projects on the IPL. Next, work with base programmers to develop project scopes and costs for the pavements. The requirements and projects applicable to PM will be included in the PMP.

***Airfield Pavements/Roads & Parking/Other Pavements Management Process***

- Analyze mission needs for the pavements - repair and sustain what you need to do the mission
- Develop, maintain, and organize the pavement inventory
- Assess the current condition of pavements
- Record M&R history in PAVER database
- Use/Develop models to predict conditions
- Report on condition performance
- Develop scenarios for M&R based on budget (Work Planning)
- Plan and determine how to execute projects

***Data Collection and Analysis Processes***

See SMS - TNAP Guidance: Business Rules for TNAP Segmentation for additional information

***Traffic Control Devices (Markings, Signs, Signals) Data Analysis and Forecasting Approach***

***Assessment Purpose:*** To capture installation's inventory/condition of their own Traffic Control Devices done locally as they will not be included in the enterprise SMS databases.

***Team Composition:*** The assessment team should consist of experienced personnel from civil engineering. At a minimum, the civil engineering team should be represented by the pavements engineer (or assigned engineer), community planner, and operations personnel from the pavement and equipment shop and sign shop.

***Procedure:*** The assessment process is a three-part procedure that involves gathering requirements from the various tools, visually assessing the traffic control assets to validate known requirements, identifying new requirements, and developing project scopes and costs for traffic control devices. The requirements and projects applicable to PM will be included in the PMP.

***Traffic Control Device Management Process***

- Develop, maintain, and organize the inventory for the traffic control devices
- Assess the current condition of the traffic control devices
- Keep track of M&R history
- Plan projects

***Data Collection and Analysis Processes***

Installations are responsible for managing data and analysis. SMS databases will not include Traffic Control Devices.

***Bridges Data Analysis and Forecasting Approach (Includes pedestrian bridges and culverts with length as measured down the centerline with the flow of traffic of 20' and greater)***

- Develop, maintain, and organize the bridge inventory using assessment reports
- Assess the current condition of bridge assets
- Prioritize requirements
- Plan and program required projects

***Aircraft Arresting Systems (AASs) Data Analysis and Forecasting Approach***

The TNAP Sub-AMP management of the AASs in conjunction with CEMIRT's inputs is under development. Continue to use local procedures until further guidance is established.

***Navigational Aids (NAVAIDS) Data Analysis and Forecasting Approach***

Navigational aids are under Buildings in the BUILDER SMS. Guidance is found in the Facilities SMS Playbook.

***Airfield Lighting Data Analysis and Forecasting Approach***

Airfield lighting is under Electrical in the Utilities SMS. Guidance is found in the Utilities SMS Playbook.

***Ports (Wharfs and Piers) Data Analysis and Forecasting Approach***

TNAP guidance is under development. Continue to use local procedures until further guidance is established.

# SMS – TNAP Guidance: Business Rules for Pavement Segmentation

Overview

Segmentation Hierarchy

Pavement Management Segmentation Rules

Advice and Tips

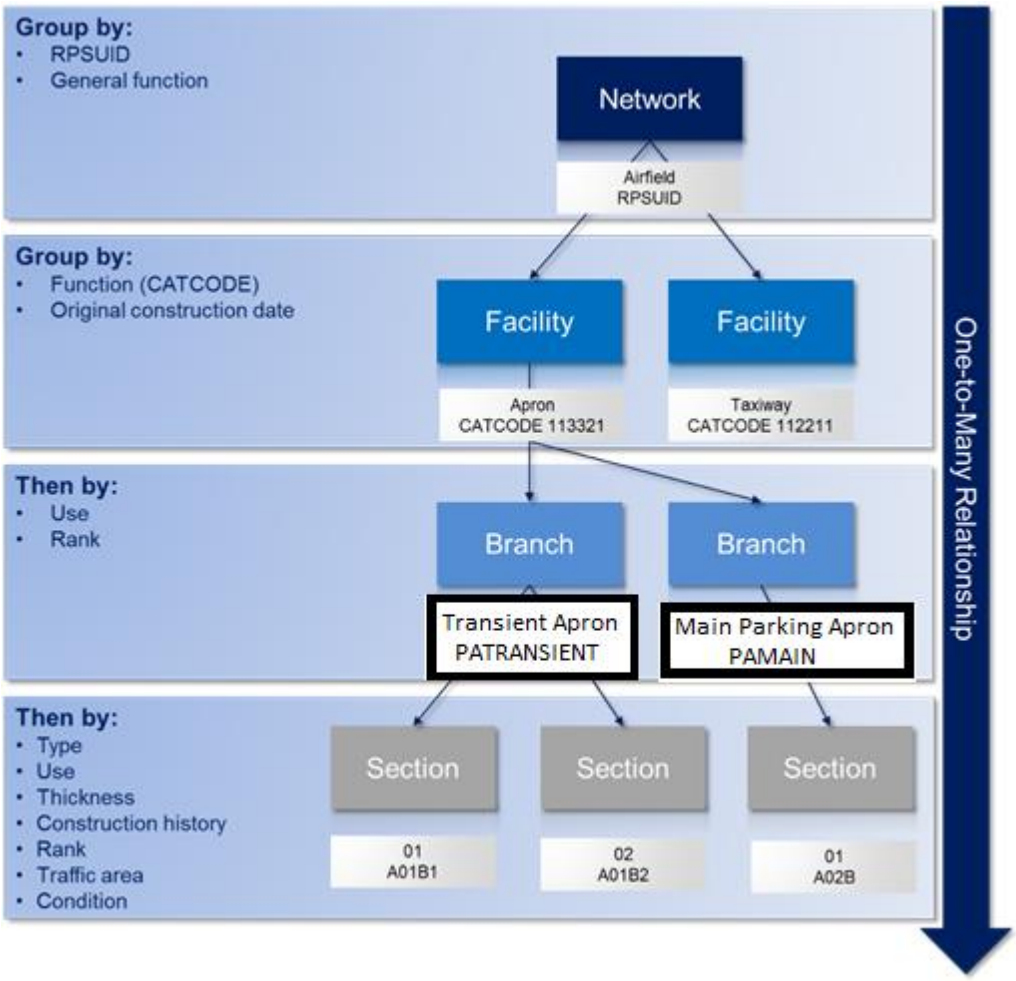
## Overview

This section outlines general business rules for the linear segmentation of pavements and provides visual examples of network component identification. The examples below outline possible scenarios and suggest how they can be handled. However, recommend working closely with Real Property to ensure the proper updates are reflected in the real property records.

## Segmentation Hierarchy

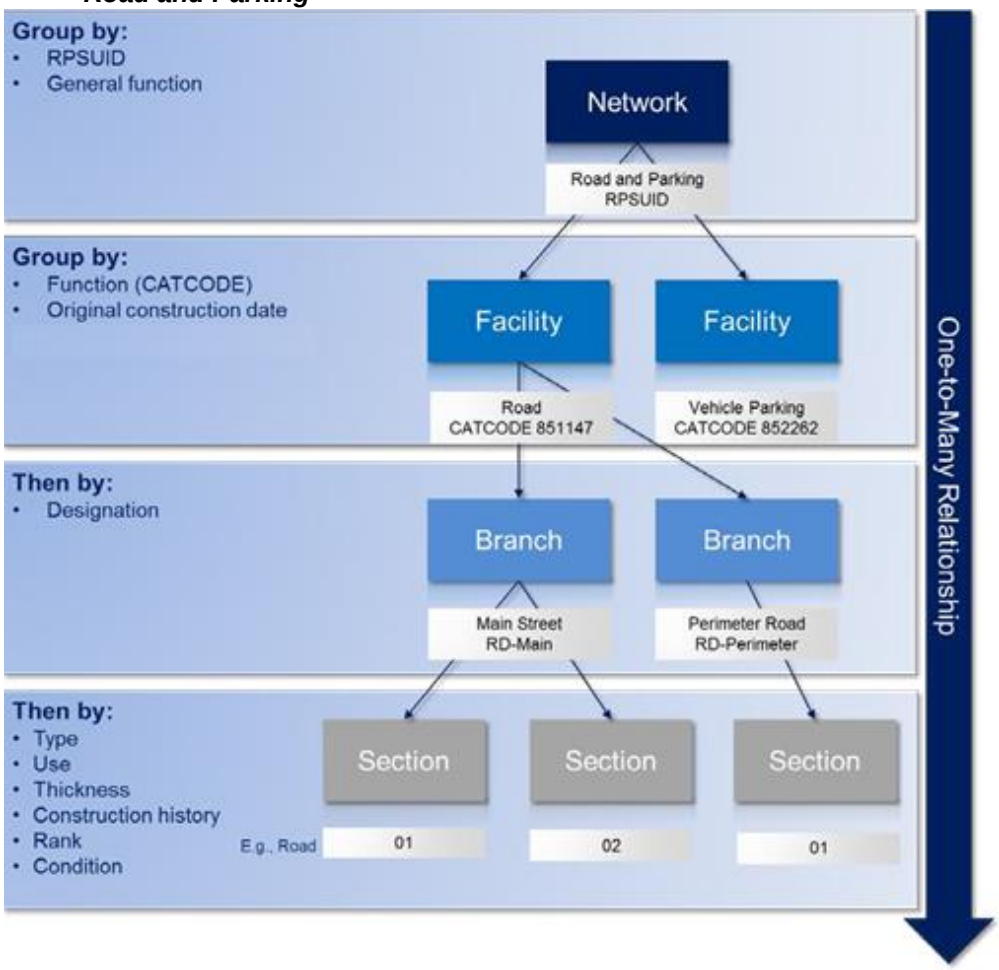
The Segmentation Hierarchy represents a one-to-many relationship among linear segments moving down the hierarchy. A facility can consist of many branches, which can consist of many sections. Sections are the most specific segment type and are identified by a unique combination of physical and usage characteristics. The hierarchies shown below are based on business rules established to maintain a structured relationship between real property data elements and pavement engineering data elements. It is important to note that the Real Property Unique Identifier (RPUID), facility number, Facility Analysis Category (FAC), and category code (CATCODE) associated with each facility are all assigned at the branch level in PAVER to provide maximum flexibility for data analysis and to accommodate potential changes to business rules or requirements in the future. It should also be noted that FAC is included for analysis because sustainment costs are based on FAC rather than CATCODE. In most cases, there should be no problem maintaining this hierarchy. Instances may arise where the facility was assigned in a way that compromises the ability to manage the asset from an engineering perspective. In these cases, engineers should work with the RPO to modify the facility designation to resolve the conflict. If this is not possible, the hierarchy may be disregarded to maintain the integrity of the branch. An example of this would be a runway that has two facility numbers, one for the reconstructed portion of the runway and another for the original runway. Ideally, there should only be one facility number for the load bearing surface of the runway. From the engineering perspective, the team should consider the entire load bearing surface of the runway as a branch. Creating two runway branches to align with the facilities would cause issues in evaluating and reporting the runway condition and capability as a whole. If the RPO cannot combine the two runway facilities, the runway sections should be aligned as separate facilities, but only one branch should be created for the runway since the hierarchy cannot be maintained.

***Airfield Segmentation Hierarchy***




***Airfield Segmentation Hierarchy***

***Road and Parking***




***Road and Parking Segmentation Hierarchy***

## *Pavement Management Segmentation Rules*

UFC 3-270-08 delineates specific pavement segmentation business rules. Table 12 below summarizes that guidance.

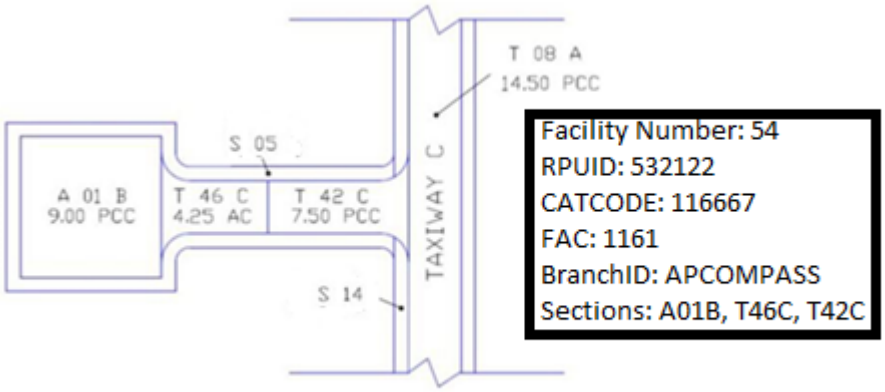
| *SEGMENT* | *DESCRIPTION* | *CONSTRAINT* | *DATA ELEMENTS* | *AUTHORITATIVE SOURCE* |
|---|---|---|---|---|
| Network | Pavement group based on general function, such as airfield pavement network or paved road, drive, and parking area network | Network can only be associated with one RPSUID | PAVER Network ID, RP network, RPSUID | OSD Real Property Information Model (RPIM) Version 5.0 |
| Facility | An area of pavement with a specific single function, such as a runway, apron, taxiway, road, driveway, or parking area | For linear assets, a facility can have only one FAC and CATCODE | CATCODE, FAC, facility number, RPUID | AFI 32-9005 |

| SEGMENT | DESCRIPTION | CONSTRAINT | DATA ELEMENTS | AUTHORITATIVE SOURCE |
|---|---|---|---|---|
| Branch | A logical subset of the network, such as a named taxiway or a named road | Branches are confined to a single pavement use for airfields, road name for roads, and facility supported or use for parking areas | Branch name, PAVER Branch ID | UFC 3-270-08 |
| Section | A subset of a branch that is assigned based on specific physical and/or usage characteristics | Sections are confined to a unique combination of physical or usage characteristics | PAVER Section ID, pavement type, thickness, construction history, rank, traffic area, surface condition. Note that RPUID, facility number, FAC, and CATCODE are all assigned at the branch level in PAVER | UFC 3-270-08 |

***Table 12 Pavement Management Segmentation Rules***

The following examples illustrate segmentation rules for airfield, road, and parking pavements.

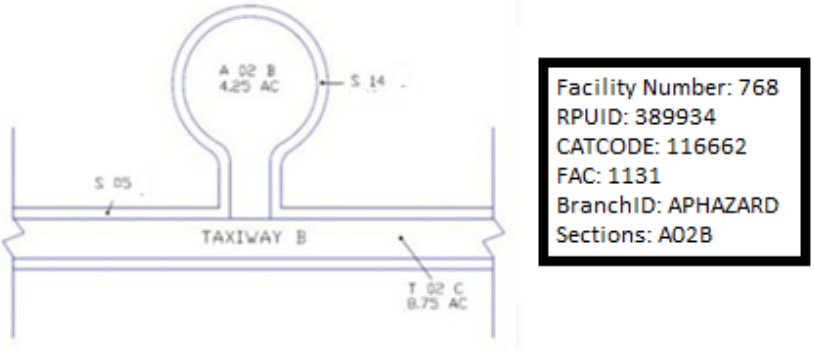
***Army and Air Force Compass Calibration Pad***




***Calibration Pad Segmentation***

In the figure above, the compass calibration pad facility is made up of one branch, Other Apron, APCompass. The branch is made up of three sections; the access taxiway to the compass calibration pad services no other aprons or pads and consists of two sections. One is constructed of asphalt and the other of concrete. The pad itself is a separate section constructed of concrete. All three sections are assigned the RPUID and facility number for the compass calibration pad at this base. They are also assigned the FAC 1161 (Compass Calibration Pad, Surfaced) and the CATCODE 116667 (Calibration pad). The shoulder section for both the access taxiway and the pad are part of a separate facility and they are assigned to the FAC 1165 (Aircraft Pavement, Shoulder) and CATCODE 116642 (Paved Shoulder). The shoulder associated with Taxiway C has the same category code and FAC as the apron shoulder, but it should be broken out as a separate facility with its own RPUID and facility number. In some instances, bases may combine all shoulder pavements into one facility, but ideally, they should be separated into separate facilities based on branch use; one for apron shoulders, one for taxiway shoulders, and one for runway shoulders.

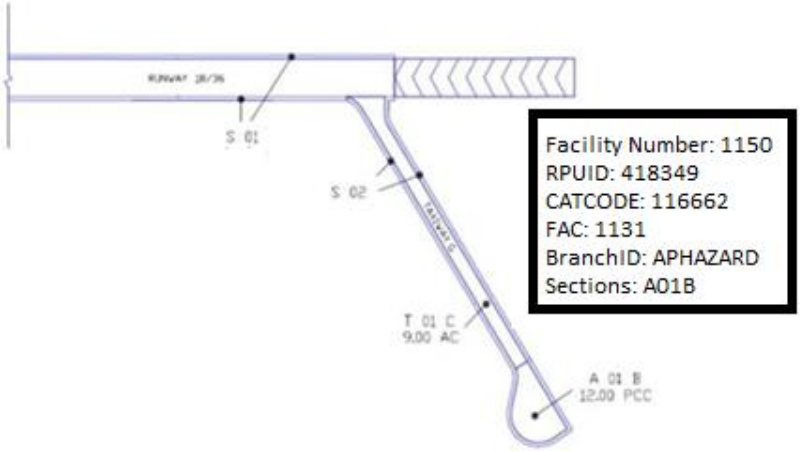
***Hazardous Cargo Pad***




***Hazardous Cargo Pad Segmentation***

In the figure above, the Hazardous Cargo Pad facility is made up on one branch, APHAZARD. The branch is made up of one section. Since the construction is the same for both the access taxiway to the Hazardous Cargo pad and the pad itself, and it serves no other pads or aprons, they are considered one section. The section is assigned the RPUID and facility number for the Hazardous Cargo Pad at this base. It is also assigned the FAC 1131 (Surfaced Aircraft Apron) and the CATCODE 116662 (Dangerous Cargo Pad, Load/Unload). Note the terms 'Dangerous' and 'Hazardous Cargo' are used interchangeably in the pavement Unified Facility Criteria (UFC). The shoulder section is handled the same way as described in the Calibration Pad example.

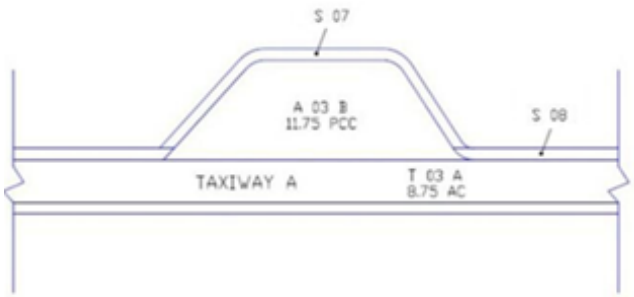
***Hazardous Cargo Pad***




***Hazardous Cargo Pad Segmentation***

In the figure above, the Hazardous Cargo Pad facility is made up of one branch, APHAZARD. The branch is made up of one section, A01B. The section is assigned the RPUID and facility number for the Hazardous Cargo Pad at this base. It is also assigned the FAC 1131 (Surfaced Aircraft Apron) and the CATCODE 116662 (Dangerous Cargo Pad, Load/Unload). The taxiway to this hazardous cargo pad was given the alpha designation G, so in this instance, T01C should be assigned to the taxiway facility. The shoulder around A01B should be assigned to the apron shoulder facility; the shoulder associated with T01C should be assigned to the taxiway shoulder facility; and the runway shoulder should be assigned to the runway shoulder facility. As noted previously, some bases may have all shoulders assigned to one facility, in which case, all shoulders should be assigned to that facility. Separate shoulder facility assignments are preferred.

***Warm-Up Aprons and Arm / Disarm Pads***

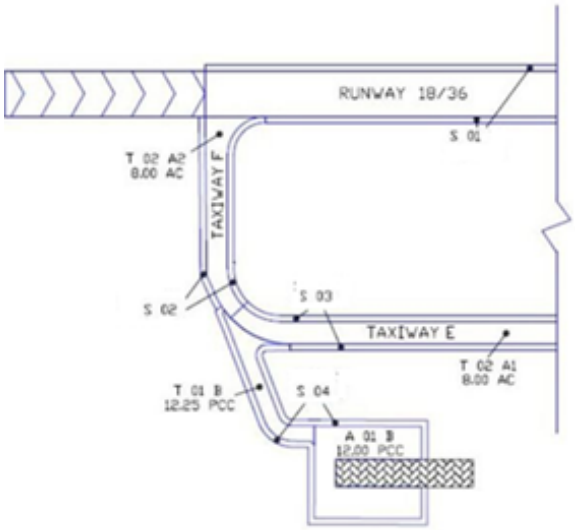



Facility Number: 90391
RPUID: 389968
CATCODE: 116666 or 116661
BranchID: APNORTH
Sections: A03B

***Warm-up Apron Arm / Disarm Pad Segmentation***

FAC 1131 also includes Warm-Up Aprons (CATCODE 116666) and Arm/Disarm Pads (CATCODE 116661). In some cases, there may be multiple Warm-up Aprons or Arm/Disarm Pads at opposite ends of the runway. In these instances, both pads (with a given category code) may be included in the same facility. If so, each will be considered a separate branch (e.g., APNORTHWARM and APSOUTHWARM). Each of these branches may have one or more sections depending on construction characteristics. The shoulders are handled in the same way as the previous example.

***Alert Apron and Taxiways***




Facility Number: 11115
RPUID: 467293
CATCODE: 113321
BranchID: PAALERT
Sections: A01B, T01B

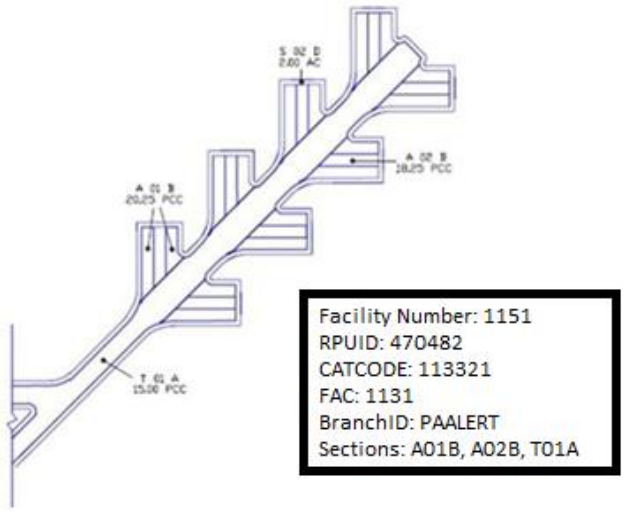
Facility Number: 10409
RPUID: 414916
CATCODE: 112211
FAC: 1121
BranchID: TWE and TWF
Sections: T02A1, T02A1

***Alert Apron and Taxiway Segmentation***

- ***Alert Apron:*** The figure above shows an alert apron with an access taxiway. The access taxiway does not have an alpha designation, so it is considered part of the alert apron facility. The facility has one branch Apron, PAALERT, which is made up of two sections: the access taxiway T01B, which is constructed of 12.25-inch concrete pavement, and the main alert apron A01B, constructed of 12.00-inch concrete pavement. Both sections are assigned FAC 1131 and CATCODE 113321. If there are any shoulders present on either the access taxiway or the alert apron itself, they will be handled the same as described in the compass calibration pad example
- ***Taxiways:*** Ideally each named taxiway will have its own facility number. In practice, however, taxiways are sometimes included in one facility, or multiple taxiways are included in one facility. In this graphic, even though the construction is similar for both T02A1 and T02A2, they are divided into two separate segments: one assigned to Taxiway E and one to Taxiway F. Taxiway E and F should both be separate branches, but both of these branches are assigned to Facility Number 10409. Named taxiways assigned to multiple facility numbers (e.g., parallel taxiway) should be broken into two parts. The team should

work with the base RPO to see if these facilities can be combined. If not, the team should create sections that align with the facility boundaries.

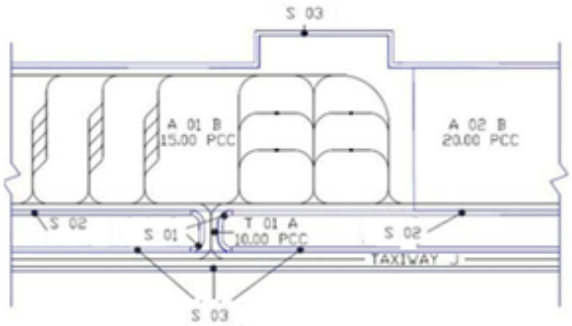
***Alert Area***




***Alert Area Segmentation***

The alert pads and the access taxiway, which does not have an alpha designation and only services the alert pads, are treated as one branch PAALERT. The branch has three sections (A01B, A02B, and T01A) that are structurally different. They are assigned the FAC 1131 and CATCODE 113321. Ideally the alert apron would have its own facility number but, in practice, it may be included in a facility with other aprons. In the latter case, each of these aprons will be assigned a different branch designation. Shoulders should be handled as described previously.

