An Assessment of Adaptive Program Management Development by the
United States Navy in Guam

by

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April 8, 2013
Duke Environmental Leadership Master of Environmental Management
Advisor: Dr. Michael K. Orbach

Masters project submitted in partial fulfillment of the requirements for the Masters of Environmental Management degree at the Nicholas School of the Environment of Duke University
Acknowledgements

I am grateful to my wife Melissa for her commitment to my education over the past two years. She has shouldered far more than her share of family duties, not the least of which was caring for and keeping up with of our teenage daughters Hannah and Lauren. My daughters have sacrificed precious time with their Dad - I was touched by their patience and sustained by their joy when we reconnected over the holidays, during a handful of very short weekends, a few band performances and soccer games.

I am also grateful to Navy leadership at the Joint Guam Program Office for supporting my graduate work by allowing me to integrate study into work time and professional development opportunities. Daniel Cuff (CAPT, USN Ret.) was a great encouragement.

To Don Wells, thank you for helping us maintain a calm sense of perspective – it worked most of the time. To my advisor, Dr. Michael Orbach, and the faculty and staff at the Nicholas school, thank you for your patience and support. To the DEL MEM class of 2013 - thank you for bonding and sharing. We have a special charge to the sustainably manage our environment for people.

“Only be careful, and watch yourselves closely so that you do not forget the things your eyes have seen or let them fade from your heart as long as you live. Teach them to your children and to their children after them.”
Deuteronomy 4:9 (NIV)
Abstract

AN ASSESSMENT OF ADAPTIVE PROGRAM MANAGEMENT DEVELOPMENT BY
THE UNITED STATES NAVY IN GUAM

by

Randel L. Sablan

May 2013

Adaptive management has been widely used to manage ecological and natural resources from large aquatic and terrestrial ecosystems to individual special status species. Adaptive Program Management (APM) is a unique application of adaptive management to a large, complex, and long-duration construction program in support of the relocation of U.S. Marine Corps personnel and dependents from Okinawa, Japan to Guam. APM is aimed at avoiding significant construction related environmental impacts including potentially significant impacts to already degraded utility infrastructure and fragile public service systems on Guam. The uncertainty and potential severity of impacts stem from a projected rapid and large population increase over a five to ten year construction period.

Federal and local representatives have assisted the U.S. Navy to develop APM guidance and an operating charter for the Civil Military Coordinating Council (CMCC) the organization responsible for implementing APM. In this paper I evaluate the development of APM from five perspectives – the project record of decision and environmental impact statement, Council on Environmental Quality guidance, the Department of Interior’s Adaptive Management Technical Guide, an article by Gregory R (Gregory et al. 2006) and from insights by the key stakeholders involved in developing APM.

I conclude that APM has substantially met the intent and guidance from the literature cited above, and offer five management recommendations to further develop APM for implementation; 1) better defining the concept of induced population growth; 2) providing additional workshop-level efforts to develop impact triggers followed by investigations into low-cost yet adequately scoped monitoring approaches that inform triggers; 3) formulating a new standard operating procedure to enhance collaboration among practitioners; and 4) granting full authority to the CMCC to determine an optimal mix of membership. APM application to other large, complex and long-duration construction projects may benefit from organizing and managing environmental and social impacts by replacing traditional management frameworks without adding a new level of management.

Approved

Dr. Michael K. Orbach

April 21, 2013

Date

Master’s Project submitted in partial fulfillment of the requirements for the Master of Environmental Management degree in the Nicholas School of the Environment, Duke University May 2013
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**Acronyms**

Alliance Transformation and Realignment Agreement  \( \text{ATARARA} \)
Adaptive Management  \( \text{AM} \)
Adaptive Program Management  \( \text{APM} \)
Base Realignment and Closure  \( \text{BRAC} \)
Civil Military Coordinating Council  \( \text{CMCC} \)
Commonwealth of the Northern Mariana Islands  \( \text{CNMI} \)
Construction Assessment Reports  \( \text{CAR} \)
Council on Environmental Quality  \( \text{CEQ} \)
Council Working Groups  \( \text{CWG} \)
Charter Tiger Team  \( \text{CTT} \)
Defense Policy Review Initiatives  \( \text{DPRI} \)
Department of Defense  \( \text{DoD} \)
Department of the Navy  \( \text{DoN} \)
Draft Environmental Impact Statement  \( \text{DEIS} \)
Endangered Species Act  \( \text{ESA} \)
Final Environmental Impact Statement  \( \text{FEIS} \)
Federated States of Micronesia  \( \text{FSM} \)
Government Accountability Office  \( \text{GAO} \)
Government of Guam  \( \text{GovGuam} \)
Government of Japan  \( \text{GoJ} \)
Guam Water Works Authority  \( \text{GWA} \)
Induced Population Growth  \( \text{IPG} \)
Integrated Global Presence and Basing Strategy  \( \text{IGPBS} \)
Joint Guam Program Office  \( \text{JGPO} \)
Joint Region Marianas  \( \text{JRM} \)
Live Fire Training Range Complex  \( \text{LFTRC} \)
Military Construction  \( \text{MILCON} \)
Military Relocation  \( \text{MR} \)
National Defense Authorization Act  \( \text{NDAA} \)
National Environmental Policy Act  \( \text{NEPA} \)
<table>
<thead>
<tr>
<th>Term</th>
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<tr>
<td>National Marine Fisheries Services</td>
<td>NMFS</td>
</tr>
<tr>
<td>Notice of Intent</td>
<td>NOI</td>
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<tr>
<td>Office of the Assistant Secretary of the Navy</td>
<td>OASN</td>
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<tr>
<td>Quadrennial Defense Review</td>
<td>QDR</td>
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<td>ROD</td>
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<tr>
<td>Supplemental Environmental Impact Statement</td>
<td>SEIS</td>
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INTRODUCTION

This paper evaluates the work undertaken to design and implement Adaptive Program Management (APM), a major mitigation measure to address a number of uncertainties and timing issues identified during the National Environmental Policy Act of 1969 (NEPA) analysis process and committed to by the Department of Defense (DoD) in the record of decision (ROD) for Guam and Commonwealth of the Northern Mariana Islands military relocation environmental impact statement (EIS) (DoN 2010b). This paper provides a qualitative analysis of the APM effort by comparing criteria, factors and guidance from three sources: 1) The President’s Council on Environmental Quality guidance (CEQ 1997 and CEQ 2011); 2) the Department of Interior’s Adaptive Management Technical Guide (Williams et al. 2009); and 3) an article that provides a set of critical criteria for developing adaptive management (Gregory et al. 2006). The paper also draws from the insights of several individuals who have participated as members of the tiger team that has develop APM guidance and drafted an operating charter for the Civil Military Coordinating Council (CMCC), the entity responsible for implementing APM for the military relocation (MR) construction program.

Background

On September 21, 2010, the United States Department of the Navy (DoN) and Department of the Army (US Army) issued the ROD for the Guam and Commonwealth of the Northern Mariana Islands (CNMI) relocation EIS (DoN 2010a). This ROD pertains to a component of U.S. Marine Corps forces that are being relocated from Okinawa, Japan to Guam, commonly referred to as the “Guam Buildup”. Implementing the military relocation requires the involvement of various federal and Guam agencies...
over a multi-year effort lead by the DoD. Implementation includes several components, the largest of which is the construction of facilities and infrastructure to support 8,600 Marines and 9,000 dependents originally proposed to be relocated to Guam, as well as the construction of facilities for training and operations on Guam and the island of Tinian in the CNMI (DoN 2010a). The DoN published a Notice of Intent (NOI) on March 17, 2007 to prepare the Guam Buildup EIS.

U.S. Military changes in the Pacific began in the early 2000s under the DoD Integrated Global Presence and Basing Strategy (IGPBS) and the Quadrennial Defense Review (QDR). In a 2002 parallel initiative, the U.S. and the Government of Japan (GoJ) initiated discussions to plan for U.S. force posture changes in Japan, which became known as the Defense Policy Review Initiatives (DPRI). The DPRI discussions lead to an agreement known as the Alliance Transformation and Realignment Agreement (ATARA). ATARA covers a number of component relocation programs within Japan and other locations in the Pacific. ATARA provides that “the Government of Japan, recognizing the strong desire of Okinawa residents that such force relocations be realized rapidly, will work with the U.S. Government to examine and identify appropriate financial and other measures to enable the realization of these relocations to Guam” (Rice et al. 2005). ATARA further produced the US-Japan Roadmap for Realignment Implementation, known as the “Roadmap Agreement” to guide various aspects of the Marine relocation to Guam (DoN 2010a).

The relocation was originally planned to be substantially completed by 2014 with a cost-sharing arrangement of approximately $6.09 billion from Japan and $4.18 billion for the U.S. (in U.S. 2008 dollars) for the relocation including required utilities improvements totaling $10.27B (IAC 2011). Figure 1 presents the sequence of events leading up to and including actions subsequent to the Guam Buildup EIS to prepare a supplemental EIS (SEIS) to address a reduction of personnel relocating to Guam. The reduction in personnel relocating to Guam is potentially a significant new factor that could reduce total
costs, comparatively speaking, the level of environmental impacts and mitigation requirements. The reduction in personnel is treated further at the end of the next Section.

Actions subsequent to the ROD include a limited number of construction projects not subject to the ongoing SEIS. The future applicability of AMP will be considered in the developing the SEIS.

Federal agencies greatly contributed to the development and refinement of a number of critical ROD provisions, including approaches to implementation of mitigation measures. The Executive Office of the Presidential Council on Environmental Quality (CEQ) facilitated discussions leading up to and between the draft and final EIS to help the military proponents reach agreement with various federal regulatory agencies. These agencies included the Environmental Protection Agency, Department of Interior, National Oceanographic and Atmospheric Administration and Government of Guam (GovGuam)
agencies on key environmental impact issues. This included the commitment to use APM and to establish a CMCC to implement APM. Military construction project implementation will require these agencies to participate in a “continuing role through either a regulatory, permitting, or advisory capacity and will continue to be a partner in the implementation of the actions” (DoN 2010a, p 3).

Uncertainties and Controversy

The MR has been mired in a number of controversial issues. From the release of the Draft EIS (DEIS) to the Final EIS (FEIS) and for the past two and half years since the ROD, Congress has exerted consistent oversight requiring the DoD to justify and comprehensively master plan the overall Pacific realignment. There were delays in completing the NEPA process and securing both a biological opinion from U.S. Fish and Wildlife Service (FWS) under Section 7 of the Endangered Species Act, and a programmatic agreement (PA) from the Guam Historic Preservation Office under Section 106 of the National Historic Preservation Act (NHPA). There were also projected delays in the start of relocation construction activities.

