INVENTORY AND CONDITION ASSESSMENT

PHASE II REPORT

U.S. Department of the Interior
Office of Insular Affairs

Insular ABCs

Insular Schools Assessment of Buildings and Classrooms

August 2013

US Army Corps of Engineers
Honolulu District

Helber Hastert & Fee
Planners, Inc.

Prologue

The preparers of this report are indebted to the assistance and support provided by the scores of dedicated professionals in the insular area school districts and supporting agencies. Their advice and keen insight into local conditions was invaluable.

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Insular Schools: Assessment of Buildings and Classrooms

--**Final**--

August 2013

Prepared by:

Helber Hastert & Fee, Planners

Under contract with:

US Army Corp of Engineers, Honolulu District

Prepared for:

US Department of the Interior, Office of Insular Affairs

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Contents

Acronyms

ABCs	Insular Schools: Assessment of Buildings and Classrooms
CIP	Capital improvement project
CNMI	Commonwealth of the Northern Mariana Islands
CRV	Current replacement value
DM	Deferred maintenance
DOI	US Department of the Interior
DPW	Department of Public Works
ECM	Energy conservation measure
EAM	Enterprise asset management
FCI	Facility condition index
FIMS	Facility information management system
H/S	Health and safety
IEQ	Indoor environmental quality
M&R	Maintenance and repair
SME	Subject matter expert
USACE	US Army Corps of Engineers
USVI	US Virgin Islands
$M	Million Dollars

Executive Summary

This report documents the findings of an assessment of the physical condition of public schools (Kindergarten – Grade 12) in the US Insular Areas (Commonwealth of the Northern Mariana Islands, Guam, American Samoa and US Virgin Islands). This "Phase II" report is part of the US Department of the Interior/Office of Insular Affairs "Insular ABCs" initiative (Assessment of Buildings and Classrooms) to improve the condition of insular area schools, a goal of DOI's FY11- FY16 Strategic Plan. The report is the second in a series of steps associated with the ABCs Initiative. The first report provided situational awareness, a preliminary assessment of school conditions and a methodology for conducting a comprehensive school condition assessment. This report documents the findings and recommendations of that comprehensive assessment. The third step will be to implement the recommendations following the general scope and timeline provided in this report.

All 115 public K-12 schools in the four insular areas were surveyed between August 2012 and April 2013. Close coordination between the assessment team, school district leadership and staff, and school principals was maintained to gain input and participation and maximize results of the assessment process. Data was input into a relational database which is also accessible via a secure project website. Conditions of key building elements for each building were scored in the field[1] and approximations of associated deferred maintenance (DM) cost were generated through a cost algorithm in location adjusted, 2013 dollars. Quantities, costs and a condition "score" can be aggregated at the building system level, building, school, island, insular area and all insular area levels, and provides OIA and the insular areas with simple metrics to gauge condition of insular schools – and to monitor progress. The accompanying table provides a high level overview of the school inventory.

Insular Schools Summary

	Schools	Buildings	Total SF (M)*	DM ($M)	Replacement Cost** ($M)
Am Samoa	28	293	0.9	$10.0	$100
CNMI	20	298	0.9	$11.3	$162
Guam	35	641	3.0	$89.9	$870
USVI	32	344	2.5	$66.2	$606
Total	**115**	**1,576**	**7.3**	**$177.4**	**$1,738**

*Based on room measurements
**Based on local replacement cost data

The insular area school replacement value is estimated at approximately $1.7 billion. Deferred maintenance is estimated at approximately $177 million, of which approximately 9% is associated with high priority health and safety issues. School grounds conditions were also assessed (e.g., site drainage, pavement conditions, fencing, etc.) and deficiencies were identified, but associated costs were not calculated as part of the Phase II effort. Indoor environmental quality assessments identified practical, low cost options to immediately improve classroom condition (e.g., re-opening sealed windows, improving natural lighting and installing/repairing fans) that are also not directly included in the DM backlog. Energy audits identified cost-effective energy conservation measures to significantly reduce utility bills and improve occupant comfort while reducing electrical and water consumption.

It is recommended that OIA and the insular areas engage closely in a partnership to achieve significant progress in completing ABCs Initiative Phase II recommendations within the next five years.

[1] Deferred maintenance estimates were based on a simple condition rating system using scores ranging from five (no DM) to one (major DM), with zero representing "not present but required."

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1 Introduction

The Insular ABCs initiative represents a partnership between OIA and four insular areas (American Samoa, the Commonwealth of the Northern Mariana Islands (CNMI), Guam, and US Virgin Islands (USVI)) to improve the physical condition of K-12 public schools. This report represents Phase II of a three-phased initiative: the first was a feasibility study undertaken to gain situational awareness, collect preliminary inventory data and establish assessment methodology. The Phase II report provides a first-ever baseline inventory and condition assessment of the insular K-12 public schools (115) identifying deferred maintenance (DM) costs (maintenance that should have been performed but was delayed for a future period), energy conservation measures to reduce overall utility costs and increase energy security, and measures to improve indoor environmental quality conditions to boost student performance.

The Insular Schools: Assessment of Buildings and Classrooms (ABCs) initiative, or Insular ABCs, was initiated to support the US Department of the Interior's (DOI) FY 2011-2016 Strategic Plan Goal #2, Empower Insular Communities, Strategy #1, Improve Quality of Life in the insular areas, the supporting performance measure of which is "Percent of schools in acceptable condition based on specified safety and functionality standards." As stated in the Strategic Plan, the DOI through its Office of Insular Affairs (OIA) "will assist the insular areas to improve the quality of life by pairing access to financial resources for capital improvements and public services with robust oversight, and by improving interagency coordination on insular issues." Implementation of the Phase II recommendations represents the third and final phase and is outlined in Chapter 6.

The report is organized into six chapters. Chapter 1 provides a general introduction and overall context. Chapter 2 summarizes methodology, including descriptions of assessment techniques and cost model. Chapter 3 provides a high level overview of the insular school districts and general findings from the condition assessment. Chapter 4 summarizes insular area-specific findings. Chapter 5 summarizes the various work products produced as part of the Phase II effort. Chapter 6 presents the implementation plan.

1.1 Purpose

DOI's Strategic Plan identifies the need to improve insular school conditions as an important performance measure in improving quality of life. Comprehensive condition assessments currently do not exist for all areas and prioritization of school facility investments is inconsistent and in some cases subject to strong political pressures.

Purpose	Need
• Provide comprehensive, verifiable data to assess needs based funding requirements. • Develop estimates of deferred maintenance cost needed to improve condition of insular schools.	• Lack of awareness regarding exisiting deficiencies and funding needs. • Existing investment decisions rely on incomplete information.

Deferred maintenance is defined by The Federal Accounting Standards Advisory Board (www.FASAB.gov) as: *maintenance that was not performed when it should have been or was scheduled to be and which, therefore, is put off or delayed for a future period. For purposes of this standard, maintenance is described as the act of keeping fixed assets in acceptable condition. It includes preventive maintenance, normal repairs, replacement of parts and structural components, and other activities needed to preserve the asset so that it continues to provide acceptable services and achieves its expected life. Maintenance excludes activities aimed at expanding the capacity of an asset or otherwise upgrading it to serve needs different from, or significantly greater than, those originally intended.* Statement of Federal Financial Accounting Standard 6

1.2 Value to OIA and Insular Areas

Condition assessment and deficiency reporting established in Phase II of the Insular ABCs initiative provides insular school stakeholders (OIA, Governors, School District officials, etc.) with a clear view of how building elements and school facilities throughout the respective districts are performing and provides a snap shot, based on standard metrics (e.g., score and DM backlog), of the relative condition of insular schools. The comprehensive view of facility condition provided in this phase will help inform investment strategies and enhance facility longevity. The condition assessment also identified health and safety concerns that need immediate attention, as well as more systemic problems such as deteriorated roofs, and supporting utility systems, etc. that will need to be addressed in a sustained, programmatic approach.

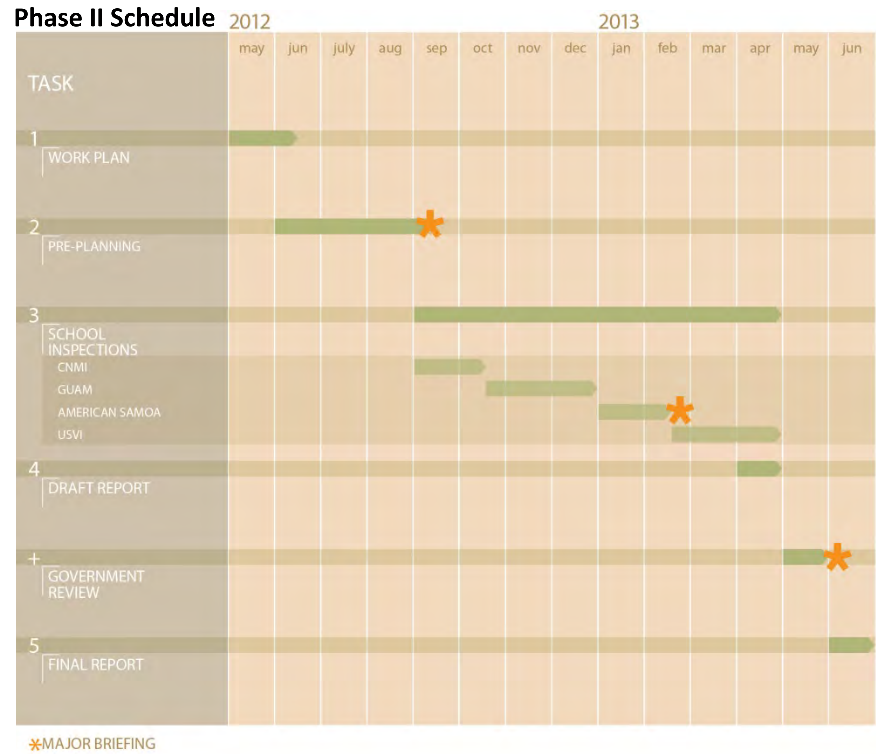
A comprehensive, geo-referenced facility inventory was created to support the condition assessments, establishing the first-ever insular facilities database of all school buildings. Costs estimates were developed for the 131 building elements assessed, accounting for a subset of major building costs, referred to as current replacement value (CRV). It is important to note that the parametric cost estimates provided are for high level planning purposes and are not substitutes for project-level design costs. Facility floor areas and CRVs provide valuable metrics for facilities planning and analyzing maintenance program alternatives.

DM percentage of total CRV (DM/CRV), or cost of needed repairs compared to the respective asset value, is referred to as the facility condition index (FCI) and is provided at all levels, from insular area to building element, and helps inform funding needs. FCI can help identify the magnitude of particular problems regardless of cost (e.g., an FCI over 50 percent may indicate replacement is warranted). Based on survey results, 25 percent of elements rated had FCI's above 15 percent and are considered, for the purposes of this report, to have a high FCI.

1.3 Project Schedule

The overall project was conducted over a fourteen-month period (May 2012 through June 2013) as indicated on the accompanying chart. Assessment criteria and methodology were developed from May through August 2012. A prototyping exercise took place at CNMI schools in August 2012 to validate/refine assessment tools and methods, before full surveys began in September 2012. School surveys started in CNMI in September 2012, moved to Guam in November, American Samoa in January 2013 and finally, to USVI in March 2013. School surveys concluded in April 2013.

Status briefings with OIA were provided in September 2012, and March and July 2013. Report findings were briefed to each of the insular area Governors in late July and early August 2013. Training sessions on how to access FIMS information were also provided to insular area staff during this period. This final report is to be published on the OIA website in late August 2013.



1.4 Team Organization

OIA contracted with the US Army Corps of Engineers (USACE) Honolulu District to undertake the ABCs initiative. USACE retained Helber Hastert & Fee, Planners and its multi-disciplinary team of subject matter experts to lead the effort. HHF was the primary liaison with school district personnel.

Insular ABCs Team Members

Overall Lead	USACE Honolulu District
Consulting Team Leader/ Facility Planners	Helber Hastert & Fee Planners, Inc.
Architect	Mason Architects, Inc.
Structural Engineer	Martin & Chock, Inc.
Mechanical Engineer	InSynergy Engineering, Inc.
Electrical Engineer	InSynergy Engineering, Inc.
Civil Engineer	Austin Tsutsumi & Associates, Inc.
FIMS Developer	Total Resource Management, Inc.

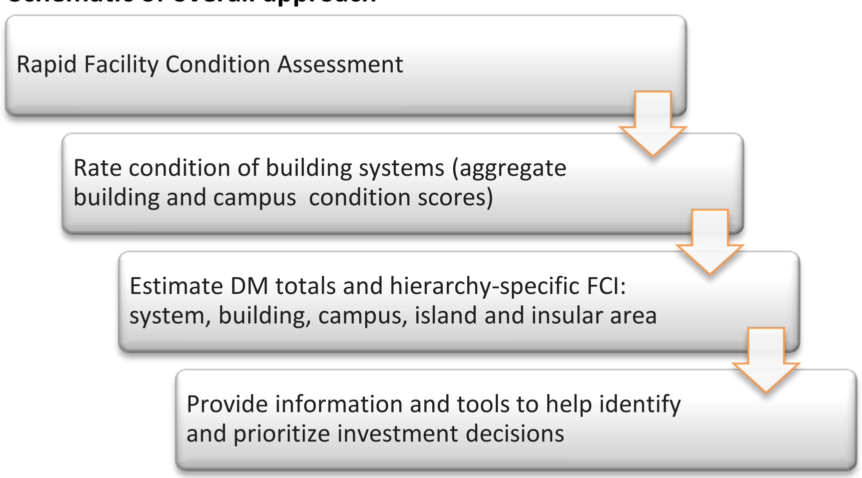
2 Methodology

Phase II of the Insular ABCs included assessment and rating of building elements and DM estimation (based on component cost and condition score) to identify specific needs. DM estimates were aggregated at the building, building system, school, and regional levels to identify budgetary needs and help prioritize investment decisions. The initiative required development of the overall assessment approach, a cost model to calculate DM costs, an information management database, and a website data reporting system.

2.1 Overall Approach

The Insular ABCs used a rapid condition assessment model following a standard set of assessment procedures, a simple condition score range, and score-based DM calculations. Data summaries were then provided by composite system and building level score, DM, and FCI.

Schematic of overall approach



Key components of the Insular ABCs initiative included development of assessment standards, stakeholder engagement practices, and data reporting systems. Data compilation and reporting tools are to be provided to school districts upon project completion.

Condition assessment standards included defining items to be assessed, assessment criteria, establishing data collection practices and needed tools, and developing systems for compiling data and reporting back to school principals, school district personnel, and OIA officials. Health and safety concerns were also recorded when immediate hazards to student safety were identified such as potential for falling concrete, jagged edges on finishes or fixtures, electrocution or fire risk, failed/near-failing integrity of structural elements, lack of emergency exits, serious air quality problems, fall risk, septic system problems (leaks or backups), or lack of nearby fire hydrants.

Engagement with insular area school superintendents and school facility managers (principals, planning, programming and budgeting offices, maintenance personnel, and other school district staff) was critical to capturing facility inventory data and existing needs. Facility management personnel were invited to participate in the assessments and were engaged throughout the assessment process to maximize awareness of the process and findings.