***Parking Apron***

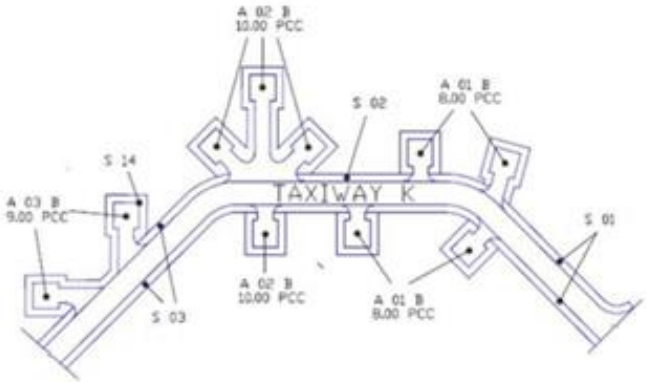



Facility Number: 3118
RPUID: 458490
CATCODE: 113321
FAC: 1131
BranchID: PAMAIN, PATRANSIENT
Sections: A01B, A02B, T01A

***Parking Apron Segmentation***

The figure above shows a main parking apron facility. The facility has two branches, the main parking apron (PAMAIN) (A01B and T01A) and the transient parking apron (PATRANSIENT) (A02B). Note that the taxilanes on the main apron are not broken out as separate sections; they are considered part of the apron. Shoulders are handled as described previously.

***Dispersed Parking Aprons (Pads or Hardstands)***

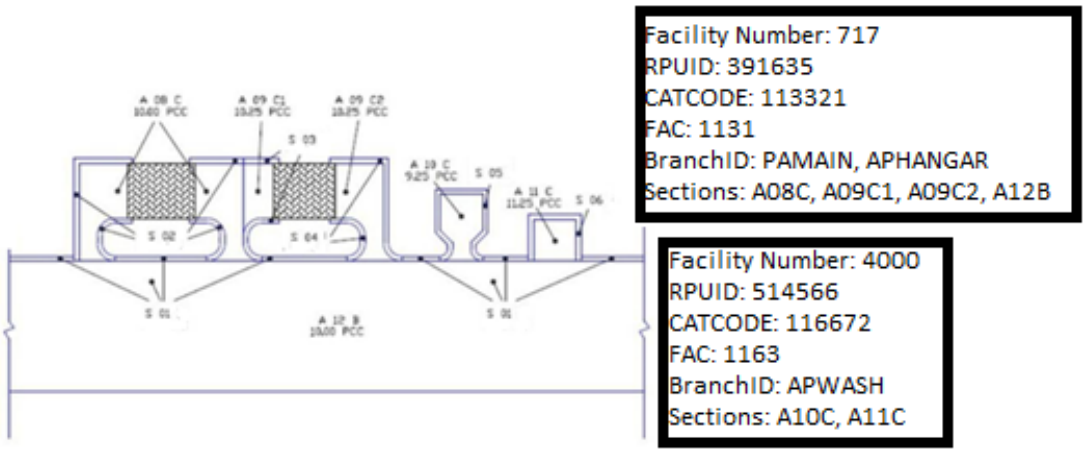



Facility Number: 15001
RPUID: 412571
CATCODE: 113321
FAC: 1131
BranchID: PATWK
Sections: A01B, A02B, A03B

***Dispersed Parking Apron Segmentation***

In the figure above, all the dispersed aprons on Taxiway K are in one facility (15001). They are all assigned to a single branch (PATWK). The branch consists of three sections A01B, A02B, and A03B. Taxiway K is a separate facility with its own branch and sections. The shoulders for Taxiway K, S01, S02, and S03 are all part of the taxiway shoulder facility and the Taxiway K shoulder branch. The shoulders for the dispersed parking aprons are all part of the apron shoulder facility. In this example, they are all included in one section S14, which is part of the Taxiway K shoulder branch. Dispersed parking pads or aprons can become complex. If the team encounters a base where each pad has been given a facility number, they will need to assign a section number to each pad. If the pads are structurally similar, as shown in the figure above, they would shred out the sections (e.g., A01B1, A01B2). Each of the separate facilities should also have its own branch.

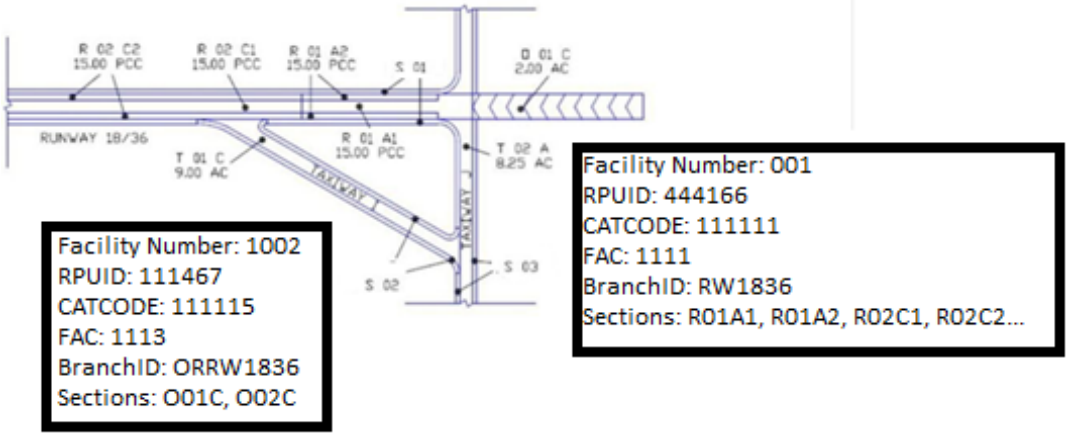
***Hangar Access Aprons and Washracks***




***Hangar Access Apron and Washrack Segmentation***

- ***Hangar Access Aprons***: Hangar Access Aprons are typically tow-only areas that include the apron surface and the access taxiway. Ideally, all hangar access aprons should be included in a separate facility, but in the figure above, the hangar access aprons are part of a facility that includes the main apron. The main apron should have a branch designation, PAMAIN, and the hangar access aprons should have a branch designation, APHANGAR. The main apron has an “AP” prefix, because it is for parking aircraft. The hangar access apron is given an “AP” designation, because its main purpose is not parking aircraft but rather to provide a surface for maneuvering aircraft into/out of the hangar. The Hangar Access Apron Branch has three sections: A08C, A09C1, and A09C2. Note A09C1 and A09C2 are structurally similar but are shredded out because there is a significant (>15-point) difference in the pavement condition index (PCI) (Note: the base may have given the Hangar Access Aprons a separate facility number. In that case, the facility would have only one branch in this example).
- ***Washracks***: Washracks are handled the same way as compass calibration pads or hazardous cargo pads. In the figure above, both washracks are included in one facility (4000) with FAC 1163 and CATCODE 116672. Both washracks should also be assigned to one branch (APWASH). The branch should have two sections, A10C and A11C. In the event the base has given each washrack a separate facility number, the team should create a separate branch for each washrack, and each branch should be assigned a single section number. Shoulders should be handled as described previously.

***Runways and Overruns***



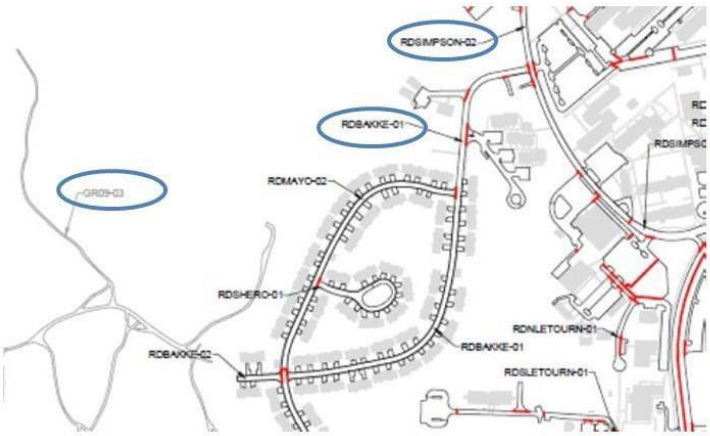

***Runway and Overrun Segmentation***

- ***Runways***: Typically, each runway on a base has a facility number. This facility (001) consists of the load

bearing pavement, FAC 1111, CATCODE 111111. The load-bearing surface of the runway also has one branch (RW1836). This branch typically has multiple sections. In the example provided, R01A1 and R01A2 are structurally the same. R01A2 is created because it may not receive the same level of traffic as the keel section, will likely have a different deterioration rate, and may not be considered as critical as the keel section. R02C is treated in a similar manner. Note: not all sections for this runway are shown. The keel section is typically considered the center 75 feet, although, this may be adjusted to align with joint spacing or if the keel section is structurally different that the outer portions of the runway. Ideally, runway shoulders are assigned to a runway shoulder facility. That facility should have one branch for runway shoulders. In the event all shoulders are combined into one facility at a base, shoulders should still be broken out as separate branches

- ***Overruns***: Typically, the overruns for each runway on a base should be assigned a facility number (1002 in this example). All overruns for the runway should be included in one branch (OR1836). The branch should be divided into at least two sections (one for the overrun at each end of the runway O01C and O02C). Overruns do not typically have shoulders, but if the team encounters this situation, they should include these shoulders in the runway shoulder facility

***Roads***



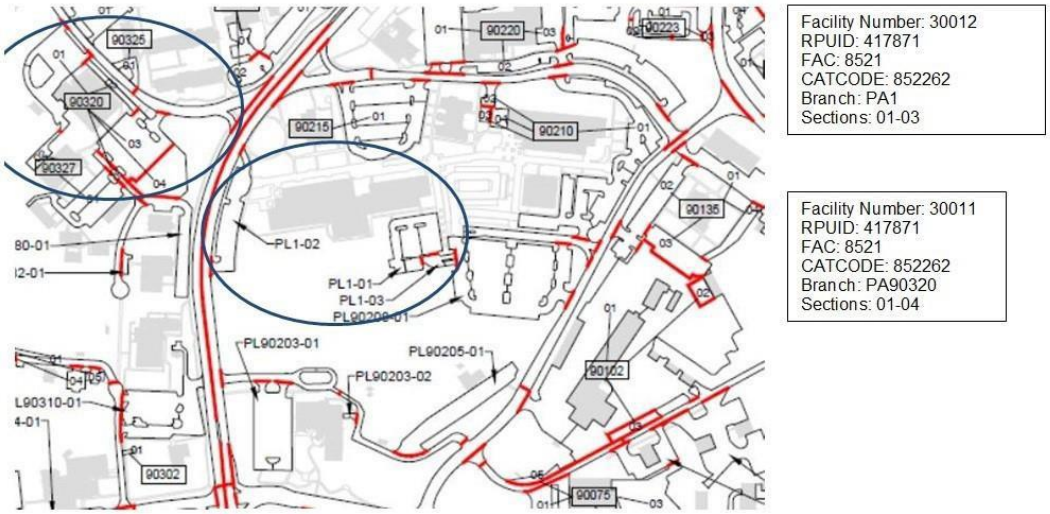

Facility Number: 3100
RPUID: 417909
FAC: 8511
CATCODE: 851147
Branch: RDSimpson….multiple
Sections: multiple

Facility Number: 3010
RPUID: 1036518
FAC: 8512
CATCODE: 851201
Branch: UR09
Sections: multiple

***Road Segmentation***

- RDSIMPSON-02: This section is part of the Simpson Road Branch (RDSIMPSON). The branch can have from one to “x” number of sections depending on its length and physical characteristics. As mentioned previously, each named road on a base should be assigned a branch name, which in turn is assigned to a facility. In this case, Simpson Road is just one of the branches that are in facility 3100. The team may find that the base has one facility for all paved roads or multiple facilities
- RDBAKKE-01: This section transitions from the cantonment area into the housing area. Housing areas may be created as separate networks (and as separate facilities), especially if they are privatized. If this housing area were in a separate network/facility, the section would need to be divided at the point where the transition from cantonment to privatized housing takes place. The respective sections should be placed in the appropriate facility
- GR09-03: This section is an unsurfaced road that is part of the unsurfaced road network. Note the branch name will need to be changed from GR09 to UR09 to reflect the current naming standard. Unsurfaced roads are handled the same as paved roads. Each named road is typically a branch. These branches are assigned to the facility(ies) for unpaved roads. In many instances, unsurfaced roads are not named. In these cases, the team lists them as Unnamed Road 01 to Unnamed Road XX or, as in this case, gives the road a number 09. As with paved roads, the branch can have one to many sections depending on its length and physical characteristics.

### *Parking Areas*

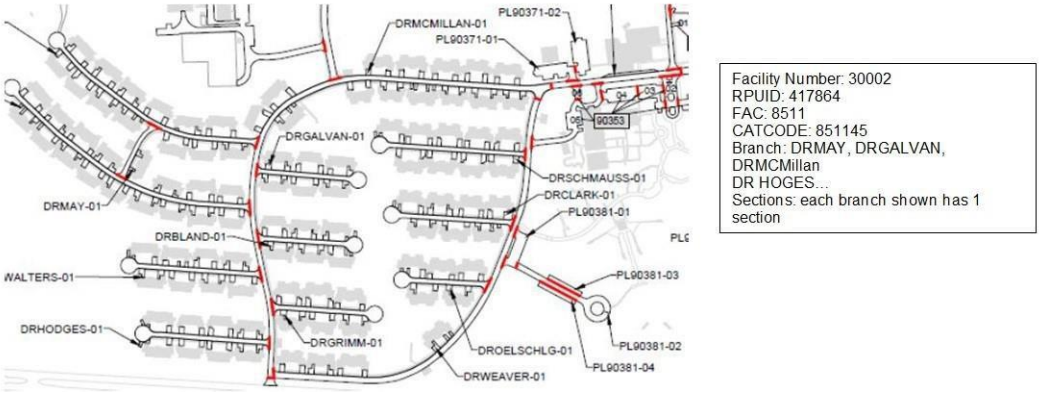



***Parking Area Segmentation***

***PA1 (formerly PL1):*** PA1 has three sections. Even though these sections are not contiguous, they all service the same building and are part of the same facility (30011). Note that unpaved islands have been identified and excluded from the area included in the section.

***PL90320:*** The branch name should be changed from PL90320 to PA90320 to reflect current standards. PA90320 has four sections. Sections 03 and 04 divide the contiguous area based on physical characteristics. Note that the access drives from the road to the parking are included as part of the parking area. In some instances, these access drives may be divided into separate sections if they have different physical characteristics.

### *Driveways*




***Driveway Segmentation***

The figure above shows the driveways in a privatized housing area. All the driveways on a given road are included in a branch with the DR prefix for driveway and the name of the road. For example, DRWalters includes all of the driveways on Walters Street. Multiple driveways may be included in a section to get a sufficient sampling size or to simplify the segmentation. For example, all the driveways on the north side of Walters Street may be section 1 and all of those on the south side will be included in section 2.

Unpaved roads typically have a prepared surface whether it is compacted gravel or simply a graded soil surface. In some instances, trails are shown on maps. The team should work with the RPO to determine the proper categorization or to determine if it should be included in the unpaved road network. The image of the unpaved trail below is an example that would not be considered a facility.

***Unpaved Trail***

- ***Templates***
  - N/A
- ***Policies and Regulations***
  - AFMAN 32-1041, *Airfield Pavement Evaluation Program*
  - AFI 32-9005, *Real Property Accountability and Reporting*
  - OSD RPIM Version 5.0
  - UFC 1-300-08, *Criteria for Transfer and Acceptance of Real Property*
  - UFC 3-260-01, *Airfield and Heliport Planning and Design*
  - UFC 3-260-03, *Airfield Pavement Evaluation*
  - UFC 2-260-16*, O&M Manual: Standard Practice For Airfield Pavement Condition Survey*
  - UFC 3-270-08, *Pavement Management*
  - TSPWG 3-270-08. *Preventive Maintenance Plan For Airfield Pavements*
- ***Forms***
  - N/A
- ***Documents***
  - Air Force Category Codes
- ***File Directories / Systems***
  - N/A
- ***Websites***

  - Air Force Publications Website
  - Whole Building Design Guide
- ***Related Playbooks***
  - N/A

## *Advice and Tips*

- Facility numbers should follow a pattern at each base, but there is no standard numbering scheme for assigning facility numbers across the Air Force. The RPUID provides the unique number that identifies each facility
- Unpaved roads typically have a prepared surface, whether it is compacted gravel or simply a graded soil surface. In some instances, trails are shown on maps. The team should work with the RPO to determine the proper categorization or to whether it should be included in the unpaved road network

# ESMS – TNAP Guidance: RAIL

Overview

Roles and Responsibilities

Training

Implementation Support

TNAP Rail System Resources

Inventory/Assess

Analyze/Forecast

## Overview

### Process Overview

Railroad System Assessments: In FY16, AFCEC/CO embarked on a multi-year effort to baseline Air Force railroad asset inventories and their associated condition to determine the enterprise way-forward for maintaining/sustaining this asset. Starting FY16, USACE/ERDC was provided funding to inspect 100 miles of railroad at 10 installations. Since then, AFCEC/CO continued supporting this effort and as a result, additional 92 miles in FY17, 73 miles in FY18 and completed the remaining 90 miles in FY19.

All data from these inspections of Air Force owned rail assets are currently available in the ESMS RAIL database hosted on CERL servers and read-only rights can be obtained by request. Currently ESMS RAIL does not provide the base POCs an update capability within the database. AFCEC will continue centrally manage and fund the 5-year requirement for Ultrasonic inspection testing of active railroad. These inspections will provide the bases condition and operation restrictions of their railroad system, and can also provide justification for potential projects to repair rail lines not within current operating standards. AFCEC will review and update current rail inspection guidance to incorporate any modifications, particularly those regarding determination of probability of failure and consequence of failure.

This railroad inspection program follows the guidance and recommendations specified in UFC 4-860-03, “Railroad Track Maintenance and Safety Standards,” 13 February 2008. ESMS RAIL is a knowledge- based track management program that gives planners decision support in the sustainment, restoration, and modernization (SRM) of their track network. It combines condition assessment, work plan generation, and spatial analysis through a companion Geographical Information System (GIS) program to help provide support and informed decisions to managers.

### Process Overview Map

- Complete/Update Rail Facility Maps - Define Network Inventory
- Update Facilities Segmentation (Update Segments and Nodes [Stationing])
- Perform Track Structure Condition Index (TSCI) Survey
- Identity Base-Level Requirements and Parametric Costs
- Rack and Stack Requirements using TNAP Business Rules
- Bundle Requirements into Projects and do Detailed Estimates
- Prioritize Projects at Base Using TNAP Business Rules
- Validate and Prioritize Projects at MAJCOM/AFCEC Using TNAP Business Rules
- Combine Projects on Integrated Priority List (IPL)
- Prioritize IPL
- Repeat Process

### Management Overview

AFCEC Operations Directorate (AFCEC/CO) is the focal point representing the Air Force on the Tri-service RAILER Working Group and is the lead for the implementation and incorporation of RAILER into Air Force enterprise asset management activities. The RAILER Tri-Service Working Group in turn provides information and input to the DoD Installation Support Panel. The Air Force Member of the RAILER Tri-Service Working Group is also a member of the Air Force Sustainment Management Systems (SMS) Implementation Working Group (SMSIWG). The Chair of the SMSIWG is the official Air Force Representative to the DoD Installation Support Panel for all SMSs.

***Installation Points of Contact***

Each installation with railroad assets should provide a primary and alternate point of contact (POC) to AFCEC for all issues related to Railroad data and tools. AFCEC recommends that these POC's be the TNAP AMP and/or Sub-AMP Manager. All ESMS RAIL account requests must be submitted to AFCEC Rail Program Manager to validate before forwarding it to CERL for account set up/activation.

***MAJCOM DET Points of Contact***

Each MAJCOM DET should provide a primary and alternate POC to AFCEC and to each of their installations for all issues related to RAIL/TNAP data and tools.

***AFCEC POCs***

The following are also the Account Verifiers for the ESMS RAIL account request:

- Ms. Jane Davis, Railroad Program Manager
  jane.davis.3@us.af.mil
  DSN 523-6200
- Mr. John Sprouse, Railroad Program Manager backup
  john.sprouse.2@us.af.mil
  DSN 523-6794
- Mr. Pat Kelly, Transportation Sub-AMP Manager
  patrick.kelly.26@us.af.mil
  DSN 523-6304

## *Roles and Responsibilities*

***Rail System (Includes Railroad Bridges) Base Responsibilities:***

- Create a rail facility map for the rail system
- Update real property records using the DD Form 1354 to reflect what was in the RCI survey Real Property Report
- Develop preventive maintenance plans and generate projects to address requirements in the RCI report
- Ensure required inspections are completed IAW guidance; support centralized inspection efforts
- Provide construction history to AFCEC program manager for projects completed between centrally managed railroad evaluations

***AFCEC Responsibilities:***

- Centrally manage railroad inspection program; validate inspection data and installation projects to ensure rail assets are maintained throughout the life cycle
- Review railroad inspection data and maps and coordinate adjustments with base

## *Training*

The following outlines RAIL training:

- ***Railroad Track Maintenance and Inspection Course:*** The training is offered annually and AFCEC will fund tuition/course material but the unit of attendees will fund travel and TDY costs. Data call

requesting names for attendance will be sent out to the BCEs once dates and location are determined.

- ***Military Railroad Electronic Safety Tracking (MREST) Training***: It's a tablet application where the base inspectors can use and record assessment data, which will be eventually fed to the ESMS RAIL. MREST data will be handled the same as the ERDC inspection data with a post process through RAILER desktop and then through a manual upload through CERL team. The GIS portal for rails is under development and when the GIS portal is in production mode, MREST data will be pushed to the GIS portal where post processing tools will check for errors. The goal is to setup a link between the GIS portal and ESMS to automatically publish data into ESMS. This training is a part of centrally funded and managed program. Contact AFCEC Railroad Program Manager for details.
- ***ESMS Rail User Guide:*** Located in AFCEC SharePoint RAILER SMS Workspaces

Computer-based AFCEC/USACE Training is currently under consideration for development.

## Implementation Support

Several websites assist with implementation:

| RESOURCE | LOCATION |
|---|---|
| *AFCEC Reach Back Center* | https://usaf.dps.mil/teams/CEDASH/Scripts/RBC/Reachback%20Center.aspx<br>DSN: 523-6995<br>COMM: 1-850-283-6995; Toll Free: 1-888-232-3721<br>Email: afcec.rbc@us.af.mil |
| *RAIL SMS Workspace* | https://usaf.dps.mil/teams/10758/RAILERSMS/SitePages/Home.aspx |

## TNAP Rail System Resources

| RESOURCE | LOCATION |
|---|---|
| *Unified Facility Criteria* | https://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc<br>• UFC 4-860-01FA Railroad Design and Rehabilitation<br>• UFC 4-860-03 Railroad Track Maintenance and Safety Standards |

## Inventory/Assess

### Rail System Data Collection and Inspection Approach

As a result of completing baseline inventory and inspections of AF owned railroad system in 2019, all track have been segmented and entered into the Enterprise SMS RAIL system.

For all active track, railroad inspections to include ultrasonic testing will be accomplished on a 5-year cycle under AFCEC funded and managed program. Between 5-year evaluation cycles, the bases are expected to perform safety inspections at an interval specified in UFC 4-860-03 depending on traffic frequency. For inactive track, the bases will be responsible to perform minimum inspections/maintenance IAW UFC 4-860-03.

## Analyze/Forecast

### Rail System Data Analysis and Forecasting Approach

Asset management requires knowing the comprehensive condition and criticality of the asset. Rail Condition Index (RCI) surveys and rail bridge evaluations only provide elements of the total requirements. A comprehensive assessment by a working group is needed to pull together all of the requirements and formulate cost-effective solutions for Preventive Maintenance (PM), minor and major M&R, and reconstruction.

***Assessment Purpose:*** A track structure assessment is required to develop a rail system Preventive Maintenance Plan (PMP) as well as minor and major M&R requirements.

***Team Composition:*** The assessment team should consist of experienced personnel from civil engineering.

At a minimum, the civil engineering team should include the assigned TNAP AMP manager, Sub-AMP manager(s), a programmer, and shop personnel.

***Procedure:*** The assessment process is a three-part procedure that involves gathering requirements from the various tools, visually assessing the track structure to validate known requirements, identifying new requirements, and developing project scopes and costs for rail system. The requirements and projects applicable to PM will be included in the PMP.

***Rail System Management Process***

- Develop and organize the rail system inventory
- Assess the current condition of rail system/track structure
- Keep track of M&R history
- Develop models to predict conditions (to be developed)
- Report on condition performance (to be developed)
- Develop scenarios for M&R based on budget (Work Planning)
- Plan projects

***Data Collection and Analysis Processes***

ESMS - RAIL helps the base POCs responsible for rail assets answer the following questions:

- What rail assets exist?
- What defects and deficiencies exist, and how much do these cost to fix?
- What restrictions are imposed due to defects, and what is the effect on rail operations and readiness?
- What is the physical health and condition of the track?
- What are the best short and long-term maintenance strategies under limited budgets?