Federal agencies including the U.S. Environmental Protection Agency (EPA), Guam political leaders, special interest groups, and the public were concerned about the potential overwhelming impacts to Guam’s infrastructure, environment, and socioeconomic base that would result from such a high and rapid level of population growth. Volume 10 of the Guam MR FEIS includes more than 10,000 comments from the Draft Environmental Impact Statement (DEIS) (DoN 2010b). The full scope of concerns identified by the public during the review of the DEIS cannot be covered here, but the following summarizes the major concerns identified.

A good understanding of the context of the uncertainties and controversy surrounding this project is critical as it sets the stage for the DoD’s commitment to APM. Five major areas of uncertainty
and controversy are offered here as the backdrop context for APM. The author’s intent here is to identify the main issues and not to comprehensively describe the scope or intensity of the issues. The FEIS, in particular Vol. 10, serves as the best record of these controversies. The FEIS documents are available under the archived document tab on the project website www.guambuildupeis.us. The five major areas are:

1) **Population growth** – Unconstrained peak construction period population was estimated at 79,178 in 2014. This peak population represents an approximate 47 percent growth from a Guam baseline population of 172,000 in 2010. Most communities would be concerned about the amount of development required to accommodate this level of growth, including housing, healthcare, education, public safety and a number of other basic public services. Additional community concerns are that more than half of the growth would be associated with a construction “boom and bust” cycle, which would potentially leave many without steady employment after construction and the blight and effect of temporary labor camps, and over supply of other housing and commercial properties in the real estate market.

2) **Land acquisition** – The DoD currently owns 27 percent of the island and prior to the Base Realignment and Closure Act (BRAC) closures of Naval Air Station Agana and return of under-utilized DoD properties, this figure was just above 30 percent. Many Guamanians are bitter about the original land acquisitions by the DoD after WWII – there is a long and complicated history involving allegations of fraud and non-payment of compensation by the DoD. Land is a significant part of the Chamorro (indigenous people) culture. Family identities are closely linked to a strong sense of place and the loss of land is viewed, in part, as a loss of identity and ultimately standing in the community. Many activists that oppose the Guam Buildup feel most passionately about the prospect of losing GovGuam land held in trust to the DoD for a live fire
training range. These strong feelings were the basis for a law suit in 2010 challenging the adequacy of the DoD alternatives analysis under NEPA.

3) Water and wastewater disposal infrastructure – Most of MR projects that would house military populations, including the air combat element and main cantonment (main base) and the associated temporary worker housing in northern Guam, require new sources of water (deep wells) developed by the DoD on DoD lands and disposal of wastewater to publically-owned treatment facilities. The publically-owned treatment plants and potable water systems are under a federal court-stipulated order which resulted from a law suit by EPA in 2000. The stipulated order requires that the Guam Water Works Authority (GWA) to make significant improvement in operations and maintenance of water sources, mainly deep wells, to ensure water quality compliance with the U.S. Safe Drinking Water Act, and similarly upgrade waste water treatment plants to meet discharge permit requirements and eventually upgrade primary treatment plants to secondary treatment. The order also requires significant reorganization of the GWA from operator certifications to qualified management (U.S. District Court 2003). The recapitalization and upgrade of these systems has been slow and expensive, and thus controversial from a rate payer perspective. EPA the Guam Consolidated Commission on Utilities, and local political leadership have advocated for tens of millions of dollars in DoD funded upgrades as a precondition of accepting the build. DoD has agreed to contribute to upgrades commensurate with assessed impacts plus certain interim improvements to meet the buildup’s aggressive timeline. There has been significant uncertainty related to when and how upgrades would be made to handle population growth and when DoD would need to connect to non-DoD infrastructure. APM was viewed by EPA as the only possible way to allow the NEPA
process to move forward in light of the fact that induced population growth would indirectly impact non-DoD water and directly impact wastewater infrastructure.

4) Natural resources – Generally, the Guam buildup was seen as a major threat to natural resources from indirect development (non-DoD construction), increased pressure on marine resources including fisheries and water quality impacts from construction related storm water runoff (erosion) and non-point runoff from post-development. There were also concerns for the loss of endangered species recovery habitat both within the USFWS established wildlife overlay refuge which exists on federal lands (most of the 27 percent owned by DoD) and outside the refuge such that reintroduction of threatened and endangered but extirpated species would be jeopardized. In the early 1990s the USFWS proposed critical habitat on Guam for about a half dozen species. Ultimately, this proposal was modified to establish an overlay refuge and a governing memorandum of agreement to manage the habitat. One other basis for APM was the proposal to construct a visiting (or transient) aircraft carrier wharf in Apra Harbor at Naval Station Guam, which would require the destruction of approximately 45 acres of coral reef habitat. Again, the NEPA alternatives analysis was criticized as too limited in scope by local activists, political leaders, the fishing community and National Marine Fisheries Service (NMFS). The carrier berthing proposal was programmatically decided to be located in Apra Harbor but a final location was deferred pending a separate supplemental environmental analysis.

5) Cultural resources – Along with the potential for land acquisition to locate a live-fire training range complex and military family housing, the predicted loss of cultural resources (cultural sites and historic properties) resulted in a major outcry from activists to stop the relocation process.
The potential loss of access to a place known as the “Pagat historic site” and perceptions that munitions fragments would directly impact cultural resources and artifacts formed the basis for a critical review of the DoD NEPA alternatives analysis process and the lawsuit mentioned above. The largest protests against the MR centered on concerns for the loss of cultural resources, especially for any proposal requiring DoD to acquire public lands containing rich cultural resources.

As a result of these controversial issues and a shift in regional strategic interests, the U.S. and Japan adjusted the Road Map Agreement in April 2012 by decreasing the number and composition of Marines and dependents relocating to Guam. The reduction of personnel from the original 8,600 Marines associated with various III Marine Expeditionary Force (III MEF) headquarters commands and 9,000 dependents to 5,000 Marines, two-thirds of which would be rotational units, and 1,300 dependents. The adjusted agreement does not set a firm deadline for the relocation. Figure 2 graphically depicts Guam’s geographic location and travel distances/times to key Asian cities which make it a valuable U.S. forward strategic location. Figure 3 identifies DoD lands on Guam, non-DoD lands of interest, and all other non-DoD lands (private, other federal and government of Guam lands). Figure 4 shows the conceptual layout of the proposed Marine Corps main base (main cantonment) in northwestern Guam which was selected for implementation (alternative 2 from the FEIS).

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1Rotational units refers to military personnel that are deployed (away from permanent duty stations) for approximately six months, primarily for deterrence, training, and readiness activities. Rotational forces typically do not involve accompanying family or personal property.
Figure 2. Guam’s Strategic Location

Source: Adapted from Commander, Joint Region Marianas 2011
Figure 3. DoD, Non-DoD and DoD Lands of Interest on Guam

Area: 211 square miles
Population: 160,000
DoD owns approximately 27% of total land mass
Figure 4. Layout of Marine Corps Main Base and Housing at NCTS Finegayan

Source: DoN 2010b
**Research Objectives**

This paper examines APM in the context of the larger original relocating force structure for two important reasons. First, APM is predicated upon significant environmental impacts that were difficult to accurately quantify or predict over a long development and construction timeline (greater than five years) with associated high population growth that would strain Guam’s social and physical infrastructure. Second, the DoN, at the time of this writing, is undertaking an SEIS to reassess impacts associated with the reduced number of personnel relocating from Okinawa for which a new or supplemental ROD is not expected until early 2015. The research objectives for this project are:

1. To evaluate APM development over the first two and a half years since it was committed to in the project ROD against the ROD and FEIS scope and goals.
2. To assess APM implementation challenges.
3. To provide recommendations to resolve those challenges.

The working hypothesis for this project is:

*Adaptive program management is a consensus-based environmental management approach applied to a large, complex and long-duration construction program. APM will have limitations that define its effectiveness.*

This project will define and then examine the broad implications of the application of APM to the Guam military relocation, taking into account initial and formative objectives and collaborative experience of regulatory, resource, and military stakeholders. The project investigates and summarizes similar work in the field of environmental and adaptive management, captures perceptions of the APM
development process from key stakeholders, and identifies expectations for implementation and limitations that may affect the program as it advances into implementation. These objectives should provide important insight to answer specific questions and reveal areas for improving APM use in future projects for the DoD and other organizations. The critical questions that need to be answered are:

1. Do the APM guidance and the proposed CMCC operating structure satisfy the intent and policy direction envisioned by CEQ’s mitigation and monitoring guidance?

2. Does APM meet the expectations of federal resource agency partners, government of Guam (GovGuam) and the USN to address major concerns (deficiencies) from the NEPA process?

3. Is APM, as designed, practical and implementable or does it go too far/fall short of requirements to manage the military construction program?

4. How effective is APM in identifying and addressing post-NEPA impacts and mitigation?

5. Are there lessons that could be drawn from similar construction program-related AM efforts across the nation?

**Author’s Role in APM Development**

This Masters Project is being prepared with the support of the Joint Guam Program Office (JGPO) Office of the Assistant Secretary of the Navy for Energy, Installations and Environment (OASN EI&E). The office was established by the Deputy Secretary of Defense on August 25, 2006 to provide oversight, facilitation, management, and to execute requirements to relocate a component of the Marines Corps personnel from Okinawa to Guam. JGPO is responsibilities include coordinating planning among DoD commands and stakeholders to ensure the existing DoD infrastructure capabilities on Guam are effectively and efficiently utilized. JGPO is also required to work closely with Japan and Guam
political and defense leadership, and the U.S. Congress in order to manage this large redevelopment effort (ICG 2011).

The author has been employed by JGPO as an Assistant Environmental Director in the organization’s office on Guam since June 2009. In this position, the author has been directly involved in the NEPA environmental planning for the relocation effort. The original EIS ROD stipulated that major mitigation in the form of APM would be addressed in coordination with key DoD components, federal and local government stakeholders, and implemented to mitigate potentially significant impacts of the MR effort (DoN 2010a). The author serves as the JGPO representative to the CMCC Charter Tiger Team (CTT), which is responsible for writing the organization’s charter and developing APM guidance for implementation.

The author’s involvement in planning for and practical development of APM through extensive negotiations with the GovGuam and federal stakeholders provides a unique perspective of the development process. Any bias can be traced to representing the Navy’s interest that APM be developed in order meet the department’s ROD commitments which includes careful design to avoid extending the scope into unrelated areas (or “mission creep”). There have been a number of challenging issues related to project scope and interpretation during charter negotiations, but these have been resolved collaboratively. The author is native (Chamorro) of Guam with 22 years of experience in environmental protection on Guam.