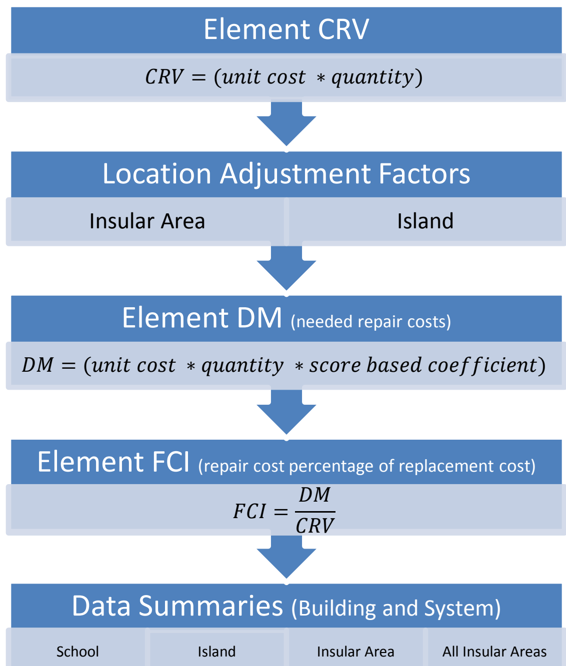
A facility information management system (FIMS) was developed to collect and store assessment data, geocode facilities and related data, process calculations, and report findings. In addition to FIMS use, data compilation and reporting assessment findings included immediate reports back to school principals when safety risks were observed, out-briefs to school district personnel on major and common findings, delivering narrative reports in each insular area, and presenting summary condition data on the project website.

2.2 Cost Model

The Insular ABCs assessment model as described in the Phase I report is based on the NASA DM Parametric Estimating Method (NASA model). Summary scores and costs from the Insular ABCs condition assessments are reported at the system level, including seven building systems generally following the NASA model. "Site" was added to account for school grounds conditions, including drainage problems.[2]

Building Systems	
1. Structure	5. Mechanical (HVAC)
2. Roofing	6. Electrical
3. Exterior	7. Plumbing
4. Interior	8. Site

Key components of the cost model (identified in the schematic diagram to the right) include estimating element-level CRV, applying location adjustment factors, estimating DM based on a score coefficient (shown on the System Condition CRV Percentages table), calculating FCI to assist in data interpretation, and reporting data summaries through the system hierarchy on the project website.



The building component typology was established generally following the national standard UNIFORMAT II Elemental Classification for Building Specifications, Cost Estimating, and Cost Analysis guide (1999) with some adjustments provided by team SMEs. Element costs were then estimated from national average RSMeans data (another national standard source for cost estimating data), and then adjusted by location factors based on local construction cost history, all expressed in 2013 dollars.

A total of 54 assessment categories, or subsystems, (e.g., roof covering, exterior windows, exterior wall construction), and 162 cost selections (e.g., asphalt roofing, aluminum windows double hung, reinforced masonry bearing walls), were identified to capture construction material types and address key grounds and building components. Subsystem and element material choices allowed surveyors to rapidly select appropriate building element types and collect required quantity information during assessments.

The cost selection total also includes 22 "Site" elements for which assessments were conducted but costs not assigned. The Insular ABCs cost model could be expanded during the implementation phase to include costs for Site work components.

CRV is only calculated for the assessed building elements so it does not represent full facility replacement cost.

The costs assigned to each element (elemental CRV) were calculated through the cost model via 13 primary formulas and ten secondary formulas (applied when data for the primary calculations were not available). Most calculations were based on unit costs multiplied by quantities (e.g., floor area, columns, perimeter length) obtained by the assessment team.

[2] Site deficiencies were identified but associated costs to address the deficiencies were not calculated as part of the Phase II effort.

DM cost estimates were derived by applying a score to the individual element (abbreviated score definitions are provided below; each SME prepared and followed a more detailed set of system and subsystem criteria to ensure consistency). The rating system used scores ranging from five to zero, five indicating no DM, one indicating significant DM, and zero representing not present but required.

Element Score Definitions
5. No DM. Only normal scheduled maintenance required.
4. Minor DM. Some minor repairs needed. System functions as intended.
3. Moderate DM. More minor and some larger repair required. System occasionally unable to function as intended.
2. Significant DM. Significant repairs required. Excessive damage clearly visible. Obsolete. System not functional as intended. Parts not easily obtainable. Does not meet all codes.
1. Major DM. Major repair/replacement required to restore function. Unsafe to use.
0. Not Present. Element needs to be acquired/installed

The scores corresponded with a system condition CRV percentage as shown in the table below.

System Condition CRV Percentages (for estimating DM)

System\Score	5	4	3	2	1	0
Structure	0%	2%	25%	50%	120%	100%
Exterior	0%	1%	10%	75%	100%	100%
Roofing	0%	9%	25%	90%	120%	100%
Interiors	0%	3%	10%	75%	101%	100%
Mechanical	0%	10%	25%	50%	120%	100%
Plumbing	0%	10%	25%	50%	120%	100%
Electrical	0%	10%	25%	50%	120%	100%

System Condition CRV Percentages for Structure, Exterior, Roofing, and Interiors were developed by the respective SMEs to correlate with their assessment criteria. As shown, a score of 5 indicates no DM (0%). Rating an element with a lower condition score yields a higher DM percentage. Zero means an element is not present but requires installation, while 1 means full replacement, which often exceeds the installation costs due to other factors (e.g., demolition and disposal costs).

Insular area cost adjustment factors were developed, and applied to elemental CRVs, based on recent construction cost schedules collected from the insular areas and normalized to the US National average cost.

Insular area adjustment factors:

Insular Area	Factor
U.S. National Average	1.00
American Samoa	0.86
CNMI	1.22
Guam	1.95
U.S. Virgin Islands	1.63

Island adjustment factors, applied to adjusted insular area costs, were derived from cost estimate differences provided through local official interviews.

Island adjustment factors:

	Am Samoa	Factor	CNMI	Factor	Guam	Factor	USVI	Factor
Island	Tutuila	1.0	Saipan	1.0	Guam	1.0	St. Thomas	1.0
	Aunu'u	1.2	Tinian	1.3			St. Croix	0.8
	Manua	2.0	Rota	1.5			St. John	1.5

Element costs, condition score, DM, and FCI were aggregated to system and building totals. These two “rollups” are continued through school, island, insular area, and total inventory to allow views into building and system issues at various levels and illustrate the scale of problems identified. This model was based on rough, order-of-magnitude parametric cost estimates developed for high level budgetary purposes and is inappropriate to use for design purposes. Building elements and costs can continue to be refined in the future to improve precision and more accurately account for actual building replacement values. Details on cost elements, associated cost factors and the various calculations used are provided in an accompanying technical paper.

Defining condition assessment criteria was a critical component to standardizing this process and included the definition of visual assessment queues that would be used to assign one of the six ratings to each element assessed. Estimating DM costs for Site deficiencies was outside of the project scope; however, 22 Site elements were assessed to capture conditions of existing roadways, parking lots, pedestrian paving, fences & gates, water supply, sanitary sewer, and storm sewer.

Deficiencies could be identified by the surveyors as health and safety concerns. Health and safety DM costs were totaled independent of other DM costs for priority attention.

The rapid assessment process provided the ability to assess general building conditions but stopped well short of a code compliance audit. It is recommended that project planning and design for major renovations to address deferred maintenance also include identification of and correction of possible code compliance issues for structural, electrical and mechanical systems.

2.3 Assessment Procedure

Establishment of assessment procedures was undertaken early in project planning to instill a consistent and replicable process that could be taught to and used by building surveyors and applied in any locale over time. Key components included:

- Local engagement
- School district personnel engagement
- Assessment protocol

2.3.1 Local Engagement

Close coordination between the assessment team, school district staff, and school principals was maintained to minimize disruption to the teaching environment and maximize results of the assessment process.

Local officials

- Relevant government officials were briefed on project objectives, and asked to provide information on recent school construction costs, utility records, hard asset data, existing site and floor plans, schools with drainage problems, GIS data, capacity and enrollment data, previous studies and planned improvements, and logistical matters.

Principals

- To engage school principals constructively and efficiently in the assessment process, a short questionnaire was sent to school principals in advance of surveys with a read ahead of basic project information. Information requested in the questionnaires provided insight on existing conditions

Inspection schedule

- School assessment schedules were created based on school district communications, maintained by the assessment team, and shared with school district personnel throughout surveys. Standard pacing was established early in the process, averaging about one school per day.

Survey assistance and participation

- School district personnel were encouraged to accompany the assessment team for process awareness and as a quality control measure. School administrative or maintenance staff typically showed the assessment team prominent or pervasive problems with the school facilities and grounds.

Briefings

- Kickoff meetings with school district leadership were held within one month prior to the surveys to brief local officials on objectives, assessment methods, and assessment schedule and gain input.
- In-briefs were conducted the first working day of team arrival to introduce the surveyors, get school personnel assignments for those joining the team during surveys if applicable, review protocol and standards, and go over logistics.
- Out-briefs were provided to facility management personnel at or near the completion of the surveys to report assessment findings, including common and major findings.

2.3.2 Assessment Protocol

A standard protocol was developed for the assessment team to complement the written assessment criteria.

Prior to school visit:

- Review principal questionnaire and other available school information
- Notify principals if there are schedule changes; request permission to visit schools on Saturdays and holidays
- Confirm ability for the surveyors to access to each room

At the school:

- Check in at the front desk and in-brief the principal or assigned representative
- Get input on existing problems from school maintenance personnel to the extent possible

During surveys:

- Wear team identification badges and any school district-specified personal protective equipment
- Walkthrough surveys of all rooms in buildings with minimal disruptions to ongoing activities

Post surveys:

- Check out at front desk and provide feedback if requested by the principal
- Report observed life safety concerns to school principals or assigned representative immediately
- Complete data entry and reporting

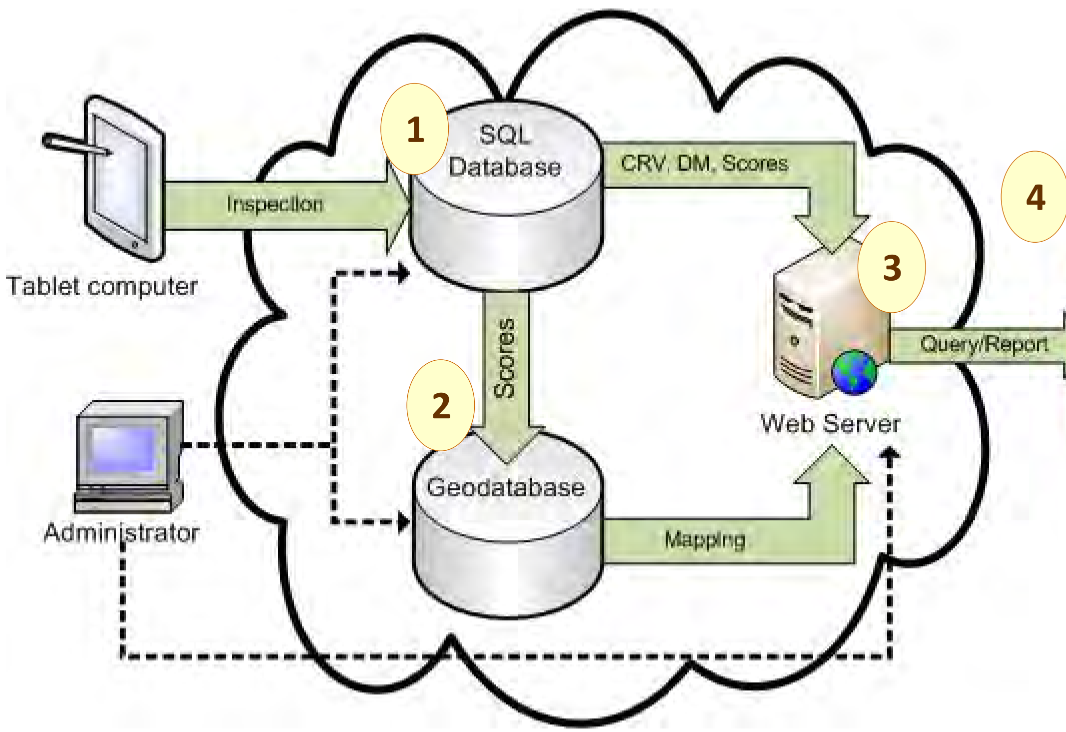
2.4 FIMS Design

The FIMS included laptops, tablets, and cameras for data collection, GIS shapefiles to geocode referenced facility information, a relational database server to compile, store, and process data, and a website to report findings. Access privileges for both entering and viewing information were developed to protect data integrity and safeguard insular area information.

2.4.1 Basic Database Structure

The FIMS database stores facility data and the score weighting, FCI, and DM algorithms used to calculate data summaries for reporting assessment findings. The system includes applications to capture, track and report data to inform repair and replacement budgets and provide a foundation for possible IT-based facility management programs. The system is developed to support senior level managers' needs to report on funding and resource requirements and the surveyors' needs to efficiently record information.

Schematic Illustration of the FIMS model



Website
http://insularabcs.org

Basic Components

1. Assessment data and other available facility data was gathered and uploaded to the SQL database via tablets and laptops.
2. Facility data was geo-referenced for map-based data viewing.
3. Query and reporting tools were developed to provide data summaries.
4. Data was made accessible to authorized users through a web interface.

2.5 Web Interface

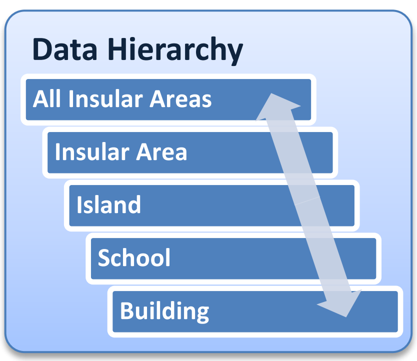
The project website (http://insularabcs.org/) was developed to provide data summaries of basic facility information queries to high level federal and insular area officials and more specific facility information and assessment details to facility managers. Database hierarchy is mirrored in the project webpages taking information summaries from the insular area to individual building levels. All pages identify hierarchy-specific DM totals, inventory CRV, composite scores, the number of buildings in each score range, and FCI estimates.

Insular Area and Island pages show regional system and school DM and FCI summaries. In addition to DM and FCI summaries, School pages provide graphical indications of building composite and system-level assessment scores. Additional school details are also provided.

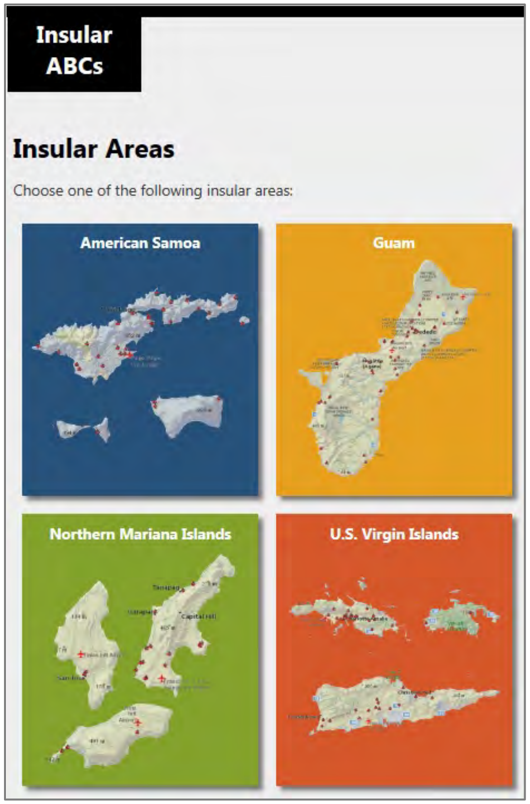
Building pages include DM and score summaries as well as elements assessed in each system, scores given, comments, and photos of deficiencies. Additional building details are also provided. Through the Building pages, facility managers can access element specific details to see where problems exist and review comments and photos.

Aerial maps on the School and Building pages (see image at right) provide color-coded score indications to give school district personnel and facility managers a quick view of where problems exist by both building and system.