ESMS - RAIL links each recorded defect to operations restrictions and maintenance levels based on governing standards, RCI metrics relating physical quality and condition, and local work actions to correct the defect.

Base POCs and data managers can use this information to make informed decisions in the development of efficient short and long-range work plans. Using the RCI and the track standards and customized set of business rules and prioritization schemes, managers can use RAIL to narrow down a long list of deficiencies to a filtered list of the most important work based on the condition and operations for the track.

# SMS – Utilities Guidance

Introduction to Utilities

General Process Description

Roles and Responsibilities

Desired Outcomes

## Introduction to Utilities

This Utilities Guidance expounds on the standard process information in the SMS Playbook particular to utilities. This guidance provides instruction to continue efforts to meet the intent of the SMS OSD mandates. This section describes how linear segmentation (LS) requirements support the condition assessment process and includes specific information on leveraging installation GeoBase GIS data to use the future Enterprise SMS Utilities Domain and Enterprise SMS Utilities Fuels Domain currently in development by the United States Army Corps of Engineer, Engineering Research Development Center, Construction Engineering Research Laboratory to support DoD and Air Force asset management efforts.

Each utility system (electric, gas, water, wastewater, storm water, thermal systems (steam and chill water) and fuels) contains assets with an independent physical, functional and geospatial identity. Effective management of these important utility systems requires a framework to inventory, assess, and accurately locate to achieve sustainable utilities infrastructure. This section of the Utilities Guidance outlines the processes for the LS of utilities and serves as the standard operating procedures (SOP) for the 2012 OSD directive to segment linear assets.

## General Process Description

### Data Migration Background

Installation GeoBase GIS data needs to be migrated to the most current Spatial Data Standard for Facilities, Infrastructure and Environment (SDSFIE) version, which is currently SDSFIE 4.0.3.1 ESRI tools are available at the following links:

ESRI conversion tools, crosswalk software, and implementation videos on the CE

Portal:
https://cs1.eis.af.mil/sites/ceportal/ProgramGroups/Resources/GeoBase%20Documents/Forms/Data.aspx
Additional videos can also be found at: https://www.milsuite.mil/book/groups/wgio-afcec-gio-training.

### Linear Segmentation and Condition Assessments

***SMS Implementation and Audit Readiness Timelines***: The USD (ATL) September 10, 2013 policy memo states,

"…ensure that a facility condition index for each asset ….is properly recorded …. with inspections using the SMS standard process completed for all facilities and facility components within 5 years of the date of this policy document."

The intent of the "5-year" guidance was to establish a review/validation cycle that matches the real property review cycle required by DoDI 4165.14, as paragraph 5 of the Implementation Guidance points out. Paragraph 1 of the Implementation Guidance states,

"All real property assets shall have a validated Facility Condition Index (FCI) by September 2017."

The 2017 date corresponds to the audit readiness target date of the Financial Improvement & Audit Readiness (FIAR) Act. As asset condition is an auditable data element (see http://comptroller.defense.gov/fiar (page C-28, Line 17)), it's suggested that Components strategize to meet audit readiness by focusing inspections on buildings first, leaving structures and lineal structures toward the end so at minimum building assets meet the FIAR schedule.

The Operation Program Group (OPG) approved the AFCEC implementation approach to execute LS with in- house staff and contract augmentation support as the best option. The CE Board was briefed 10 June

2015 for the required resources needed to support LS for Active AF installations.

The AF implementation process involved AFCEC/COAU government civilians as Utilities Sub-AMP Managers (SAMs) to facilitate base visits by a centrally managed GIS LS contractor. This support was concluded after the four-year contract ended in September 2019. Asset conditions were be determined through a knowledge-based data collection approach through interviews with base civil engineer personnel. Direct condition ratings were used to assess AF owned and operated utility assets at 96 installations. This course of action best supports Asset Management implementation and Real Property Inventory validation to meet the intent of the LS policy.

The initial phase of linear segmentation considers the standardization for identifying linear segments and ensuring the real property (RP) records reflect the inventory at the segmented level. This will require coordination with the Real Property Accountable Officer (RPAO), GeoBase, and CE Operations. AFCEC/COAU is the AF Lead office for Linear Segmentation of Utilities Systems.

***Data Maintenance***

This step-by-step process provides simplified guidance for fulfilling the minimum GeoBase data field entry requirements. Failure to follow instructions provided within this guidance may prevent requirements from receiving prioritization and/or funding consideration within the Comprehensive Asset Management Plan (CAMP) development and Integrated Priority List (IPL) execution. Utilities requirements not assessed as part of the AMP will not be considered during the IPL process.

***Step 1: Focus on Inventory and Assessment of Worst and Most Important Requirements First***

SAMs and Sub-AMP working groups should continue to strive to collectively identify the installation's worst and most important utilities requirements. It is recommended that SAMs focus priorities on Critical Infrastructure Tier 1 assets that have a preponderance of repairs and outages, leaks, service calls, or failures, as defined in the *Categories and Definitions Critical Infrastructure Mission Dependency Index (MDI)* workbook. All italicized references in this document can be found in the Wastewater/Storm Water Toolbox located on the right side of this CE Portal Playbook page.

The *Operations Engineering Playbook* provides instructions for pulling various Automated Civil Engineering System (ACES) and NexGen IT reports that may facilitate focus in the outlined areas.

***Step 2: Establish Installation Geospatial Information System (IGIS) Asset Record and Minimum Data***

The Air Force will use GeoBase to establish inventory and condition data for linear utilities assets. The installation's GIS data will be the authoritative data source for use by the SMS. Verify that the all-utility assets are segmented according to the standards set forth in the *Linear Segmentation Playbook* (link found in the Toolbox on the right side of this CE Portal page). If the installation has the results from a recent utility survey, CE personnel should migrate that data into GeoBase for use in the AMP process. Update the geodatabase to account for the increase in the numbers of utility segments and to comply with the upcoming *SDSFIE 4.0.3.1 Standards*. At a minimum, perform surveys and/or assessments to collect the AMP-identified attributes, referred to in the *Utilities Condition Index AMP Scoring Worksheets*, on the identified priorities.

***Step 3: Sustain and Maintain Data***

The Air Force will use GeoBase GIS data to establish inventory and condition data for linear utilities assets. Verify that the utility requirement(s) selected are segmented according to the standards set forth in the Linear Infrastructure Playbook. If Sub-AMP Managers are in possession of the installation's most recent utility survey results, that data should be migrated into GeoBase for use in the AMP process. Update the geodatabase to account for the increase in the numbers of utility segments and to comply with the upcoming SDSFIE 4.0.3.1 Standards. At a minimum, perform surveys and/or assessments to collect the AMP-identified attributes, referred in the Utilities Condition Index AMP Scoring Worksheets, on identified priorities.

***Step 4: Utilize Data to Analyze and Fine-Tune Work Programs***

While GeoBase data enables the Air Force Civil Engineer Center (AFCEC) to develop long-range

infrastructure investment plans for AF enterprise use, collecting and maintaining additional attribute data is of great importance to base civil engineers and mission owners as well. This practice enables Work Order supply budgeting, benefits scheduling and planning strategies, improves business case analyses for capital investments, and/or facilitates the advocacy for project funding. Local condition assessment ratings and scoring algorithms can be adjusted to consider finer levels of detail for Preventive Maintenance or Priority Action programs. Procedures for generating AMP Utility Condition Indexes directly within GeoBase have been developed called the UCI Dashboard 2.0. This tool is available at this link: https://maps.af.mil/geoportal/home/group.html?id=c3650edebf5a46a0832e5a89ed05179c. For performing manual calculations of AMP Utility Condition Indexes, refer to the Utilities Condition Index AMP Scoring Worksheets.

## Roles and Responsibilities

| ROLES | RESPONSIBILITIES |
|---|---|
| ***AMP Manager*** | • Anticipate and manage water supply, wastewater/storm, thermal/mechanical (Steam and Chill Water and natural gas), electrical, and liquid fuels services. This includes the management of supporting infrastructure networks and coordination with sub-AMPs to meet regulatory requirements, such as Environmental Quality (EQ) and public health permitting<br>• Retains final authority in accepting segmentation assignments |
| ***Utilities Sub-AMP Manager (SAM)*** | • Provide day-to-day operational support and guidance at the base as it relates to specific AF utility systems and governance documents<br>• Responsible for all installation facilities and systems that are for the sole purpose of providing transmission, monitoring, and maintenance support of base utility systems. Specific responsibilities include review/validation of installation comprehensive planning support, system design and modeling, development of projects for utility systems, and validating scope and project requirements. |
| ***Real Property Accountable Officer (RPAO)*** | • Determines AF-owned assets and distinguishes between linear and non-linear assets<br>• Has final authority regarding any changes to the facilities/facility map resulting from this process |
| ***GeoBase Office*** | • Identifies geographical/functional area of the linear utilities assets as well as the segment assignments<br>• Creates a geometric network of segment groupings using technology capabilities in ArcGIS.<br>• Supports in-house field evaluations and sustainment of the accuracy of base utility maps<br>• Incorporates necessary changes to the facility map following linear utilities assets evaluations |
| ***Civil Engineer (CE) Operations*** | • Provides input identifying attributes such as ownership, geographical/functional area, and grouping of the linear utilities' assets based on maintenance records, and any other knowledge<br>• Supports in-house field evaluations<br>• Comprises of the Utilities AMP Manager, Operations Engineering, and the Shop, wherein the Utilities AMP Manager retains final authority in accepting segmentation assignments and Operations Engineering proposals for design/project development and/or manages the design of new utilities<br>• Ensures design meets linear segmentation guidelines and provides as-builts of existing utilities (where available) and new facilities upon completion<br>• Receives assistance from GeoBase office areas and segment groupings based on the linear segmentation rules for utilities |
| ***Built Infrastructure Assessment Team (BIAT)*** | • Composed of an in-house team of experts or a team of contractors with the necessary expertise<br>• Collects data points on a facility's current use and compares this information to most recent documentation in order to identify discrepancies |

***Table 13 Utilities Roles and Responsibilities***

## Desired Outcomes

The overall outcome for inventory is to collect and log detailed asset inventories from the Real Property utility systems in GeoBase using SDSFIE 4.0.3.1 GIS mapping standards.

This guidance supports the desired outcome of collecting and logging detailed utility asset inventories and assessments on utility systems for each real property facility in GeoBase using SDSFIE 4.0.3.1. Utilities assets include all Air Force-owned electrical power production and transmission systems within the base boundary (normally up to the five-foot line of serviced structures) and service contract oversight for electrical distribution systems within base boundaries that have been privatized in accordance with 10 United States Code (USC) 2688.

The goal of the linear segmentation program is to use GeoBase maps to associate linear and non-linear segments of real property facilities to facilitate asset management of the infrastructure at the sub-AMP manager level and focus infrastructure assessment to all areas. The implementation of linear segmentation is an ongoing process across the enterprise. Linear Segmentation supports data accuracy recorded in the installation's real property records. Capital improvements must be recorded in the installation maps. Base engineers are responsible for keeping installation maps current.

Bases should ensure GeoBase, Sustainment Management Systems (SMS), and NexGen IT data are complete, accurate, and up to date.

# SMS – Utilities Management: Utilities Segmentation Rules

[Introduction](#)

[Sub-AMPs](#)

[Segmentation Hierarchy](#)

[Utilities Management Segmentation Rules](#)

[Linear Segmentation Rules](#)

[Utilities Segment Prefix Conventions](#)

## Introduction

This section outlines general business rules for the linear segmentation of utilities and provides visual examples of network component identification. Air Force Instruction (AFI) 32-1067, Water and Fuel Systems provides guidelines for managing water and wastewater systems at United States Air Force (AF) bases.

**Linear Infrastructure Overview**

Linear segmentation achieves more accurate RP data to support increased asset visibility, more auditable RP records, investment planning for operations and preventive maintenance efforts, and an understanding of the impacts on related facility systems in the environment. This guidance captures key rules for segmenting assets, as well as best practices for implementing segmentation on an AF installation.

This guidance will help implement Department of Defense (DoD) and AF policy to institute the linear segmentation approach for asset management, where each asset is divided into standardized nodes and segments. The concept of linear segmentation dates back to 2005 with the implementation of the Real Property Inventory Requirements (RPIR) initiative. The Office of the Secretary of Defense (OSD) established linear segmentation as a policy directive in 2008. This directive refers to the RPIR initiative and requires the DoD Components to identify linear structures (e.g., pavement, railroads, and distribution lines) into trackable and measurable modules in the appropriate RP asset management system.

The implementation of the linear segmentation policy is four-phased. This guidance supports the first phase, in which the installation employs a standardized approach in identifying linear segments and ensures the RP records are updated to reflect the inventory at the segmented level. This phase achieves compliance with the OSD requirement, updates records to reflect the most current state of pavement and utility systems, and validates the RP record. This phase is expected to start immediately and be completed over the next few years.

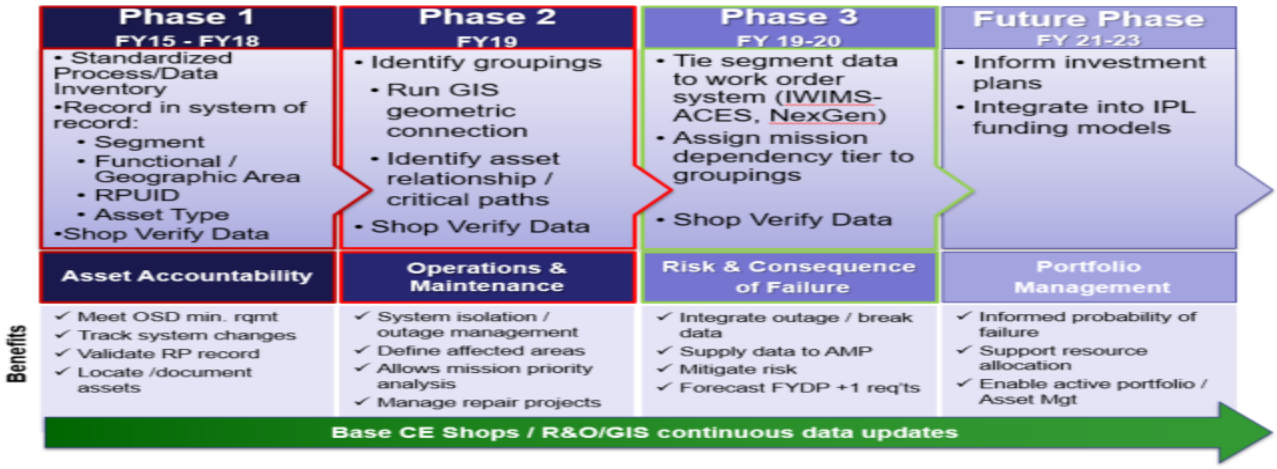



***Figure 8 Linear Segmentation Process***

## *Sub-AMPs*

### Electrical Systems and Generators

The Electrical Systems and Generators Sub-Activity Management Plan (Sub-AMP) encompasses all Air Force-owned electrical power production and transmission systems within the base boundary normally to the secondary taps of the transformer(s) supplying a facility and service contract oversight for electrical distribution systems within the base boundaries that have been privatized in accordance with 10 United States Code (USC) 2688. Electrical activities encompass overhead and underground distribution lines, transformers, substations and switching stations, generation plants, poles, lightning protection, grounding and bonding systems, and cathodic protection. This Sub-AMP is also responsible for the airfield lighting systems.

### Mechanical Distribution

The Mechanical Distribution Sub-Activity Management Plan (Sub-AMP) encompasses all Air Force-owned facilities that exist for the sole purpose of providing transmission monitoring and maintenance support to the distribution system, including natural gas, hot water and steam transmission systems, facility-specific heating and ventilation, and centralized Heating, Ventilation, and Air Conditioning (HVAC) plant systems. It also includes service contract oversight for Mechanical distribution systems within the base boundaries that have been privatize.

### Potable/Non-Potable Water

The Potable/Non-Potable Water Sub-Activity Management Plan (Sub-AMP) encompasses all Air Force-owned potable water, non-potable water, and Fire Emergency Services (FES) systems up to the five-foot line of serviced facilities, including wells, distribution lines, potable water treatment plants, pumps, valves, hydrants, storage, and service contract oversight for Potable distribution systems within the base boundaries that have been privatized.

### Wastewater/Storm Water

The Wastewater/Storm Water Sub-Activity Management Plan (Sub-AMP) encompasses all Air Force owned industrial and domestic wastewater systems up to the five-foot line of serviced facilities and service contract oversight for Wastewater distribution systems within the base boundaries that have been privatized. It also includes the edge of paved surfaces for storm water, including lift stations, collection lines, manholes, wastewater treatment plants, oil/water separators, other wastewater pre-treatment units, storm water pipes, swales, detention/retention areas, and outfalls.

## *Segmentation Hierarchy*

The utilities segmentation hierarchy represents a one-to-many relationship among linear segments moving down the hierarchy (Figure 9). A facility can consist of many branches, which can consist of many sections. Sections are the most specific segment type and are identified by a unique combination of physical and usage characteristics.

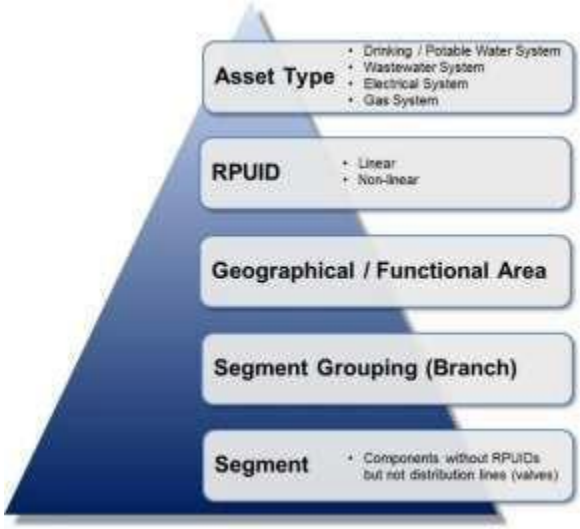



***Figure 9 Segmentation Hierarchy***

## *Utilities Management Segmentation Rules*

Asset type and Real Property Unique Identifiers (RPUIDs) are already established by real property (RP) records and should be the starting point for linear segmentation. The below business rules provide descriptions from the highest level (Asset Type) to lowest level (Segment).

**Required Attribution**

There are 12 key GIS attributes initially required for linear segmentation as prescribed by OSD. In addition to Asset Type and RPUID, required attributes included the following: Segment Identification Number, Functional Area, Operational Status, Total Length, Utility Network Type, Location Coordinates, Installed Year, Material Type, Size, Utility Network Type, and Condition Rating Value.

**Asset Type**

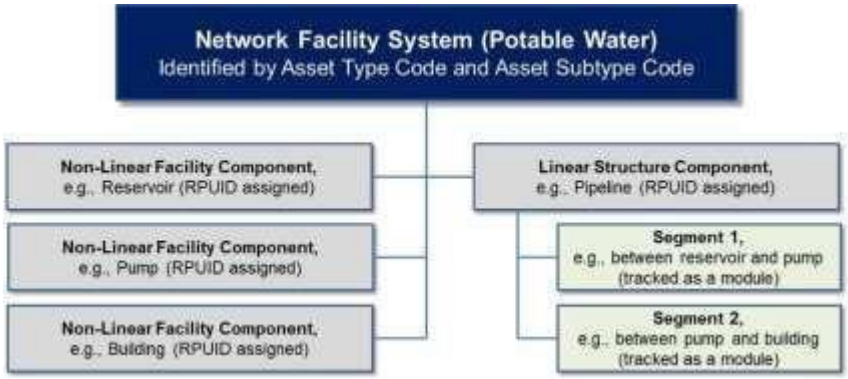



***Figure 10 Network Facility System***

The largest level or most encompassing level of segmentation is Asset Type. The above diagram shows an example of the complete hierarchy for linear segmentation based on the protocol described in previous sections.

**RPUIDs – Linear and Non-linear**

RPUIDs are the specific facility/asset identification number under the DoD Real Property systems. RPUIDs are assigned to a complete and separate facility, or assets with a CATCODE. RPUIDs can be non-linear facilities (vertical construction) or linear structures (water distribution lines, wastewater collection, electrical distribution lines, etc.).

For linear structures, one RPUID is assigned to one completely connected system. For example, if the distribution lines between the storage facilities are connected, there should be only five RPUIDs: four RPUIDs for the storage facilities and one RPUID for the entire distribution line (see Figure 11). However, if an installation has a water system with four separate and isolated distribution lines with a storage facility, there should be eight RPUIDs: four RPUIDs for the storage facilities and four RPUIDs for each separate and isolated distribution line (see Figure 12).

It is important to note that for linear assets, there can be multiple RPUIDs for each CATCODE. Bases will need to work with existing RP records for official RPUIDs listings. Each linear segment must contain the appropriate segment ID and that information must be available through GIS to link the linear structure segment information to the RPUID. This information will be important to the future ESMS UTILITIES DOMAIN as well.

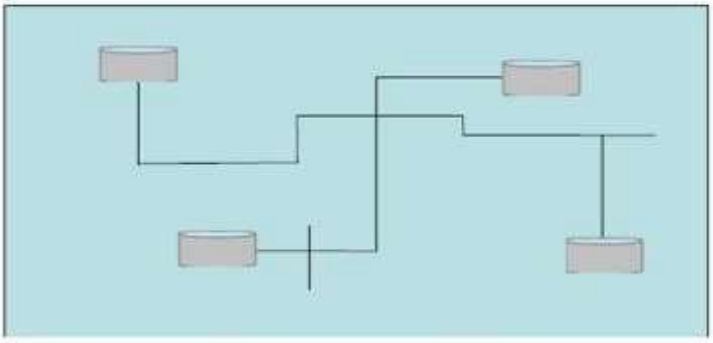


***Figure 11 One Connected Line***

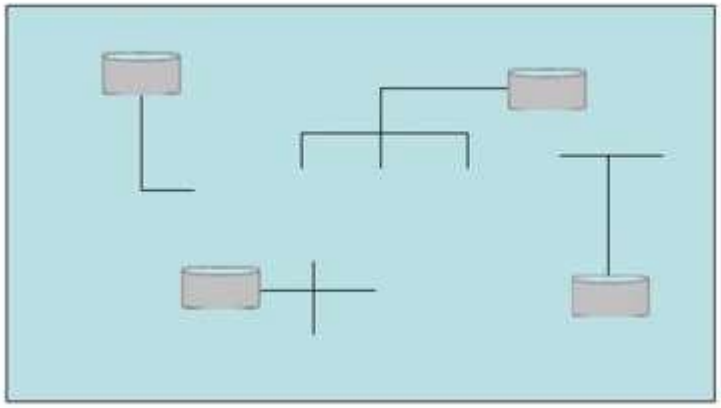


***Figure 12 Four Separate and Isolated Lines***

The protocol for RPUIDs are as follows:

- Use existing RPUIDs
- Facility or asset has a specific CATCODE
- Facility or asset complete and separate

**Geographical / Functional Area**

This categorization is optional and recommended if the base already has local geographical / functional descriptors established. Currently, a RPUID is assigned to one entire system, which makes associating the type of funding and identifying the office of management for these assets difficult. To make it more apparent, the segments / other components should be grouped by the main function of that area such as flight-line, cantonment, housing or multiple. At larger bases, there may be a need to expand the areas since there may be multiple tenant units or remotely located portions of an installation. The business rules for the areas are as follows:

- Each area should be connected to the system with the ability to be isolated from the others areas by valves, switches or other mechanism
- Each area should be named after main function – at least 75% of the utilities support a function (flight-line, cantonment, or certain utility support areas)
    - Flight-line – at least 75% of the utilities support a flight-line function

  - Cantonment – at least 75% of the utilities support a cantonment function
  - Housing – at least 75% of the utilities support a housing area
  - Circuit A – electrical circuit a supports a certain area
- When no function represents at least 75% of the utility system, geographical area descriptions
  - Northside, Bayside, Southside, etc.

**Grouping**

Grouping consists of interconnected segments (linear and non-linear), which would isolate a utility service line with the minimum by valves, switches, or other mechanisms needed from the rest of the utility service line. Figure 13 is a low- level schematic depicting segment grouping; it is not meant to show specific exact pipe placement.