**Need for Research**

As the second largest federal department in terms of budget annual expenditures, the DoD is almost constantly in the process of redeveloping or constructing new military facilities, and in some
cases new bases. The scale of DoD construction in the continental U.S., to say nothing of the large base building programs in foreign countries, could benefit from an APM approach to more fully meet the intent of NEPA and commitments to mitigation planning and monitoring.

Despite U.S. economic conditions beginning in 2008, the 2012 National Defense Authorization Act (NDAA) cuts, and the combined effects of Base Realignment and Closure (BRAC) actions from 1989, 1991, 1993, 1995, and 2005, the DoD has steadily grown due to war campaigns in Iraq and Afghanistan and the war on terrorism. Some BRAC actions are realignments which have resulted in new construction as base installations are consolidated to achieve long-term efficiencies through joint basing. The Government Accountability Office (GAO) estimated that the DoD’s Future Year Defense Program (2000 to 2005) would require $23.9 billion for military construction (MILCON) and $18.2 billion for family housing. These estimates do not include operations and maintenance costs. Historic and projected costs for MILCON from 1991 to 2005 illustrate expenditures averaging approximately $5 billion annually for a total of approximately $70 billion (GAO 2000).

In 2008, the GAO reported on the challenges facing communities surrounding high DoD-related growth by examining 20 communities identified as seriously and substantially impacted by DoD-related growth (GAO 2008). Table 1 provides a summary of projected population growth greater than 25 percent at DoD installations by active duty members and dependents from the 2008 GAO report.
Table 1. Estimate Population Growth Greater Than 25 Percent at Select DoD Installations

<table>
<thead>
<tr>
<th>Installation</th>
<th>Estimated beginning population FY 2006 active duty/dependents</th>
<th>Estimated ending population FY 2012 active duty/dependents</th>
<th>Estimated population net gain FY 2012 active duty/dependents</th>
<th>Percentage of estimated net gain in total population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fort Bliss, TX</td>
<td>19,500 / 17,300</td>
<td>46,500 / 59,200</td>
<td>27,000 / 41,900</td>
<td>138 / 242</td>
</tr>
<tr>
<td>Fort Belvoir, VA</td>
<td>19,600 / 10,400</td>
<td>45,200 / 25,500</td>
<td>25,600 / 15,100</td>
<td>130 / 145</td>
</tr>
<tr>
<td>Fort Riley, KS</td>
<td>14,900 / 15,800</td>
<td>25,200 / 30,300</td>
<td>10,300 / 14,500</td>
<td>69 / 92</td>
</tr>
<tr>
<td>Fort Knox, KY</td>
<td>13,000 / 10,400</td>
<td>20,100 / 16,600</td>
<td>7,100 / 6,200</td>
<td>55 / 60</td>
</tr>
<tr>
<td>Fort Lee, VA</td>
<td>21,400 / 5,800</td>
<td>31,400 / 9,000</td>
<td>10,000 / 3,200</td>
<td>46 / 55</td>
</tr>
<tr>
<td>Fort Carson, CO</td>
<td>23,000 / 28,700</td>
<td>32,800 / 43,600</td>
<td>9,800 / 14,900</td>
<td>43 / 52</td>
</tr>
<tr>
<td>Fort Lewis, WA</td>
<td>39,800 / 40,200</td>
<td>55,700 / 57,800</td>
<td>15,900 / 17,600</td>
<td>40 / 44</td>
</tr>
<tr>
<td>Fort Sam Houston, TX</td>
<td>34,700 / 13,100</td>
<td>47,500 / 18,700</td>
<td>12,200 / 5,600</td>
<td>37 / 43</td>
</tr>
<tr>
<td>Fort Bragg, NC</td>
<td>55,800 / 66,200</td>
<td>72,000 / 83,300</td>
<td>16,200 / 17,100</td>
<td>29 / 26</td>
</tr>
<tr>
<td></td>
<td>2007(^1)</td>
<td>2015(^1)</td>
<td></td>
<td></td>
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<tr>
<td>Guam, USA</td>
<td>14,100(^2)</td>
<td>21,000(^2)</td>
<td>6,900</td>
<td>49</td>
</tr>
</tbody>
</table>

\(^1\) FEIS estimated combined active duty and dependents beginning and ending populations  
\(^2\) FEIS estimated combined active duty and dependents beginning and end populations

The movement of military units, indicative of the realignment actions illustrated in table 1, necessitates expanding or redeveloping U.S. bases by undertaking very large construction programs involving hundreds of functional facilities including housing, transportation, training facilities, and other military functions over many years. The effects on the environment and social fabric of surrounding communities can be very significant.

The overall DoD U.S. base footprint in terms of acres and number of bases may be getting smaller through the BRAC process, but a number of large movements to consolidate to joint basing may require environmental management systems that go beyond established prescriptions under BRAC and NEPA. Outside the development of DoD bases, large federal development projects will also impose significant impacts on small communities and fragile ecosystems. While APM is the result of a major construction program described above, the approach could be scaled to smaller projects and may also be applied outside the confines of NEPA mitigation or federal undertakings as an extension of traditional construction program management paradigms. Federal departments and agencies will continue to
propose very large projects of regional if not national scope that are controversial, complex, involve many stakeholders and require large financial commitments over compressed development time frames. These large projects may lack predictable effects, which means they may not be adequately assessed resulting in mitigation gaps with unacceptable adverse impacts on host communities and environs. One example is the Department of Energy’s eventual siting and development of deep geologic spent nuclear fuel repositories as proposed by the Blue Ribbon Commission on America’s Nuclear Future report of 2012 (BRC 2012). Other projects where this tool might be applied are the TransCanada Keystone Pipeline, offshore mineral development, and large scale wind projects, among others.

This paper evaluates a highly collaborative and transparent development process in Guam which could be applied to similar large federal undertakings where resources are highly stressed and therefore fragile, where there is accelerated population growth and accelerated construction which result in many potentially significant impacts.

METHODS

*Analytical Method*

The project approach is a policy evaluation using a single case qualitative analysis. This analysis provides results in the form of management recommendations for continued development and future application of APM. The evaluation incorporates lessons learned and compares them to AM criteria, factors and guidance. Data evaluation (review and synthesis) is qualitative, based on interview responses, literature research, and interpretation of collaboratively developed work to date.
Data Sources

Data was obtained from a number of Guam APM project documents from the project DEIS, FEIS, ROD, CTT, CMCC Council Working Groups, DoN project records, focused group interviews, CEQ guidelines, NEPA Task Force reports and other relevant documents. A set of core and supporting documents were available and accessible through the Joint Guam Program Office Forward (JGPO Fwd) in Guam, and Naval Facilities Engineering Command Marianas (NAVFAC MAR). Two potentially significant sources of information were not available for review which are the final contract deliverables (scope of work) to EPA Region 9 from their APM contractor who researched AM and developed APM trigger guidance and records from the JGPO in Arlington, VA pertaining to CEQ facilitated meetings between federal resource agencies and DoN related to APM as a major mitigation commitment.

DEVELOPMENT OF ADAPTIVE PROGRAM MANAGEMENT

First, Adaptive Management

APM is adaptive management (AM) applied to a large-scale, complex and long-duration military construction program. A working definition of APM is presented later in this paper. An operational definition of AM is provided here from the Department of the Interior’s (DOI) Adaptive Management Technical Guide which originated from the National Research Council.

“Adaptive management [is a decision process that] promotes flexible decision making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood. Careful
monitoring of these outcomes both advances scientific understanding and helps adjust policies or operations as part of an iterative learning process. Adaptive management also recognizes the importance of natural variability in contributing to ecological resilience and productivity. It is not a ‘trial and error’ process, but rather emphasizes learning while doing. Adaptive management does not represent an end in itself, but rather a means to more effective decisions and enhanced benefits. Its true measure is in how well it helps meet environmental, social, and economic goals, increases scientific knowledge, and reduces tensions among stakeholders.” (Williams et al. 2009, p 4)

A literature review of AM application illustrates that the decision making process has been applied as an approach to natural resource management in marine ecosystems, forestry, fisheries, water, renewable resources, wildlife and landscape ecology, conservation of biological diversity, research and monitoring, and restoration, among others (see Ministry of Forest and Range 2005; Vasishth 2006; Jensen 2010). The application of AM to natural systems and resources has traditionally focused on improving ecosystem and resource services and functions. Additional research by EPA to identify other applications of APM reached similar conclusions in 2011 according to draft documents internal to the agency and shared with the author.
Overview of Adaptive Program Management

The United States Navy (USN) introduced a variation of AM as a “program” management tool in its ROD for the Guam MR (DoN 2010a). APM is major mitigation to adaptively manage the relocation of 8,600 Marines and 9,000 Marine Corps dependents from Okinawa to Guam. APM was developed by the USN to address federal and territorial resource agency and Guam political leadership concerns that the original scope and pace of the relocation program would greatly exceed the physical infrastructure, natural resource, and socioeconomic infrastructure of Guam through an accelerated temporary and permanent increase in the island’s population.

The population growth associated with the MR is referred to in the FEIS and ROD as induced population growth (IPG), which is population growth above an established baseline directly and
indirectly attributed to the U.S. Marines’ relocation program. This includes growth attributed to temporary construction labor, civilian service industry, civilian construction support industry, and migration of people from within the Western Pacific region such as the CNMI and the Freely Associated States to Guam.

To a lesser extent, population growth will come from Hawaii and U.S. mainland states as people seek out construction job opportunities. IPG may include some small, but as of yet, undefined component of Guam’s tourism industry growth. IPG applies to the actual construction period which is estimated to be longer than five years, beginning in 2011 (now estimated to be 2020). IPG, as originally estimated in the 2010 MR FEIS, is the primary environmental impact type that necessitated the APM mitigation commitment based on uncertainties about the extent of peak population growth from 2013 to 2015. Unconstrained peak population was estimated at 79,178 in 2014. The unconstrained peak population represents an approximate 47 percent growth from a Guam baseline population of 172,000 in 2010. Figure 5 shows the MR population projection and table 2 illustrates the modeled unconstrained population growth from 2010, the start of construction, to 2019 when IPG reaches a steady state, and the potential effects of APM by modifying construction tempo.