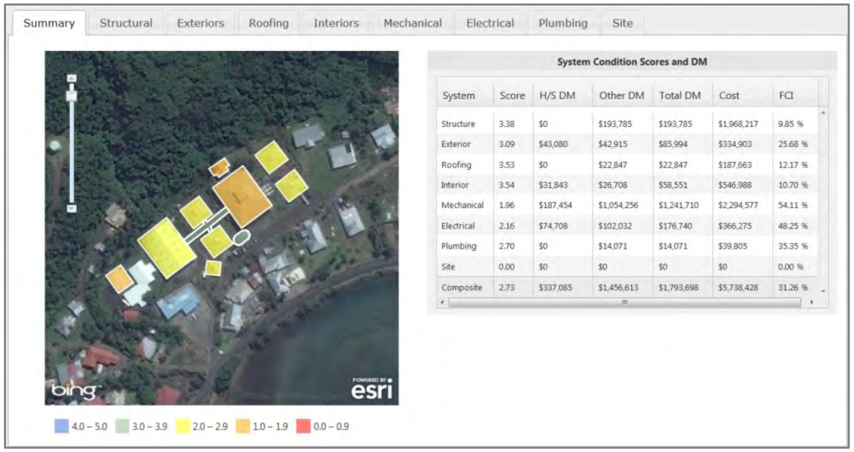
Website access permissions were developed to direct officials and facility management personnel to pages useful for their purposes to streamline web-browsing and screen area-specific information.



Home page view



The home page (left) provides a roll-up of all the insular area data for OIA use. Each insular area has access to its own page with associated data roll-ups at the school district, school (below), building and building system level.



System Condition Scores and DM

System	Score	H/S DM	Other DM	Total DM	Cost	FCI
Structure	3.38	$0	$193,785	$193,785	$1,968,217	9.85 %
Exterior	3.09	$43,080	$42,915	$85,994	$334,903	25.68 %
Roofing	3.53	$0	$22,847	$22,847	$187,663	12.17 %
Interior	3.54	$31,843	$26,708	$58,551	$546,988	10.70 %
Mechanical	1.96	$187,454	$1,054,256	$1,241,710	$2,294,577	54.11 %
Electrical	2.16	$74,708	$102,032	$176,740	$366,275	48.25 %
Plumbing	2.70	$0	$14,071	$14,071	$39,805	35.35 %
Site	0.00	$0	$0	$0	$0	0.00 %
Composite	2.73	$337,085	$1,456,613	$1,793,698	$5,738,428	31.26 %

School-level view

3 Insular Area Overview

This chapter provides a high level overview of the K-12 school facilities and related matters in the insular areas.

The general lack of available data on facility inventory, school facility and campus standards, and funding metrics in the respective insular areas obscures existing programmatic and facility needs and impedes the ability to determine or track the effectiveness of maintenance and repair (M&R) funding assistance. The lack of capital improvement project (CIP) planning in some areas also reduces facility management efficiency.

During the Insular ABCs surveys, it was observed that school district facility management personnel and maintenance staff were, by and large, committed to maintaining safe and secure facilities and educational environments for students, but varying levels of resources and experience creates challenges with maintenance programs and general practices.

3.1 Insular Area Comparison

Construction costs, school district management approaches and budgets, and demographics vary considerably across the insular school districts. The table below provides a general overview and comparison of the insular school inventory.

	Schools	Buildings	Total SF* (M)	Enrollment	Replacement Cost** ($M)
Am Samoa	28	293	0.9	13,025	$100
CNMI	20	298	0.9	10,117	$162
Guam***	35	641	3.0	25,051	$870
USVI	32	344	2.5	15,192	$606
Total	**115**	**1,576**	**7.3**	**63,385**	**$1,738**

*Net floor area based on room measurements

**Based on local replacement cost data

***Building, enrollment, and cost figures for the 35 schools assessed (not total 40 public schools)

3.1.1 Annual School District Budgets

Budget analysis was beyond the scope of the study, but information gathered during local engagement or supplemental project research was compiled to compare, at a gross scale, funding differences between insular areas.

	FY 2013 Budget ($M)	Budget $/Student	Budget $/sf
Am Samoa	$61	$4,700	$70
CNMI	$61	$6,064	$68
Guam	$272	$8,550	$78
USVI	$210	$13,799	$83

3.1.2 CIP Planning and M&R Programming

The extent of CIP planning, including capacity and construction metrics and identification of basic facility standards, as well as long range goals and objectives, also varies considerably and is needed in American Samoa and USVI to define such metrics and establish goals and objectives.

Insular Area	Comprehensive CIP Planning	Track Needed CIP Projects	Seek Funding as Needed
Am Samoa		X	
CNMI	X		
Guam	X		
USVI			X

School CIP and M&R program organization varies by school district. The general model vests M&R responsibility with the school district, with CIP support services either solely provided by, or through shared responsibility with, the Public Works Department (DPW). Most of the districts have central office maintenance staff that support selected schools or building systems (e.g., plumbing, electrical, carpentry) and custodial staff at schools providing lighter-duty support. Generally, school principals are required to get personally involved in school maintenance oversight, which detracts from their primary responsibilities as school administrators.

The CNMI Public School System is the most autonomous School District, handling all CIP planning and M&R internally or through consultant services. It also supports a seven-year CIP planning process which is undergoing its second revision. The Guam Department of Education is in the process of re-evaluating and updating its 1999 ten-year CIP plan. American Samoa school CIP planning consists of a worksheet, providing a five-year projection of planned CIP projects, which is updated annually and submitted to the Governor for consideration in the annual budget process. It falls short of a comprehensive plan in that it lacks a vision statement, implementing policies, opportunities for public participation and engagement, and a clear articulation of facility needs and standards. USVI has a more limited school CIP planning process.

Guam DOE has recently moved to procuring its new schools through a design/build/operate/maintain program where the school district leases its new schools from a third party. It is also experimenting with outsourcing its CIP, M&R, custodial, and food preparation functions.

American Samoa DOE previously relied on its DPW for CIP and M&R services, but assumed M&R responsibilities some time ago in an effort to be more responsive to school needs. Based partly on reducing duplication and level of effort (the DOE and DPW both typically need to maintain M&R-related equipment and supplies), the new Administration has proposed to move M&R responsibilities back to DPW as an efficiency measure.

USVI DOE maintains a close working relationship with DPW for CIP support. It operates the only multi-district system in the insular areas with a system wide, central maintenance office supporting the two separate school districts, each with dedicated maintenance staff.

School-based parent/teacher organizations provide important community support for minor school improvement projects. Current practices permit these organizations to undertake minor construction projects that may not meet current code requirements and may lead to future problems. Policies are needed to provide structure and accountability for these types of projects.

Due to the aging physical plant, harsh coastal environments and chronic underfunding, all of the school districts’ maintenance staff spend much of their time responding to trouble calls. These limitations impact the school district’s ability to focus on preventative maintenance programs, work order management systems, or training programs and perpetuate the struggle to balance resources with needs. Annual M&R budgets are largely set by historic allocation trends, and are not based on empirical data or predictive lifecycle modeling. Difficulty in tracking equipment and system records and warranties is also common and in some cases results in a significant loss of value.

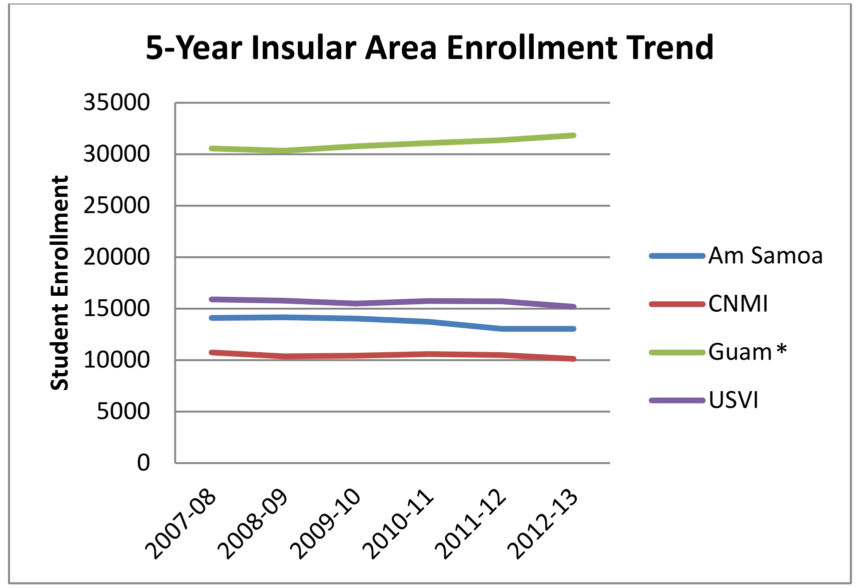
Facility standardization provides significant economies of scale for M&R programs and simplifies CIP programming. American Samoa adopted a standard 10-classroom, two-story concrete building, which is gradually replacing the 1960’s-era concrete and wood fale classroom, reducing design and maintenance costs. CNMI is pursuing a similar practice in developing new buildings based on plans from recent construction projects. USVI is in the process of standardizing its repair parts inventory (windows, doors, plumbing, etc.) to streamline replacement projects. Standardization efforts need to be supported and expanded.

3.1.3 Population and Enrollment Trends

The insular areas experienced significant post-war growth as their economies matured and air travel improved. In the past decade however, all but Guam have experienced population declines (Guam +3%; USVI -2%; American Samoa -3%, CNMI -22%; insular average: -4%). Although overall population trends are not directly related to public school enrollment trends, for a number of reasons (e.g., age cohorts, private school competition, etc.), they tend to track each other over time.

To the extent this transition from decade-over-decade growth to stability and decline is more than a transitory phenomenon, the years of adding school capacity may be transitioning to a period of school consolidation and replacement/renovation. Areas of localized growth and decline within each of the insular areas exist that require careful local analysis. For example, Guam is experiencing significant growth on its northern end and population decline in the south. While CNMI has experienced significant overall population decline, areas around Garapan and Tinian are growing. American Samoa is generally experiencing a population shift from the outer islands to the main island of Tutuila.

On the margins, there is also interplay between public and private school enrollments. In Guam and American Samoa, there is some shift from Public to Private schools while CNMI is experiencing the opposite trend.

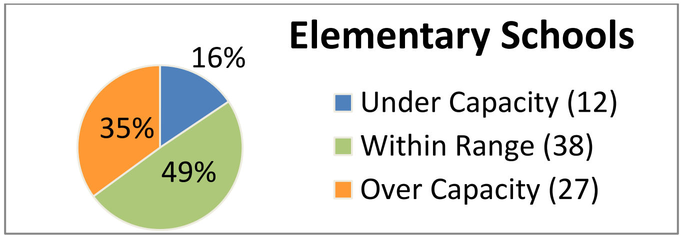


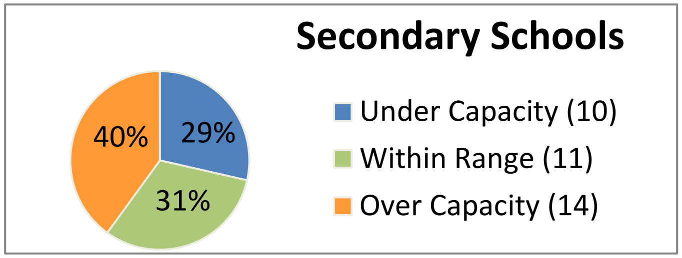
*Guam enrollment for all 40 public schools

Over the last five years, American Samoa public school enrollment has declined 8%, CNMI is down 6%, and USVI is down 5%. Similar to the population trend, Guam's public school student enrollment has increased 4% in five years.

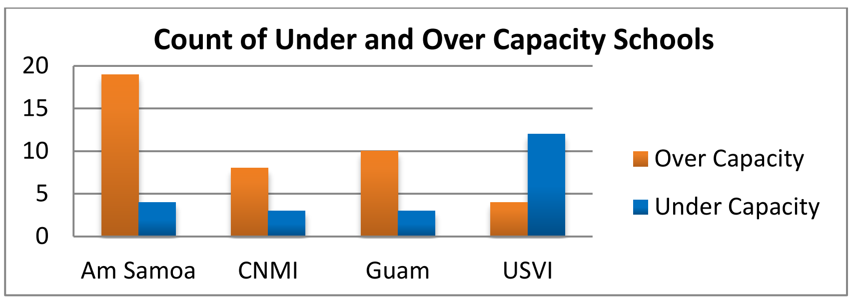
The effects of these fluctuations are demonstrated in the school capacity charts presented on the following page.

School Capacity Metrics[3]





Thirty-five percent of elementary schools (27 schools) and 40 percent of secondary schools (14 schools) were considered over capacity based on national gross area per student average ranges (Council of Educational Facility Planners).[4] Fewer were considered under capacity (see accompanying charts).



[3] Capacity estimated for 112 schools; Old Rota High (CNMI) was recently closed and enrollment figures were not available for Edith L. Williams Alternative Academy and Positive Connections Alternative (USVI).

[4] Capacity estimate are based on gross square feet per student to nominally account for supporting facilities (e.g., libraries, offices, restrooms, cafeterias, auditoriums, and circulation).

3.1.4 Building Age

The average age of insular school buildings is approximately 40 years. The Insular Schools were generally constructed post WW-II in increments with the earliest in the 1950s and the latest in the 2000s – generally following the significant post war population growth experienced in the insular areas. The main exception to this trend are the colonial-era buildings in the USVI inventory that are centuries old. Reinforced concrete buildings built in the '50s are often in relatively good condition compared to more recent, lightly-framed buildings, so building age is not necessarily an accurate determinant of condition. There are no inherent limits to how long a building can last; it depends primarily on the level of consistent maintenance, but longevity is also a function of location (e.g., coastal exposed site vs. more protected inland site), construction materials and importantly, quality of construction. The insular areas are generally located in harsh, coastal environments with limited capacity for preventative M&R programs, and buildings in many cases show the wear of time and climactic conditions.

Older schools typically were planned following the "factory school" model (e.g., "fingers" of classrooms, a multipurpose building like a cafetorium, and an administrative building) that does not readily support current teaching models as effectively as more modern, open plan schools. So, in addition to age or physical condition of the building, functional obsolescence (i.e., the building's ability to support current and future use) is an equally compelling factor to consider in CIP planning.

3.2 Condition Assessment Overview

Building elements were rated based on observed conditions. These scores were used to estimate DM and FCI values and were assigned weights based on estimated element costs. Weighted scores were aggregated at the building and system levels for schools, islands, insular areas, and for all insular areas. Weighted scores for buildings assessed were grouped into ranges to summarize conditions.