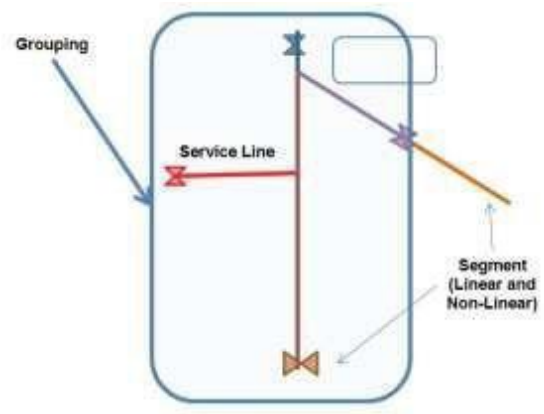



***Figure 13 Segment Grouping***

**Segments**

Segments should contain elements of pipe / distribution segments and other components without RPUIDs such as valves, pumps, backflows, transformers, etc.

Below are commonly used components of non-linear assets associated with linear utilities assets. If a particular asset does not fit under any of the listings below, another non-linear component may be used.

- **Water:** Valves, backflow prevention, Energy Management Control System (EMCS) component, flush point, hydrant, meter manhole
- **Electrical:** Transformers, generator points / backup generators, substations / switching stations, perimeter / security / street lighting, pole (includes cross arms, arrestors, etc.), sectionalized junctions, sectionalized switches
- **Wastewater:** Valves, cleanout, manhole, EMCS component
- **Stormwater:** Culverts, manhole, headwall, wing wall, inlet, outlet
- **Natural Gas:** Valves, cathodic protection, EMCS component for linear assets, the segmentation should follow these protocols:
- A segment must be made of common attributes (installation date, material, diameter, etc.)
- Line segments will be commonly assigned from pipe junction (intersection) to pipe junction, and pipe junctions to distribution valves
- A line that does not provide positive water pressure or feed (i.e., service line to facility, fire hydrant) will not break a segment

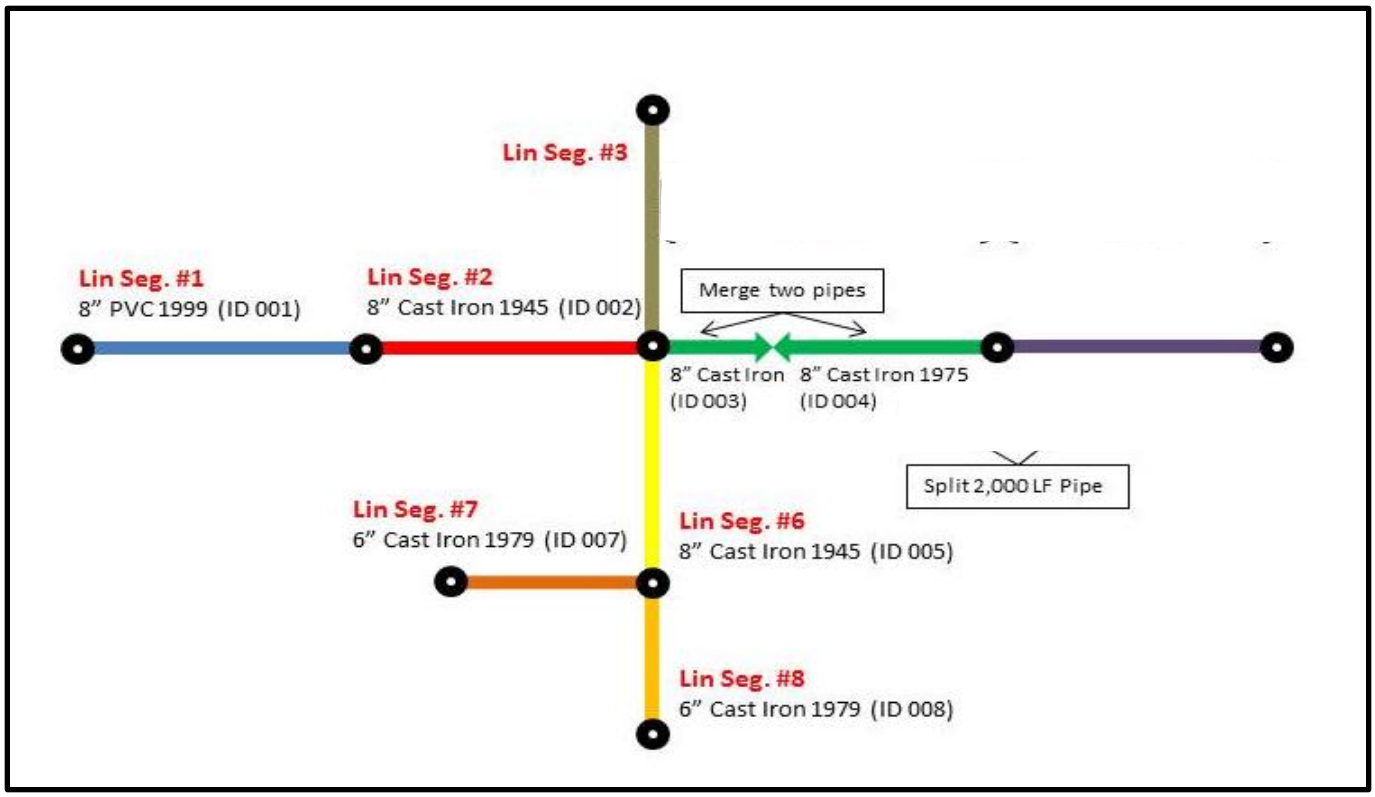



***Figure 14 Linear Segments & IDs***

**Linear Segmentation Rules for Repair, Demolition, and New Construction.**

When segments are repaired, demolished, or new segments are constructed, the following four rules apply as required:

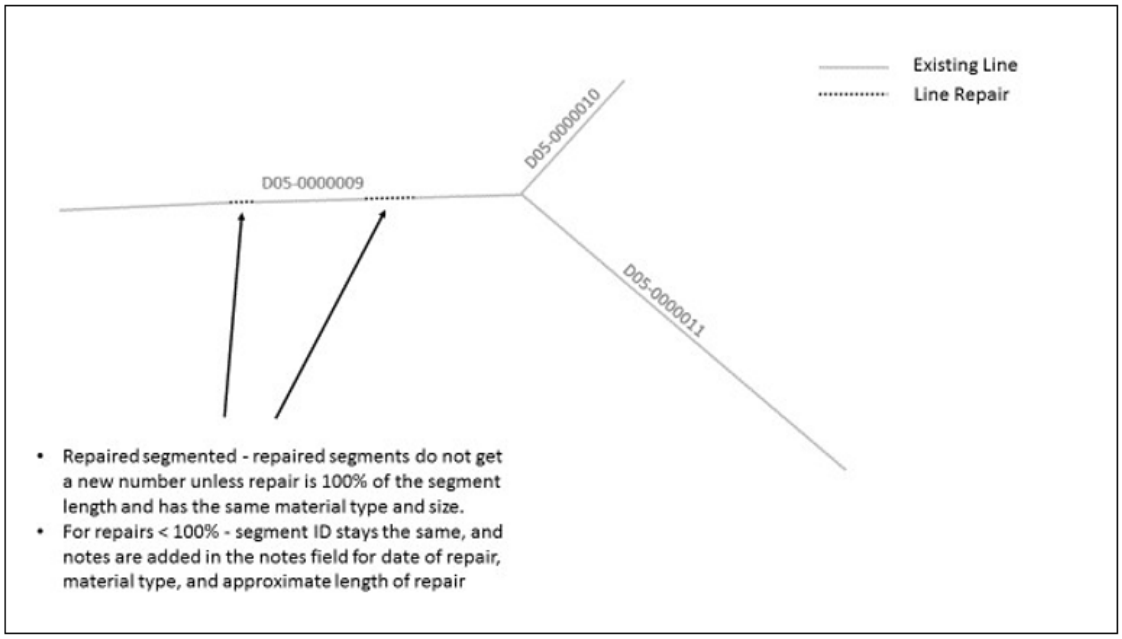



***Figure 15 Repaired and Segmented***

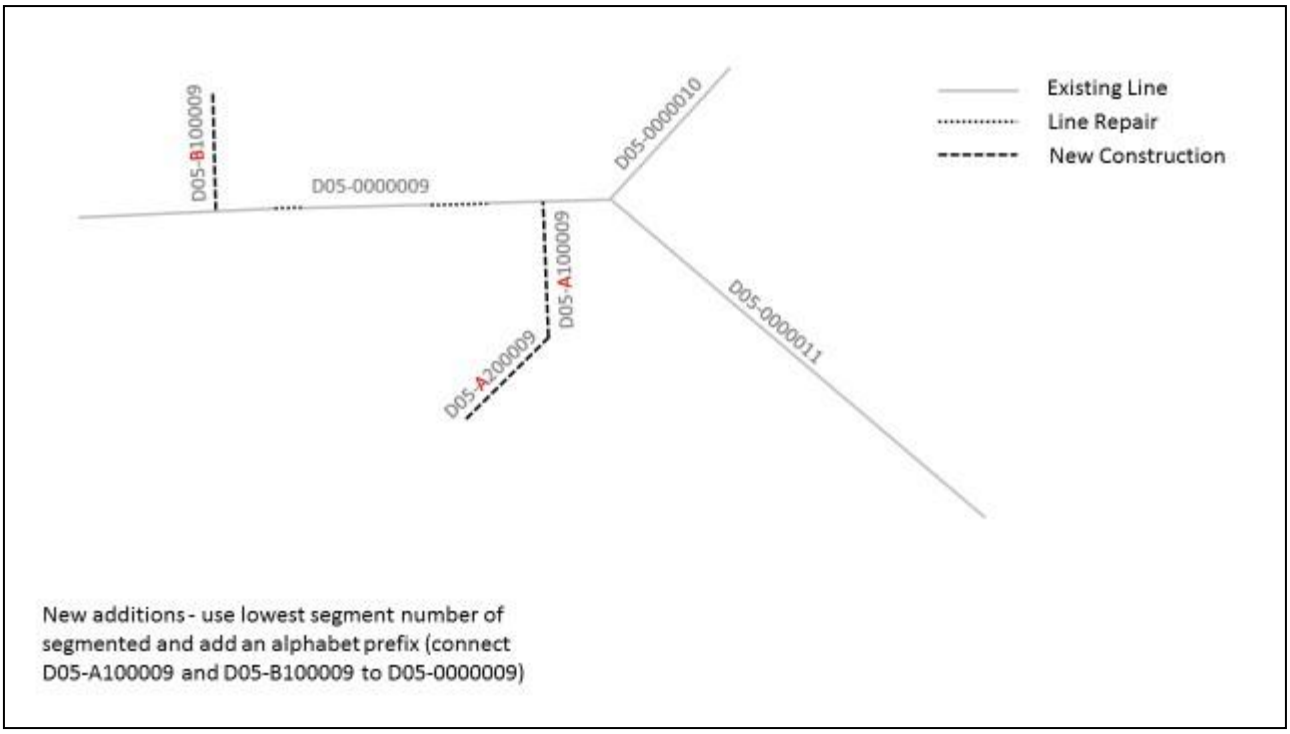



***Figure 16 New Addition Segments***

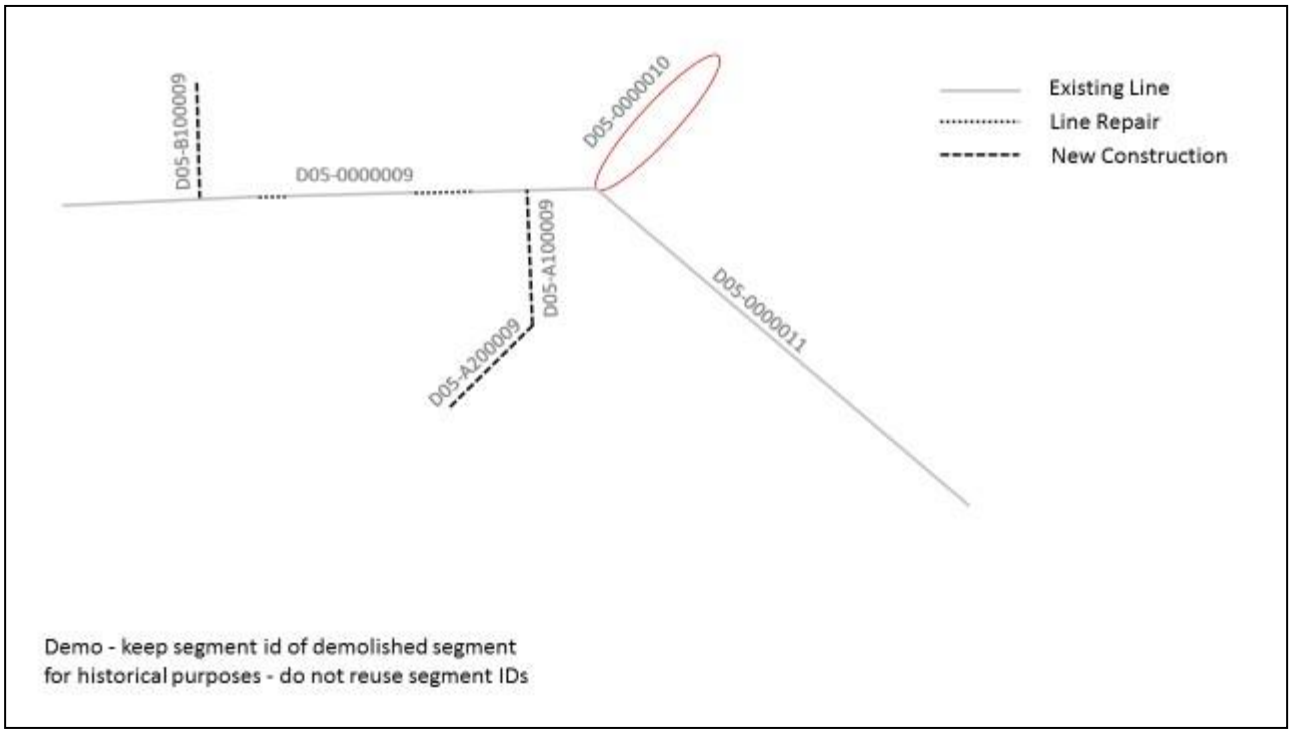



***Figure 17 Demolished Segment***

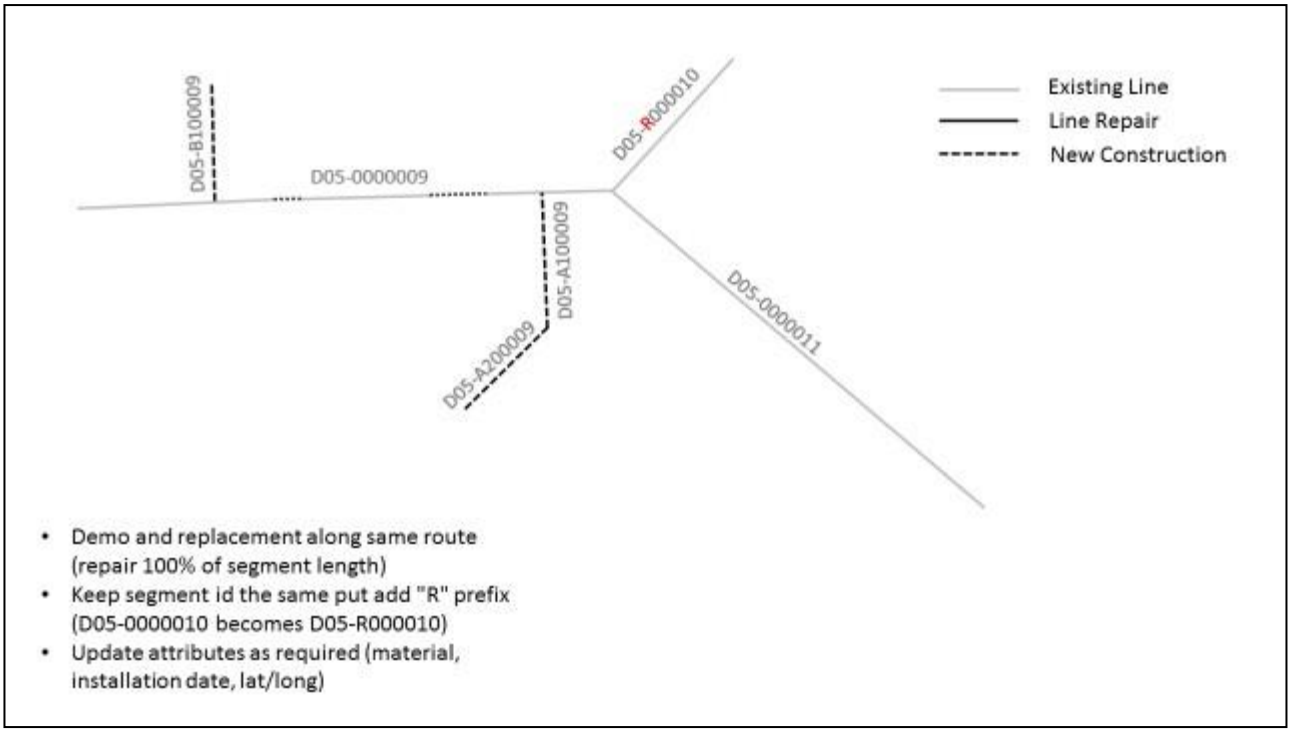



***Figure 18 Demolished and Replaced Segment***

## *Linear Segmentation Rules*

### Utility Water Mains

**Rule #1:** Water main segments will contain all like attributes and be split where there is a change in attribution such as material, diameter, installation date, change in ownership, operations status, etc.

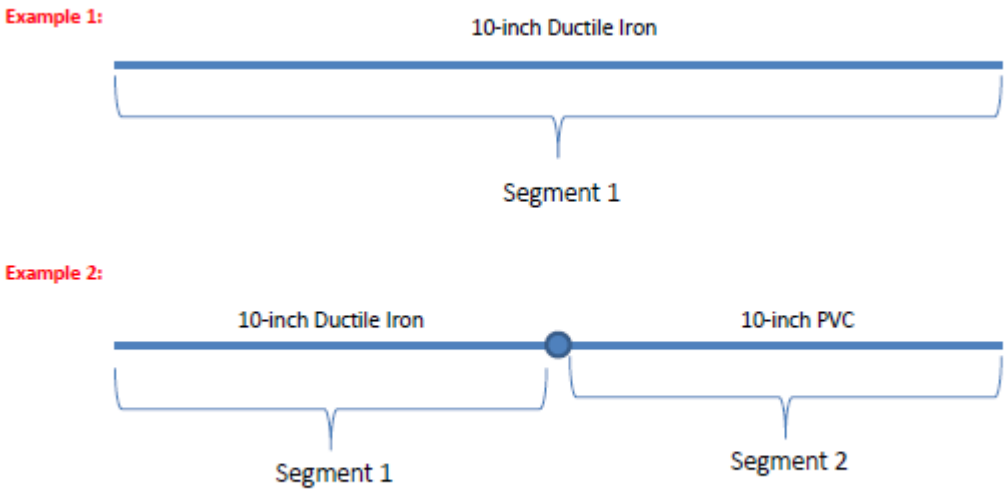



***Figure 19 LS – Water mains: Rule #1***

**Rule #2:** All valves will be snapped to the line segment at a vertex; however, they will not break the line segment.

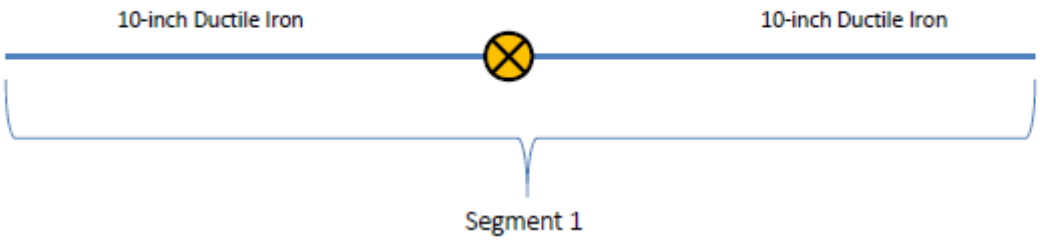



***Figure 20 LS – Water mains: Rule #2***

**Rule #3:** Water mains will be **broken at all connections** with another pipe (pipe junctions), including hydrant leads and services.

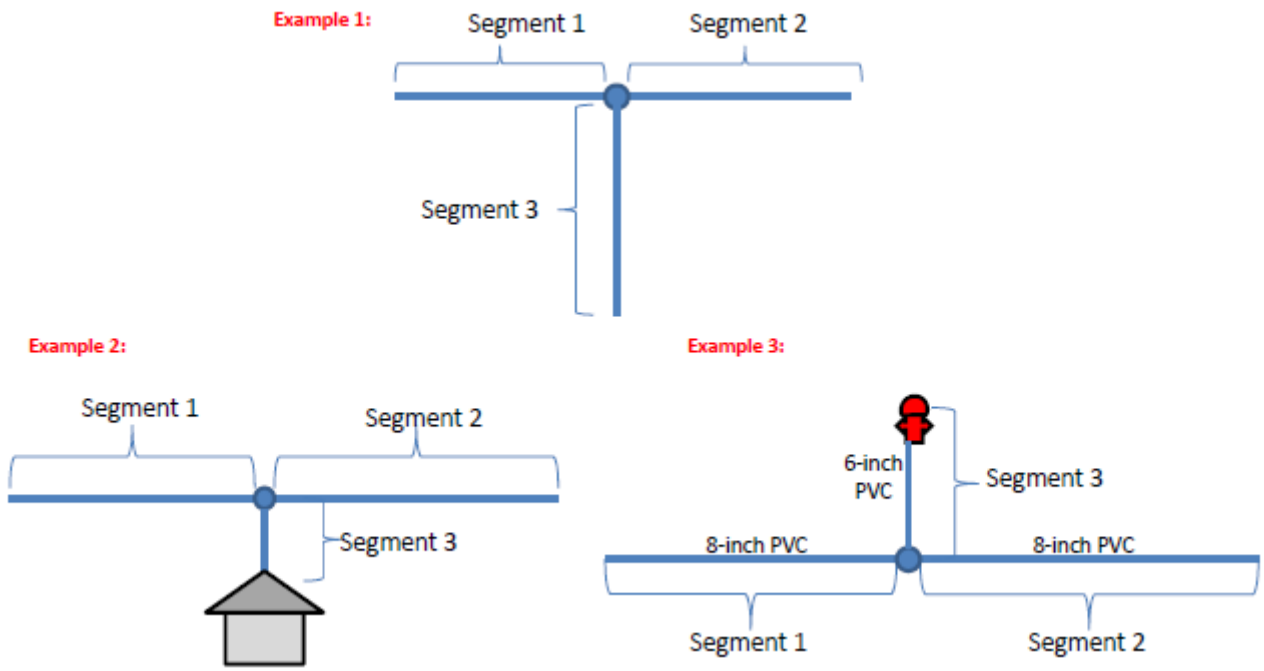


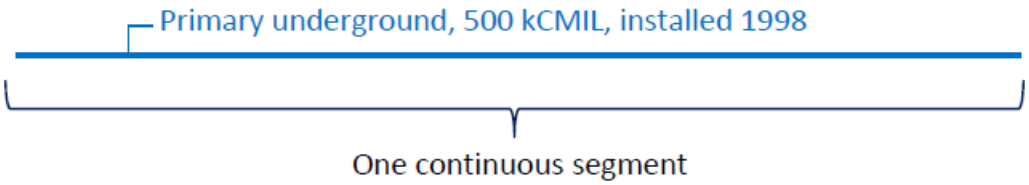

***Figure 21 Water mains: Rule #3***

## Electrical Systems

Linear Segmentation for the Electrical Distribution System: Overhead and Underground primary power lines are represented by linear segments. Non-linear segments, such as Transformers, Sectionalizer Switches, Sectionalizer Junctions, Power Station, Substations, Manholes, and Poles, are represented by nodes. Create the segments according to the specific segmentation rules presented below. Field evaluation is sometimes required to ensure the electrical system is mapped consistently and accurately.

**Rule #1:** Power lines (Overhead or Underground) shall be segmented when attributes change: Attributes include overhead versus underground, circuit, type of conductor material, conductor size, installation date, ownership (Base or Local Utility), operation status (active or abandoned), and category type (Primary Main, Secondary Main, Distribution Main, and Service Line, See Appendix B, Table B1 for definitions). Also, do not limit the segment length to 1,000 feet as noted in the AF CE Playbooks.

Example 1:




Example 2: Same circuit with different dates of installation; segment breaks.