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2 “Unconstrained Scenario is a maximum-impact approach. This scenario assumes no constraints in the Guam and CNMI economies that might lessen the indirect economic growth potential resulting from the proposed action. The Unconstrained Scenario represents the maximum growth likely to occur. The Constrained Scenario is a minimum-impact approach. This scenario assumes there would be aspects on Guam’s economy that would block the full realization of potential beneficial indirect growth. This scenario does not explicitly identify all these blockages, but assumes some mix of limitations. It also assumes absorption of currently non-working Guam residents by the job market, less in-migrants, and fewer non-working dependents per in-migrant.” (EIS Vol. 9, Appendix F (page ES1)
**Figure 6. Guam Military Expansion – Population Growth**

![Guam Military Expansion – Population Growth](image)

**Table 2. Induced Population Growth and Projected Effect of APM**

<table>
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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Direct DoD</td>
<td>5,646</td>
<td>14,112</td>
<td>21,343</td>
<td>25,125</td>
<td>46,052</td>
<td>39,685</td>
<td>29,545</td>
<td>24,713</td>
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<tr>
<td>Direct DoD</td>
<td></td>
<td>1,548</td>
<td>8,127</td>
<td>13,021</td>
<td>18,476</td>
<td>20,379</td>
<td>22,036</td>
<td>25,309</td>
<td>27,997</td>
<td>30,040</td>
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<tr>
<td>Population</td>
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<td></td>
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<tr>
<td>Indirect and</td>
<td>5,393</td>
<td>13,723</td>
<td>22,957</td>
<td>27,450</td>
<td>33,126</td>
<td>25,233</td>
<td>12,374</td>
<td>8,718</td>
<td>8,895</td>
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<tr>
<td>Induced Population</td>
<td></td>
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<tr>
<td>Indirect and</td>
<td>195</td>
<td>6,453</td>
<td>12,240</td>
<td>20,186</td>
<td>20,977</td>
<td>18,453</td>
<td>15,885</td>
<td>13,142</td>
<td>10,326</td>
<td>7,823</td>
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<tr>
<td>Induced Population</td>
<td></td>
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<tr>
<td>Total Population</td>
<td>11,038</td>
<td>27,835</td>
<td>44,301</td>
<td>52,575</td>
<td>79,178</td>
<td>64,918</td>
<td>41,919</td>
<td>33,431</td>
<td>33,431</td>
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<tr>
<td>Total Population</td>
<td>1,742</td>
<td>14,580</td>
<td>25,262</td>
<td>38,662</td>
<td>41,178</td>
<td>40,490</td>
<td>41,194</td>
<td>41,139</td>
<td>40,366</td>
<td>37,357</td>
</tr>
</tbody>
</table>

Bold figures: Reduced population resulting from construction tempo modification
Adapted from Table 2.4-1 Vol. 7 FEIS (DoN 2010b)
Figure 8 shows IPG under three scenarios of unconstrained growth using the ROD selected main base alternative, growth with force flow applications\(^3\), and growth with APM.

*Figure 7. Military Relocation Induced Population Growth under Three Scenarios.*

\(^3\) “Force flow is the rate at which the military population, including military personnel, their dependents, and civilian workers for the military, would arrive on Guam. Relocation of military units from Okinawa would be synchronized with the construction schedule for facilities needed to support those units” (DoN 2010b, Vol. 7 p 2-4).
After two and half years of APM development and the drafting of a CMCC operating charter, the governments of Japan and the United States renegotiated the international agreement for relocating Marines to reduce the number of Marines to approximately 5,000. Two-thirds of these will be rotational forces and associated family members to 1,300 (Clinton et al. 2012). On 12 October, 2012, the USN issued a NOI in the federal register to conduct a SEIS for the relocation program. Research and writing for this project is occurring during the draft SEIS. Development of APM and an operating charter continues to present.

APM will be addressed by the DoN when a new ROD is issued in early 2015. The final decision on APM for the relocation program could take three basic forms: 1) It could be determined that the reduction in relocating Marines will not require APM and therefore APM is abandoned all together; 2) the USN may modify APM and the oversight functions of the CMCC to account for findings from a lower level of impact significance; or 3) the USN may essentially retain APM as originally committed. Except for the implementation recommendations involving reduced personnel numbers at the end of this paper, the primary focus of this project is APM as developed through April 2013 and is independent of relocation numbers, construction program scope, pace, or related factors that are under further environmental analysis in the SEIS.

The National Research Council description of AM clearly points to benefits that lead to “more effective decisions and enhanced benefits” and that “ it’s true measure is in how well it helps meet environmental, social, and economic goals, increases scientific knowledge, and reduces tensions among stakeholders” (Williams et al. 2009, p v). For the purposes of this paper, APM is defined by the author, using the original National Research Council definition of AM as a framework as a management approach that involves establishing environmental, infrastructure and public service [system] baseline conditions, estimating critical impact thresholds, monitoring system capacities and construction, conducting impact trend analysis, periodic reporting of trends and monitoring results, and
recommendations to modify construction programs based on monitoring results to avoid or reduce impacts. APM response actions may result in modifications to the construction programs in two ways: (1) Adjusting the pace of construction projects (i.e. authorizing more or less projects in a given calendar year - adjusting the overall construction schedule), and or (2) changing the sequence of projects (i.e. individual projects or project phasing). APM response recommendations target future year construction projects and are actionable through the DoD decision maker in order to meet environmental, social, and economic goals and reduce tensions among stakeholders. Figure 8 presents the APM cycle, a modification of the traditional AM cycle illustrated in figure 8 and the APM definition above.

*Figure 8. Adaptive Program Management Cycle*
The CEQ began to formally consider the application of AM in the NEPA process in 1997 (CEQ 1997). Strong interest in applying AM to the management of ecosystems emerged in the 1970s through the work of C.S Holling at the International Institute of Applied Systems and Analysis in Austria. A number of research efforts have examined management applications that were developed by the USDA U.S. Forest Service in the Pacific Northwest including the evaluation of Adaptive Management Areas designed to meet forest-planning objectives by George Stankey and others (Stankey et al. 2003). Since, Holling, Stankey, and others first explored AM applications; many others have replicated, improved, and continued evaluations and application of AM for the management of ecological systems and natural resources.

Contemporary AM is actually an expansion of the traditional environmental management model which prescribes a stepwise process of predicting effects, developing appropriate mitigation, and implement mitigation to realize positive results. The environmental management model is ultimately only as effective as predictions are accurate about impacts and mitigation effectiveness as a one-time process (CEQ 1997). Advocates of AM recognized that traditional environmental management is lacking with regard to accounting for unanticipated changes in the environment, does not offer solutions for inaccurate predictions, or manage new information that suggests a need for new protection measures. These shortcomings are addressed by the AM model which adds monitoring and adaptive actions to the process such that environmental management is cyclical in nature (CEQ 1997).

The CEQ’s Modernizing NEPA document provides a framework for using AM in the NEPA process to provide management flexibility to address unanticipated results of projects as they are implemented and to adjust decisions for effective outcomes. The CEQ’s development of guidance for AM application in the NEPA process addresses both the initial analysis of impacts through requisite conditions and
information about future actions that involve uncertainty and beyond into project implementation to ensure impacts are managed to remain within originally anticipated thresholds precluding the need for further NEPA analysis. CEQs guidance aims at the appropriate use of AM, benefits, key factors and approaches, oversight and public involvement, documentation, cumulative effects, and integration of AM with Environmental Management Systems (NEPA Task Force 2003).

APM, as developed by the DoN for application in Guam, differs from the NEPA guidance on AM in that it primarily addresses the MR construction program to adaptively manage IPG impacts to Guam’s potable water and waste disposal system infrastructure and indirectly on the whole of Guam’s environment. APM is consistent with CEQ’s guidance to federal department and agency heads regarding the use of mitigation and monitoring (CEQ 2011, 2003) which identifies the need for a “comprehensive approach to mitigation planning, implementation, and monitoring” (CEQ 2011, p 9) to reduce impacts. CEQ also states (CEQ 2011, p 9), with regard to establishing a mitigation monitoring program, that “Adaptive management can help an agency take corrective action if mitigation commitments originally made in NEPA and decision documents fail to achieve projected environmental outcomes and there is remaining federal action” (emphasis added). “Agencies can, in their NEPA reviews, establish and analyze mitigation measures that are projected to result in the desired environmental outcomes, and can then identify those mitigation principals or measures that would apply in the event that the initial mitigation commitments are not implemented or effective. Such AM techniques can be advantageous to both the environment and the agency’s project goals” (CEQ 2011, p 9). This corrective action focus is the main objective for developing APM for the Guam Buildup. APM is a program management measure to ensure that other mitigation measures and practices are effective as originally predicted and intended to mitigate significant impacts (avoid, minimize, and/or compensate) to Guam’s infrastructure and environment. The Guam MR was assessed in the NEPA process as a large construction program that would result in potentially overwhelming stress on Guam’s
environment including from rapid IPG. The key distinction between AM and APM is that AM is typically used to manage ecosystems and natural resources to protect and enhance ecosystem services and functions while APM is the use of AM model applied to a large construction program to ensure impacts (direct, indirect, and collective) do not overburden the island’s physical and socioeconomic infrastructure. Additional detail about the APM, its implementation, oversight, and intended outcomes through measures to adjust construction pace and sequence are described in the following sections.

**CASE PROFILE – GUAM AND CNMI MILITARY RELOCATION**

*Overview of APM for the Guam MR Project*

APM development over the past two plus years (2010 – 2012) included negotiations to draft a CMCC Operating Charter, as called for in the ROD, and initial efforts to develop resource impact triggers. This effort began in December 2010, and a working group, which eventually became known as the CMCC CTT, was formed and continues to meet approximately every two to three weeks to develop the charter. Records of these meetings have been kept, including multiple draft versions of the charter. The membership of the CTT has remained remarkably stable and consistent, with the exception of military active duty team members who are reassigned every two years and four changes in representation from the GovGuam as a result of an administration transition. CTT membership includes the GovGuam, NAVFAC MAR, JGPO, U.S. Marine Corps Activity Guam, EPA, FWS, NMFS, NPS, DOI OIA, and the USDA APHIS. Facilitation services have been provided by Joint Region Marianas (JRM). Table 3 lists the milestones of APM development.
Table 3. APM Development Milestones