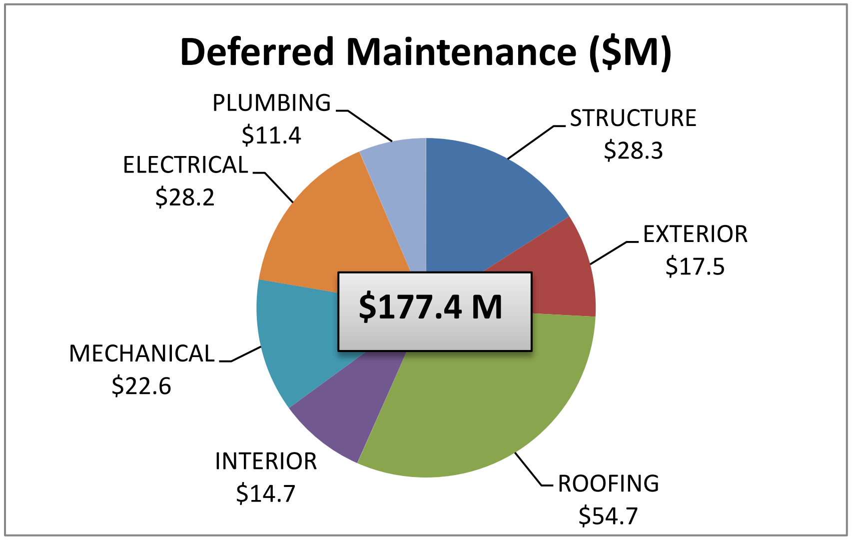
Distribution of School Buildings by Score

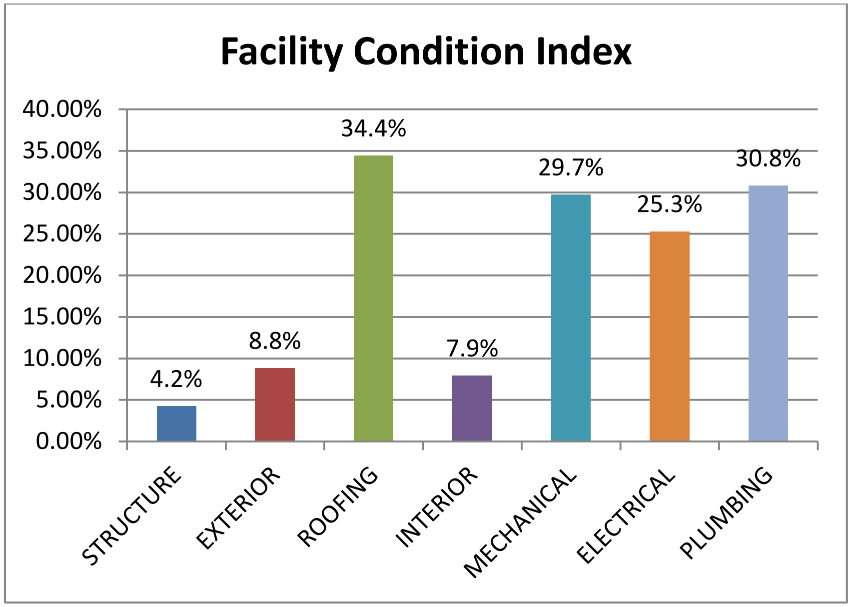
Score Ranges	Number of Buildings*
5	14
4.0 – 4.99	687
3.0 - 3.99	859
2.0 - 2.99	92
1.0 - 1.99	18
0.0 - 0.99	196
Total	1,866

*Includes ancillary structures in addition to inhabited buildings

Insular Area Assessment Summary

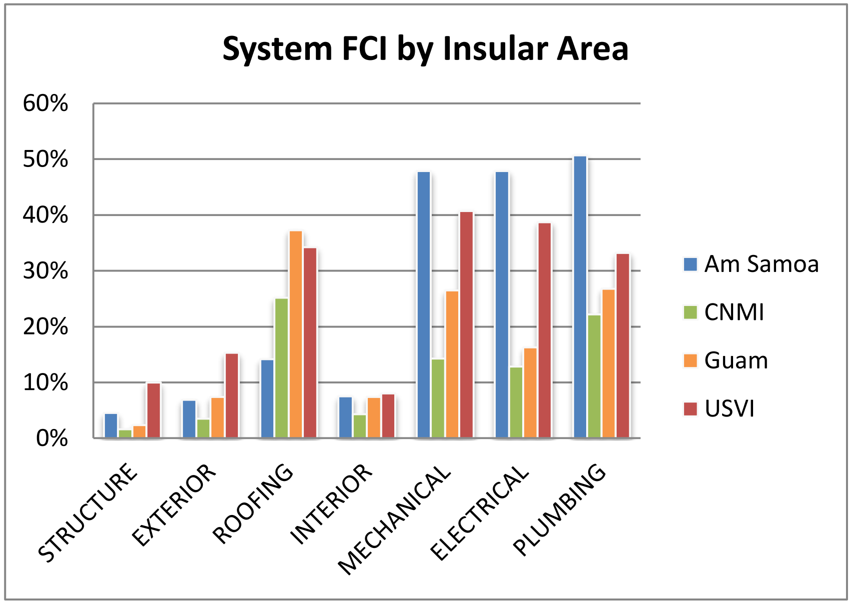
Score (1-5)	H/S DM ($M)	Total DM ($M)	FCI
3.9	**$17**	**$177**	**12%**

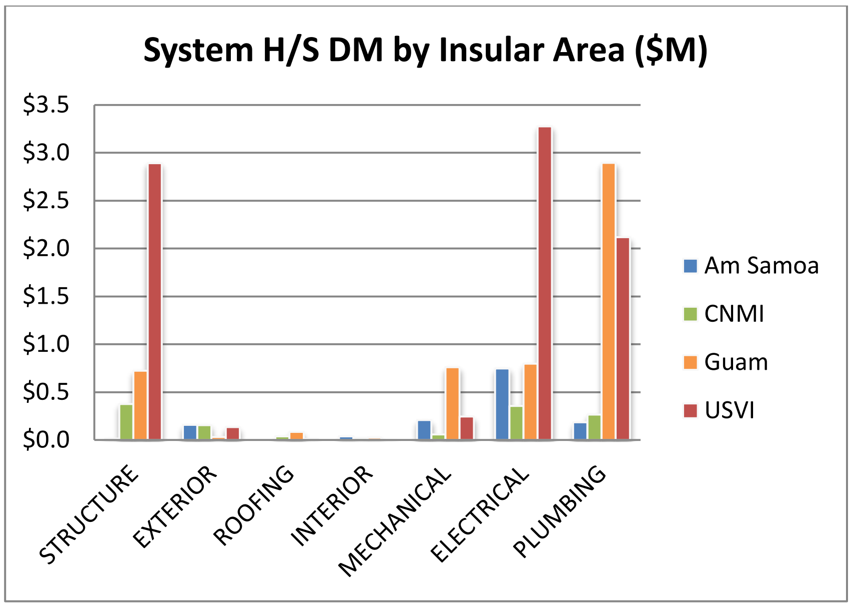




DM and FCI values were calculated and aggregated for all systems and buildings. Throughout all insular areas, roofing, mechanical (AC), and electrical systems were found to have the highest amount of DM. Even though the plumbing system had relatively low DM costs, the estimated FCI values were relatively high, indicating relatively poor condition.

A general need for greater oversight during project bidding and execution to insure materials and installation specifications are met was reported by surveyors—particularly for roofing replacement and other repairs to building exterior enclosures.





3.2.1 Overview of Common Problems

Throughout all insular areas, fourteen assessed elements were identified that, based on assessment results, commonly had relatively high FCIs (greater than 15 percent).

Element	FCI	DM ($M)	AS	CNMI	Guam	USVI
Intercom System - 12 Stations	70%	$3.5	X	X	X	X
MEP Infrastructure[5]	58%	$3.4	X	X	X	X
Fire Alarm Command Center	41%	$5.1	X	X		X
Fluid Applied Roofing	40%	$41.8	X	X	X	X
Gutters	36%	$0.6	X		X	X
Ductless dx split - air cooled	32%	$11.9	X		X	X
Service Installation - 1,000 A	29%	$9.4	X		X	X
Central ducted dx - air cooled	28%	$7.5	X	X	X	X
Rolled Asphalt Roofing	27%	$0.1		X	X	X
Fire Sprinklers	26%	$1.5	X	X	X	X
Single Ply Membrane - 60 mils Roofing	21%	$0.3		X	X	X
Plumbing Fixtures	21%	$4.5	X		X	X
Security System	20%	$0.8	X	X	X	
Fluorescent Lighting Fixtures	19%	$5.1	X	X	X	X

FCIs for security and intercom systems were especially high because in many cases these were not present and full installation is required. Other relatively high FCI items include: failing roofing materials, under-performing air conditioning systems, MEP infrastructure, electrical service and lighting fixtures.

[5] MEP infrastructure was used to account for the presence and costs of ancillary school utility buildings and equipment that serve more than one building (e.g., generators, water distribution pumps, water tanks) that were not captured in the building inventory and assessment cost model and additional items not included in element costing and assessment selections (e.g., kitchen hood fire suppression system). Additional items to be added as specific element selections in future cost model expansions.

3.2.2 Site Concerns

Site assessments (i.e., school grounds) were conducted, initially, to address flooding and drainage concerns at school with known drainage problems. Site assessments were expanded during early project planning to include roadways, parking lots, pedestrian paving, fences and gates, water supply, sanitary sewer, and storm sewer. Site conditions identified as health and safety issues and concerns commonly found are summarized below:

Site Health and Safety Concerns	Am Samoa	CNMI	Guam	USVI
1. Inadequate fire protection on or near campus	X	X	X	X
2. Lack emergency vehicle access	X	X	X	X
3. Lack of backflow prevention	X	X	X	X
4. Sewage backup or leaks		X	X	
5. Septic tank/leaching field concerns	X	X	X	
6. Pedestrian hazards from poor vehicular circulation	X			X
7. Inadequate perimeter fencing/gates	X			X
Other Common Issues				
1. Lack site drainage plans or engineering	X	X		X
2. Inadequate drainage system maintenance		X	X	X
3. Potable water system problems	X	X		
4. Inadequate roadway signage, surfacing/maintenance	X			X

In American Samoa, major regional needs were identified including regional drainage problems, requiring engineered site drainage solutions and large scale electrical infrastructure upgrades (existing conditions create serious safety concerns). Addressing these concerns through major concerted regional projects and cross-departmental project planning is recommended.

Health and safety concerns identified by other disciplines (i.e., immediate safety hazards such as injury risk, electrocution hazards, or serious air quality concerns) are discussed in Chapter 4.

3.2.3 Building Structural Conditions

Structural deficiencies were relatively isolated and related to various building types; therefore, no single type of structural DM concern resulted in a relatively high FCI. While structural DM in all insular areas was relatively low, deficiencies were identified in all areas and should not be overlooked due to the costs and risks associated with deferring maintenance of structural components. Structural deterioration is primarily caused by corrosion of steel components, including steel reinforcing within concrete or masonry buildings, and termite damage or rot of wood framed components. Most of this deterioration is due to water infiltration or exposure to humid, salt-laden atmospheric conditions. Therefore, keeping water out of the interior enclosure with well-maintained exterior wall and roof finishes and isolation of steel components from the outside environment will prevent most structural deterioration. This will also eliminate wood decay and most termite activity.

The chart below provides an overview of structural deterioration based on building type for in each insular area and an indication of frequency of both the building types and the problems associated with each particular building type:

Common Structural Concerns by Building Type	Am. Samoa	CNMI	Guam	USVI
One and Two-Story Low Slope Reinforced Concrete Roofs and Masonry Walls	Observed in isolated instances	Observed very frequently	Observed very frequently	Observed in isolated instances
Roof water ponding causing leaking, reinforcing corrosion and spalling	Observed commonly	Observed commonly	Observed in isolated instances	Observed commonly
Prefabricated Concrete Gable Roof Slabs and Concrete Walls	Not applicable to Insular Area	Observed commonly	Observed very frequently	Not applicable to Insular Area
Isolated cracks and spalls, leaks at ridge joint	Not applicable to Insular Area	Observed commonly	Observed commonly	Not applicable to Insular Area
Concrete Gable Frames with Wood Decking and Masonry Walls	Observed in isolated instances	Observed very frequently	Not applicable to Insular Area	Not applicable to Insular Area
Termite damage in wood decking and nailers	Observed in isolated instances	Observed commonly	Not applicable to Insular Area	Not applicable to Insular Area
Rot or other wood damage	Observed commonly	Observed commonly	Not applicable to Insular Area	Not applicable to Insular Area
Deficient wind uplift capacity	Observed very frequently	Observed very frequently	Not applicable to Insular Area	Not applicable to Insular Area
One and Two-story Wood Framed Gable Roofs with Masonry Walls	Observed very frequently	Observed commonly	Observed in isolated instances	Observed commonly
Termite damage or rot in wood decking and nailers	Observed in isolated instances	Observed commonly	Observed commonly	Observed commonly
Incomplete uplift ties between walls and roof	Observed in isolated instances	Observed in isolated instances	Observed in isolated instances	Observed in isolated instances
Unreinforced Stone Rubble Walls and Wood Frame Roofs	Not applicable to Insular Area	Not applicable to Insular Area	Not applicable to Insular Area	Observed commonly
Termite damage or rot in wood roof framing	Not applicable to Insular Area	Not applicable to Insular Area	Not applicable to Insular Area	Observed in isolated instances
Unreinforced walls susceptible to earthquakes	Not applicable to Insular Area	Not applicable to Insular Area	Not applicable to Insular Area	Observed very frequently
Incomplete uplift ties between walls and roof	Not applicable to Insular Area	Not applicable to Insular Area	Not applicable to Insular Area	Observed commonly
Light Gage Metal Roofs with Masonry Walls	Observed in isolated instances	Not applicable to Insular Area	Not applicable to Insular Area	Observed commonly
Corrosion of steel components, esp. exposed rafter tips	Observed in isolated instances	Not applicable to Insular Area	Not applicable to Insular Area	Observed commonly
Light Framed Metal Walls and Metal Truss Gable Roofs	Not applicable to Insular Area	Observed commonly	Observed commonly	Not applicable to Insular Area
Questionable lateral load path from walls to roof diaphragm	Not applicable to Insular Area	Observed very frequently	Observed very frequently	Not applicable to Insular Area
Prefabricated Wood or Steel Framed Roofs with Structural Steel Walls	Observed in isolated instances	Observed in isolated instances	Observed commonly	Observed commonly
Corrosion of steel components affecting structural integrity	Observed commonly	Observed in isolated instances	Observed commonly	Observed commonly
Wood Framed Buildings on Slabs or Elevated Piers	Observed commonly	Observed in isolated instances	Observed commonly	Observed commonly
Isolated termite damage or rot	Observed commonly	Observed commonly	Observed commonly	Observed commonly
Missing uplift ties or under-designed for wind uplift or lateral loads	Observed very frequently	Observed commonly	Observed commonly	Observed commonly
Slabs cracked or spalled	Observed commonly	Observed in isolated instances	Observed in isolated instances	Observed in isolated instances
Fales	Observed very frequently	Not applicable to Insular Area	Not applicable to Insular Area	Not applicable to Insular Area
Isolated termite damage	Observed very frequently	Not applicable to Insular Area	Not applicable to Insular Area	Not applicable to Insular Area
Corrosion of steel connectors	Observed in isolated instances	Not applicable to Insular Area	Not applicable to Insular Area	Not applicable to Insular Area
Slab on grade cracking/spalls	Observed in isolated instances	Not applicable to Insular Area	Not applicable to Insular Area	Not applicable to Insular Area

(darkest)	Observed very frequently
(dark)	Observed commonly
(light)	Observed in isolated instances
(grey)	Not applicable to Insular Area

Each of the insular areas has been historically subject to relatively frequent hurricanes, typhoons or cyclones due to their tropical locations, and also earthquakes and tsunamis. Consequently, there are a high proportion of concrete and masonry buildings which are naturally resilient to extreme wind events. Building performance during earthquakes is largely dependent on the level of reinforcing in the walls and roofs. To evaluate reinforcing in typical buildings, "as-built" building plans were reviewed, as available, and a reinforcing scanner in the field was used on a sample of common building types. In general, most typical building types have at least a minimal level of reinforcing. Where there is light frame wood or light gauge steel construction, it is generally equipped with uplift ties.

A cursory structural building code assessment was done for common building types. Most building types were found to have at least some reinforcing for resisting lateral loads and ties for resisting high wind uplift forces. However, the historic unreinforced stone masonry buildings found in USVI were identified to be the most deficient compared to current building standards. These buildings are well-built, and proven to be resilient over the decades, but are expected to be vulnerable to a large earthquake given the level of seismicity in the region. It is recommended that further structural assessments and probable retrofits be performed for regularly occupied and historically-significant buildings.

Some light framed buildings, in various insular areas, had questionable load paths between the walls and roofs and questionable wind uplift capacity and further structural investigation warranted. However, because occupancy is expected to be a greater concern during an earthquake than a wind event, addressing the seismic vulnerability of the unreinforced stone masonry buildings in USVI is a higher priority concern.