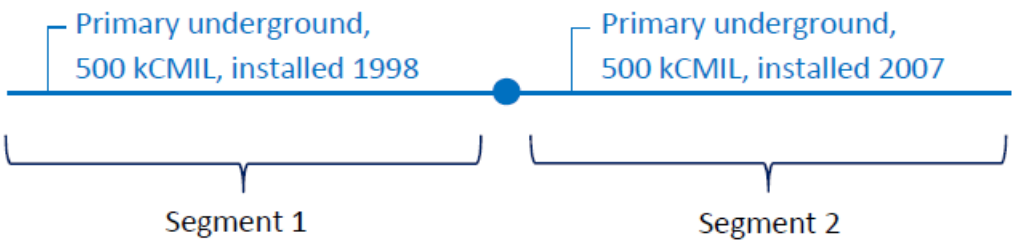



***Figure 22 Electrical System: Rule #1***

**Rule #2:** Power line (OH or UG) shall be segmented where connected with another circuit, or to equipment such as Transformer, Switch, Junction Cabinet, Power Station, Substation, whether the attributes change or not.

Example 1: Circuit 'A' is segmented when connected to the switch.

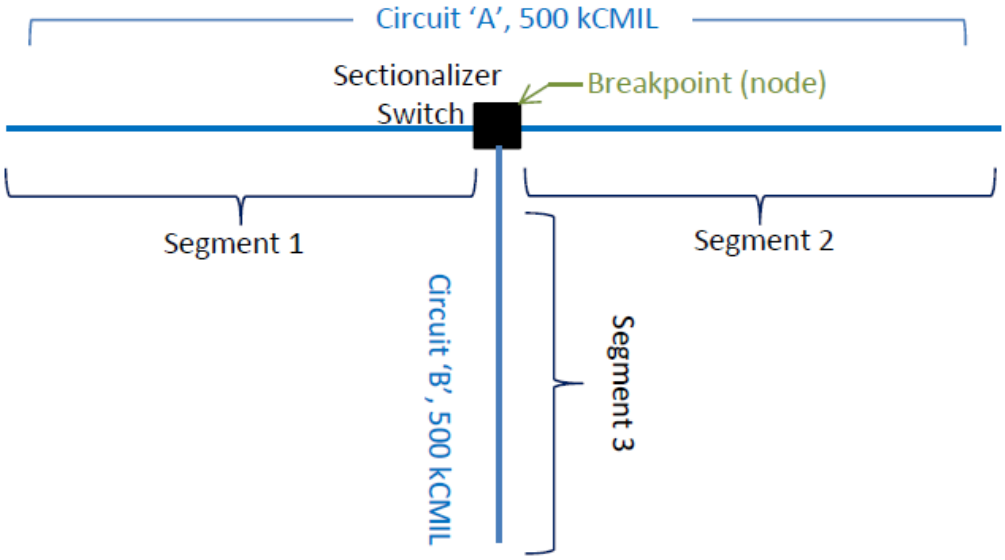



***Figure 23 Circuit A Segmentation Example***

**Rule # 3:** Electrical manhole and power pole shall be snapped onto the power line segment as a node; however, they shall not break the line segment if all attributes are the same on each side of the node.

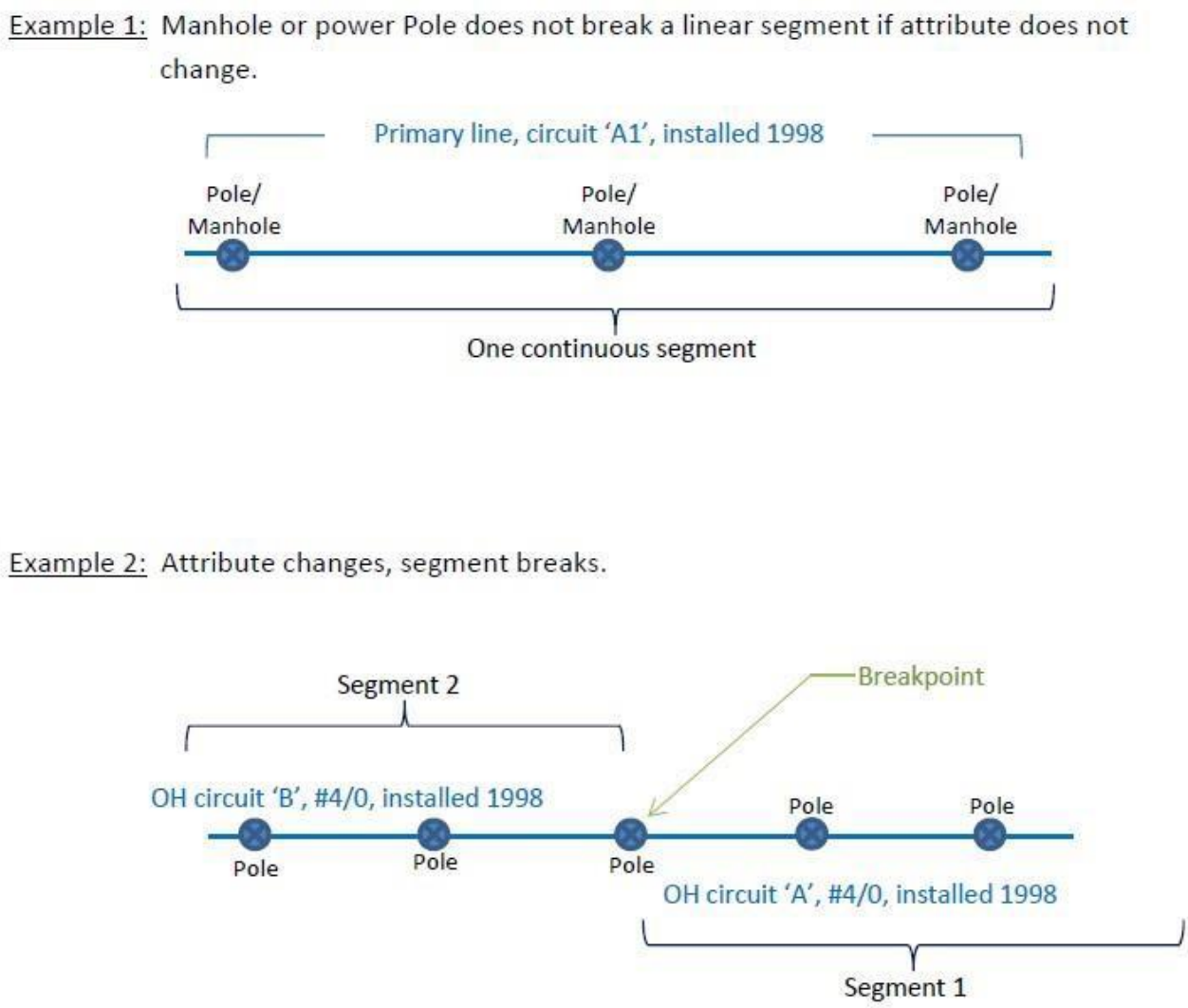



***Figure 24 Electrical System: Rule 3***

**Rule #4:** When multiple power lines/circuits are in near vicinity to one another (i.e. pass through the same manhole or strung on same pole at different heights), only one line will represent the multiple circuits in the GeoBase. Hovering the cursor over the line will display the individual circuits that the line represents with its associate attributes.

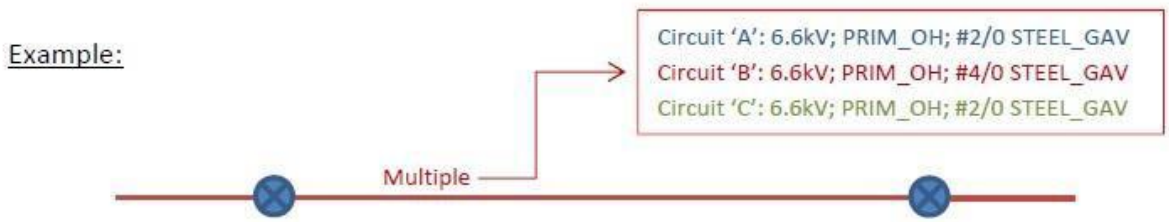



***Figure 25 Electrical System: Rule #4***

## Sanitary Sewer Mains

**Rule #1:** Split sanitary sewer mains at each manhole.

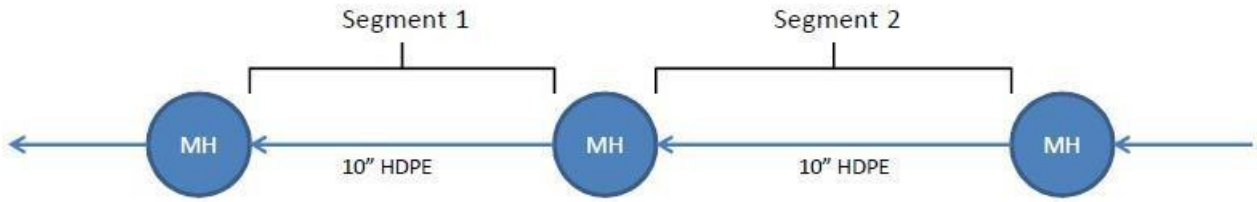



***Figure 26 Sanitary Sewer Mains: Rule #1.***

**Rule #2:** Split sanitary sewer mains where there is a change in categorization (E.g. main to trunk, trunk to primary/interceptor). In most cases a change in category will occur at a manhole (a); however, a category change can occur without a manhole (b).

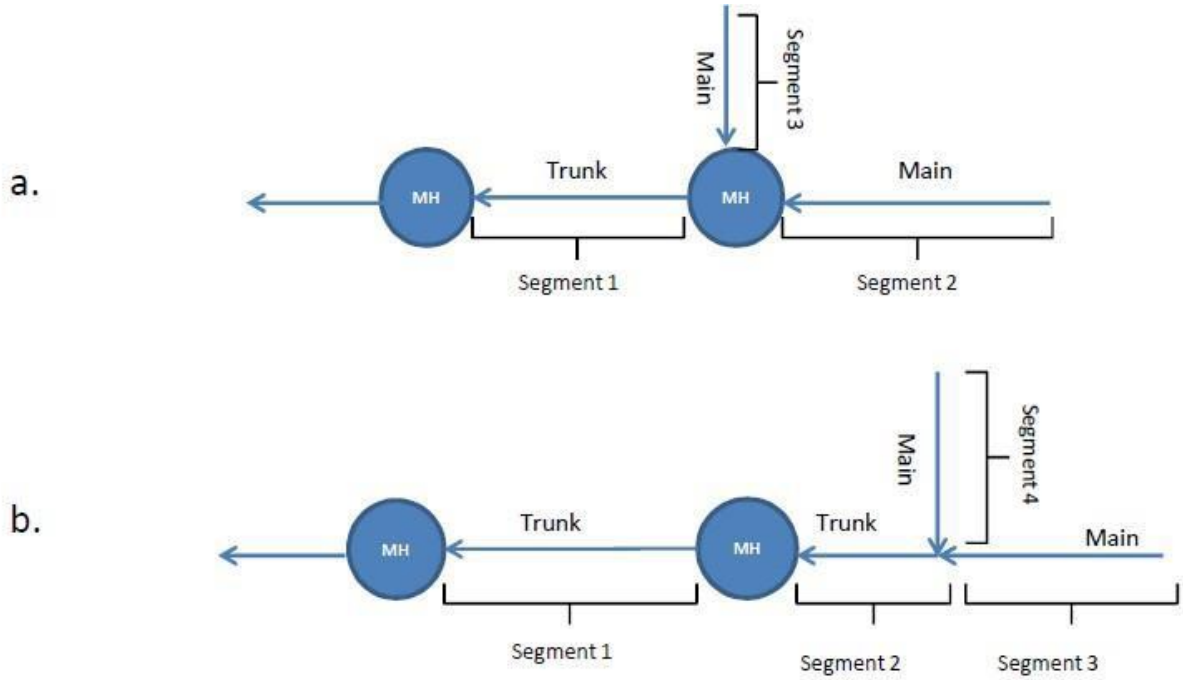



***Figure 27 Sanitary Sewer Mains: Rule #2***

**Rule #3:** Sanitary sewer mains that receive flow from lateral/service lines in-between manholes will remain as a single segment and not split at the junction.

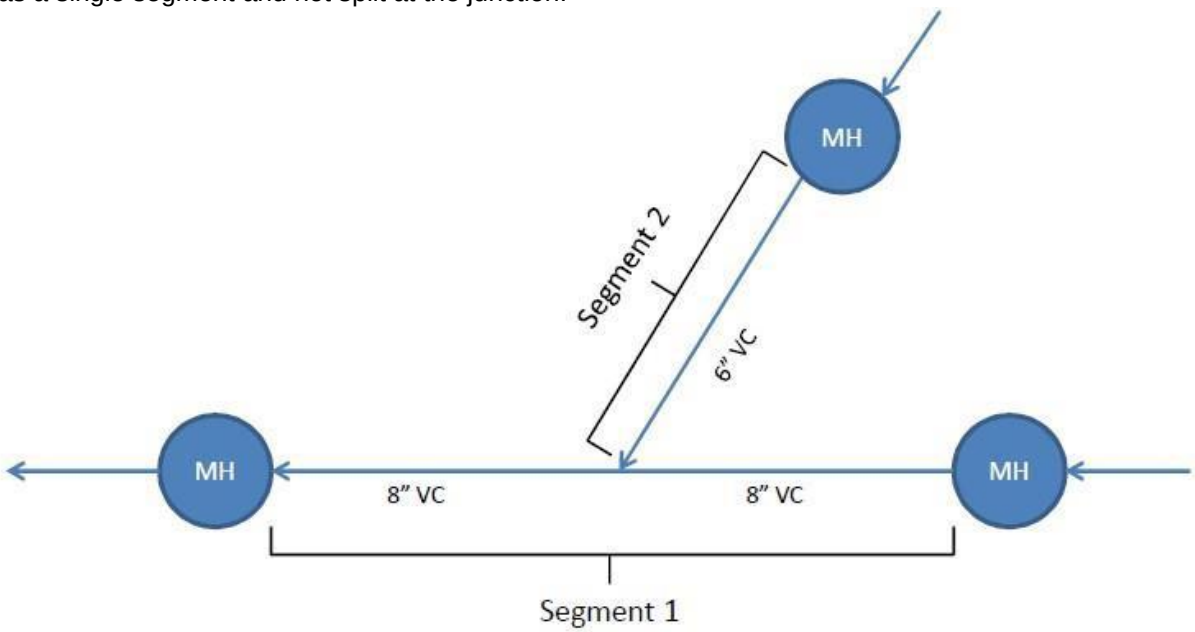



***Figure 28 Sanitary Sewer Mains: Rule #3***

**Rule #4:** There will be a split in pipe segments where there is a change in attributes that doesn't occur at a manhole (unlikely).

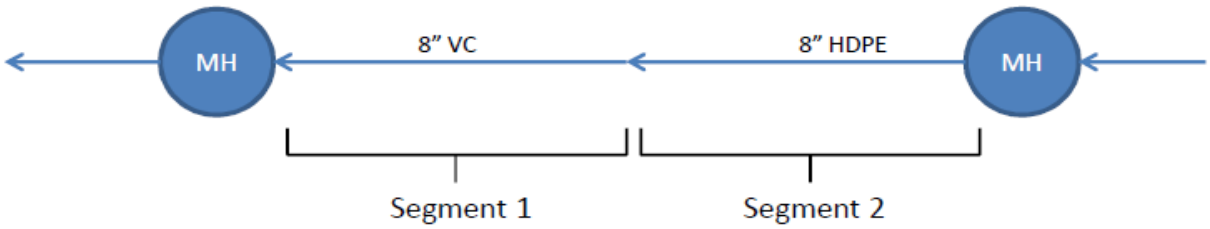



***Figure 29 Sanitary Sewer Mains: Rule #4***

**Rule #5:** Split mains into separate segments between cleanouts where there is a known change in attribute data (Example “a”). In situations where there are no known changes in attribute data, the pipes will be continuous segments (Example “b”).

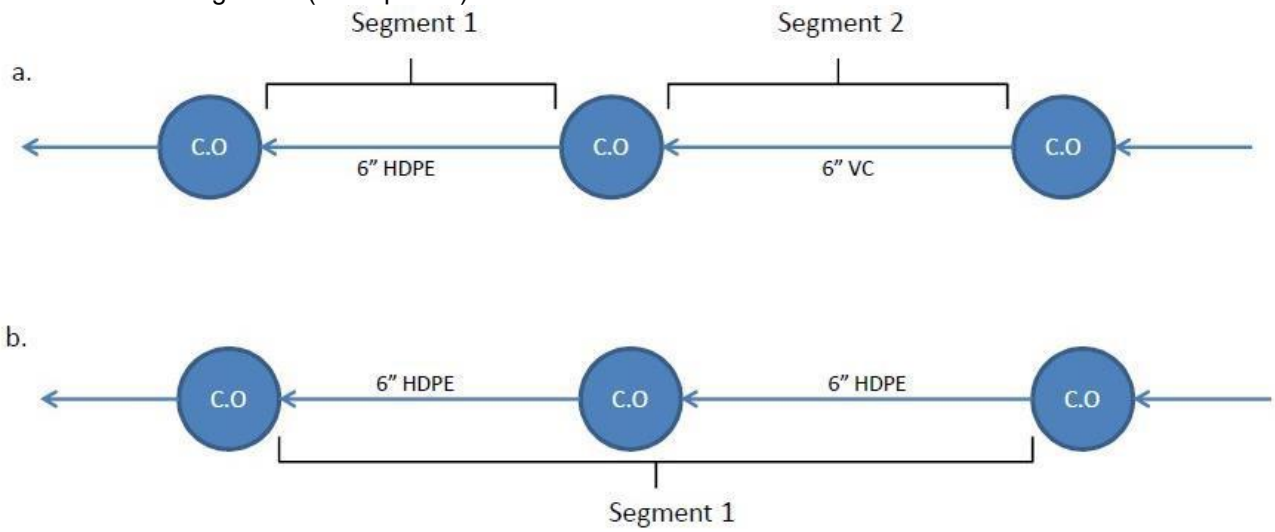



***Figure 30 Sanitary Sewer Mains: Rule #5***

**Rule #6:** Mains will be a continuous segment where there is a change in direction (but not attributes) which does not occur at a manhole.

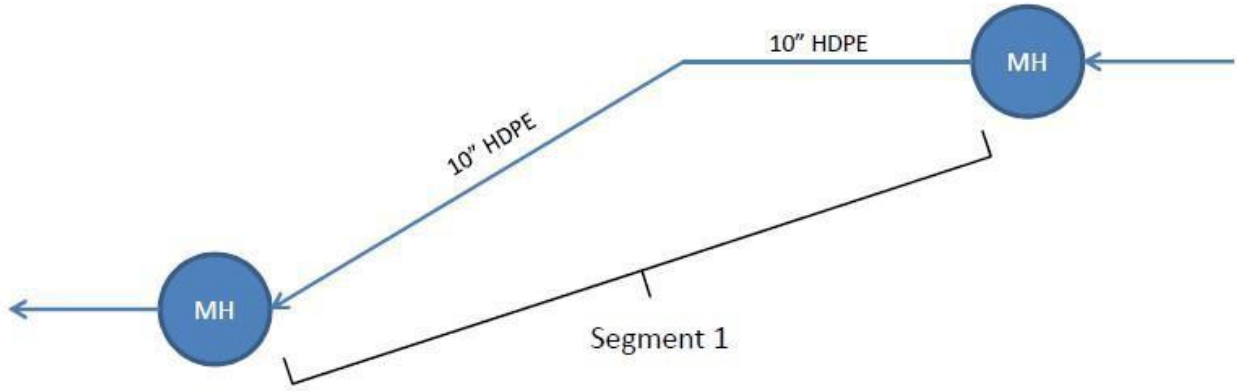



***Figure 31 Sanitary Sewer Mains: Rule #6***

## Storm Water Mains

**Rule #1:** Split storm water mains and open drainage lines (drainage channels) at each manhole.

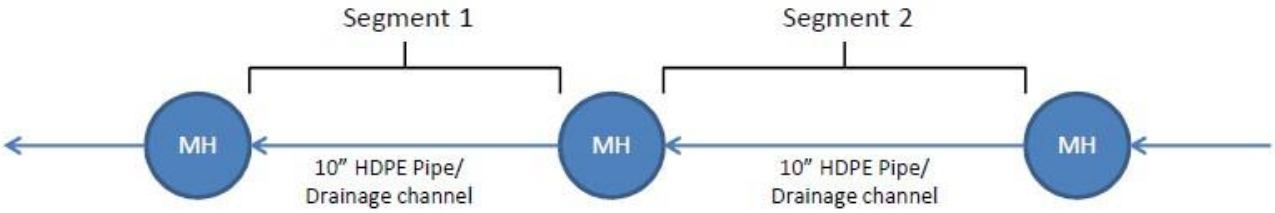



***Figure 32 Storm Water Mains: Rule #1***

**Rule #2:** Split storm water mains and open drainage lines into separate segments between inlets that act as junction points.

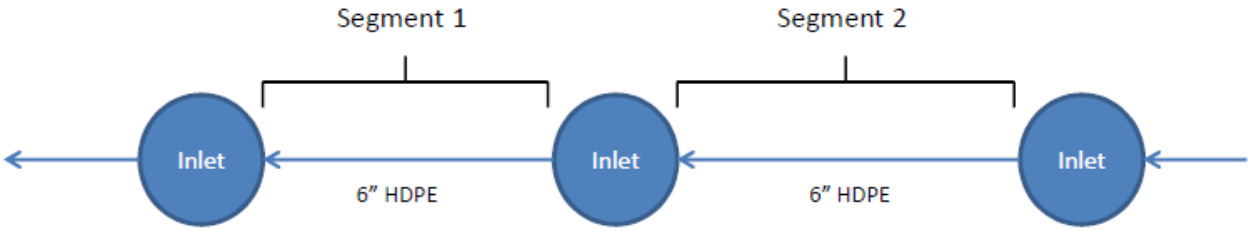



***Figure 33 Storm Water Mains: Rule #2***

**Rule #3:** Split storm water mains and open drainage lines where there is a change in categorization (E.g. main to trunk, trunk to primary/interceptor). In most cases, a change in category will occur at a manhole (a); however, a category change can occur without a manhole (b).

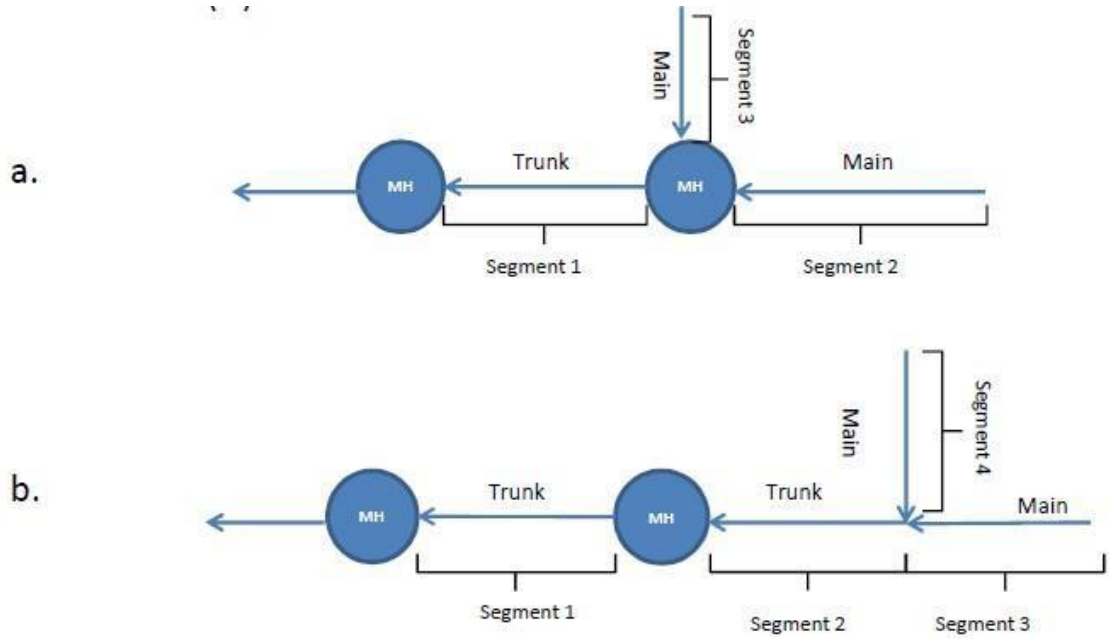



***Figure 34 Storm Water Mains: Rule #3***

**Rule #4:** Storm water mains and open drainage lines which receive flow from lateral/service lines in-between manholes will remain as a single segment and not split at the junction.