<table>
<thead>
<tr>
<th>APM Milestone</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Draft Environmental Impact Statement (DEIS) Guam and CNMI Military Relocation public comments – over 10,000 public comments received including critical comments regarding the scope and pace of relocation and various unknown impacts to critical infrastructure, environment, and public services from IPG (IPG).</td>
<td>November 2009</td>
</tr>
<tr>
<td>Council on Environmental Quality (CEQ) facilitates federal stakeholder negotiations to resolve ten (10) critical significant impact subject areas in an effort to improve the EIS.</td>
<td>January – June 2010</td>
</tr>
<tr>
<td>Final EIS published and Adaptive Program Management (APM) proposed to avoid potential significant impacts from the compressed development timeline IPG.</td>
<td>July 2010</td>
</tr>
<tr>
<td>Record of Decision (ROD) published.</td>
<td>September 2010</td>
</tr>
<tr>
<td>Negotiations begin to draft a CMCC Operating Charter with key federal stakeholders</td>
<td>December 2010</td>
</tr>
<tr>
<td>Guam Adaptive Management Workshop for Federal Agency (San Francisco, CA) to understand agency Charter goals and expectations, plan for APM Implementation, plan for Guam APM workshop.</td>
<td>February 16, 2011</td>
</tr>
<tr>
<td>Guam Adaptive Management Workshop (Guam) to present overarching APM goals, DoD data collection efforts, “dash board” format, trigger guidance, breakout planning by Council Working Groups (CWG).</td>
<td>April 5-6, 2011</td>
</tr>
<tr>
<td>First CMCC meeting – Membership matters, purpose and governance of CMCC, CWG membership, and data collection discussion.</td>
<td>October 18, 2010</td>
</tr>
<tr>
<td>Second CMCC meeting – update on Charter drafting, DoD monitoring and construction projects, and presentations of proposed trigger metrics by CWGs (construction, utilities, transportation, cultural/natural resources and housing).</td>
<td>May 17, 2011</td>
</tr>
<tr>
<td>Notice of Intent for expanded SEIS based on Roadmap Adjustments</td>
<td>November 2012</td>
</tr>
<tr>
<td>Draft Supplemental Environmental Impact Statement (SEIS) – the SEIS is expected include recommendations for mitigation including the future APM.</td>
<td>Early 2014</td>
</tr>
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</table>

The APM framework, as detailed below, is based on a near final draft of the CMCC Operating Charter dated April 2013. Completion and endorsement of the Charter is projected to occur in 2013, notwithstanding policy decisions that could hold the Charter and formal CMCC work in abeyance
pending the ROD for the ongoing 2012 Roadmap Adjustments SEIS for a reduced USMC force structure for Guam. The Charter developed to date could be adopted under the reduced force structure or modified to ensure a more appropriate fit. There is also the distinct possibility that APM and the CMCC, as the implementing oversight entity, will be permanently disestablished in the new ROD for lack of significant environmental impacts such that standard mitigation will be adequate to address all impacts. At the time of this writing, there was a lack of definitive project impact information to draw upon to more accurately predict APM mitigation status going forward.

**Civil Military Coordination Council**

The CMCC members are comprised of the signatory organizations of the agreement and represented by senior leadership (herein after referred to as the “Council”). The member organizations and number of representatives from each organization are listed below. New members may be added by consensus agreement among the Co-Chairs if they provide specific expertise not already available within Council. Functionally, the Council is comprised of three entities: 1) Co-Chairs - Commander, Joint Region Marianas (CJRM) and the Governor of Guam; 2) The Council comprised of the signatory organizations including the Commander, Marine Corps Activity Guam (CMCAG); and 3) CWGs which provide technical support. The CJRM receives primary support from DoD representatives, including the Commander, 36th Wing – US Air Force, Commander NAVFAC MAR (the regional engineer), and the Director, JGPO Fwd.

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4 The descriptions from Civil Military Coordination Council through Construction Assessment Report were adapted from the December 12, 2012 draft version of the CMCC Operating Charter (CMCC 2012, pp 4-9 and Appendix A).
The Governor of Guam appoints and receives primary support from various GovGuam agencies, including the Executive Director of the Guam Buildup Office, Bureau of Statistics and Plans, Department of Labor, Department of Land Management, Historic Preservation Office, Department of Agriculture, Guam Environmental Protection Agency, Department of Public Works, Department of Public Health and Social Services and Port Authority of Guam, and a representative of the Consolidated Utilities Services which represents the Guam Power Authority, GWA and Guam Solid Waste Management Authority. Federal agencies are represented by the DOI OIA, NPS, NMFS, FWS Ecological Services, EPA, USDA APHIS, and Federal Highway Administration.

**Council Working Groups**

CWG membership includes local and federal government agency representatives, as determined by the Council, who have the appropriate expertise and/or authority. Membership may also include governmental entities with additional needed expertise. Not all CWGs will be active throughout the buildup construction period, and may be called into service as needed to engage on issues. CWGs will have both DoD and GovGuam points of contact and Chair and Co-Chairs. The draft Operating Charter establishes construction, utilities, cultural and natural resources, transportation and housing CWGs to address key issue areas of concern for APM. Additional CWGs may be added by the Council to address other areas of concern brought forward in the future.

These CWGs address key environmental impact issues identified in the NEPA process and biological opinions, which may include but are not limited to socio-economics, housing, natural resources (fresh water, soils, coral reefs/marine resources, terrestrial), environment (air quality, storm water), public health, education, labor, health and social services, infrastructure (power, water, wastewater, solid waste), transportation (roads, seaports, airports), and transportation-related
inspections (customs and bio-security). Figure 9 is the Council’s functional organizational structure inclusive of the five current CWGs.

Figure 9. CMCC Organizational Structure

CMCC Concept of Operations

The concept of operations involves the collection and sharing of essential information related to construction on all Guam construction projects, including award dates, costs, project locations, scope, footprint, schedules, details on potential resource impacts (based on basic trigger metrics), other mitigation measures and agreements, and other monitoring metrics identified by the Construction CWG. Basic monitoring data is provided to all CWGs for trend analysis and to inform CWG specific monitoring. When a cautionary trigger point is approached, the CWG will begin to develop a recommendation briefing paper, which is forwarded to the Council.

The Council reviews the recommendation brief, and if consensus is reached, the Council forwards the recommendation to the responsible agency for a decision to implement or to decline to take action on the recommendation. The responsible agency reports back to the Council on the
decision. The Council operates exclusively to provide coordination and advice to agencies conducting construction activities (mainly the Navy) and therefore has no inherent authority to impose recommended actions on an agency. Once the Council approves a recommendation to modify construction pace, sequence or other mitigation to a responsible agency that agency may, under its own authority, accept and implement the recommendation or dismiss the recommendation. Dismissing a Council recommendation could ultimately result in a formal dispute for which a dispute resolution procedure exits and is available for use at both the CWG and Council levels. The CWG and Council operate by consensus to monitor, develop and approve recommendations to agencies, most of which are actually signatory members of the council except for private sector entities engaged in major construction activities for private development projects. Throughout the CMCC Operating Charter drafting process the CTT discussed decision making at length and resolved that the based on the ROD the Council did not have the authority to impose recommendations. Council decision making is limited to making recommendations. Figure 10 is illustrates the concept of operations in a flow diagram.
Figure 10. CMCC Concept of Operations (NAVFAC MAR Briefing slide 10, Feb 2013)

- Analysts present data to Council & CWGs
- CWGs monitor & collect data

- CWGs reviews & makes recommendation
- CWG Consensus?
  - NO: Dispute Resolution < 90 days
  - YES: CWG recommends to Council

- Council reviews and recommends <90 days
- Council Consensus?
  - NO: Dispute Resolution < 90 days
  - YES: Council recommends to Agency

- Agency responds to Council
- Council Accepts?
  - NO: External Evaluation
  - YES: Council follows-up

Steps < 60 days
Developing Impact Triggers and Monitoring Metrics

The following section was modified from Appendix A of the draft CMCC Operating Charter dated April 2013. The following guidelines are for the CWGs to development triggers and monitoring metrics for specific impact issue areas. To date, four trigger and monitoring efforts have been developed using this, as well as additional guidance provided by EPA at two workshops in 2011. None of the triggers and monitoring proposals have yet to be finalized or approved by the Council. Guidelines are intended to be flexible and provide a framework for a comprehensive and consistent approach for APM implementation. The CTT has identified five essential steps to development APM:

1. Indicator Identification: impacts to avoid
2. Trigger Development and Implementation
3. Data Collection and Monitoring
4. Identifying Response Actions
5. Identifying Responsible Parties

The overarching goal of APM is to monitor and adapt the military relocation, GovGuam, and private sector construction programs to avoid or minimize significant impacts or exceed infrastructure capacities (DoN 2010b). APM should distinguish, where possible, between significant changes that might be attributable to military construction and associated growth and historical and existing environmental conditions. APM should provide adequate lead-time to implement changes to avoid and/or reduce significant impacts from build-up construction. Ideally, one to two years lead-time is desired in order to effectively plan for construction program modifications given that Congressional authorization and appropriations are time limited and major changes to the program would have to be presented at a minimum for accountability purposes to the members of the Senate Armed Services Committee and the House Armed Services Committee. APM must be focused on existing infrastructure,
environmental, and social systems that are under the greatest stress and quantify future additional demand or impacts. IPG information is critical to adequately support analysis of various triggers.

Trigger points should be based on critical thresholds or changes in island services and conditions with emphasis on potable water and wastewater infrastructure, port throughput capacity, aquatic and terrestrial resources, and various social services before impacts become significant or when unacceptable impacts are forecast to occur, and to make recommendations on construction pace, sequence, and/or project modifications to avoid and/or reduce those impacts. To be most effective for advising the Council on future construction, triggers should target broad-based system assessments rather than day-to-day activities.

It is also important to develop triggers with appropriate links to the NEPA documentation to avoid conflicting courses of action, duplication of effort, parallel efforts, or gaps in data collection and monitoring. An APM Trigger Selection Worksheet was developed to help refine triggers and supporting metrics and justify their use. While triggers can be developed using other methods, CWGs must demonstrate that a proposed trigger is linked to environmental planning documents and ROD. The following steps are recommended to guide trigger development:

- “Review and consider the FEIS resource descriptions and data sets which are located in the first section of each resource chapter, including cumulative effects in Volume 7, Chapters 3 and 4. This review should result in the preliminary identification of triggers and supporting data.
- Review and consider the FEIS Environmental Consequences and Determination of Significance. This review should result in the identification of target thresholds, both qualitative and quantitative.
• Review and consider the FEIS/ROD summary findings for Construction impacts by region and/or installation, including cumulative effects. This step will identify, in most cases, impacts unique to construction activities.

• For item three above, focus on significant impacts and significant impacts mitigable to less than significant.

• Review and consider the Final NAVFAC Pacific Mitigation ‘Monitoring and Tracking Plan for the Guam and CNMI Military Relocation Program, June 2012.” (CMCC 2012, pp 27-28)

The CWGs should share information, specific data points, analyses, and potential recommendations, among others across the CWGs to avoid isolated assumptions and conclusions and to ensure that recommendations made to the Council do not conflict or lack supporting data that is otherwise readily available from other CWGs (CMCC 2012).