3.2.4 Indoor Environmental Quality Recommendations

Indoor Environmental Quality (IEQ) assessments for each school were prepared by the team architect to identify conditions that may be adversely affecting the health and academic performance of students. Based on pre-established assessment criteria, the team evaluated instructional spaces with regard to four environmental parameters:

- Thermal Comfort
- Indoor Air Quality
- Visual Comfort/ Lighting
- Acoustics

These parameters are identified in green building research findings as major determinants of occupant performance. The assessment criteria were informed by current green building literature including methods established by the US Environmental Protection Agency for K-12 schools (Draft K-12 School Environmental Health Program Guidelines, February 2012), as well as guidelines for designing quality learning spaces using natural lighting.

At every school, each classroom building or building type was evaluated to identify adverse conditions that might negatively impact the student learning environment. Some conditions recorded were due to building design, campus site layout, school programming or scheduling, or environmental issues, while others were often due to localized incidents.

In response to observed conditions, a list of suggested actions to mitigate those conditions was developed. The suggested actions can largely be addressed out of school district operations and maintenance funds that have been proven to directly benefit student performance, and include minor projects such as relamping, fan repair/upgrades, mold resistant paints, modest window repair and maintenance, or larger projects such as improvements that would increase the level of natural daylighting or ventilation, etc. These are generally readily achievable projects that will jumpstart the ABCs Initiative (i.e., identify lower cost, interim fixes that provide immediate benefit—but don't replace the need for a robust and well planned M&R program). The chart below provides an overview of the types of problems that were observed in each insular areas and indication of frequency:

Common IEQ Concerns	Am Samoa	CNMI	Guam	USVI
Thermal Comfort				
Inoperable, Broken or Inadequate Windows	dark red	dark red	dark red	dark red
Inadequate or Missing Roof Insulation	dark red	dark red	dark red	dark red
Window Blockage Preventing Ventilation	dark red	orange	beige	beige
Inoperable/Malfunctioning AC Units	beige	beige	dark red	orange
Unused/Missing Eave or Ridge Vents	yellow	beige	beige	beige
Indoor Air Quality				
See or Smell Mildew Growth/Moisture Problems	orange	orange	dark red	yellow
Inadequate Air Circulation	beige	dark red	orange	dark red
Unclean Air Diffusers	beige	yellow	dark red	orange
Mildewed/Broken Ceiling Tiles	beige	beige	orange	orange
Inadequate/Lacking Window Screen	orange	beige	beige	beige
Dirt/Dust Build Up	orange	beige	beige	beige
Unclean/Garbage in or Around Classrooms	yellow	beige	beige	yellow
Lack Weather Seal on Doors	yellow	beige	beige	beige
Visual/Lighting Quality				
Inoperable Lights	dark red	orange	dark red	yellow
Inadequate Interior Shading/ Windows Tint	beige	dark red	dark red	dark red
Window Blockage Preventing Natural Lighting	beige	dark red	orange	orange
Non-reflective Paint Color Darkens Room	yellow	orange	beige	yellow
Lack Differential Light Controls	beige	beige	beige	yellow
Unclean Light Covers	beige	beige	yellow	beige
Non-uniform Light Bulb Temperature (K value)	yellow	beige	beige	beige
Acoustics				
Inadequate Ceiling Acoustic Treatment	orange	dark red	yellow	orange
Inadequate Classroom Partitions/Wall Insulation	yellow	orange	yellow	yellow
Excessive Noise from AC Units/Adjacent Vehicle Parking	orange	beige	yellow	yellow

dark red	Problem observed frequently
orange	Problem observed in many instances
yellow	Problem observed in isolated instances
beige	Problem not reported as significant

3.2.5 Energy Audit Recommendations

Energy Audits for each of the insular schools were prepared by the team's mechanical and electrical engineers. The general methodology followed a hybrid of ASHRAE "Level 1" and "Level 2" energy audits.[6] The Level 1 audit is referred to as a "walk-through audit" and is the basic starting point for building energy optimization. In the hybrid approach used, the building's energy cost and efficiency were also assessed by analyzing energy and water/sewer bills and using data collected during on-site building surveys. Once the field data and utility information were used to determine the approximate breakdown of utility consumption by major use category, a list of potential energy conservation measures (ECM's) for each school was developed. The lists of ECM's vary from low cost measures to capital investment measures and were based on observed existing conditions at each school. An energy analysis was also performed to estimate the energy savings for each measure. Cost estimates for each ECM were then developed based on current RS Means data and marked up to include taxes, fees, and local labor rates. A simple payback of 10 years or less was used as a metric to determine if each ECM is financially attractive. The availability of trained maintenance staff and resource adequacy should be considered before implementing ECMs.

Walk-through surveys included interviews with school administrators, maintenance/janitorial staff to provide information about facilities that may not be easily observed. School operation hours and occupancy were collected during the interviews. Baseline modeling was approached at the school level and not by building. Historical utility usage was based on an average of the previous 2-3 years' worth of data if available. Electricity and water utility rates were based on an average of the most recent year.

Energy analysis conducted for the audits showed that water/sewer and power consumption rates and costs vary greatly between insular areas as summarized below.

Insular Area	kW/ sf/ yr	Annual Electric Bill ($M)	kGal/ person/ yr	Annual Water Bill ($M)	Total Utility Costs ($M)
Am Samoa	6.22	$2.3	3,463	$0.5	$2.8
CNMI	5.43	$2.4	1,740	$0.9	$3.3
Guam	11.3	$11.4	5,920	$1.9	$13.3
USVI	8.2	$8.9	3,161	$1.8	$10.7

Source: Energy Audit Reports

The chart below provides an overview of the ECMs recommended for each insular area, the potential annual savings in utility costs, the estimated amount of time needed to payback ECM investments (simple payback), and the percent of utility cost reduction:

Energy Audit ECM Recommendations	**Am. Samoa**	**CNMI**	**Guam**	**USVI**
ECMs - Electric				
New Solar Hot Water or Heat Recovery System				
Replace T12 Fixtures with T8 LED				
Replace T8 Fluorescent Lamps with T8 LED				
Programmable Thermostats for AC				
Roofmount 30-200 KW PV system				
Fix Supply Air Discharge Duct Leaks				
New Lighting Controls				
New VFDs/High Efficiency Booster Pump Motors				
New Heat Recovery/ Desuperheater System				
Insulate Non-insulated Roofs				
Replace AC Systems with High Efficiency Units				
Retrofit with Ultra Low Flow Plumbing Fixtures				
Total Investment ($M) - Primary ECMs	$9.1	$11.3	$13.6	$34.8
Simple Payback (years) - Primary ECMs	8	7	8	8
Investment Capitalization (years) - Primary ECMs	8	10	10	8
Dollar Savings (millions per year) - Primary ECMs	$1.1	$1.5	$1.7	$4.4
Percent Reduction in Utility Costs - Primary ECMs	55%	40%	20%	56%

Legend:
- ECM Recommended – Primary Recommendation
- ECM Recommended– Other, feasible if funding permits
- Not proposed

Total Annual Savings: $8.7M

* Because of the low cost of water in American Samoa, water conserving ECM's were not considered as they would not be economically viable.

[6] ASHRAE (Procedures for Commercial Building Energy Audits Second Edition, 2011) classifies commercial building energy analysis into three levels of effort: 1) Walk¬-Through Analysis, 2) Energy Survey Analysis and 3) Detailed Analysis of Capital-intensive Modifications.

4 Insular Area-Specific Findings

4.1 American Samoa Overview

The overall American Samoa school facility score is 3.7 (on a scale of 1-5). Schools are 40 years old on average. Site surveys occurred following completion of ARRA[7]-funded facility improvements (e.g., roof repairs, painting, etc.). Key problems include electrical infrastructure, gutters and drains, regional drainage problems, flooding school grounds and buildings, vehicular/pedestrian circulation hazards, parking limitations, emergency vehicle access, and fire protection (i.e., lack of proximate fire hydrants).

Distribution of School Buildings by Score

Score Ranges	Number of Buildings*
5	1
4.0 – 4.99	75
3.0 - 3.99	209
2.0 - 2.99	26
1.0 - 1.99	2
0.0 - 0.99	18
Total	331

*Includes ancillary structures in addition to inhabited buildings

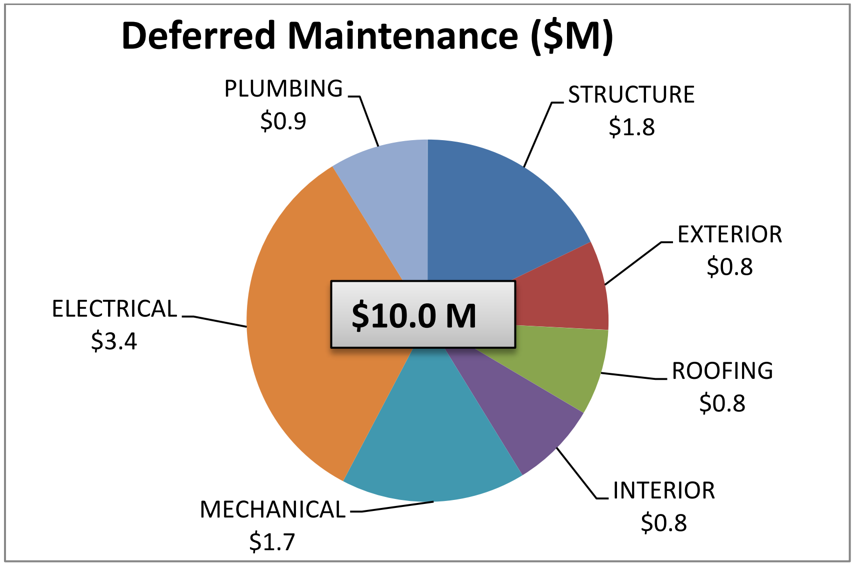
American Samoa Assessment Summary

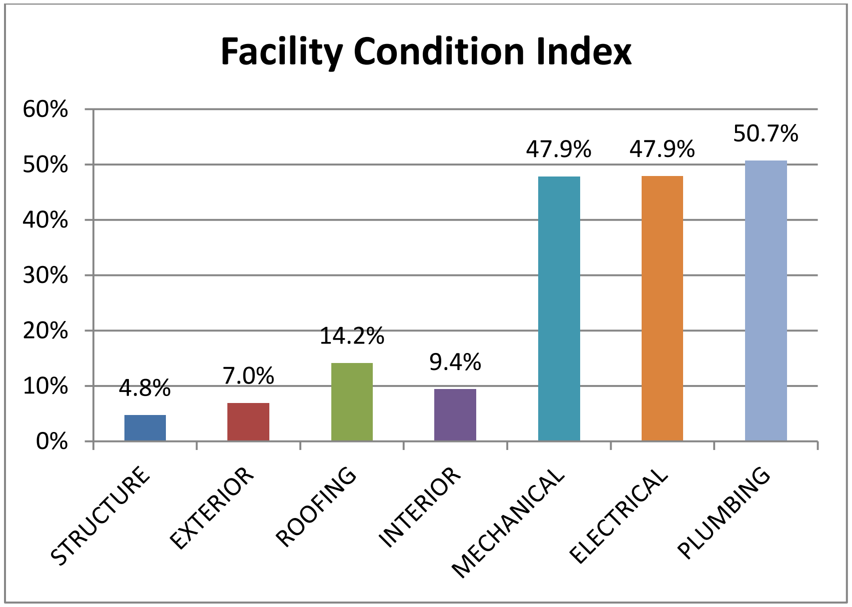
Score (1-5)	H/S DM ($M)	Total DM ($M)	FCI
3.7	**$1**	**$10**	**13%**

Facility standards, items that may not be present at schools but considered to be required, were established during consultation with each school district. Standard items to be rated zero if not present (recommending full installation) included:

1. Fire alarm
2. Fire hydrants/standpipes
3. Backflow preventer
4. Emergency vehicle access
5. Gutters and drains
6. Covered walkways

4.1.1 Summary Assessment Findings





[7] American Recovery and Reinvestment Act of 2009

Health and safety (H/S) concerns were flagged during surveys for priority attention. The H/S concern table below summarizes the number of hazardous conditions identified at each school and DM cost by system.

Health and Safety Concerns:

Priority Needs – Frequency of H/S Concerns and Related DM	Electrical	Exterior	Interior	Mechanical	Plumbing	Structure
A.P. Lutali ES	2					
Afonotele ES	2				1	
Alataua II ES	2					
Alofau ES	4				2	
Aua ES	6				1	
Coleman ES	18	1			1	
Faga'itua HS	5	2	1	1		
Faleasao ES	6					
Fitiuta ES	5					
Lauli'i ES	1					
Le'atele ES	4				1	
Leone HS	2				1	
Leone Midkiff ES	1	1				1
Lupelele ES	4					
Manu'a HS	4					
Manulele ES	5					
Masefau ES	1				1	
Matafao ES	13			1		1
Matatula ES	4					
Mt. Alava ES	3				1	
Nu'uuli Polytech	5				2	1
Olomoana ES	5				1	
Olosega ES	8				3	
Pavaia'i ES	5	1				1
Samoana HS	8			1	1	
Siliaga ES	4					3
Tafuna ES	1	2	1			
Tafuna HS	7					
Total Count	**135**	**7**	**2**	**3**	**16**	**7**
Subtotal ($M)	**$0.75**	**$0.16**	**$0.04**	**$0.21**	**$0.19**	**$0.02**
Total H/S DM:	**$1.4M**					

FCI, or the DM cost percentage of full replacement, can help identify major deficiencies. Based on assessment results, approximately 25 percent of elements rated had FCI's above 15 percent and are considered to have a high FCI. High FCI elements are summarized in the table below.

High FCI Elements:

Element	Estimated DM ($M)	Estimated FCI
MEP Infrastructure[8]	$0.121	120%
Fire Alarm Command Center	$0.665	101%
Fire Sprinklers	$0.080	100%
Intercom System - 12 Stations	$0.189	99%
Security System	$0.384	98%
Fluid Applied Roofing	$0.103	90%
Aluminum Windows - double hung	$0.006	75%
Central ducted dx - air cooled AC	$0.212	73%
Service Installation - 1,000 A	$1.314	46%
Ductless dx split - air cooled AC	$1.446	46%
Plumbing Fixtures	$0.683	44%
Acoustic Ceilings	$0.102	42%
***Fluorescent Fixtures**	$0.775	40%
Wood Doors - Double	$0.047	39%
Gutters	$0.022	33%
Foundation – Crawl Space	$0.016	29%
Aluminum Windows - picture	$0.021	29%
Wood Joists	$0.002	29%
Wood Columns	$0.004	23%
Tile & Covering - Carpet	$0.026	22%
Wood Bearing Walls	$0.108	16%
Exterior Stair Construction	$0.046	15%

*Surveys preceded a school district lighting project which has been completed.

[8] MEP infrastructure: includes school utilities and items lacking assessment selections

Site Concerns

Cost estimates for Site deficiencies were outside of the Phase II scope. In lieu of cost estimates, narrative lists were compiled to bring attention to major and common Site deficiencies identified during surveys. Major Site concerns identified include:

1. Inadequate fire protection on or near campus
2. Lack of emergency vehicle access
3. Pedestrian hazards from non-delineated roadways; fall hazards
4. Lack of perimeter fencing/gates
5. Lack of regular septic tank maintenance (overflow reported)
6. Lack of backflow prevention for potable water system
7. Lack site drainage plans (including regional drainage issues)

Other Common issues included:

1. Inadequate roadway surfacing and maintenance
2. Lack of roadway access signage
3. Lack designated pick up/drop off areas
4. Lack student play areas (some sites)
5. Perimeter fencing absent or in poor condition

4.1.2 Collateral Findings

Site concerns in American Samoa were great relative to other insular areas and should be seriously considered in regional and cross-departmental project planning. Major needs identified by school surveyors include the need for regional drainage improvements and large scale electrical infrastructure upgrades. Regional drainage problems exist in many valleys and low lying areas, where many of the schools are sited. In these cases, drainage issues cannot be rectified with only onsite improvements. Underground drainage system installation is warranted in some cases. The need for electrical upgrades is addressed in many of the electrical health and safety concerns captured in the survey data. Addressing these concerns through major concerted regional projects is advisable.