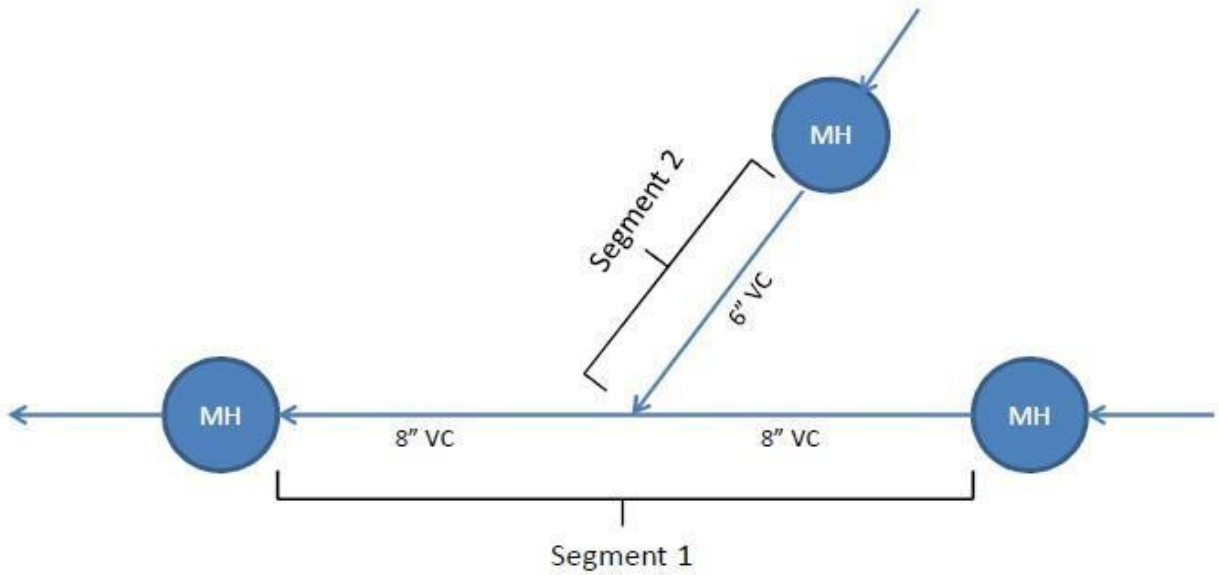



***Figure 35 Storm Water Mains: Rule #4***

**Rule #5:** There will be a split in pipe segments where there is a change in attributes that does not occur at a manhole (rare occurrences).

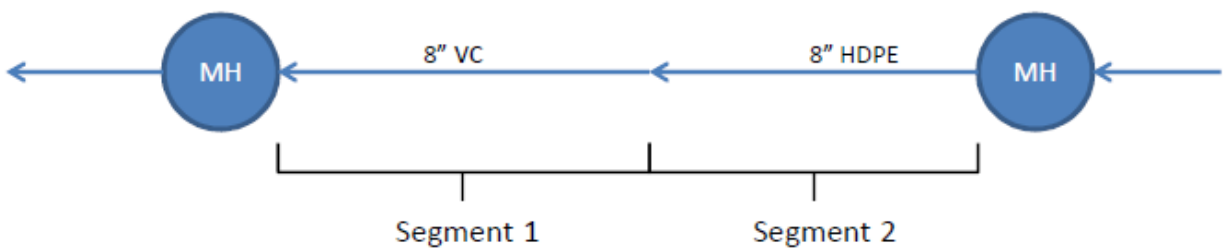



***Figure 36 Storm Water Mains: Rule #5***

**Rule #6:** Storm water mains and open drainage lines will be a continuous segment where there is a change in direction (but not attributes) which does not occur at a manhole.

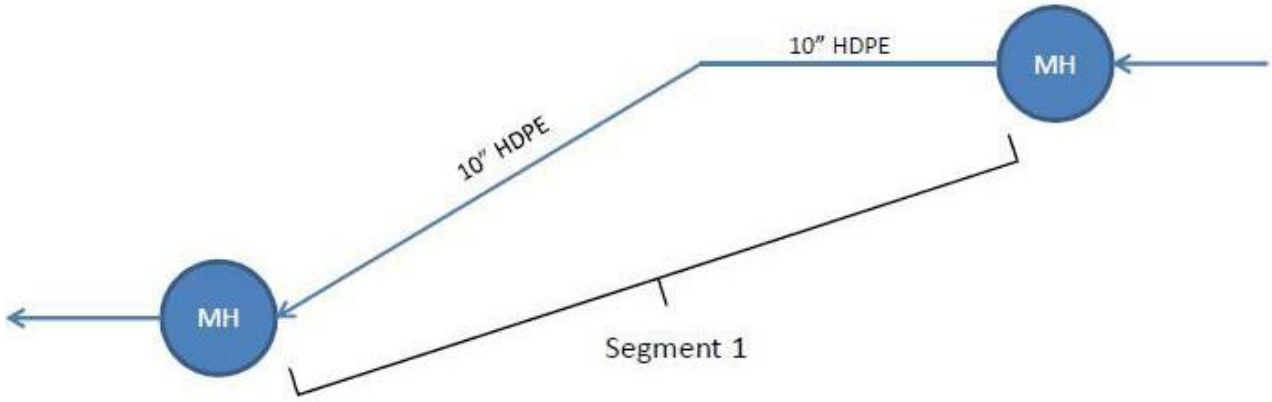



***Figure 37 Storm Water Mains: Rule #6***

**Natural Gas** Under construction
**Steam Utilities** Under construction

Central Chilled Water Utilities

Under construction

Identifying Attributes

Segments should be categorized by the following attributes:

- **Installation Year:** The installation year indicates when the segment was first installed or the year that the system was constructed
- **Material Type:** Below are commonly used material types for both linear and non-linear segments
  - **Water, Wastewater, Natural Gas:** Polyvinyl chloride (PVC), cast iron, ductile, steel, concrete, asbestos cement, polyurethane, high-density polyethylene (HDPE)
  - **Stormwater:** PVC, cast iron, ductile, steel, concrete, asbestos cement, polyurethane, natural swale / ditch

Electrical:

    - Linear – copper, aluminum, triplex, steel
    - Non-linear – wood, metal, concrete, pole mount, pad mount, substation
- **Size:** Depending on the utility type, the size may vary in unit of measure (inches, kilo volt amps [KVA], etc.)
- **Total Length:** A line segment should not exceed 1,000 except with adequate justification
- **Use:** Below are common identifications for usage

Water:

    - Linear – fire suppression system, potable, irrigation, main, lateral, source
    - Non-linear valves – butterfly, pressure reducing, gate, globe, check, air
    - Non-linear backflow prevention – reduce pressure zone device, spill resistant vacuum breaker assembly, double check valve assembly, pressure vacuum breaker assembly

Wastewater:

    - Linear – sewer main, sewer trunk, sewer interceptor, sewer lateral
    - Non-linear valves – butterfly, pressure reducing, gate globe, check valve, air valve, high / low valve
  - **Stormwater:** Storm main, structural, non-structural
  - **Electrical:** Transmission line, distribution line, feeder, conduit, counterpoise

Natural Gas:

    - Linear – main, lateral
    - Non-linear valves – butterfly, pressure reducing, gate, globe, check, air
- **Location Coordinates**: Coordinates should be in the same format as GeoBase records and can be used by Civil Engineer (CE) Operations to locate each segment during fieldwork
- **Operational Status**: Operation status indicates whether an asset is active, inactive or abandoned

***Utilities Segment Prefix Conventions***

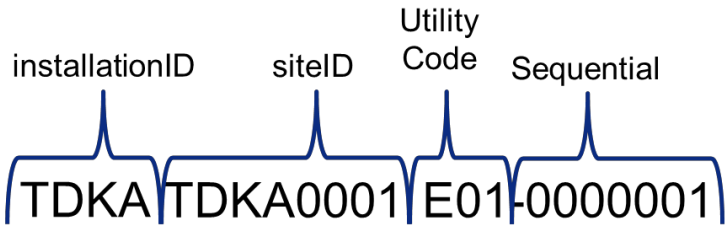
**The following conventions are to be used when labeling utility segments:**

# Linear Segmentation Unique ID

*Updated 4.0.3.1*

| | | | |
|---|---|---|---|
| E | UtilitiesElectrical | O | UtilitiesFuels |
| G | UtilitiesGas | Sw | UtilitiesStormwater |
| S | UtilitiesSewer | W | UtilitiesWater |
| T | UtilitiesThermal | Cg | UtilitiesCompressedGas |

WaterControl - no prefix designated/assigned



| UtilitiesElectrical | | | | | |
|---|---|---|---|---|---|
| **Entity Name** | **Utility Code OLD** | **Utility Code NEW** | **Entity Name** | **Utility Code OLD** | **Utility Code NEW** |
| EAbandonedElectricLine | | **E25** | EMiscNetworkFeature | | **E42** |
| EAccessPoint | **E01** | **E01** | EPriOhLineSegment | **E10** | **E10** |
| EAerialMarker | | **E26** | ESecOhLineSegment | **E11** | **E11** |
| EAirfieldLight | | **E27** | ETranOhLineSegment | **E12** | **E12** |
| EAnchorGuy | | **E28** | EOpenPoint | | **E43** |
| EBusBar | | **E30** | EPfCorrectingEquipment | | **E46** |
| ECapacitorBank | | **E31** | Eriser | | **E47** |
| EConduitSystem | **E02** | **E02** | EScadaSensor | | **E48** |
| ECounterpoiseSystem | **E03** | **E03** | EServicePoint | | **E49** |
| ECpAnode | | **E32** | ESpanGuy | | **E51** |
| ECpBondJunction | | **E33** | Esubstation | **E14** | **E14** |
| ECpBondWire | | **E34** | EsupportStructure | **E13** | **E13** |
| ECpRectifier | | **E35** | ESurfaceStructure | **E15** | **E15** |
| ECpRectifierCable | | **E36** | Eswitch | **E16** | **E16** |
| ECpTestPoint | | **E37** | ESwitchingStation | **E17** | **E17** |
| ECurrentRegulator | **E04** | **E04** | Etransformer | **E18** | **E18** |
| EDemarcationPoint | | **E38** | EPriUgLineSegment | **E19** | **E19** |
| EDynamicProtectiveDevice | **E05** | **E05** | ESecUgLineSegment | **E20** | **E20** |
| EElectricalFacilitySite | | **E38** | ETranUgLineSegment | **E21** | **E21** |
| EExteriorLight | **E06** | **E06** | EUndergroundStructure | | **E53** |
| Efuse | | **E40** | EUtilityArea | | **E54** |
| Egenerator | **E07** | **E07** | EUtilityMarker | | **E55** |
| EGroundingPoint | | **E41** | EVoltageRegulator | **E22** | **E22** |
| Emeter | **E09** | **E09** | | | |

| UtilitiesCompressedGas | | | |
|---|---|---|---|
| **Entity Name** | **Utility Code NEW** | **Entity Name** | **Utility Code NEW** |
| CgAftercooler | **Cg01** | CgReliefValve | **Cg10** |
| CgAirFlowArrow | **Cg02** | CgSpatialOperationsRecord | **Cg11** |
| CgCompressor | **Cg03** | CgStorageStructure | **Cg12** |
| CgDrip | **Cg04** | CgTrap | **Cg13** |
| CgFilter | **Cg05** | CgValve | **Cg14** |
| CgFitting | **Cg06** | CgValvePit | **Cg15** |
| CgMeterPoint | **Cg07** | CompressedGasUtilityNode | **Cg16** |
| CgProductionStructure | **Cg08** | CompressedGasUtilitySegment | **Cg17** |
| CgRegulator | **Cg09** | | |

| UtilitiesFuels | | | | | |
|---|---|---|---|---|---|
| **Entity Name** | **Utility Code OLD** | **Utility Code NEW** | **Entity Name** | **Utility Code OLD** | **Utility Code NEW** |
| OAirEliminator | **O01** | **O01** | OInstallationPipeline | **O06** | **O06** |
| OCasingSleeve | | **O16** | OInterterminalPipeline | **O07** | **O07** |
| OCpAnode | | **O17** | OMeter | **O09** | **O09** |
| OCpBondJunction | | **O18** | OOwsSystem | **O10** | **O10** |
| OCpBondWire | | **O19** | OPigLaunch | **O11** | **O11** |
| OCpRectifier | | **O20** | OPigReceiver | | **O25** |
| OCpRectifierCable | | **O21** | OPump | **O12** | **O12** |
| OCpSystem | | **O22** | OPumpingFacility | **O13** | **O13** |
| OCpTestPoint | | **O23** | OSamplingSite | | **O26** |
| ODefuelingLine | | **O24** | OTank | | **O27** |
| OFilterSeparator | **O03** | **O03** | OValve | **O02** | **O02** |
| OFitting | **O04** | **O04** | StorageTankFarm | **O15** | **O15** |
| OHydrantOutlet | **O05** | **O05** | | | |

| UtilitiesGas | | | | | |
|---|---|---|---|---|---|
| **Entity Name** | **Utility Code OLD** | **Utility Code NEW** | **Entity Name** | **Utility Code OLD** | **Utility Code NEW** |
| GAbandonedGasDevice | | **G18** | GPigLaunch | **G11** | **G11** |
| GAbandonedGasPipe | | **G19** | GPigReceiver | | **G33** |
| GAlcoholInjectionEquipment | **G01** | **G01** | GPipelineMarker | | **G34** |
| GGasPipeCasing | | **G20** | GPressureMonitoringDevice | **G12** | **G12** |
| GFitting | **G04** | **G04** | GPumpStation (Area) | **G13** | **G13** |
| GValve | **G02** | **G02** | GPumpStation (Point) | **G14** | **G14** |
| GCpAnode | | **G22** | Gregulator | **G15** | **G15** |
| GCpBondJunction | | **G23** | GRegulatorStation | | **G35** |
| GCpBondWire | | **G24** | GReliefValve | | **G36** |
| GCpRectifier | | **G25** | GRuralTap | | **G37** |
| GCpRectifierCable | | **G26** | GScadaSensor | | **G38** |
| GCpTestPoint | | **G27** | Gscrubber | **G16** | **G16** |
| GDemarcationPoint | | **G28** | GServiceArea | | **G39** |
| GMainLine | **G06** | **G06** | GServiceLine | **G08** | **G08** |
| GDrip | **G03** | **G03** | GStationStructure | | **G40** |
| GGasLamp | **G05** | **G05** | GTank | | **G41** |
| GLeakSurveyArea | | **G29** | Gstrainer | **G17** | **G17** |
| GLineHeater | **G07** | **G07** | GTownBorderStation | | **G42** |
| Gmanhole | | **G30** | GUndergroundEnclosure (Area) | | **G43** |
| GMeterPoint | **G09** | **G09** | GUndergroundEnclosure (Point) | | **G44** |
| GNonControllableFitting | | **G31** | GUtilityArea | | **G45** |
| Godorizer | **G10** | **G10** | GUtilityMarker | | **G46** |

| UtilitiesSewer | | | | | |
|---|---|---|---|---|---|
| **Entity Name** | **Utility Code OLD** | **Utility Code NEW** | **Entity Name** | **Utility Code OLD** | **Utility Code NEW** |
| Scasing | | **S21** | SLateralLine | **S05** | **S05** |
| SCleanOut | **S01** | **S01** | Smanhole | **S09** | **S09** |
| SCpAnode | | **S22** | SMeterPoint | **S10** | **S10** |
| SCpBondJunction | | **S23** | SMotor_P | | **S32** |
| SCpBondWire | | **S24** | SOilWaterSep | **S11** | **S11** |
| SCpRectifier | | **S25** | SForceMain | **S07** | **S07** |
| SCpRectifierCable | | **S26** | SPump_P | **S13** | **S13** |
| SCpTestPoint | | **S27** | SSamplingSite | | **S36** |
| Sfitting | **S03** | **S03** | STank | **S17** | **S17** |
| SGravityMain | **S05** | **S05** | STreatmentPlant | **S18** | **S18** |
| SGreaseTrap | **S04** | **S04** | SUgEnclosureAccess | | **S39** |
| Sinlet | | **S30** | SSystemValve | **S02** | **S02** |
| SLagoonOrSettlementPond | | **S31** | | | |

| UtilitiesStormwater | | | | | |
|---|---|---|---|---|---|
| **Entity Name** | **Utility Code OLD** | **Utility Code NEW** | **Entity Name** | **Utility Code OLD** | **Utility Code NEW** |
| SwCasing | | **Sw11** | SwPump | **D08** | **Sw08** |
| SwCulvert | **D02** | **Sw02** | SwPumpStation (Area) | | **Sw22** |
| SwDischarge | **D03** | **Sw03** | SwPumpStation (Point) | | **Sw23** |
| SwFitting | | **Sw14** | SwRetentionBasin | | **Sw24** |
| SwGravityMain | **D05** | **Sw05** | SwSamplingSite | | **Sw25** |
| SwInlet | **D04** | **Sw04** | SwStorageReservoir (Area | **D10** | **Sw10** |
| SwUgEnclosureAccess | **D06** | **Sw06** | SwStorageReservoir (Poin | **D09** | **Sw09** |
| SwOilWaterSeparator | | **Sw20** | SwSystemValve | **D01** | **Sw01** |
| SwOpenDrain | **D07** | **Sw07** | | | |

| UtilitiesThermal | | | | | |
|---|---|---|---|---|---|
| Entity Name | Utility Code OLD | Utility Code NEW | Entity Name | Utility Code OLD | Utility Code NEW |
| TCasing | | **T13** | THighTempHotWaterSupply | | **T29** |
| TChannel | | **T14** | TJunction | **T08** | **T08** |
| TChilledWaterReturn | | **T15** | TLowTempHotWaterReturn | | **T30** |
| TChilledWaterSupply | | **T16** | TLowTempHotWaterSupply | | **T31** |
| TCondensateCollector | | **T17** | TOtherReturn | | **T35** |
| TCpAnode | | **T18** | TOtherSupply | | **T36** |
| TCpBondJunction | | **T19** | TPump | **T10** | **T10** |
| TCpBondWire | | **T20** | TPumpStation | **T11** | **T11** |
| TCpRectifier | | **T21** | TRegulator | | **T39** |
| TCpRectifierCable | | **T22** | TReliefValve | | **T41** |
| TCpSystem | | **T23** | TSamplingSite | | **T43** |
| TCpTestPoint | | **T24** | TScadaSensor | | **T44** |
| TExpansionJoint | | **T26** | TSteamReturn | | **T48** |
| TExpansionTank | | **T27** | TSteamSupply | | **T49** |
| TFitting | **T05** | **T05** | TSystemValve | | **T53** |
| THighTempHotWaterReturn | | **T28** | TThrustProtection | | **T54** |

| UtilitiesWater | | | | | |
|---|---|---|---|---|---|
| Entity Name | Utility Code OLD | Utility Code NEW | Entity Name | Utility Code OLD | Utility Code NEW |
| WAnalysisPoint | | **W14** | Wpump | | **W28** |
| Wcasing | | **W15** | WPumpStation (Area) | | **W29** |
| WControlValve | **W01** | **W01** | WPumpStation (Point) | **W09** | **W09** |
| WCpAnode | | **W16** | WReliefValve | **W10** | **W10** |
| WCpBondJunction | | **W17** | WSamplingSite | | **W31** |
| WCpBondWire | | **W18** | WScadaSensor | | **W32** |
| WCpRectifier | | **W19** | WLineService | **W06** | **W06** |
| WCpRectifierCable | | **W20** | Wsource | **W11** | **W11** |
| WCpTestPoint | | **W21** | WStorageStructure | | **W35** |
| Well | | **W23** | WSurgeReliefTank | | **W36** |
| WFireHydrant | **W02** | **W02** | WSystemValve | | **W37** |
| Wfitting | **W03** | **W03** | WThrustProtection (Area) | | **W38** |
| Whydrant | **W04** | **W04** | WThrustProtection (Point) | | **W39** |
| WMainLine | **W05** | **W05** | WUndergroundEnclosure | | **W40** |
| WMeterPoint | **W07** | **W07** | | | |

# SMS – Utilities Guidance: Enterprise SMS Fuels Domain

FUELER Development Status

## Enterprise SMS Fuels (DLA) Development Status

- ESMS Fuels (DLA) began development in 2012 when DLA funded the USACE Engineering Research Development Center (ERDC), Construction Engineering Research Laboratory (CERL), Champaign, IL to develop a new SMS for DLA use
- ESMS Fuels (DLA) support fuels infrastructure at all DoD installations that support capitalized fuel products – fuels received, stored, transferred and issued prior to use
- Developing assessment and project-level work generation rules leveraging existing Air Force ACC Fuels tool (Fuels Assessment Tool [FAST] as the original technical foundation for the ESMS Fuels (DLA) development effort
- ESMS Fuels (DLA) will provide Facilities Condition Assessments (FCA) and standardized SMS approach DoD Wide for capitalized infrastructure assets
- Field Testing of ESMS Fuels (DLA) Software DoD wide began in FY18 and is being used exclusively by DLA to conduct assessments and drive requirements for DLA FSRM funding for capitalized fuels infrastructure at DoD installations

## Enterprise SMS Utilities Fuels Domain Development Status

- The Air Force funded the inclusion of non-capitalized fuel storage and distribution systems under USAF ownership and maintenance to be called ESMS Utility Fuels Domain
- Software development will leverage GIS (SDSFIE) Version 4.0.3.1 standards and STAR (Storage Tank Accounting and Reporting) data
- Additional funding support anticipated from Service Delivery Points for service unique work management system interfaces (NexGen IT for Air Force)
- Field Testing of ESMS Utilities Fuels software is planned at Moody AFB in FY 21-22
- AFIT will begin development of training courses in FY 22
- ESMS Utilities Fuels planned Initial Operating Capability (IOC) projected for end of CY20 with Full Operating Capability (FOC) in FY 2025
- Air Force Approval for implementation and adoption for use will occur once NexGen IT interface has been completed and DoD has received the authority to operate (ATO) for DoD wide use

# SMS – Utilities Guidance: Enterprise SMS Utilities Domain

UTILITIES SMS Development Status

## Enterprise SMS UTILITIES Domain Development Background and Status

- Enterprise SMS Utilities Domain is under development by the USACE Engineering Research Development Center (ERDC), Construction Engineering Research Laboratory (CERL), Champaign, IL, which began in 2014 and was fully funded by FY 16
- Software development will leverage GIS (SDSFIE) Version 4.0.3.1 standards
- Air Force 3400 funding supports the development of ESMS Utilities Domains: Electric, Water, Gas, Wastewater, Storm water, Thermal (Steam & Chill Water) and Dams Utility Systems as individual Domains
- ESRI GIS Software used by AF Geobase will interface with ESMS Utility Domains
- ESMS Utility Domains will have an Automated Programming Interface (API) with AF CE work management system, NexGen IT in the future
- ESMS has included Microsoft Power BI as the data analysis and visualization engine
- AFCEC GIO is implementing SDSFIE 4.0.3.1 Adaptation across Air Force (AF) Enterprise
- Bases' GIS data will serve as authoritative data input to ESMS Utilities Domains – Installations must be migrated to AF GIS Spatial Data Standards for Facilities, infrastructure and Environment (SDSFIE) Version 4.0.3.1,
- Beta test and Proof of Concept testing of software architecture completed at Hurlburt Field, FL (installation development partner) Q1/Q4 FY17 – Hurlburt Field, FL utility systems are AF owned & linear segmented
- Pilot Test of Storm water sub-domain conducted at Hurlburt Field, FL, 29-31 Aug 17 – Demonstrated the use of a new common IT architecture based on ESMS Fuels (DLA) for future ESMS application
- Continued software testing at other AF bases with LS GIS data was completed in FY18
- Software Operational Testing and Evaluation (OT&E) for ESMS Web application completed Sep 2020
- Non-capitalized Fuels Systems to be integrated under Utilities as a sub domain under ESMS
- Initial Operating Capability (IOC) for the ESMS Web Application was achieved at the end of CY2020 at Moody AFB, the AF designated pilot location for ESMS development
- Testing of the ESMS Mobile Application is planned at Moody AFB FY 21-22.
- CERL is processing the ESMS software to receive the authority to operate (ATO) for DoD approval by first quarter FY 22
- AFIT is partnered with AFCEC and CERL for ESMS training development and integration into asset management curriculum FY 22-23
- Full Operating Capability (FOC) will occur once NexGen IT interface with ESMS is completed which is anticipated in FY 2025

# Extracting Value from SMS Data

Introduction

Extracting Value Using BUILDER Best Practices

Extracting Value Using AF Institute of Technology Data Analysis Guidance

Case Studies and Best Practices

## Introduction

Extracting value from our SMS data through data analysis is a critical part of the asset/activity management process. The populated SMS modules provide large amounts of asset data directly at an installation's fingertips. Most of the analysis an installation performs serves a need specific to them.