A set of questions was developed to guide CWGs in trigger development and is essential to properly scope and frame the triggers which should minimize, if not eliminate, the tendency to develop more triggers than are actually necessary to guide management recommendations. Trigger metrics should be confined appropriately to essential information as opposed to learning for the sake of learning (or for the sake of research), and be linked or de-conflicted among CWGs (avoid overlap). Admittedly, many highly-detailed and broadly-scoped monitoring programs are desirable for any number of reasons and each cadre of experts within CWGs will feel that their discipline and areas of management are critical to APM effectiveness. Triggers and monitoring must be logically focused to be valuable for decision making. Developing the effective triggers and the right number of triggers can be challenging without strict adherence to certain criteria or guiding principles. EPA developed the questions in table 4 to focus trigger development. The response and determination categories were added for illustrative purposes.
Table 4. EPA Trigger Development Questions

<table>
<thead>
<tr>
<th>Question</th>
<th>Response</th>
<th>Determination</th>
</tr>
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<tbody>
<tr>
<td>Is the trigger measuring impacts caused by military construction,</td>
<td>No</td>
<td>Trigger is not valid</td>
</tr>
<tr>
<td>associated public and private development, and/or IPG?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Will the trigger provide an accurate and timely warning of adverse</td>
<td>No</td>
<td>Trigger is not valid</td>
</tr>
<tr>
<td>impact?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are historical baseline data available for comparison?</td>
<td>No</td>
<td>Need to identify best available historical data</td>
</tr>
<tr>
<td>Is the trigger truly unique or is it similar or identical to another</td>
<td>No</td>
<td>Must be unique or trigger is not valid</td>
</tr>
<tr>
<td>trigger?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the trigger easy to explain to the public?</td>
<td>No</td>
<td>Make every effort to describe the trigger effectively to the public</td>
</tr>
</tbody>
</table>

Source: EPA’s APM workshop materials 2011

Data Collection and Monitoring

Implementation of APM depends on good data collection, monitoring, and trend analysis. The CTT recommends (by way of the draft Charter) that a group of engineers, permitting technicians, resource specialists be established as Construction Analysts to collect, development basic construction related trends including population-growth data within the Construction CWG. CWGs are encouraged to use existing data sources to the greatest extent possible. If critical data gaps exist, the CWG will follow the basic operating parameters, as defined in the Operating Charter, to determine whether and how to obtain the data needed. CWGs may convey the need for new data to the Council with recommendations on how to address the gap(s).
APM implementation requires that baseline conditions be established for each resource to enable the identification of impacts or trends, both positive and negative, resulting from construction to guide project planning and allocation of resources. Baseline conditions must be established as early as possible to accurately characterize pre-construction conditions. Resource baseline information is available in the FEIS under the “Affected Environment” sections of resource chapters and appendices D through N of Vol. 9.

Construction Analysts work with CWGs, to collect and periodically distribute, at a minimum, the following information in the form of a Construction Assessment Report (CAR):

- Projected levels of all construction activities on Guam and the associated supply to meet those construction activity requirements.
- DoD, public, and private construction activity, workforce levels and population growth.
- Workforce related issues, including workforce housing facilities, transportation, and medical care.
- Other relevant data and analyses.

The CWGs will be responsible for collecting additional specific data and monitoring trends associated with the impact that the military, public, and private construction activity have on natural resources, utility capacity, and social services. This information will be used to forecast various utilities, infrastructure, or public services capacities, distribute relevant data and analysis to affected stakeholders, and to identify appropriate response actions or recommendations. The ROD focuses on two types of recommendations that CWGs should present to the Council which are to adjust the pace or tempo and/or sequencing of future construction. Although not specified in the ROD, the CTT has proposed that the Council also consider receiving recommendations other than pace and sequencing of construction. For example, these may include infrastructure improvements or adjustments in
construction management processes. Ultimately, any advice and recommendation that the Council may consider and recommend to responsible agencies should be aimed at future construction activities. When recommendations address ongoing construction the Council will refer such to the appropriate agencies for possible action; however, the ultimate disposition of the recommendation is not within the purview of the Council. Recommendations concerning ongoing construction are best managed under existing regulatory provisions and mitigation at the individual project level. APM was not design to overlap or provide for additional regulatory oversight of day-to-day construction compliance efforts. Examples of appropriate regulatory mechanisms for ongoing construction are the project Programmatic Agreement under the NHPA Section 106 consultation, the Biological Opinion (BO) issued under authority of the Federal Endangered Species Act (ESA) Section 7 consultation process, and other DoD mitigation commitments and Best Management Practices identified in the ROD.

As identified in the FEIS and covered in the draft Operating Charter Appendix A modifying construction pace means the collective pace of all DoD (or other entities) construction on Guam. The DoD could slow start of construction (awards and notices to proceed) for short-term projects identified as falling within 0 to 3 months, mid-term projects between 3 to 12 months, or long-term project execution between 12 to 24 months to address infrastructure capacity concerns (DoN 2010b). Short and mid-term pace modifications would be difficult given certain cost implications associated with construction awards and potential claims against the Navy for costs incurred for mobilization. As a primary area of consideration, monitoring IPG would focus on avoiding and/or reducing impacts to environmental resources especially those associated with water and wastewater utility systems that could impact, for example ground, surface, and ocean waters. For APM to be truly effective it must be oriented toward providing recommendations to modify pace, sequence and other management actions 12-24 months in advance of construction awards. Even with this lead time, there will likely be stringent
accountability and reporting requirements from the Navy to the U.S. Senate and House of Representatives.

“Adjusting construction sequencing involves redirecting the sequence of construction to projects that require fewer construction workers (e.g., re-sequencing from horizontal to vertical projects that require fewer workers), thus controlling the workforce population rate of increase.” Construction sequencing would also include the regional redistribution of “construction projects to avoid the concentration of construction activities with the potential to overburden local utilities systems at a particular location” (DoN 2012b, Vol. 7, p 2-54).

Responsible parties, for the purpose of APM trigger development and implementation can be an individual, federal, or local agency (or a group of agencies) committed to coordinate APM activities. “Responsible parties” under the APM is not synonymous with “Action Proponent” under NEPA. Responsible parties are not always associated with an agency’s financial commitment to implement triggers beyond agency participation or to fund broader CWG activities. CWGs should consider identifying responsible parties based on factors such as the capacity to provide technical expertise, agency mandates, existing programs, fiduciary responsibilities/liability, and other similar considerations. APM is an iterative process, and as noted above, the process will involve variables and inputs that change over time.

Construction Assessment Reports

Construction Assessment Reports (CARs) are an essential tool for informing APM work. As mentioned above, the primary responsibility of Construction Analysts is to collect, analyze, and disseminate information on the anticipated impacts associated with the construction phase of the MR,
non-military construction, and IPG. These analyses will be presented to the Council and CWGs for review and evaluation with sufficient lead time to develop recommendations. CARs are the essential input to the CWG trend analyses for determining if construction impacts are approaching an unacceptable trigger point. DoD and GovGuam are committed to share their publicly-available future project planning, even if this project planning is subject to change.

Construction Analysts will present to the Council and CWGs information and analysis, including the CAR, in order to maximize the efficiency of reviews and recommendations. Projects will be presented based on the program schedule for solicitation and presented in sets of projects at least six months prior to the initiation of construction solicitation. When available, DoD will provide information and analysis for projects greater than 12 months in the future (typically upon passage of the National Defense Authorization Act) which will allow for longer reviews of future projects. In order to maximize efficiency of reviews and recommendations, Construction Analysts will provide project information at least six months in advance.

Construction Analysts will consider the results of other DoD performance-based mitigation measures in developing the CAR. These “other mitigation measures” are DoD’s ROD commitments beyond APM, as well as DoD mitigation measures on other military projects outside the scope of the MR program. The CAR will provide information on a geographic basis and will include narrative descriptions, spreadsheets, charts, graphs, and other graphics to facilitate CWG analyses and coordination.
RESULTS

*Internal Evaluation*

The CMCC CTT is comprised of eleven (11) federal and local government entities or subdivisions thereof. The CTT entities are JRM, NAVFAC MAR, JGPO, EPA, USFWS, National Oceanic and Atmospheric Administration (NOAA) - NMFS, U.S. Department of Agriculture - Wildlife Services (UDSA WS), USDOI, OIA, and Office of the Governor of Guam - Guam Buildup Office (GBO), NPS, USMC MCAG. Six representatives from five of the entities were interviewed in order to assess progress towards the development and implementation of APM through December 2012. Five of these entities participated (JRM, USFWS, NMFS, GBO, and NPS). Two additional entities were asked to participate but declined. EPA Region 9 declined because interview responses would require extensive legal review and oversight which might delay project progress. The DOI OIA never responded to the request for interview.

The following evaluation findings were drawn from interviews and represent significant issues that address the primary research question and critical research questions, areas of potential improvement, identification of procedural or management approach gaps in APM development and information related to criteria and factors for designing and implementing AM identified in the DOI AM Technical Manual.

*Others uses of APM*

Are there lessons that could be drawn from similar construction program-related AM efforts across the nation? All of the CTT members responded that they had no specific knowledge of similar
construction-related AM efforts (i.e., APM). Research did not yield documented examples or case studies of APM.

Consensus-based compliance management

Respondents noted that consent-based management is practiced in various forms, including where a regulated entity has full control and authority to develop and implement management measures to address pollution problems (Tsutsui 2013). In countries such as those in the South Pacific, which lack well-developed or western-style regulatory and legal frameworks for the protection and management of natural resources, consent-based management is essentially the only approach available and is part of culture and traditions. An example cited is the management and sustainable use of fishery resources and coral reefs (Davis 2012). Other respondents cited consent-based management either in advance of, in-lieu of, or as part of very formal and judicial over-sighted regulatory compliance measures such as for riparian areas in the arid American Southwest (Alberti 2013; Calvo 2013; Pangelinan 2012; Campbell 2012). These examples differ from the Navy APM framework which was developed as mitigation to address NEPA deficiencies but that will be implemented through a consensus-based process.

Induced Population Growth (IPG)

All respondents expressed either a lack of clear understanding of or skepticism that IPG could be defined with precision. Respondents are concerned that the concept is dependent on many factors that need more description to identify drivers of population growth over the construction period, which is assumed to be greater than five years, to include three broad economic sectors: military construction, a
tourism boom, and normal population growth. For APM, population is expected to grow as a direct result of foreign construction labor because Guam’s existing supply of skilled labor is inadequate to support the work demand. Sources of labor include the Philippines, Hawaii, other U.S mainland states, and Micronesian. Population is also expected to increase from tourism-related and general-service industry development. There is concern that accurate data will be difficult to obtain in a timely manner to inform various CWGs and their respective monitoring programs (Alberti 2013; Calvo 2012; Campbell 2012; Davis 2012; Pangelinan 2012; Tsutsui 2013). The main question is how much, if any, growth is related directly or indirectly to military construction?