In many cases, inadequate planning when adding new structures to schools was observed resulting in site congestion, obstructed natural ventilation, vehicular circulation impacts, and site drainage problems. School site plans do not exist and are needed for facility siting.

Many schools are on or near the shoreline and vulnerable to typhoon or tsunami impacts. Accelerated building material deterioration occurs near the ocean due to high concentration of salt in the atmosphere. This was a greater problem in American Samoa than in other insular areas, primarily due to the close proximity of buildings to the ocean.

The predominance of gable and hip roof structures in American Samoa school buildings (i.e., well sloped roofs) appeared to result in less water related structural damage than observed in the other insular areas (which had a higher proportion of flat roof structures). However, breach of the interior enclosure can also occur through cracks or openings in the walls, which leads to deterioration of corrodible components. Facilities in salty coastal environments are particularly vulnerable to moisture infiltration.

Replacement of termite damaged members and anchorage of roof components for cyclones is needed in some cases. It was observed that opportunities to undertake these retrofits were missed during recent reroofing projects (for some light framed roofs). It is noted that these retrofits appear to be regular practice and were observed in other cases.

4.2 CNMI Overview

The overall facility score is 4.3 (on a scale of 1-5) for CNMI Public School System (PSS) facilities. Schools are 36 years old on average. Surveys occurred following completion of ARRA-funded facility improvements (e.g., roof repairs, painting, etc.). Key problems include weatherproofing, inadequate natural ventilation, emergency vehicle access, fore protection (including fire hydrant provision), and site drainage.

Distribution of School Buildings by Score

Score Ranges	Number of Buildings*
5	6
4.0 – 4.99	218
3.0 - 3.99	48
2.0 - 2.99	13
1.0 - 1.99	6
0.0 - 0.99	31
Total	322

*Includes ancillary structures in addition to inhabited buildings

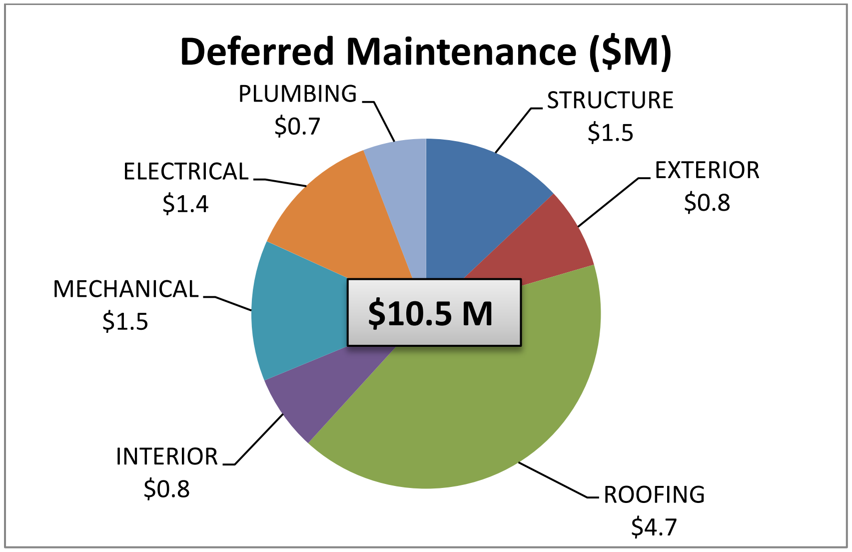
CNMI Assessment Summary

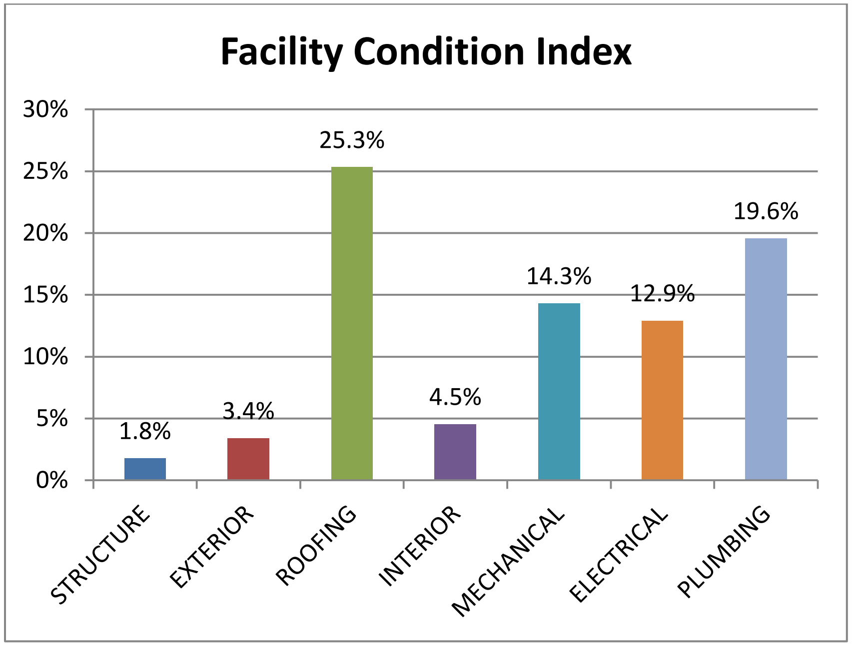
Score (1-5)	H/S DM ($M)	Total DM ($M)	FCI
4.3	**$1**	**$11**	**7%**

Facility standards, items that may not be present at schools but are considered to be required, were established during consultation with each by the school district for assessment rating purposes. Standard items to be rated zero if not present (recommending full installation) included:

1. Fire alarm
2. Fire hydrants/standpipes
3. Backflow preventer
4. Emergency vehicle access
5. Fences and gates
6. Covered walkways
7. Sports fields

4.2.1 Summary Assessment Findings





H/S concerns were flagged during surveys for priority attention. The H/S concern table below summarizes the number of hazardous conditions identified at each school and associated DM cost by system.

Health and Safety Concerns:

Priority Needs – Frequency of H/S Concerns and Related DM	Electrical	Exterior	Interior	Mechanical	Plumbing	Roofing	Structure
Dandan ES		1					
G.T. Camacho ES	3						
Garapan ES	7	1			1		
Hopwood JHS	3		1				1
Kagman ES	11			1			
Koblerville ES	4						1
Marianas HS	2	6		1	2		5
Oleai ES	1				2	1	
Reyes ES	3				1		
Rota HS	2						
Rota JHS			1				1
Saipan Southern HS	2				1	1	
San Antonio ES	2						2
San Vincente ES	10					1	1
Sinapalo ES	1						
Tanapag ES	3				1		
Tinian ES	1						
Tinian Jr./Sr. HS	2	1					
Total Count	**57**	**9**	**2**	**2**	**8**	**3**	**11**
Subtotal ($M)	**$0.36**	**$0.16**	**$0.02**	**$0.06**	**$0.27**	**$0.04**	**$0.38**
Total H/S DM:	**$1.3M**						

FCI, or the DM cost percentage of full replacement, can help identify major deficiencies. Based on assessment results, approximately 25 percent of elements rated had FCI's above 15 percent and are considered to have a high FCI. High FCI elements are summarized in the table below.

High FCI Elements:

Element	Estimated DM ($M)	Estimated FCI
Rolled Asphalt Roofing	$0.017	90%
Sprinkler Systems	$0.208	80%
Intercom System	$0.049	52%
MEP Infrastructure[9]	$0.130	51%
Wood Bearing Walls	$0.013	47%
Security System	$0.014	36%
Fluid Applied Roofing	$3.608	29%
Tile & Covering - Carpet	$0.081	29%
Preformed Metal Roofing	$0.592	20%
Steel or Braced Frames – Ext. Walls	$0.122	19%
Wood Windows - Picture	$0.025	18%
Steel Doors - Overhead, Rolling	$0.042	18%
Central Ducted dx - Air Cooled AC	$0.744	17%
Metal Siding	$0.124	16%
Tile & Covering - Acrylic	$0.076	16%
***Fluorescent Fixtures**	$0.515	16%
Single Ply Membrane Roofing	$0.118	16%
Fire Alarm Command Center	$0.236	16%
Formed Metal Roofing	$0.316	15%

*A major lighting project was completed in early 2013 (post assessment).

[9] MEP infrastructure: includes school utilities and items lacking assessment selections

Site Concerns

Cost estimates for Site deficiencies were outside of the Phase II scope. In lieu of cost estimates, narrative lists were compiled to bring attention to major and common Site deficiencies identified during surveys. Major Site concerns identified include:

1. Inadequate fire protection distribution and storage on or near campus
2. Lack of emergency vehicle access
3. Sewage backup; malfunctioning septic tank/ leaching field (pumped regularly)
4. Lack of backflow prevention for potable water system
5. Non-potable water supply fed from fire hydrant (two schools)

Other Common issues included:

1. Inadequate site drainage engineering including: missing, degraded, or inadequate swales, ditches, culverts, drainage system, and/or detention basins
2. Regular maintenance of drainage systems, retention basins, drainage ditches, swales, and culverts is required.

4.2.2 Collateral Findings

CNMI public school facilities are primarily constructed with concrete. Structurally, concrete buildings generally perform well if a waterproof enclosure is maintained. Most problems observed stem from water penetration of roof or wall components. Flat roof structures with parapets or those that rely on maintenance of a drainage system are more susceptible than naturally drained sloped roof structures. Wood and metal buildings tend to be more susceptible to deterioration due to termite or water damage and corrosion.

During the Phase II assessments, surveyors observed an on-going roofing project and determined that the fluid-applied roofing material being used was inappropriate, and identified instances where this material failed in a short time period. Material and process specification requirements and review practices are needed to encourage repair project adequacy.

The common practice of building single story buildings using flat roofs with inadequate drainage and reinforcing projecting out of the roof for future second story expansion, leads to ponding issues, deterioration of the roofing materials and deterioration of the concrete roof structure. The roofing of these types of buildings needs to be sloped appropriately. When reroofing, exposed reinforcing should be eliminated or protected.

Reroofing of light-framed roofs needs to include replacement of termite damaged members and typhoon anchorage of roof components. This was observed to have happened for past projects, but was not evident in all recent reroofing projects.

School site plans do not exist and are needed for facility siting.

4.3 Guam Overview

The overall facility score is 4.0 (on a scale of 1-5) for Guam Department of Education (DOE) facilities. Schools are 40 years old on average. Surveys occurred just prior to commencement of ARRA-funded facility improvements (e.g., roof repairs, electrical upgrades, painting, etc.). Five of Guam's 40 public schools are leased by GDOE; surveys excluded these schools.[10] Key problems include roof slope, weatherproofing, corroding rebar, spalled concrete, fresh air provision, emergency vehicle access, fire protection (including fire hydrant provision), and site drainage.

Distribution of School Buildings by Score

Score Ranges	Number of Buildings
5	6
4.0 – 4.99	344
3.0 - 3.99	286
2.0 - 2.99	21
1.0 - 1.99	7
0.0 - 0.99	103
Total	767

*Includes ancillary structures in addition to inhabited buildings

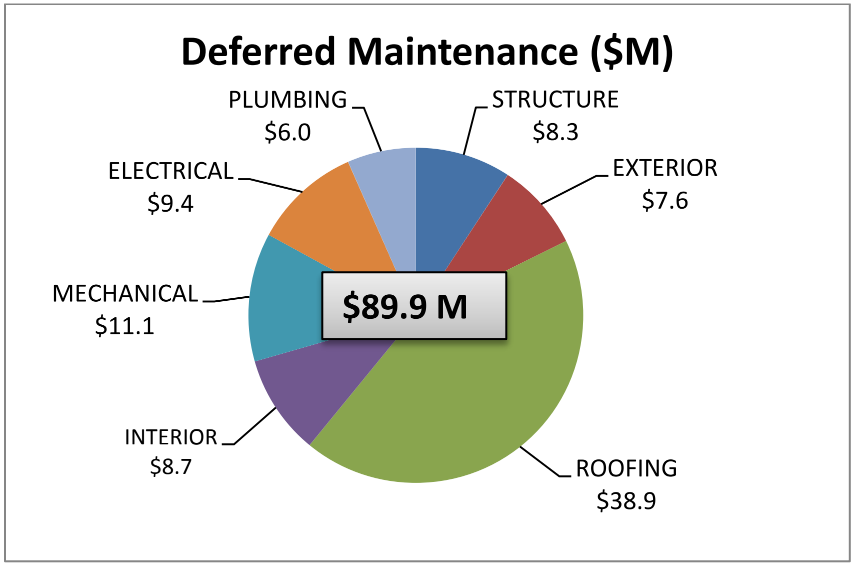
Guam Assessment Summary

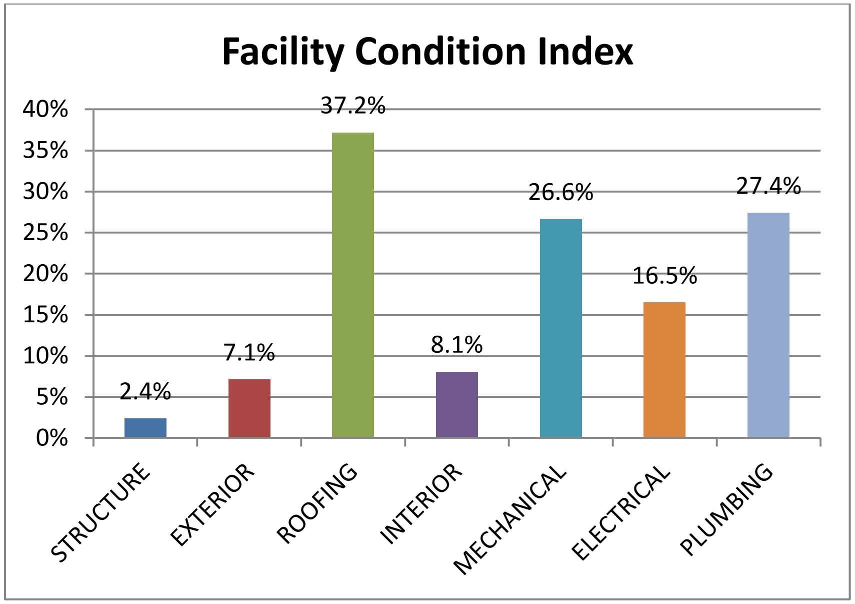
Score (1-5)	H/S DM ($M)	Total DM ($M)	FCI
4.0	**$5**	**$90**	**11%**

Facility standards, items that may not be present at schools but are considered to be required, were established during consultation with each by the school district for assessment rating purposes. Standard items to be rated zero if not present (recommending full installation) included:

1. Fire alarm
2. Fire hydrants/standpipes
3. Backflow preventer
4. Emergency vehicle access
5. Fences and gates
6. Covered walkways
7. Sports fields

4.3.1 Summary Assessment Findings





[10] Leased schools include Okkodo HS, JFK HS, Astumbo ES, Liguan ES and Adacao ES. Additionally, F.Q. Sanchez is closed.

H/S concerns were flagged during surveys for priority attention. The H/S concern table below summarizes the number of hazardous conditions identified at each school and associated DM cost by system.