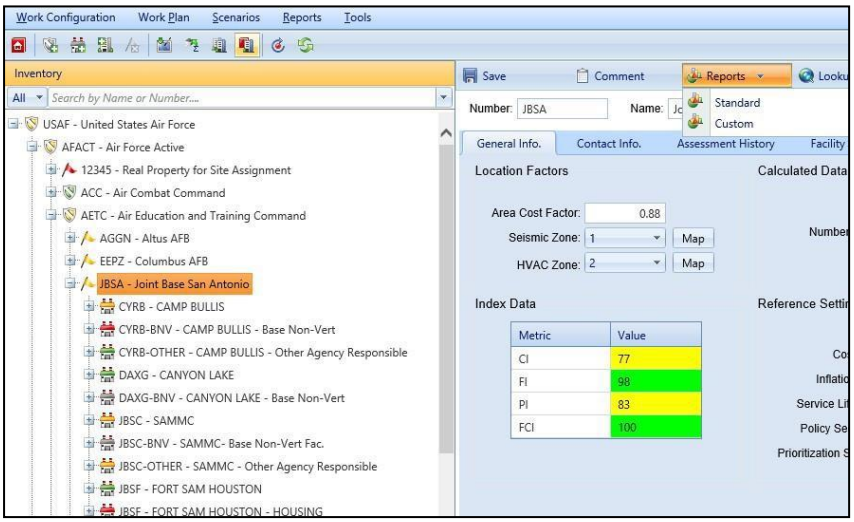
Additionally, a Case Study from RAF Lakenheath and a link to additional Best Practices are included in Section 8.4 to demonstrate some of the individual analyses other installations have performed. The additional illustrated analyses are not required but may inspire others in the field with ways to improve their asset/activity management processes with better data analysis.

## Extracting Value Using BUILDER Best Practices

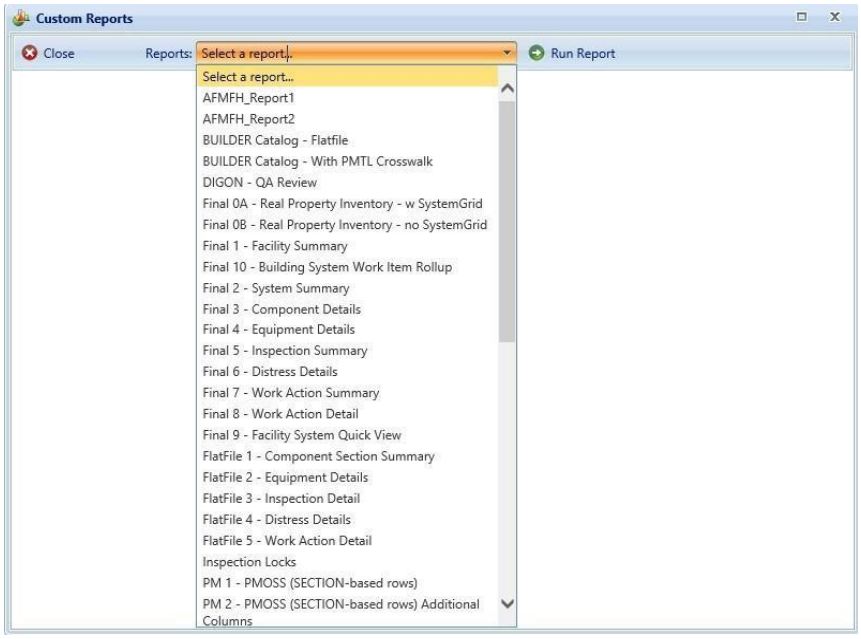
### 1. Useful BUILDER Reports for Data Analysis

BUILDER reports are a useful tool AMP and Sub-AMP managers can use to increase visibility of the facilities and effectively plan additional actions.

Verify the inventory tab is displayed.




1. Select the level at which you want to run the report. The report will include all levels beneath what you select.
2. Click the reports drop down.
3. Select Custom.




4. Select from the available reports in the drop-down list.
5. Click Run Report.

   When the next window opens, you can choose to export the report to pdf, Excel or other file forms. As stated earlier, Excel is the best format for working with data. CSV format is useful when running large reports because it has no associated formatting.

   1. **Final 9 – Facility System Quick View Report**

      The Final 9 – Facility System Quick View Report is a great place to *start* planning projects.

      - Review real property data and system condition installation wide.
      - Multi-disciplinary, multi-facility projects.
      - Shows the system condition index for all systems.
      - The system condition index is a general indicator of system health.
      - More detailed information gathering using the DIGON QA Review and QC 6 is still required.
      - The report is useful for multi-disciplinary and multi-facility projects. Optional information:
      - However, because of how the CI is rolled up from one level to another it is insufficient detail to plan a project.
      - Sections with a high CRV have more influence on the CI, so this will hide issues that are tied to sections with a low CRV and exaggerate issues tied to sections with a high CRV.

   2. **QC6 – Inspections Report**

      The QC6 lists most of the items the DIGON QA review does including all historical assessments.

      This report is most useful to validate assessments.

1. There should be a comment for every rating of Amber/Red. Photos are now optional. The report automatically highlights missing inspection comments.
2. Inspection comments should describe the distress in standard terms like on the back of the assessment cards (e.g., corroded).
3. Search the "Insp. Comments" column for key words like "old" and find inspections that are age based. Inspections should not be based on age but actual physical distresses.
4. Note other common inspection errors.
5. Compare the reports to previous assessments. This should show a gradual degradation of the equipment. It is suspicious to find assessments that show green, then red, in a short amount of time.

**3. QA 14A/B/C – IMSC Incentive Reports**

The QC14 reports examine all assets with a Category Code MDI of 40 or higher to determine "Completeness" (A report), "Currency" (B report), and compliance with three section-level data quality measures (C report) to ensure complete, current, and error-free data reside in the BUILDER SMS database to enable work requirements development for in-house or project execution against the highest priority assets on any installation.

This report set is most useful to achieve the financial incentive and more importantly, ensure high quality data are available to users such as project programmers, engineers, planners, and R&O staff.

1. 14A: There should be an assessment recorded for every active system in each valid asset. The report shows white blocks where assessments are needed but have not been entered. Systems not present should be deleted which will show as "N/A" on this report output.
2. 14B: All active systems for valid assets must contain current assessments. Current means less than 5 years old. At least 90% of all sections within a system must be current for the system to be current, and all active systems must be current for the asset to be counted as current.
3. 14C: Data Quality. For the same set of asset records as shown in the 14A and 14B reports, each asset must comply with three selected data quality measures. The first measure is inspection comment compliance. There should be a comment for every rating of Amber/Red. The second measure is section install date. All section install dates must not be older than the facility build date. The third and final quality measure is the component replacement value (CRV) compared to the plant replacement value (PRV). No CRV should ever be greater than the PRV and if it is then there is a data quality problem of some kind with the offending section that must be corrected.

**4. Scenario Summary Report**

The Scenario Summary report predicts future work requirements for up to 10 years into the future for each asset based on existing component conditions, component ages, and known component service life durations. The report displays recommended work actions, including paint, repair, and replacement work items and summarizes the annual projected dollar amounts by asset and by fiscal year.

This report is most useful to identify future work for both in-house and project accomplishment.

1. Systems that contain only one or few components that are at end of life could

be considered for replacement through proactive in-house accomplishment to restore the system to good condition. These work items could be used to enable job skills training, prevent emergencies, and to increase facility operational reliability. The Sub-AMP and AMP managers should make recommendations for in-house work items to meet these individual objectives as they support squadron objectives. The best way to do this is to filter the report for “replace” items, provided sorted results to the affected shops for line-item validation, and then initiate service tasks in NexGen IT for the validated work items to begin the execution process. In this way, and Operations Flight can introduce proactive work requirements into their workload to reduce emergencies and improve facility reliability.

2. Systems that contain a single system that is significantly degraded should be considered for ExPlan programming and accomplishment. Regardless of the facility MDI, the scope of such work typically will not be large enough to compete for centralized funding through the AFCAMP. These facilities could also be considered for grouping together with other facilities containing similarly degraded systems for a mutli-facility project. Examples of this might be only roof replacements, or perhaps only roofs and HVAC systems, or only HVAC and fire system upgrades. In all of these examples the scopes would not be large enough to warrant seeking centralized funding.

3. Systems that contain multiple degraded systems, especially high MDI assets, should be programmed to compete for AFCAMP funding. These can be identified in the Scenario Summary report due to the high cost and possibly large quantity of recommended work items across the 10-year forecast period. This predicted list of requirements coupled with first-hand knowledge of the mission and facility will lead to devising and implementing the best possible course of action in keeping facilities operating at a high level.

## 2. BUILDER Tips to Aid in the VAST Process - DELETED

The VAST capability has been discontinued. AFCEC and CERL have created three pre-formatted scenarios for every active AF installation, and CERL runs each scenario twice per year to ensure data currency. Base personnel can run any of these three scenarios more frequently than every 6 months to obtain even more up-to-date future work forecasts from the BUILDER SMS. To extract the scenario summary data, simply choose the “AF Scenario Summary” custom report within BUILDER and choose the version with the desired length. The available scenarios are three, six, and ten years long respectively.

## 3. BUILDER Opportunities/Projects Using the AFCAMP Business Rules

When determining the viability of a project or opportunity in BUILDER, additional calculations are sometimes required. To obtain reliable, repeatable, and valid calculations, the Project Scoring Worksheet is an accepted Tool. For additional guidance on the Project Scoring Worksheet, refer to the Business Rules in the AFCAMP Playbook which is updated annually.

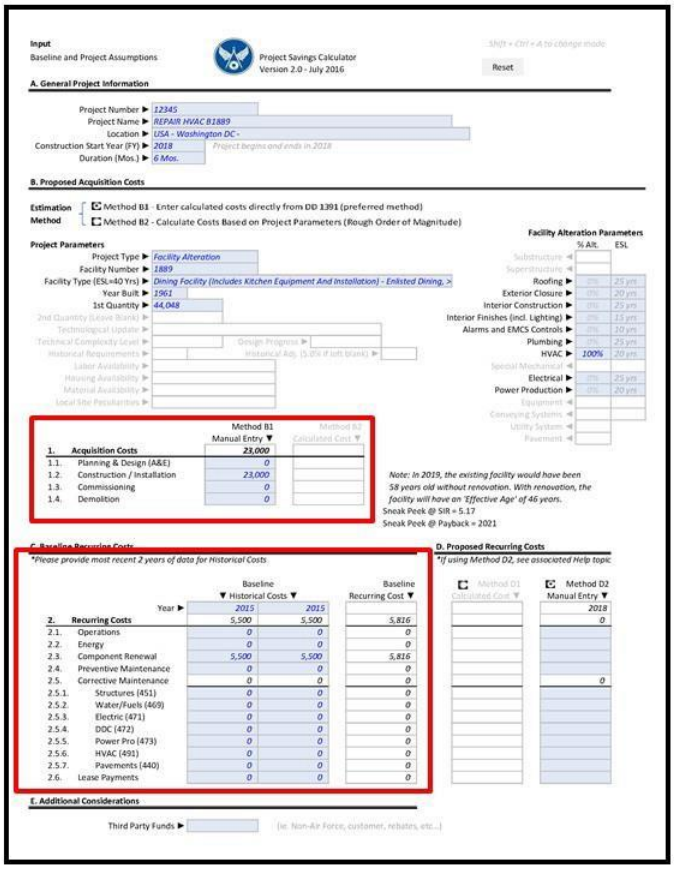
## Project Scoring Worksheet

This shows where to put the information in a project savings calculator. It is available

***Facilities Project Scoring Worksheet***

*NOTES ON USING THIS WORKSHEET*
*1. This worksheet assists in calculating a "Project CI" and Project MDI" by cost weighting individual System Components. This worksheet also calculates a "Project PoF" for a project that includes work driven by both CI (poor condition) and a Change in Function and/or Minor Construction.*
*2. Use the drop down menu in the "Project Element Type" Column to select type of entry: Sustainment, Change of Function or Minor Construction.*
*3. For Repair (Sustainment) or Repair (R&M) project elements, enter Condition Indices (CI) from BUILDER-SMS for each Component-Section, Component, and/or System within the project's scope. Programmers should use common sense to determine what CI to use (Component-Section (CSCI), Component (BCI), System (SCI)). For example, a fire protection System overhaul might use SCI; an HVAC system requiring Component and/or Component-Section repairs may use BCI and/or CSCI as determined by the project scope. Do not enter a PoF for Sustainment project elements as PoF will be automatically calculated.*
*4. For Minor Construction project elements and Change of Function project elements, enter (select in pull down) the appropriate PoF as described in the Minor Construction and Change of Function sections in the AFCAMP Business Rules. Do not enter a UNIFORMAT Code or CI for Minor Construction or Change of Function project elements.*
*5. Upload this Project Scoring Worksheet as indicated in the Validation Documents Section in the AFCAMP Business Rules.*

| Project Number: | 5GBP130040 | | Project Title: | RPR FIRE SUPPRESSION BENNIE DAVIS, B457 | | | |
|---|---|---|---|---|---|---|---|
| Project Element Type (select) | Facility Number | Facility MDI | UNIFORMAT Code | Description | CI from SMS | PoF (select) | Cost |
| Repair (Sustainmen | 457 | 70 | D40 | FIRE PROTECTION | 33 | | $7,000,000.00 |
| | | | | | | | |
| | | | | | | | |
| | | | | | | |



Input
Baseline and Project Assumptions

Project Savings Calculator
Version 2.0 - July 2016

Reset

A. General Project Information

Project Number ▶ 12345
Project Name ▶ REPAIR HVAC B1889
Location ▶ USA - Washington DC -
Construction Start Year (FY) ▶ 2018 — Project begins and ends in 2018
Duration (Mos.) ▶ 6 Mos.

B. Proposed Acquisition Costs

Estimation Method
☐ Method B1 - Enter calculated costs directly from DD 1391 (preferred method)
☐ Method B2 - Calculate Costs Based on Project Parameters (Rough Order of Magnitude)

Project Parameters
Project Type ▶ Facility Alteration
Facility Number ▶ 1889
Facility Type (ESL=40 Yrs) ▶ Dining Facility (Includes Kitchen Equipment And Installation) - Enlisted Dining, >
Year Built ▶ 1961
1st Quantity ▶ 44,048
2nd Quantity (Leave Blank) ▶
Technological Update ▶
Technical Complexity Level ▶
Historical Requirements ▶ — Design Progress ▶ — Historical Adj. (5.0% if left blank) ▶
Labor Availability ▶
Housing Availability ▶
Material Availability ▶
Local Site Peculiarities ▶

Facility Alteration Parameters

| | % Alt. | ESL |
|---|---|---|
| Substructure ◀ | | |
| Superstructure ◀ | | |
| Roofing ▶ | 0% | 25 yrs |
| Exterior Closure ▶ | 0% | 20 yrs |
| Interior Construction ▶ | 0% | 25 yrs |
| Interior Finishes (incl. Lighting) ▶ | 0% | 15 yrs |
| Alarms and EMCS Controls ▶ | 0% | 10 yrs |
| Plumbing ▶ | 0% | 25 yrs |
| HVAC ▶ | 100% | 20 yrs |
| Special Mechanical ◀ | | |
| Electrical ▶ | 0% | 25 yrs |
| Power Production ▶ | 0% | 20 yrs |
| Equipment ◀ | | |
| Conveying Systems ◀ | | |
| Utility System ◀ | | |
| Pavement ◀ | | |

| | | Method B1 Manual Entry ▼ | Method B2 Calculated Cost ▼ |
|---|---|---|---|
| 1. | Acquisition Costs | 23,000 | |
| 1.1. | Planning & Design (A&E) | 0 | |
| 1.2. | Construction / Installation | 23,000 | |
| 1.3. | Commissioning | 0 | |
| 1.4. | Demolition | 0 | |

Note: In 2019, the existing facility would have been 58 years old without renovation. With renovation, the facility will have an 'Effective Age' of 46 years.
Sneak Peek @ SIR = 5.17
Sneak Peek @ Payback = 2021

C. Baseline Recurring Costs
*Please provide most recent 2 years of data for Historical Costs

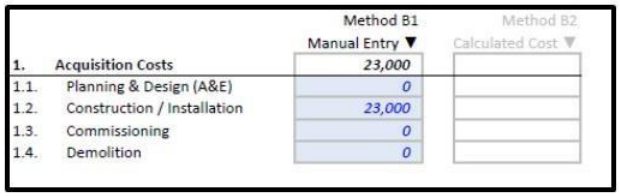
| | | Baseline ▼ Historical Costs ▼ | | Baseline Recurring Cost ▼ |
|---|---|---|---|---|
| | Year ▶ | 2015 | 2015 | |
| 2. | Recurring Costs | 5,500 | 5,500 | 5,816 |
| 2.1. | Operations | 0 | 0 | 0 |
| 2.2. | Energy | 0 | 0 | 0 |
| 2.3. | Component Renewal | 5,500 | 5,500 | 5,816 |
| 2.4. | Preventive Maintenance | 0 | 0 | 0 |
| 2.5. | Corrective Maintenance | 0 | 0 | 0 |
| 2.5.1. | Structures (451) | 0 | 0 | 0 |
| 2.5.2. | Water/Fuels (469) | 0 | 0 | 0 |
| 2.5.3. | Electric (471) | 0 | 0 | 0 |
| 2.5.4. | DDC (472) | 0 | 0 | 0 |
| 2.5.5. | Power Pro (473) | 0 | 0 | 0 |
| 2.5.6. | HVAC (491) | 0 | 0 | 0 |
| 2.5.7. | Pavements (440) | 0 | 0 | 0 |
| 2.6. | Lease Payments | 0 | 0 | 0 |

D. Proposed Recurring Costs
*If using Method D2, see associated Help topic

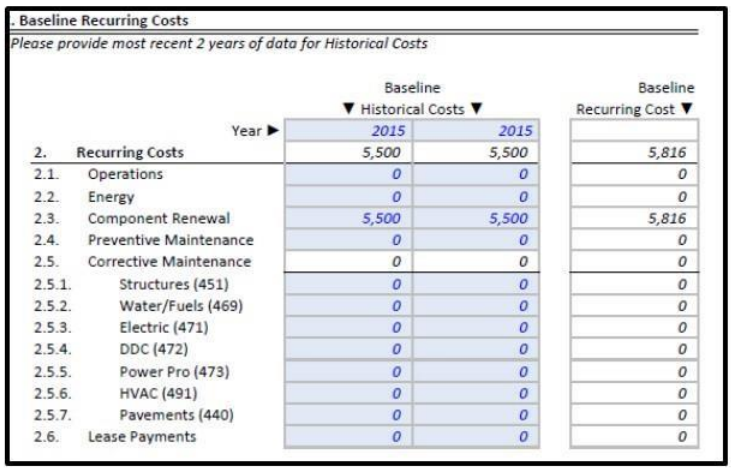
| | Method D1 Calculated Cost ▼ | Method D2 Manual Entry ▼ |
|---|---|---|
| | | 2018 |
| 2. | | 0 |
| 2.1. | | |
| 2.2. | | |
| 2.3. | | |
| 2.4. | | |
| 2.5. | | 0 |
| 2.5.1. | | |
| 2.5.2. | | |
| 2.5.3. | | |
| 2.5.4. | | |
| 2.5.5. | | |
| 2.5.6. | | |
| 2.5.7. | | |
| 2.6. | | |

E. Additional Considerations

Third Party Funds ▶ (ie. Non-Air Force, customer, rebates, etc...)



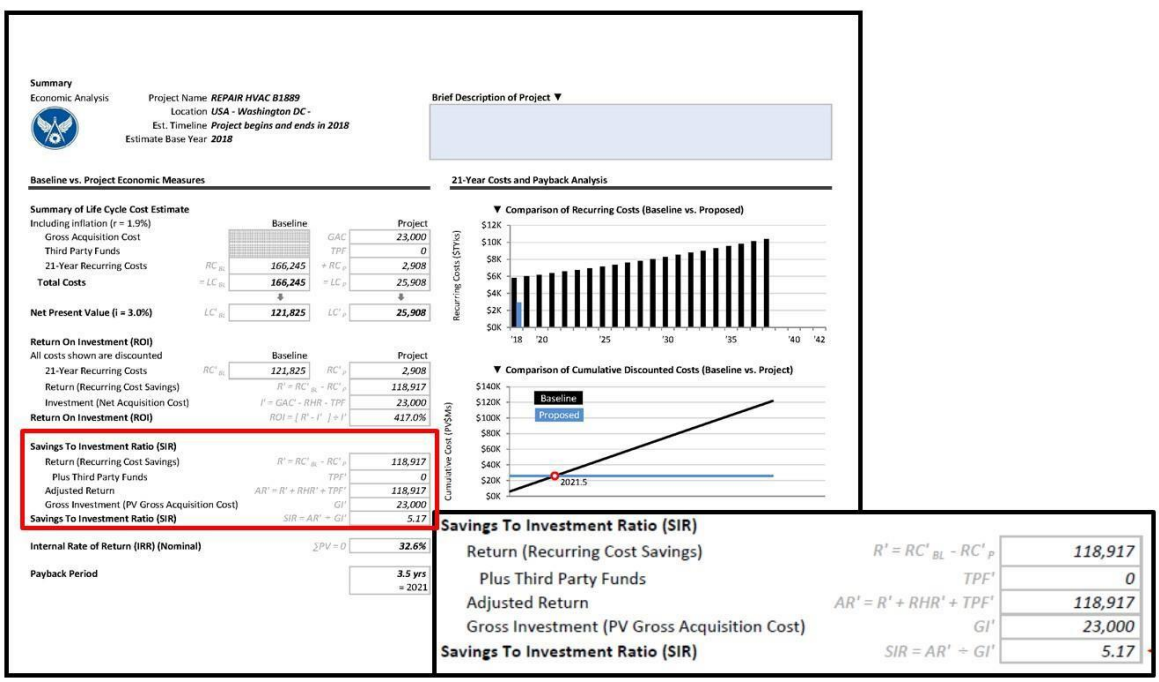
| | | Method B1 Manual Entry ▼ | Method B2 Calculated Cost ▼ |
|---|---|---|---|
| 1. | Acquisition Costs | 23,000 | |
| 1.1. | Planning & Design (A&E) | 0 | |
| 1.2. | Construction / Installation | 23,000 | |
| 1.3. | Commissioning | 0 | |
| 1.4. | Demolition | 0 | |



. Baseline Recurring Costs
*Please provide most recent 2 years of data for Historical Costs*

| | | Baseline ▼ Historical Costs ▼ | | Baseline Recurring Cost ▼ |
|---|---|---|---|---|
| | Year ▶ | 2015 | 2015 | |
| 2. | Recurring Costs | 5,500 | 5,500 | 5,816 |
| 2.1. | Operations | 0 | 0 | 0 |
| 2.2. | Energy | 0 | 0 | 0 |
| 2.3. | Component Renewal | 5,500 | 5,500 | 5,816 |
| 2.4. | Preventive Maintenance | 0 | 0 | 0 |
| 2.5. | Corrective Maintenance | 0 | 0 | 0 |
| 2.5.1. | Structures (451) | 0 | 0 | 0 |
| 2.5.2. | Water/Fuels (469) | 0 | 0 | 0 |
| 2.5.3. | Electric (471) | 0 | 0 | 0 |
| 2.5.4. | DDC (472) | 0 | 0 | 0 |
| 2.5.5. | Power Pro (473) | 0 | 0 | 0 |
| 2.5.6. | HVAC (491) | 0 | 0 | 0 |
| 2.5.7. | Pavements (440) | 0 | 0 | 0 |
| 2.6. | Lease Payments | 0 | 0 | 0 |

This shows that the result of replacing an HVAC unit that was breaking frequently has an SIR of 5.17. An SIR over 1.2 is considered competitive. That is more than enough to justify funding the replacement.