**Scope of APM**

The scope of APM includes effects (impact) on infrastructure, natural resources and socioeconomic conditions from direct, indirect, and cumulative (current and future actions) by military, government of Guam, and private sector construction (USN and Army 2010). None of the respondents felt that the scope was too narrow, and conversely, the opinion was that it was either appropriate or too broad to be practical. They all believed that refinements would have to be made based on a working formula tailored to the available data. For example, while military construction and labor may be highly descriptive and accurate, there is less certainty that private sector projects could be forecast more than a year in the future due to confidential business information beyond land-use zoning and building-permit data.

The issue of IPG drivers is unsettled, and at one point in the charter drafting process it appeared that most resource agencies felt that the large majority of growth would result from military development above certain, and yet to be determined, baseline. It should be noted that Governor of
Guam, together with the Guam Economic Authority and Guam Visitors Bureau, recently initiated a strategic marketing campaign to boost tourism and encourage construction of new hotels in the island’s central tourism district (Calvo 2013). Guam experienced its second highest visitor-arrivals year ever in 2012, totaling 1.3 million visitors. Additionally, due to a lack of hotel rooms, Guam had to turn visitors away for several weeks during that year (Aoki 2013). During the same time frame, military population levels remained relatively flat, except for several short-duration military training exercises.

**CMCC Roles and Responsibilities**

All respondents generally believe that the roles and responsibilities of CMCC members are well developed and understood. The same cannot be said for the CWGs. There is significant concern that the CWG responsibilities and operational context are not yet well established. There are concerns that some CWGs will not be able to perform adequate monitoring. The concerns are: 1) that CWGs will spend much time and effort defining which data points are meaningful toward developing recommendations; 2) that there will be a lack of funding and staff commitment; 3) that there will be a lack of political will to support findings if they are negative and suggest a development slowdown or moratorium is necessary; and 4) that development of impact triggers and monitoring thresholds will be difficult to formulate and gain consensus for natural resources impacts (e.g., impact on coral reefs, fisheries, loss of land cover, non-point source pollution, wetlands and other surface water resources, aquifer water quality, threatened and endangered species, and invasive species, etc.).

In some cases data and trigger development is thought to be fairly straightforward (e.g., utility and healthcare capacity). Another area of potential difficulty is the process of formulating and presenting recommendations to the CMCC. It was noted that there is a gap in the process of making
recommendations that involves cross-communication of monitoring results and trends between CWGs and that the groups may work in isolation or fail to identify linkages between data sets and potential problems. The CMCC will need to develop a set of procedures to ensure that CWGs meet a minimum level of cross-communication, information sharing, and collaborative problem solving with regular interaction between CWG chairs and co-chairs (Tsutsui 2013). A common operating picture will be essential to focus timely CWG operations which will result from a refinement of the CAR tool and involve additional collaboration to coalesce CWG monitoring data, thresholds and triggers.

**Monitoring and data collection**

Federal and local resource agency funding constraints were generally felt to be a potential barrier to implementing targeted monitoring programs and data collection. One respondent noted that funding is always used as a reason for skepticism in agency planning but that in practice, environmental managers typically find resources to accomplish important work even if such entails leadership direction to reprioritize work, situational urgency and other factors (Tsutsui 2013). That being said, it is generally believed that critical unfunded monitoring proposals could be justified to the DoN for supplemental funding beyond existing monitoring and data collection programs within resource agencies. The ROD calls for all agencies to collaborate on all existing data collection and monitoring programs funded at the agency and to devise monitoring plans for APM before considering new resource commitments. Each resource agency is expected to fund participation in APM as part of the CMCC (DoN 2010b).

Concerns about monitoring and data collection include issues related to the fact that no one local or federal entity collects development and construction data in a manner that is easily accessible for analysis and reporting. However, preparation for a test run of the CAR in 2012 prompted the Guam Department of Public Works to assess its construction-permitting program to begin capturing
construction data such as type and number of projects, locations, and costs. The exercise was considered to be a benefit to GovGuam by exposing a lack of information in an area that affects long-range planning with or without APM. This issue is in the process of being improved (Calvo 2013).

Another concern by several respondents was the need to refine guidance in appendices A and B to help target what types of data are essential and adequate to capture trends in the environment and for utility infrastructure to guide recommendations and facilitate management decision making. The short list of concerns includes:

- Resource agencies will strive for more data than is necessary.
- Quality data must come from appropriately targeted design (avoid garbage in garbage out trap).
- Data points sought will be far too detailed and cumbersome to gather within existing monitoring paradigms, and therefore require third-party consulting services.
- Data collection will not be timely to support the CWG work and recommendations.
- A need for better collaboration to aid and assist in identifying existing tools and any other information that would otherwise not be known by the Guam APM effort (Pangelinan 2012; Campbell 2012; Tsutsui 2013).

**APM Recommendation Process**

APM recommendations are by design, primarily intended to target future construction project scheduling by DoD, the GovGuam, and private sector development with a minimum orientation on the next construction year. Ideally, projects of two or more years away should be considered as well. However, current project performance could be viewed as an indication of future performance. The CTT
discussed at length the inter-relationship of regulatory compliance and providing recommendations on the pace and sequence of future projects in an effort to avoid potential significant impacts. It is thought that while ongoing compliance issues may be informative in the general sense, they should be largely separated from determinations that drive recommendations to slow the pace of future construction. All regulatory agencies retain their legal authorities and options for day-to-day compliance efforts.

Respondent concerns were few, given the fact that APM implementation is still at least two years away and a training workshop is desired prior to full implementation with each CWG to test procedures. Seven concerns or predictions were expressed by respondents as follow:

- The amount of time necessary to gather and analyze may not correspond well to actual construction project awards and be viewed as delaying or disrupting project commitments (Davis 2012 and Pangelinan 2012).
- There is some concern that while the government has ultimate control of government construction (GovGuam and USN), it has limited authority to influence private project schedules (Calvo 2013). It should be noted that there is precedence at the Guam Land Use Commission and utility agencies to influence the timing of development by imposing temporary utility service moratoriums.
- Political interference from the Guam Legislature and the governor may disrupt recommendation development on behalf of private interests (Alberti 2013).
- The DoN will not have necessary flexibility to modify project commencement or pace once funding is authorized by Congress due to tight budget constraints and five-year funding shelf life typical of federal construction execution.
- The process of developing a formal recommendation will be too slow in light of the fact that a valid significant impact problem exists. It is predicted that an informal short-cut
process will develop and result in decision-maker buy-in and subsequent action ahead of the formal process. This will occur because the decision makers are part of the CMCC - all issues are essentially internal to CMCC organizations (Tsutsui 2013).

- The formal process requirements, given the length of time, for substantive data to support perceived triggers point will discourage frivolous recommendation-making. Furthermore, as the CWGs mature, a number of different trigger concerns will be minimal, as experts realize that a handful of key triggers will more than adequately capture impact issues. Resulting in the fact that the process will mature and become more streamlined over time (Tsutsui 2013).

- Dispute resolution procedures will be used at some point; however, the process may be viewed as a disincentive for protracted dispute or alternately, because agencies retain full authority to use traditional compliance approaches, they will opt to do so and bypass dispute resolution. All respondents felt that dispute resolution procedures are a necessary backstop, but that the consensus approach to APM builds trust and respect for participant missions and equities, which will effectively maintain collaborative efforts.

*Construction Assessment Report (CAR)*

All respondents recognize that the CAR tool is central to APM execution and that the version developed to date is a good first-generation document. There is some concern that while the tool must serve as a resource to all CWGs, that it will be too general in nature and only reflect construction project details as opposed to providing second- and third-tier analysis on impact trends. This concern highlights an unresolved question of balance of effort between the data collection and analysis from a
“construction project” perspective versus the need for environmental, infrastructure, or social service analysis. The question becomes - what level of analysis and data collection goes into the tool versus what levels are the responsibility of CWGs to conduct? In addition, the issues arise that there may be a point where staff capacity is lacking at the CWG level. Early discussions include a strong preference for the DoN engineering and environmental staff to conduct the bulk of both construction project trend analysis as, well as impact-trend analysis in various resource areas – a comprehensive presentation versus a basic presentation or “common operating picture” (Tsutsui 2013). The issue will likely be resolved with further refinement of the CAR through mock scenario testing and lessons learned from initial use of the CAR.

**Future Applications of APM**

There is some uncertainty as to the future of APM for the DoN Guam relocation program as the Roadmap Adjustments of April 2012 reduced the number of relocating personnel from 8,600 to 5,000 and military dependents from 9,000 to 1,300. The fact that two thirds of relocating personnel will be rotational forces and that no new deadline for completion has been specified may mean that the uncertainty and severity of potential impacts will be reduced such that APM is not necessary. Over two years of CTT work has gone into APM (Charter drafting) and all respondents believe that APM should remain a viable mitigation measure in the Roadmap Adjustments SEIS, even if only as a contingency measure. The ultimate value of APM for the Guam MR program may well be that it provides an unprecedented forum for stakeholder collaboration to address infrastructure, natural resource management, environmental protection, and socioeconomic development issues. APM is viewed as valuable for stakeholders to opportunistically exchange information, discuss issues, and offer innovative solutions that only highly transparent and collaborative relationships are likely to produce.
DISCUSSION

This section utilizes three key sources of information about issues, criteria, and effectiveness when designing AM to evaluate APM development efforts to date and to provide implementation recommendations. These sources are 1) the NEPA Task Force Report – Modernizing NEPA (NEPA Task Force 2003); 2) the Department of Interior Adaptive Management Technical Guide (Williams, et al 2009); and 3) Deconstructing Adaptive Management (Gregory et al. 2006). Recommendations are presented below.

It is important to note that the Navy’s development of APM for the Guam MR has been under a very deliberate development process by the CTT, which contentiously began as a negotiation effort to use of a memorandum of agreement instead of an operating charter as specified in the ROD. The EPA favored a formal agreement in line with other compliance frameworks, such as the Defense and State Memorandum of Agreement used for the oversight of cleanup of Formerly Used Defense Sites program in compliance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (Superfund). The negotiation process actually evolved (over about 3 months) into a more amicable partnership that settled on developing an operating charter. It became evident almost from the start that the operating charter would require a companion APM implementation guidance document. CTT members relied on a number of sources to develop the documents; however, the only documents referred to during CTT meetings were the FEIS, the ROD, APM workshop materials, and the DOI AM definition. The EPA hired a consultant to undertake a comprehensive review of the literature, including guidance for developing APM triggers and metrics, which were used in two initial APM workshops in 2011.
Benchmarking APM - NEPA Task Force Report

The NEPA Task Force Report to CEQ Modernizing NEPA Implementation 2003 identifies six effectiveness factors to consider when developing AM monitoring as part of the NEPA process. The NEPA process includes documenting AM proposals as part of the analysis and post-NEPA in the form of mitigation. CEQ identifies the following factors for APM application:

- “The ability to establish clear monitoring objectives;
- Agreement on the impact thresholds being monitored;
- The existence of a baseline or the ability to develop a baseline for the resources being monitored;
- The ability to see the effects within an appropriate time frame after the action is taken;
- The technical capabilities of the procedures and equipment used to identify and measure changes in the affected resources and the ability to analyze the changes; and
- The resources needed to perform monitoring and respond to the results” (NEPA Task Force 2003, p 50).