Health and Safety Concerns:

Priority Needs – Frequency of H/S Concerns and Related DM	Electrical	Exterior	Interior	Mechanical	Plumbing	Roofing	Structure
Agueda Johnston MS	3				1		
Astumbo ES		9			4		
C.L. Taitano ES				1	1		
Capt. Price ES	1	2		1		1	2
Carbullido ES	6				3	1	1
Chief Brodie Memorial ES	4						
F.B. Leon Guerrero MS	1	1		1	3		
Finegayan ES	3			1			
George Washington HS	3			3	2		
Hagatna Heights ES	1						
Inarajan ES				1			
Inarajan MS	2			1	1		
J.P. Torres ES	1				1		
J.Q. San Miguel ES					1		1
Jose Rios MS	4				2		
Juan M. Guerrero ES					1		
L.P. Untalan MS					2		
LBJ ES	1						
M.A. Sablan ES	2						
M.U. Lujan ES	3				1		1
Machananao ES					3		
Maria A Ulloa ES	1				2		
Merizo Martyrs ES	5		1	1	2		
Oceanview MS	4						
Ordot/Chalan Pago ES				1	1		
P.C. Lujan ES	1				1		
Simon Sanchez HS	2			2			1
Southern HS	1			1	13		1
Talofofo ES	6				1		
Tamuning ES					5		
Truman ES	2				1		
Upi ES	3			4	1		
Vicente S.A. Benavente MS	1		1				
Wettengel ES	3	1			1		
Total	**64**	**13**	**2**	**18**	**54**	**2**	**7**
Subtotal ($M)	**$0.80**	**$0.03**	**$0.03**	**$0.76**	**$2.89**	**$0.86**	**$0.73**
Total H/S DM:	**$5.3M**						

FCI, or the DM cost percentage of full replacement, can help identify major deficiencies. Based on assessment results, approximately 25 percent of elements rated had FCI's above 15 percent and are considered to have a high FCI. High FCI elements are summarized in the table below.

High FCI Elements:

Element	**Estimated DM ($M)**	**Estimated FCI**
Security System	$0.002	100%
Built-up Asphalt - Roofing	$0.449	86%
Intercom System - 12 Stations	$2.833	83%
Steel Grate Stairway	$0.026	75%
Wood Windows - picture	$0.725	69%
Steel Windows - picture	$0.102	56%
Steel Joists/ Composite Slab - Roof	$0.136	54%
Gutters	$0.352	52%
MEP Infrastructure[11]	$2.586	52%
Epoxy Coating – Exterior Finish	$0.109	47%
Fluid Applied Roofing	$34.571	40%
Beams and Lightweight Decking System	$0.045	33%
Central ducted dx - air cooled AC	$3.763	32%
Downspouts	$0.021	29%
Ductless dx split - air cooled AC	$6.204	25%
Rolled Asphalt Roofing	$0.131	25%
Fire Sprinklers	$1.251	24%
Formed Metal Roofing	$1.565	23%
Single Ply Membrane - 60 mils	$0.020	23%
Central chilled water - air cooled AC	$1.180	22%
Preformed Metal Roofing	$1.753	19%
Plumbing Fixtures	$2.124	18%
Service Installation - 1,000 A - Electrical	$2.650	17%
Steel Doors - Overhead, rolling	$0.143	17%
Paint & Covering	$1.133	15%
Fluorescent Lighting Fixtures	$2.257	15%

Note: Surveys preceded ARRA-funded roof, mechanical, and electrical repair projects.

[11] MEP infrastructure: includes school utilities and items lacking assessment selections

Site Concerns

Cost estimates for Site deficiencies were outside of the Phase II scope. In lieu of cost estimates, narrative lists were compiled to bring attention to major and common Site deficiencies identified during surveys. Major Site concerns identified include:

1. Inadequate fire protection distribution and storage on or near campus
2. Lack of emergency vehicle access
3. Sewage leaks or backup
4. Malfunctioning septic tank/ leaching field (pumped regularly)
5. Lack of backflow prevention for potable water system
6. Field equipment deteriorated and unsafe

Other Common issues included:

1. Regular maintenance of drainage systems, retention basins, drainage ditches, swales, and culverts is required.

4.3.2 Collateral Findings

Guam DOE has experienced several major changes in the past 20 years including the standup of US Department of Defense Education Activity (DODEA) schools in the late 1990's and development of a number of new, leased schools in the early 2000's. There is also increasing enrollment pressure from private schools. The opening of DODEA schools resulted in a drop in student enrollment and the loss of "DOD Impact Aid" assistance funds. Based in part on a 2009 study (Evergreen Solutions, LLC), Guam DOE has initiated a review of its school maintenance programs and is evaluating opportunities to outsource some of its internal functions. These initiatives need to be encouraged and dovetail with the recommendations of this report.

Guam public school facilities are primarily constructed with concrete. Structurally, concrete buildings generally perform well if a waterproof enclosure is maintained. Most problems observed stem from water penetration of roof or wall components. Flat roof structures with parapets or those that rely on maintenance of a drainage system are more susceptible than naturally drained sloped roof structures. Wood and metal buildings tend to be more susceptible to deterioration due to termite or water damage and corrosion.

In several cases, inadequate planning when adding new structures to schools was observed resulting in site drainage problems, site congestion, obstructed natural ventilation, and vehicular circulation impacts. School site plans do not exist and are needed for facility siting.

4.4 USVI Overview

The overall facility score is 3.6 (on a scale of 1-5) for U.S. Virgin Islands Department of Education (VIDE) facilities. Key problems include corroding rebar, spalled concrete, deteriorated wood elements, weatherproofing, air quality concerns, plumbing leaks, exposed electrical elements, vehicle circulation, emergency vehicle access, fire protections (including fire hydrant provision), and site drainage.

Distribution of School Buildings by Score

Score Ranges	Number of Buildings
5	1
4.0 – 4.99	50
3.0 - 3.99	316
2.0 - 2.99	32
1.0 - 1.99	3
0.0 - 0.99	44
Total	446

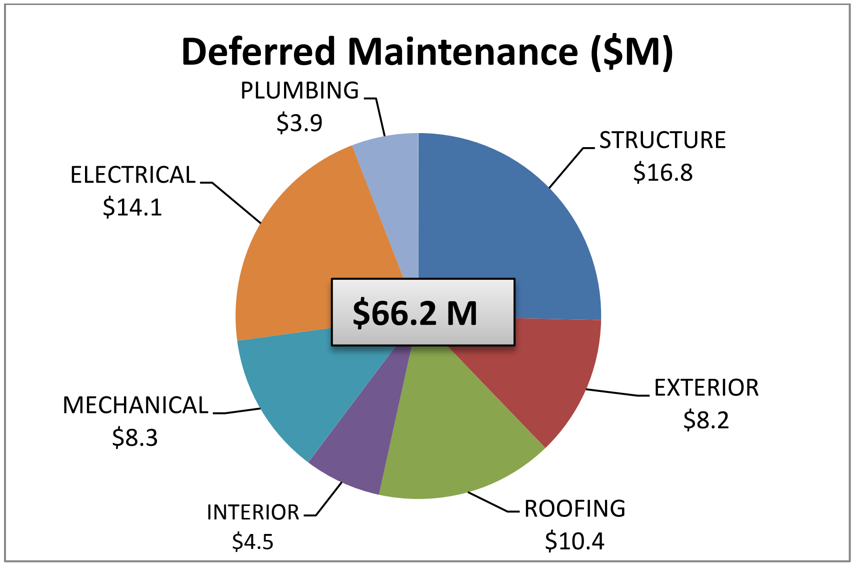
*Includes ancillary structures in addition to inhabited buildings

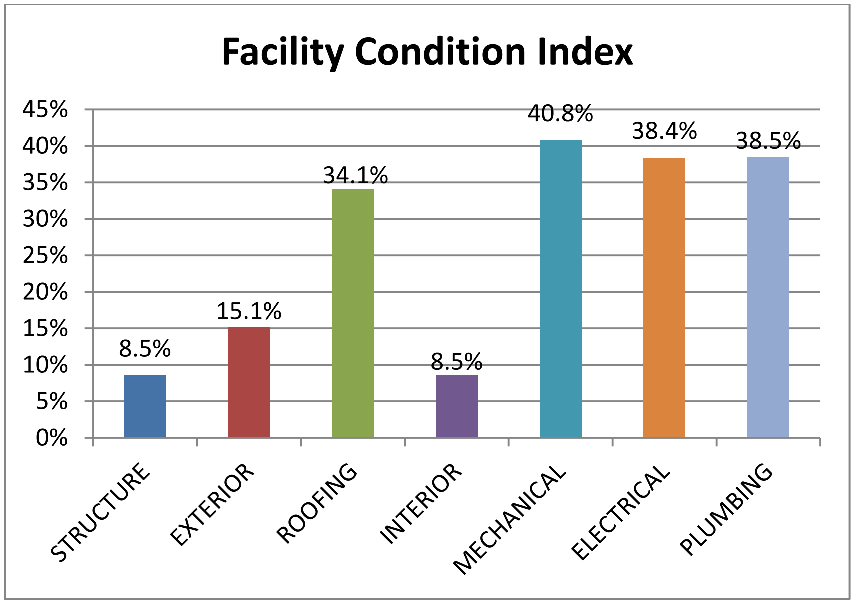
USVI Assessment Summary			
Score (1-5)	H/S DM ($M)	Total DM ($M)	FCI
3.6	$9	$66	17%

Facility standards, items that may not be present at schools but are considered to be required, were established during consultation with each by the school district for assessment rating purposes. Standard items to be rated zero if not present (recommending full installation) included:

1. PA system
2. Fire alarm
3. Fire hydrants/standpipes
4. Backflow preventer
5. Emergency vehicle access
6. Fences and gates

4.4.1 Summary Assessment Findings





H/S concerns were flagged during surveys for priority attention. The H/S concern table below summarizes the number of hazardous conditions identified at each school and associated DM cost by system.

Health and Safety Concerns:

Priority Needs – Frequency of H/S Concerns and Related DM	Electrical	Exterior	Interior	Mechanical	Plumbing	Roofing	Structure
Addelita Cancryn JHS	1	2			1		1
A. Henderson ES	2			1	2		
Alfredo Andrews ES	3			2	3		
Arthur Richards JHS	2				1		
Bertha C. Boschulte MS	2						
Charles Emanuel ES	2	2	1		2		2
Charlotte Amalie HS	3	3		1	1		2
Claude O. Markoe ES	1			1	4		
E. Benjamin Oliver ES	2				1		
Edith L. Williams Alt.	2				1		
Elena Christian JHS	3						
Eulalie Rivera ES	1			1	1		
Evelyn M. Williams ES	1			1	2		
Gladys Abraham ES	1						
Guy H. Benjamin ES	1	1					
Ivanna Eudora Kean HS	1				1		
Jane E. Tuitt ES	1						3
John H. Woodson JHS	1				1		
Joseph Gomez ES	2	3			1		
Joseph Sibilly ES	2	2			1		1
Juanita Gardine ES	2						1
Julius E. Sprauve	1						3
Leonard Dober ES	3				1		
Lew Muckle ES	3	2					
Lockhart ES	1			1			
Pearl B. Larsen ES	2						
Positive Connections Alt.	3						
Ricardo Richards ES	3						
St. Croix Central HS	3						
St. Croix Ed. Complex HS	5				7		
Ulla F. Muller ES	3	3				1	3
Y.E. Milliner-Bowsky ES	2						
Total Count	**65**	**18**	**1**	**8**	**31**	**1**	**16**
Subtotal ($M)	**$3.28**	**$0.14**	**$0.01**	**$0.25**	**$2.12**	**$0.01**	**$2.89**
Total H/S DM:	**$8.7M**						

FCI, or the DM cost percentage of full replacement, can help identify major deficiencies. Based on assessment results, approximately 25 percent of elements rated had FCI's above 15 percent and are considered to have a high FCI. High FCI elements are summarized in the table below.

High FCI Elements:

Element	Estimated DM ($M)	Estimated FCI
Fire Alarm Command Center	$4.532	107%
MEP Infrastructure[12]	$2.007	72%
EFIS Coating	$0.494	72%
Ductless dx split - air cooled AC	$4.634	61%
Steel Joists & Slab	$1.250	57%
Central Chilled Water - water cooled AC	$0.004	50%
Fire Sprinklers	$0.257	50%
Fluid Applied	$7.601	48%
Epoxy Coating	$0.194	47%
Intercom System - 12 Stations	$0.811	45%
Built-up Asphalt	$0.142	44%
Asphalt Roofing - Strip	$0.005	44%
Service Installation - 1,000 A	$5.845	44%
Beams & Lightweight Decking System	$0.025	39%
Slab Only - Floor	$1.218	39%
Aluminum Windows - sliding	$0.357	38%
Wood Windows - double hung	$0.007	36%
Light Metal Framed Structural Walls	$1.270	34%
Central ducted dx - air cooled	$3.522	29%
Downspouts	$0.199	28%
Tile & Covering - Acrylic	$0.082	28%
Gutters	$0.334	27%
Single Ply Membrane - 60 mils	$0.191	26%
Central Chilled Water - air cooled AC	$0.148	25%
Covered Walkways	$4.882	24%
Plumbing Fixtures	$1.644	24%
Fluorescent Lighting Fixtures	$2.053	23%
Formed Metal	$0.065	22%
Cellular Steel Deck, Triple Span	$0.281	22%
Concrete Ceilings	$0.160	22%
CIP Beam & Slab	$2.315	22%
CIP Beam & Slab - Roof	$1.396	21%
Slab Only -Roof	$0.406	19%

[12] MEP infrastructure: includes school utilities and items lacking assessment selections

Element	Estimated DM ($M)	Estimated FCI
Drywall Partitions/Wood Stud Framing	$0.049	17%
Steel Joists, Beams & Slab on Columns	$1.617	17%
Aluminum Windows - picture	$0.385	17%
Rolled Asphalt Roofing	$0.006	17%
Preformed Metal Roofing	$1.829	16%
Wood Joists	$0.047	15%
Exterior Stair Construction	$0.240	15%
Metal Door/Metal Frame	$0.025	15%

Site Concerns

Cost estimates for Site deficiencies were outside of the Phase II scope. In lieu of cost estimates, narrative lists were compiled to bring attention to major and common Site deficiencies identified during surveys. Major Site concerns identified include:

1. Inadequate fire protection distribution and storage on or near campus
2. Lack of emergency vehicle access
3. Lack of backflow prevention for potable water system
4. Poor traffic access and circulation (parking/pick up drop off areas)

Other Common issues included:

1. Isolated site drainage and flooding problems (concrete swale/re-grade/drainage system maintenance)
2. Asphalt and concrete pavements in poor condition
3. Parking and roadway marking/signage in poor condition or absent
4. Perimeter fencing and student play areas absent or in poor condition

4.4.2 Collateral Findings

A general need for greater oversight during project bidding and execution to insure materials and installation specifications are met was reported by surveyors—particularly for roofing replacement and other exterior enclosure repairs. Abandoned AC equipment is compromising exterior enclosures. Roadway asphalt and concrete pavings are in poor condition throughout the area.

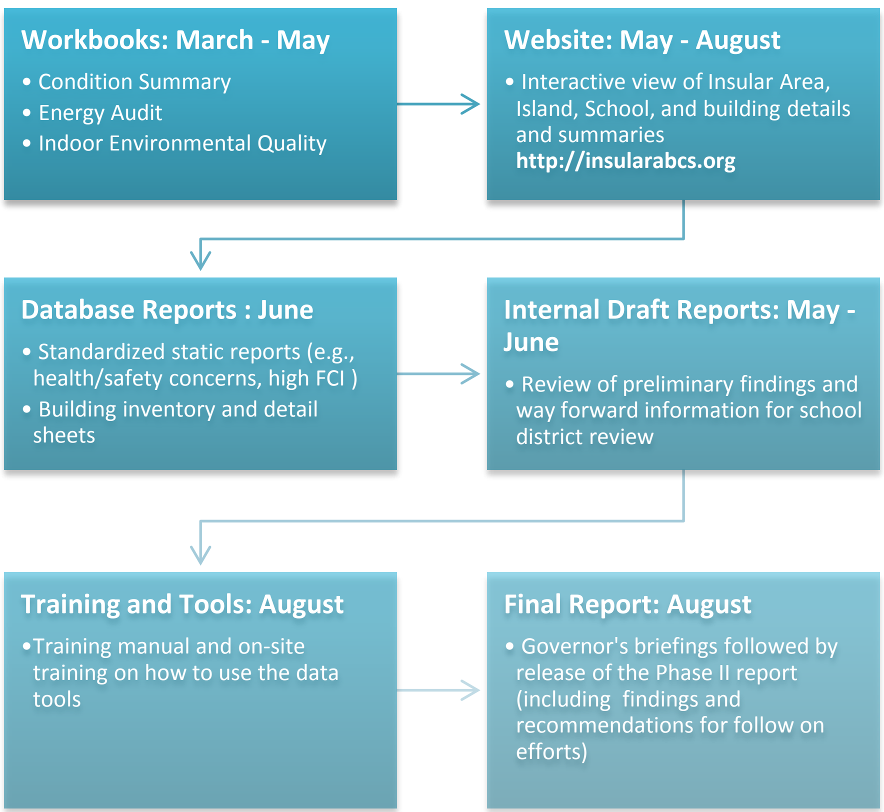
In several cases, inadequate planning when adding new structures to schools was observed, resulting in site congestion, obstructed natural ventilation, vehicular circulation impacts, and site drainage problems. School site plans do not exist and are needed for facility siting.