Summary
Economic Analysis

Project Name REPAIR HVAC B1889
Location USA - Washington DC -
Est. Timeline Project begins and ends in 2018
Estimate Base Year 2018

Brief Description of Project ▼

Baseline vs. Project Economic Measures

Summary of Life Cycle Cost Estimate
Including inflation (r = 1.9%)

| | | Baseline | | Project |
|---|---|---|---|---|
| Gross Acquisition Cost | | | GAC | 23,000 |
| Third Party Funds | | | TPF | 0 |
| 21-Year Recurring Costs | $RC_{BL}$ | 166,245 | $+ RC_P$ | 2,908 |
| Total Costs | $= LC_{BL}$ | 166,245 | $= LC_P$ | 25,908 |
| Net Present Value (i = 3.0%) | $LC'_{BL}$ | 121,825 | $LC'_P$ | 25,908 |

Return On Investment (ROI)
All costs shown are discounted

| | | Baseline | | Project |
|---|---|---|---|---|
| 21-Year Recurring Costs | $RC'_{BL}$ | 121,825 | $RC'_P$ | 2,908 |
| Return (Recurring Cost Savings) | | | $R' = RC'_{BL} - RC'_P$ | 118,917 |
| Investment (Net Acquisition Cost) | | | $I' = GAC' - RHR - TPF$ | 23,000 |
| Return On Investment (ROI) | | | $ROI = [R' - I'] \div I'$ | 417.0% |

Savings To Investment Ratio (SIR)

| | | |
|---|---|---|
| Return (Recurring Cost Savings) | $R' = RC'_{BL} - RC'_P$ | 118,917 |
| Plus Third Party Funds | $TPF'$ | 0 |
| Adjusted Return | $AR' = R' + RHR' + TPF'$ | 118,917 |
| Gross Investment (PV Gross Acquisition Cost) | $GI'$ | 23,000 |
| Savings To Investment Ratio (SIR) | $SIR = AR' \div GI'$ | 5.17 |

| | | |
|---|---|---|
| Internal Rate of Return (IRR) (Nominal) | $\sum PV = 0$ | 32.6% |
| Payback Period | | 3.5 yrs = 2021 |

21-Year Costs and Payback Analysis

▼ Comparison of Recurring Costs (Baseline vs. Proposed)
Recurring Costs ($Yrs)
$12K, $10K, $8K, $6K, $4K, $2K, $0K
'18, '20, '25, '30, '35, '40, '42

▼ Comparison of Cumulative Discounted Costs (Baseline vs. Project)
Cumulative Cost (PV$M$)
$140K, $120K, $100K, $80K, $60K, $40K, $20K, $0K
Baseline
Proposed
2021.5

Savings To Investment Ratio (SIR)

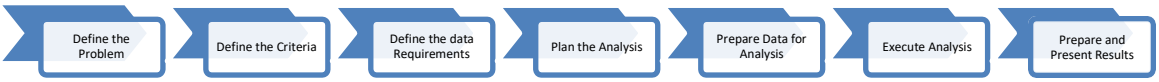
| | | |
|---|---|---|
| Return (Recurring Cost Savings) | $R' = RC'_{BL} - RC'_P$ | 118,917 |
| Plus Third Party Funds | $TPF'$ | 0 |
| Adjusted Return | $AR' = R' + RHR' + TPF'$ | 118,917 |
| Gross Investment (PV Gross Acquisition Cost) | $GI'$ | 23,000 |
| Savings To Investment Ratio (SIR) | $SIR = AR' \div GI'$ | 5.17 |

## *Extracting Value Using AF Institute of Technology Data Analysis Guidance*

Data should provide an *accurate* representation of the physical world and be relatively simple/cheap to collect and maintain. It is very important to ensure the cost of collection/analysis is proportional to the value added to the decision that it supports.

The installations are interested in 2 types of data, inventory which *does not* change with time and attributes which *do* change with time. Data Analysis should realize one of two outcomes, support a decision, recommendation or direction, and/or confirm or remove a bias.

### 1. The Data Analysis Process




1. Define the Problem.

   This is the single most important step in the data analysis process. The question or definition of the problem must be clear, concise, and measurable. Is the analysis to support a decision, provide a recommendation or confirm a bias?

2. Define the Criteria.

   The criteria determine what data is required to perform the analysis. What kind of analysis is being done? Is it qualitative or quantitative analysis? What criteria will provide value to the decision, problem, or bias? The types of data required in this scenario could be condition, cost, size, MDI, or a combination thereof.

3. Identify Data Requirements.

   Prior to beginning the collection of data, it is imperative to define what data is required. To be effective, answer the question of, “what data do I need” prior to beginning the data collection. The problem defines the criteria. A criterion defines the data requirements.

4. Plan the Analysis.

   The chosen methodology and technique must be understood by the person performing the analysis. For accurate, useful, and repeatable analysis, prior to beginning the analysis, plan the approach and method to achieve the results desired. When the data sends the analyst down a rabbit hole, sometimes it requires the removal of a parameter, quality, or specific attribute to remove the unnecessary data. Unnecessary data could hide the real issue or provide data that is not relevant to the question/definition the analyst is trying to answer. For example, condition analysis uncovers a slew of age-based assessments skewing condition values. Is this relevant to the problem being investigated or should these criteria be removed from the dataset?

5. Prepare the Data for Analysis.

   Microsoft Excel is a tool useful to analysis. Spreadsheets can display a huge amount of data without issue. This can be overwhelming. Data trimming is sometimes required to remove information that is unnecessary. Hiding or removing a column has the potential to make the spreadsheet more manageable and understandable. Column or row-based hiding or removal makes data easier to filter, sort, and analyze.

   a. How to Trim Data (Column-Based Hiding or Removal).

      i. Select the entire column you do not want (to see).

      ii. Right Click your mouse.

iii. Select delete or hide. Be careful with deleting any information.

b. How to Filter Data (Row-Based Hiding or Removal).

i. Highlight all cells in the header row.

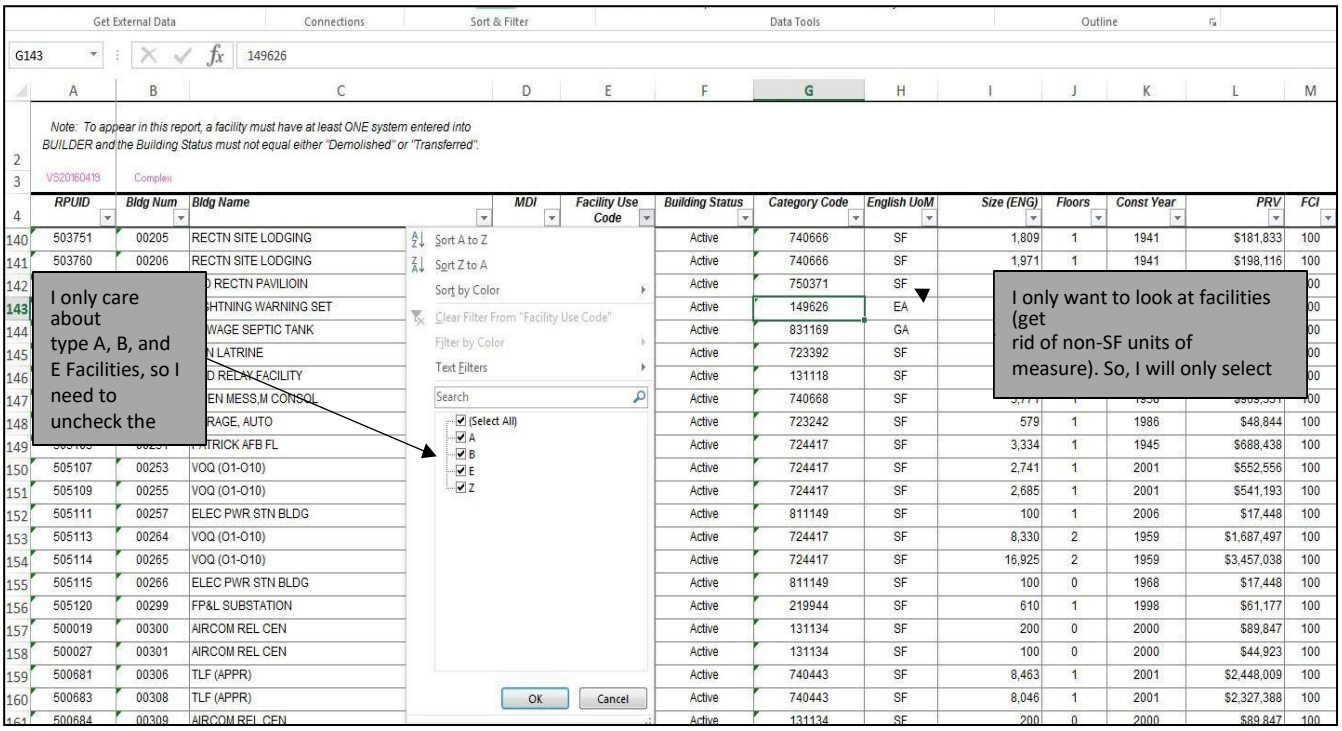
ii. Go to the Data tab.

iii. Select Filter.

iv. On the column containing the information requiring a filter, click the dropdown arrow.

v. Select the items to isolate/view.

vi. Select enter. This should reduce the amount viewed to the specific criterion desired.




6. Execute the Analysis.

To perform the analysis effectively, it is necessary to remove or highlight outliers and anomalies. Sort and search (also known as abnormality detection) allows the finding of the best and/or worst condition through a sort function. To find the outliers, highlight one of the headers and click sort.

A Pivot Table is a useful data summary tool for simplifying large quantities of data. To accomplish the creation of a pivot table, the user sets up and changes the summary's structure by "dragging & dropping" fields graphically. The attributes (columns) in data can be made into filters, columns, rows, or values in a summary table of many rows.

To manually create a PivotTable:

1. Click a cell in the source data or table range.

2. Go to Insert > Tables > Recommended PivotTable.

3. Excel analyzes your data and presents you with several options.
4. Select the PivotTable that looks best to you and press OK

7. Prepare and Present the Results.

   The results of the data analysis are reported in a format as required by the users to support decisions and further action. The feedback from the users might result in additional analysis. The data analysts can choose data visualization techniques, such as tables and charts, which help in communicating the message clearly and efficiently to the users. The data visuals should be simple and legible. They should not create more questions than they answer. The analysis tools should highlight the important information with color and form. Labels and context are essential.

## 2. Data Analysis Question and Answer Example

1. Define the Problem:

   *What are my "worst" mechanical assets on the installation?*

2. Define the Criteria:

   *Condition and Age*

3. Identify Data Requirements. (What data will I use to evaluate criteria?)

   *Component Section Condition Index (CSCI) (or aggregated Condition Index (CI)), Remaining Service Life (RSL), Facility Number.*

4. Plan the Analysis. (What are you going to do?)

   *Worst D30 (HVAC) Assets.*

   a. *Download DIGON QA report from BUILDER.*
   b. *Trim & Filter to only D30 (HVAC).*
   c. *Filter to only direct ratings (no age-based).*
   d. *Generate worst first list. The worst first list is sorted based on the asset that has the "worst" rating in the given criteria as "first" on the list for repair or replacement.*

5. Prepare Data for Analysis.

   a. *Trim: Keep Facility Number, Facility Name, System, Component, Section, Sub-Type, Inspection Type, Expected CI, Current Estimated CI, Replacement Cost, Design Life, Age, RSL.*
   b. *Filter: Using the filters, remove any outliers and anomalies.*

6. Execute the Analysis.

   a. *Sort: Current Estimated CI lowest to highest.*

      i. *Rabbit hole #1: Lots of "general equipment" needs to be inventoried properly (guidance in SMS Playbook Toolbox).*

      ii. *Rabbit hole #2: Found several instances where condition deterioration was inflated due to inoperable equipment (go fix the equipment!!).*

   b. *Using the guidance provided above in Step 6, run Pivot Tables to aggregate CI data (unweighted).*

7. Present the Results:

   a. *Found lots of improperly inventoried equipment.*

*b. Average CI is not adjusted for CRV.*

*c. D30 data would benefit from some scrubbing to improve reliability.*

*d. Some abnormalities between what BUILDER expects and the condition value input to the system.*

*e. QC3 would have done this much faster.*

| Worst Facility | Facility # | Facility Name | Avg of Current Est CI |
|---|---|---|---|
| 1 | 00100 | MULTIPURP REC BLDG | 10 |
| 2 | 00101 | RADOME TWR BLDG | 10 |
| 3 | 00102 | RDR TWR BLDG | 10 |
| 4 | 02434 | EXCH, SALES STORE | 29.58248333 |
| 5 | 01322 | SHP CONVL MUN | 30 |
| 6 | 02145 | PHOTO LAB, RECON | 30.99687333 |
| 7 | 24177 | SHP JET ENG I / MNT | 34.1173 |
| 8 | 01074 | OMNI | 34.1909 |
| 9 | 02459 | MAINT DOCK, FL SYS | 37.95095 |
| 10 | 01025 | ELEC PWR STN BLDG | 38.9551 |

## *Case Studies and Best Practices*

### Using BUILDER's Work Planning Module

The following process was developed by RAF Lakenheath, GB, to operationalize BUILDER data. Installations continue to conduct Facility Condition Assessments (FCA) on facilities not previously inventoried and conducting the periodic 5-year updates. This process will potentially change the inventories and condition on approximately 20% of an installation's facilities each year.

The process below can be used for individual facilities as a facility's FCA is produced or updated to determine if previously determined work items are still necessary or can be deferred, if a component has deteriorated faster than predicted and needs to be addressed or a facility that is receiving its first FCA has defects requiring more immediate attention.

This planning process uses BUILDER reports to determine potential Work Items, validate the Work Items being generated are according to the AF Standards and Policies for a facility's Mission Dependency Index (MDI), validate the current condition of Work Item components, determine an execution method, determine/validate costs, and coordinate for appropriate execution action.

1. Navigate to the facility desired for analysis in BUILDER:
   a. Run a Standard Condition Index Detail Report.
   b. Export the report to an Excel spreadsheet.
   c. Note the MDI of the facility.
2. Go to the Work Configuration tab in BUILDER:
   a. Select Policies/Condition Policies/USAF.
   b. Look up the MDI.
   c. Add a new column to the exported Standard Condition Index Detail Report.
   d. Annotate on the Standard Condition Index Report the Standard for each system.
3. Return to the Work Configuration tab in BUILDER:
   a. Select Standards/AF/Condition Standards.
   b. Annotate in two new columns on the Condition Index Detail Report:
      i. The individual Standards for each system (i.e., Minimum Condition (CI) for Repair).

ii. Maximum Remaining Service Life (RSL) for Replacement in the added new columns on the Condition Index Detail Report Excel spreadsheet.

4. Review the Standard Condition Index Report to identify suitable work candidates.
   a. Compare the minimum CI for Repair with the column R for each Section CI – Current Estimated). This allows identification of any Component-Section inspections that might be out of cycle (column W – inspection over 5 years ago) or any CSCI that are age based and not condition based (column R with no assessment CI for the Last Insp.)
5. Depending on the Component Section Condition Index (CSCI) score and number of Work Item candidates, decide the best execution method. Some may be singular Work Item candidates for immediate In-House Organic or In-House Contract Work. If there are numerous Work Item candidates of sufficient magnitude, a Project can be programmed for the Integrated Project List (IPL) for the appropriate year. If immediate action is required (i.e. work required within the next 2 years), a Service Request can be developed and processed through the normal Work Requirements Review Board (WRRB) for funding/execution. If a Project is required to be programmed for execution by CEN, proceed to the Work Plan.
6. Once in the Work Plan tab:
   a. Navigate to the required facility.
   b. Generate Items and Prioritize the Work Items in the Work Plan for the current and next Fiscal Years. The Work Items should be checked against the Condition Index Detail Report to ensure the Work Items are correct and following the correct trigger points established by the Standards and Policies.
7. Add a Project to the Work Plan
   a. Select the Work Items from the Generated Items or load them manually through the Add New Work Item process to develop a Project(s).
   b. Open the Detail for each Work Item in the Work Plan.
   c. Conduct a 'Cost Analysis' to identify the best ROI and ensure that the cost is realistic.
   d. Amend the Work Cost, if required.
8. Once all the Work Items are added to a Project(s):
   a. Select the Reports icon.
   b. Run a Work Plan Detail by Year report.
   c. Export the report to Excel.
   d. Filter the report to only show the Work Items for each Project.
9. The Work Plan Detail by Year report:
   a. Print and attach to a Service Request (NexGen IT) or AF Form 332 (ACES).
   b. Process through the WRRB.
   c. Forward to CEN for programming. Note: The Service Request / AF Form 332 number should be annotated on the Project General Information tab in the Work Plan section in BUILDER. An electronic copy of the Work Plan can be saved to an appropriate folder in the appropriate share drive for the CEN programmer's to access.

This process requires repeating on all desired facilities.

The process is not hard - just methodical. After running the process on several facilities, it becomes much easier and helps the Data Managers have a better understanding on the processes (Policies, Standards, trigger points, etc.) within BUILDER, apply what was learned in the Data Manager AFIT Course on Work Planning and, to some extent, how the scenario summary report works.

Regardless of how a Work Item is planned for execution, the Work Item needs to be validated as to the current condition of the component.

**RESULTS:**

RAF Lakenheath used this process after each facility periodic assessment by the Facility Condition Assessment Team (FCAT) on all their mission essential facilities (TIER 1). Work Item candidates were identified for immediate in-house execution or postured for IPL project development. They identified, validated, and priced approximately $10M of sustainment work and then went on to analyze their TIER 2, 3 and 4 facilities data. This process is being utilized to identify potential current mission Unspecified Minor Military Construction (UMMC) and MILCON projects whenever it is not economical to continue to sustain existing facilities.

Just one example of how they utilized this process: RAF Lakenheath had originally developed a project to repair the HVAC system to a munitions processing facility. However, upon analysis of the BUILDER data, it was apparent a full facility repair project was required.

Because of the operational sensitivity of the facility, it was felt that running successive projects wasn't the best option. The facility's repair needs and a recommended way forward was advocated to 48 CES leadership. RAF Lakenheath used available O&M funds to carry out 'Stop gap' repairs to ensure the systems remained operational. 48 CES/CEN engaged with AFIMSC to secure additional funding resulting in a $4.165M full facility repair project.

Of note, RAF Lakenheath did not wait before using the data for Work Planning. They analyze each facility as they complete the inventory and assessments, and then use BUILDER directly to augment the Work Plan and justify requirements.

Note: Additional information on Case Studies and Best Practices can be found on the SMS BUILDER Workspace.

## SMS Playbook Acronyms

***A***

| | |
|---|---|
| AAFES | Army Air Force Exchange Service |
| AAS | Aircraft Arresting Systems |
| ACC | Air Combat Command |
| ACES | Automated Civil Engineering System |
| ACES-PM | Automated Civil Engineering System – Project Management |
| ACES-RP | Automated Civil Engineering System – Real Property |
| AETC | Air Education and Training Command |
| AF | Air Force |
| AFB | Air Force Base |
| AFCAMP | Air Force Comprehensive Asset Management Plan |
| AFCEC | Air Force Civil Engineer Center |
| AFCEC/CO | Air Force Civil Engineer Center/Operations Directorate |
| AFCEC/COA | Air Force Civil Engineer Center/Operations Directorate – Asset Visibility Division |
| AFCEC/COAP | Air Force Civil Engineer Center/Operations Directorate – Asset Visibility Division, Airfield Pavement Evaluation Branch |
| AFCEC/DTS | Air Force Civil Engineer Center/Data Transformation Services |
| AFMAN | Air Force Manual |
| AFI | Air Force Instruction |
| AFRPA | Air Force Real Property Assets |
| AFWAY | Air Force Way |
| AHU | Air Handling Unit |
| AMP | Activity Management Plan |
| APE | Airfield Pavement Evaluation |
| AP | Apron |
| ASRR | Airfield Suitability and Restrictions Report |
| ASTM | American Society for Testing and Materials |
| ATL | Acquisition, Technology, and Logistics |

| | |
|---|---|
| ATO | Authority to Operate |

***B***

| | |
|---|---|
| BCAMP | Base Comprehensive Asset Management Plan |
| BCCI | Building Component Condition Index |
| BCE | Base Civil Engineer |
| BCI | Building Condition Index |
| BIA | Built Infrastructure Assessment |
| BIAT | Built Infrastructure Assessment Team |
| BR | Business Rules |
| BRED | BUILDER Remote Entry Database |

***C***

| | |
|---|---|
| CAMP | Comprehensive Asset Management Program |
| CATCODE | Category Code |
| CE | Civil Engineer |
| CEN | Engineering Flight |
| CERL | Construction Engineering Research Laboratory |
| CES | Civil Engineer Squadron |
| CI | Condition Index |
| CONUS | Continental United States |

***D***

| | |
|---|---|
| DAA | Designated Approval Authority |
| DCS | Defense Collaboration Services |
| DD | Department of Defense form number |
| DeCA | Defense Commissary Agency |
| DET | Detachment |
| DHA | Defense Health Agency |
| DLA | Defense Logistics Agency |
| DoD | Department of Defense |
| DoDEA | Department of Defense Education Activity |
| DSW | Direct Scheduled Work |

***E***

| | |
|---|---|
| EA | Engineering Assistants |
| EMCS | Energy Management Control System |
| EQ | Environmental Quality |
| ERDC | Engineer Research and Development Center |
| ETL | Engineering Technical Letter |

| | |
|---|---|
| ***F*** | |
| FAC | Facility Analysis Category |
| FACID | Facility Identification |
| FAsT | Fuels Assessment Tool |
| FCA | Facility Condition Assessment |
| FCI | Facility Condition Index |
| FES | Fire Emergency Services |
| FHWA | Federal Highway Administration |
| FIAR | Financial Improvement and Audit Readiness |
| FOA | Field Operating Agency |
| FoB | Found on Base |
| F&OTM | Fasteners and Other Track Materials |
| FUB | Facilities Utilization Board |
| FYDP | Future Years Defense Program |
| ***G*** | |
| GIS | Geographic Information System |
| GSU | Geographically Separated Units |
| ***H*** | |
| HAF/A4 | Headquarters Air Force/Logistics, Installations and Mission Support |
| HAF-GIO | Headquarters Air Force Geo Integration Office |
| HDPE | High-Density Polyethylene |
| HQ AFSPC/A6S | Headquarters Air Force Space Command/Communications and Information Software |
| HVAC | Heating, Ventilation, and Air Conditioning |
| HWD | Heavy Weight Deflectometer |
| ***I*** | |
| ID | Identification |
| IDIQ | Indefinite Delivery Indefinite Quantity |
| IE | Installations and Environment |
| IGIS | Installation Geospatial Information System |
| IPL | Integrated Priority List |
| IWIMS | Integrated Work Information Management System |
| IT | Information Technology |
| ***J*** | |
| | |
| ***K*** | |
| KPI | Key Performance Indicators |
| KVA | Kilo Volt Amps |

| | |
|---|---|
| ***L*** | |
| LF | Linear Feet |
| LOS | Levels of Service |
| LS | Linear Segmentation |
| ***M*** | |
| MAJCOM | Major Command |
| MDI | Mission Dependency Index |
| M&R | Maintenance and Repair |
| ***N*** | |
| NAVAIDS | Navigational Aids |
| NCOIC | Non-Commissioned Officer in Charge |
| NEX | Navy Exchange |
| ***O*** | |
| OCONUS | Outside the Continental United States |
| OH | Overhead |
| OPG | Operation Program Group |
| OSD | Office of the Secretary of Defense |
| OSD/IE | Office of the Secretary of Defense/Installations and Environment |
| ***P*** | |
| PAD | Program Action Directive |
| PCASE | Pavement-Transportation Computer Aided Structural Engineering |
| PCC | Portland Cement Concrete |
| PCI | Pavement Condition Index |
| PCN | Pavement Classification Number |
| PM | Preventive Maintenance |
| PMP | Preventive Maintenance Plan |
| PMTL | Preventive Maintenance Task List |
| POC | Point of Contact |
| POM | Program Objective Memorandum |
| P-Plan | Programming Plan |
| PVC | Polyvinyl chloride |
| ***Q*** | |
| QC | Quality Control |
| ***R*** | |
| R/A/G | Red/Amber/Green |
| RCI | Rail Condition Index |
| RED | Remote Entry Database |
| RETAI | Real Estate Transactions, Accountability, and Inventory |

| | |
|---|---|
| R&O | Requirements and Optimization |
| ROI | Return On Investment |
| ROOFER | Roofing management system |
| RP | Real Property |
| RPA | Real Property Accountability |
| RPAD | Real Property Asset Database |
| RPI | Real Property Inventory |
| RPIE | Real Property Installed Equipment |
| RPIM | Real Property Information Model |
| RPIR | Real Property Inventory Requirements |
| RPO | Real Property Office |
| RPSUID | Real Property Site Unique Identifier |
| RPUID | Real Property Unique Identifier |
| RSL | Remaining Service Life |

***S***

| | |
|---|---|
| SDSFIE | Spatial Data Standard for Facilities, Infrastructure, and Environment |
| SF | Square Feet |
| SMS | Sustainment Management System |
| SMSWIG | Sustainment Management System Implementation Working Group |
| SOP | Standard Operating Procedure |
| SOW | Statement of Work |
| SRM | Sustainment, Restoration, and Modernization |
| sub-AMP | sub – Activity Management Plan |
| SY | Square Yards |

***T***

| | |
|---|---|
| TBD | To Be Determined |
| TDS | Total Dissolved Solids |
| TERPS | Terminal Instruments Procedures |
| TNAP | Transportation Networks and Airfield Pavements |

***U***

| | |
|---|---|
| UFC | Unified Facilities Criteria |
| UG | Underground |
| USC | United States Code |
| USACE | United States Army Corps of Engineers |
| USAF | United States Air Force |
| USAFR | United States Air Force Reserve |

***V***

***W***

| | |
|---|---|
| WRRB | Work Requirements Review Board |

***X***

***Y***

***Z***