5 Work Products

Phase II of the Insular ABCs Initiative included the transfer of information gathered in the study, including facilities inventory and condition data, and a recommended implementation plan for next steps to insular area and OIA officials as appropriate.

Overall Delivery Schedule

The following chart provides a summary of the various reports and briefings presented as part of the Phase II process.



5.1 Reports

Reports and assessment data were transferred to School District personnel as data compilation and processing was completed. Initial reporting was provided by the survey team through on-site verbal updates and more formally during kickoff briefs and out briefs for each insular area.

A workbook for each insular area was compiled initially as a means to vet draft findings with School District SMEs, and later as a repository of insular area-related information. School District comments were incorporated into reports before finalizing them. The workbooks provide contextual background and narrative descriptions of assessment findings to add depth to data compiled and reported on the website, and will be an enduring legacy of the Phase II initiative. Workbook contents include:

- Narrative Condition Assessment Summaries
- IEQ Assessments
- Energy Audits
- Principal Questionnaires
- Presentations (Insular Area Kickoffs, Out briefs)
- Condition Assessment Criteria
- Database reports
- Cost Model Documentation
- School Site Plans

The project website (http://insularabcs.org) provides all insular area, insular area, island, school, building and building system level inventory, condition, and cost information through weighted scores, DM totals, and FCI calculations, as well as a repository for the insular workbooks.[13] School district personnel can navigate through the website at various

[13] Access to the "summary of all insular areas" page where summaries of all the insular areas are compiled, is limited to OIA; insular areas officials each have access to their own information.

levels of the hierarchy and track associated DM cost and health and safety issues.

The "database reports" provided in the workbooks and downloadable from the website, are immediately useful to facility managers and include specialized reports summarizing a variety of topical data including:

1. Health and safety concerns
2. DM priorities (items with high FCI)
3. Insular area, island, school, and building reports

These reports will assist facility managers in identifying high priority needs and developing DM backlog reduction strategies.

5.2 FIMS Transition

The workbooks and website provide each of the territories with the detailed inventory and condition data as well as documentation of the cost model and condition assessment criteria used in the Phase II assessments. Excel tables included in the workbooks and the drill-down capability in the website provide school facility planners the information they need to access Phase II data. OIA will continue to host the FIMS and will extend editing privileges to each of the territories as part of Phase III (see related discussion in Chapter 6).

6 Implementation Plan

OIA and the insular areas need to continue to work together to implement the recommendations of this report to improve the physical condition of insular area schools and transition the school districts to sound, adequately-funded preventative school maintenance programs. The following implementation plan should be considered notional and subject to change in discussions with each insular area. It provides general recommendations for OIA and the insular areas to follow and substantially accomplish Insular ABCs goals *within a five year time frame*. It is up to OIA and insular area leadership to develop strategies for accomplishing these goals. The "partnership" requires both OIA and the insular areas to engage by committing staff and dedicated funding, over a period of years, and elevating the concern to a high level of executive importance. The recommended implementation plan focuses on two key areas:

- Removing the DM backlog, resolving site deficiencies, and implementing the IEQ and Energy Audit recommendations
- Transforming school facility management to Industry Standard maintenance programs – to prevent the DM backlog from re-occurring

Each insular area needs to take maximum advantage of the awareness created by the Phase II report to recruit other partners and investors who share the same view – that the physical condition of insular area schools must be improved.

A general scope and timeframe for each task in the implementation plan is summarized below. A notional implementation schedule is provided at the end of this chapter. An initial three-month pre-planning/consultation period will provide time to firm up individualized implementation schedules for each insular area, based on its particular needs and requirements. A final report would be issued at the end of the initiative to document findings, lessons learned, and needed follow-on actions.

6.1 Remove DM Backlog/ Implement Report Recommendations

Removing the DM backlog is the most important recommendation of this report as it is fundamental to improving the condition of insular area schools. It is recommended that OIA and the insular areas establish a five-year timeframe to substantially remove the backlog. Establishing priority lists and strategies for addressing and correcting health and safety-related DM should be undertaken as a first step. Resolving school site deficiencies identified in the Phase II report (e.g., site drainage, pavement conditions, fencing, etc.), particularly health and safety-related problems, is a critical parallel recommendation. Implementing the range of short term, low cost initiatives outlined in the IEQ assessments, largely with existing operational funding, is also imperative because it will immediately improve the student learning environment and overall student performance. Implementing energy audit recommendations will lead to significant utility bill savings and a more sustainable, secure energy infrastructure. These initiatives are described below within the context of a long range CIP plan for public schools - a pre-requisite to addressing the DM backlog, site deficiencies, IEQ, and energy measures. This section is subdivided into four distinct topic areas:

- Develop/update comprehensive CIP plans
- Develop strategies to prioritize and implement DM Backlog, Indoor Environmental Quality improvements, and Energy Conservation Measures
- Develop strategies to define, prioritize, and implement site infrastructure improvements
- Execute plan recommendations

6.1.1 Develop/Update Comprehensive CIP plans

Long Range CIP plans are important not only to articulate local priorities and strategies for addressing immediate and near-term repair needs, but also for mapping out higher-level facility management considerations (e.g., decisions regarding school or building replacement or relocation, functional obsolescence in building design, closures, consolidations, new construction, regional needs, adaptation to changing teaching models, use of online/distance learning tools, decisions regarding outsourcing (i.e., privatization of) functions like maintenance and food service, and of critical importance, adoption of comprehensive facility standards to ensure equity and an objective context for priority setting). CIP plan development/revision is considered a pre-requisite to repair and other DM reduction efforts because it will inform facility investments and prevent undue expenditures in under-used, heavily deteriorated, or out dated facilities. CIP plans help capture facility expansion or consolidation justifications, memorialize facility standards, and document facility adequacy in meeting existing and future requirements.

Infrastructure and utility support systems are an important element of a comprehensive CIP plan. Technical input provided through the process described in Section 6.1.3 should feed into the overall CIP planning process to ensure a comprehensive and well integrated plan.

The CIP planning process will rely on both objective DM data to identify major and common problems and deeper consideration of assessment findings to identify broader issues. CNMI and Guam have a history of supporting long range planning and OIA may be able to leverage these initiatives. American Samoa and USVI need to develop long range planning programs and have a more fundamental need in this area.

Major projects undertaken should include a pre-installation assessment survey of relevant facilities to verify appropriate project definition, extents and budgets. New projects should include funding for associated infrastructure upgrades and ensure that M&R budgets will adequately address maintenance and support of newly installed material and equipment (e.g. electrical distribution upgrades as needed for new air conditioning systems, smart boards and computer station projects.)

Timeframe: Months 4-18

6.1.2 DM Backlog, IEQ, and ECM Strategies

General awareness of the magnitude of DM backlogs through the publication of this report will raise political awareness and consensus towards resolving school condition issues. As part of the Comprehensive CIP plan process, an action-oriented process needs to be developed to prioritize DM backlog investments and immediately implement IEQ recommendations. Facility standardization efforts already underway need to be formalized and expanded

A DM backlog investment strategy needs to be developed in each territory from a comprehensive perspective to focus on the highest priority areas (i.e., health and safety, specific schools, programs, systems, etc.) that can only be identified through the comprehensive planning process discussed above. A filtering process separating the larger, CIP-type projects from routine maintenance and repair projects needs to be undertaken early on, including identification of those projects that need to be implemented immediately. In composing strategies to address DM and IEQ concerns, facility planners can utilize FIMS database reports and workbook information to identify schools, buildings, systems, or possibly building elements with major concerns, and prioritize action.

The Energy Audits identify substantial annual energy and water bill cost saving potential through a variety of energy conservation measures (e.g., renewable energy initiatives, HVAC upgrades, enhanced maintenance procedures, etc.). OIA can provide consultant services to assist each insular area in developing and prioritizing a comprehensive ECM investment strategy. It can also use its status to attract national and international developer interest, potentially broadening the investment portfolio by including multiple school districts, thereby achieving scale economies not available to the individual school districts.

Timeframe: Months 4-15 (in parallel with the CIP plan task)

6.1.3 Site Improvement Strategies

Follow-on studies need to be initiated to develop the general Site assessment problems identified in Phase II into a prioritized list of defined and budgeted site improvement projects. This needs to be done following a filtering process similar to that discussed in Section 6.1.2 (e.g., separating larger, CIP-type projects from routine maintenance and repair projects), with health and safety-related projects taking priority. This would typically include preparation of infrastructure master plans to prioritize and guide investment decisions.

Timeframe: Months 4-15 (in parallel with the CIP plan task)

6.1.4 Execute Plan Recommendations

To further assist the insular areas, OIA can also provide technical support to execute the fast tracking of DM/IEQ/ECM projects by providing consulting services to develop work orders, design documents, cost estimates, system assessments, as well as project oversight/contract administration services. These roles and responsibilities would need to be closely integrated with existing DOE/DPW functions to ensure a seamless management framework.

All major projects undertaken should include a proper post-installation performance verification to ensure that the design objectives are being met and to provide feedback for modifications, if necessary.

Timeframe: Months 16-57

6.2 Initiate M&R Program Improvements

The second most important recommendation of this report is to prevent further DM accumulation. The best way to do this is through improving the efficiency and effectiveness of local M&R programs.
Three main steps are recommended:

- Program Improvements
- Standup FIMS inventory and assessment database and support transition to an enterprise asset management (EAM) system and provide related training and support if deemed appropriate and supportable by local officials
- Periodic facility re-assessment to monitor progress

6.2.1 Program Improvements

Systemic change is needed immediately to prevent DM backlog from re-occurring (reducing the DM backlog without changing the underlying reason why it occurs does not meet initiative goals). An EAM (enterprise asset management) system should be instituted in the territorial facilities offices to support and monitor progress of the five-year implementation plan, to help track assets and expected economic useful life, submit and manage repair work orders, and organize repair and maintenance efforts. Introducing the EAM is an important technological step but at the same time, maintenance program procedures and programs need to be realigned to a preventative maintenance model based on modern building science (e.g., predicted failure rates, economic useful life, building reserve funds, etc.). Foremost is the need for insular area leaders to create a heightened awareness of the value of building maintenance as an important government function.

It is recommended that OIA use its assistance programs to help the insular areas institute this change through provision of consulting services and funding temporary staff positions, and reserving 5 to 10% of its annual funding to support M&R programs (OIA currently reserves 5% in

American Samoa which is matched by a local fuel tax). Although each insular area is different in the way it approaches M&R programs, there are sufficient similarities to warrant development of common resource materials, including maintenance procedure manuals.

A critical first step is to deploy embedded facility maintenance teams in each district to support DM reduction/site improvements/IEQ/ECM initiatives as well as support internal change and process improvement. To the extent they can meet pre-defined job qualifications, it's recommended that embedded staff be recruited locally. The embedded teams would also support an effort to prepare best practice manuals for school district maintenance staff (e.g., everything from AC system maintenance procedures to review of standard specifications and oversight in project bidding and construction) and school principals who interact with maintenance and custodial staff and Parent-Teacher/self-help organizations (e.g., instructions on how to maintain school culverts and drainage ways, guidelines for self-help projects, etc.).

At a larger scale, an assessment of each insular area's M&R program is necessary to determine the optimal configuration and budgets, based on local conditions. This needs to be conducted as an extension of the FIMS/EAM deployment and would therefore engage insular area departments beyond education. Key criteria in the assessments would be cost effectiveness and overall value based on best practices and industry standards. The assessment would require the insular areas to stand up a working committee of relevant agency representatives (e.g., Governor's Office, DOE, DPW, IT, etc.) to engage in several workshops to vet and prioritize organizational options, as well as support information requests related to the evaluation. Major outcomes would include recommendations for dedicated, adequate, annual funding, associated staffing levels and general organization, and an annual review process to ensure continuous improvement.

Timeframe: Year One

6.2.2 FIMS and Migration to an EAM System

The FIMS data model developed in the Phase II initiative[14] provides a web-viewable relational database, geocoded facility inventory, condition ratings, cost algorithm, and DM cost reporting capability that can serve as the core of a facilities management database. It provides OIA with the broad overview it needs to track the physical condition of insular area schools. Coupled with re-assessments, it can also assist the insular areas to track progress in reducing DM backlog, provide information for facilities planners to develop work orders and assist in the local budgeting process.

The FIMS can also serve as the basis of a more robust enterprise asset management (EAM) system that includes planning, programming, budgeting and work order management tools. A variety of EAM systems are in use in school districts across the country to improve capital asset management in ways that increase reliability, enhance predictive maintenance, ensure regulatory compliance, reduce energy usage, and support sustainability initiatives. The EAM software evolved from computerized maintenance management systems that focused on establishing and tracking preventive maintenance schedules (e.g., monthly, quarterly and annual maintenance budgets and schedules based on economic useful life of building systems) and work order management software to budget and track service requests (from the Principal's desk to the school district facility manager, to the Procurement Department, to the onsite construction manager). An EAM system can also assist with

[14] As currently designed, FIMS system expenses, not including hardware, cost approximately $1,200 per month, and include:

1. SQL data base server
2. DataSplice (data entry software)
3. ESRI Online (GIS maps)
4. Web hosting

capital plan creation, capital budget and expenditure analysis, building system automation (e.g., electrical, mechanical, and alarm), equipment monitoring, and general inventory management (e.g., custodial, mechanical, technology, and food service). Expanded EAM capacity includes the ability to store and retrieve building system and equipment warranties, suppliers and vendor pricing information, contracts, automated purchase orders and tracking and reporting on energy consumption data relative to preset benchmarks. Upgrading to an EAM system will be particularly important to support the 5-year implementation plan. The ability to easily track work order status, for example, is critical to developing a cost effective and efficient system.

Organizational change at the Cabinet level will be required to support this technological transition; the Governor's Office, IT, Public Works, Education and perhaps other insular area agencies will need to collaborate, share resources and take ownership. The insular areas should take advantage of OIA's grant programs to support this change ranging from providing consulting services, equipment purchases and funding temporary staff positions to help implement program enhancements.

Timeframe: Months 4-15

6.2.3 Periodic Facility Re-assessment

This task is critical to monitoring the success of the ABCs initiative. OIA is encouraged to directly or indirectly support this process through its access to consultant services. Two re-assessments are recommended in the first five years of implementation:

- First re-assessment to begin in the middle of year three as part of the EAM implementation, providing a mid-point condition update and an opportunity to collect additional facilities data or condition status.
- Second re-assessment is scheduled to occur at the end of the project execution phase to validate that all projects have been completed and that the DM Backlog and other projects have been addressed.

Timeframe: Years 3 and 5

6.3 Implementation Plan Notional Timeline

The timeline organizes the various tasks into a notional five-year window, commencing with a pre-planning/consultation step and concluding with the delivery of a final report to OIA documenting findings, lessons learned and needed follow-on actions. It is notional and provides a starting point for more detailed insular area-specific plans.