When to Apply Adaptive Management

Two overarching conditions should be present in order identify when AM can be applied as a management approach. “First, there must be a mandate to take action in the face of uncertainty” and “second, there must be institutional capacity to undertake and sustain an adaptive program” (Williams et al. 2009, p 9). The ROD provides the mandate for APM and the decision maker judged that adequate resources within the Navy’s purview and through a collaborative consent-based oversight system that other federal and Guam resources agencies would contribute to implement and sustain the effort.
In addition to the overarching conditions, the decision maker must also assess six additional conditions. These six conditions are: that “a real choice of consequence needs to be made”; “there is an opportunity to apply learning”; “clear and measurable management objectives can be identified”; “the value of information for decision making is high”; uncertainty can be expressed as a set of testable models; and monitoring can be established to reduce uncertainty” (Williams et al. 2009, pp 9-12).

There are also three key institutional considerations for appropriate AM. First, there should be pre-existing organizational structures or programs to support AM. AM is not necessarily an opportunity to create institutional structure or capacity for that matter. Second, executives should be committed to AM use. Leadership commitment is not unique to the development and implementation of new management approaches in most organizational context; leadership support, even in the face of change, must be secured. Finally, management objectives should have consensus support from stakeholders. Stakeholders should actively participate in planning AM by contributing to the setting of clear expectations (objectives and outcomes), guiding decision makers along the way by providing advice and recommendations, and evaluating success.

*Limitations of Adaptive Management*

AM is but one of several well documented successful approaches to decision making for natural resource management or management for sustainability. The following is a critical perspective on AM limitations which also apply to APM, and in this case, while APM is still under development it should be applied to evaluate and determine if there are some parts of the ongoing development process that might be removed from further consideration. The MR FEIS includes a section that identifies which resources would not be substantively affected by adjustments to construction tempo or sequencing.
APM decisions to modify construction pace or sequencing would not impact land use, airspace issues, visual resources, hazardous material/waste generation, or cultural resources, historic properties, or operational noise (DoN 2010b). For a detailed discussion, the reader should refer to the FEIS Vol.7 section 2.4 and 2.5.

The DOI identifies a set of five limitations for AM application. AM is not appropriate (1) where actions are single or one-time events, (2) when monitoring information is unavailable to the decision maker, (3) where there are unresolvable conflicts about objectives or decision alternatives, (4) if management interventions cannot influence system behaviors in ways that affect management returns, and (5) if there is not a commitment to sustained funding for monitoring and assessment (Williams et al. 2009). Limitations (3) and (5) have been called into question by various CTT members noting that some CWG members insist that while APM as initially described in the FEIS and ROD places substantial responsibility on other federal and Guam resources agencies to contribute monitoring data from existing programs, the DoD is ultimately responsible to fund and carryout any necessary monitoring for lack of capacity, expertise, or funding from others.

Some of the same stakeholders also have introduced impact triggers and threshold metrics for a broad range of concerns from cultural resources to the need for an island-wide water quality and coral health monitoring plan to inform decision making. To some extent this later issue may be more associated with a process of adaptively managing APM development prior to actual implementation – an internal process. This issue of APM scope is unresolved, but not ultimately irresolvable. With regard to capacity, expertise, and funding, the DoN is seeking active participation and buy-in on objectives from stakeholders and synergies from collaborative monitoring efforts that promote partnership and ownership of the process. It is not likely that the DoD would decide to withdraw from its APM commitment for lack of resources from stakeholders.
Benchmarking APM - Deconstructing Adaptive Management

Gregory et al. (2006) developed a set of detailed criteria in the form of critical questions to be considered in the application of AM for environmental management problems. The authors identify four topic areas to consider for establishing criteria for the use of AM. These topic areas are “(1) the spatial and temporal scale of the problem, (2) the relevant dimensions of uncertainty, (3) the associated suite of costs, benefits, and risks, and (4) the degree to which there is stakeholder and institutional support” (Gregory et al. 2006, p 2414). A set of critical questions were developed to address each of the criteria when contemplating the use of AM with the intent of constructing an improved basis on which to investigate the merits involve in the selection of AM approaches (Gregory et al. 2006).

There are four critical questions that involve potential weaknesses in the design of APM to date. First, the question of parameter uncertainty is not well defined at this time. The FEIS and ROD are specific when referring to construction impacts associated with construction labor population, potential impacts to utility resources (water, wastewater, and power), port capacity, and social service impacts (public health and safety). The difficulty to date has been defining which natural resources are of concern and how to approach the development of a focused set of triggers and metrics. Natural resource agencies are concerned about a broad set of potential impacts to various resources, such as coral resources, marine and freshwater quality, loss of habitat and land cover, bio-security, air quality, essential recovery habitat for threatened and endangered species, groundwater, wetlands, and cultural resources, among others.

Second, confidence in assessments is still under development and closely related to the tenuous nature of parameter uncertainty above. Initial efforts at developing parameters or triggers did not yield full confidence in the CWGs and in particular the cultural and natural resources CWG struggled with
properly scoping the range of potential assessments and required monitoring plans. Other CWGs may be able finalize triggers because they operate from a set of well-established metrics such as quantity of port cargo throughput, periodically measured traffic, metered water and wastewater flows, etc.

Third, a formal cost-benefits analysis was not, and is not, likely to be conducted for the potential impacts or APM actions. That being said, construction cost figures associated with delays will be provided to decision makers and the impact implications from a NEPA significance standpoint is well documented.

Fourth, the issue of institutional capacity is unresolved. The DoN will and has committed resources to staff the CMCC and APM work. Adequate staffing should not be an issue over the course of the construction program. The issue of concern is the capacity of Guam resources agencies to participate fully and provide funding and technical expertise in a timely manner. Furthermore, these agencies and a number of federal agencies have expressed concerns that existing data and monitoring efforts may not be sufficient or applicable. These agencies are looking to the DoN to cover funding gaps for agency-implemented monitoring or to provide new consulting services above and beyond existing resources. The DoN is reluctant to commit to additional resources without strong justification that existing data and monitoring systems will not suffice and or that triggers (both number and level of detail) are effectively scoped to meet recommendation development efforts and decision making. Tables 5 through 8 are adapted from Gregory et al. 2006 (first two columns) with responses specific to the Guam APM project in the right column.
### Table 5. Critical Questions - Spatial and Temporal Considerations

<table>
<thead>
<tr>
<th>Topic Area Considerations</th>
<th>Critical questions</th>
<th>APM</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Spatial and temporal scale</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duration</td>
<td>“Is the project timeline to obtain verified results compatible with management decision-making requirements?”</td>
<td>Yes. While actual triggers have yet to be developed, a major criterion is that the monitoring results be timely and applicable to decision-making one to two years in advance of construction project commencement.</td>
</tr>
<tr>
<td>Spatial extent and complexity</td>
<td>“If spatial extent or complexity is large, are there opportunities to apply AM on a subset of the problem and scale up?”</td>
<td>Yes. For example, coral health monitoring can be targeted to a subset of interest areas associated with actual project sites (e.g., turbidity), as well as sensitive areas that receive increases in fishing pressure (e.g., marine preserves).</td>
</tr>
<tr>
<td>External effects</td>
<td>“Have potential issues related to background trends and cumulative effects of management actions been addressed in the AM design?”</td>
<td>Proposed. New baseline monitoring will be needed in some project areas. Cumulative effects for APM will not include past actions – only current and future.</td>
</tr>
</tbody>
</table>

Gregory et al. 2006, p 2414

### Table 6. Critical Questions – Dimensions of Uncertainty

<table>
<thead>
<tr>
<th>Topic Area Considerations</th>
<th>Critical questions</th>
<th>APM</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dimensions of uncertainty</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parameter uncertainty</td>
<td>“Has the AM design been pared down to focus on only those uncertainties most likely to influence management decisions?”</td>
<td>Proposed. Utility, transportation, and healthcare agencies have good knowledge of potential impact areas within their operations. Natural resource agencies are still attempting to focus their efforts.</td>
</tr>
<tr>
<td>Structural uncertainty</td>
<td>“Are there profound structural uncertainties? If so, how will surprise outcomes be managed?”</td>
<td>Potentially. High in-migration is a concern. Surprises will be managed by slowing the pace or sequence of construction to remain within resource limits.</td>
</tr>
<tr>
<td>Stochastic uncertainty</td>
<td>“How do low-probability random natural and other causal events affect the AM design and expected outcomes?”</td>
<td>Covered. Tropical storms events could affect expected outcomes in the natural environment and unknown pollution of groundwater could be problematic, as examples.</td>
</tr>
<tr>
<td>Confidence in assessments</td>
<td>“If the confidence in the proposed AM design is low, can expert judgment or other techniques help?”</td>
<td>Yes. Confidence is moderately high. Professional judgment, rapid assessment, and near-term corrective actions are all available to decision-makers.</td>
</tr>
</tbody>
</table>

Gregory et al. 2006, p 2414
### Table 7. Critical Questions – Costs, Benefits and Risks

<table>
<thead>
<tr>
<th>Topic Area Considerations</th>
<th>Critical questions</th>
<th>APM</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Costs, benefits and risks</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Specifying benefits and costs</td>
<td>“Can all the costs and benefits (and risks) be documented and communicated in a manner understandable to all stakeholders?”</td>
<td><strong>No.</strong> It is not practical to know all of these in order to implement APM. Many such factors were studied and reported in the project FEIS.</td>
</tr>
<tr>
<td>Magnitude of effects</td>
<td>“Will the information collected through AM have sufficient predictive ability to make a difference to managers?”</td>
<td><strong>Proposed.</strong> It is expected that triggers, threshold metrics, and procedures for making recommendations for mitigation will evolve and undergo refinement.</td>
</tr>
<tr>
<td>Multiple objectives</td>
<td>“Does the design and assessment of AM plans explicitly address the multiple goals of stakeholders (rather than only scientists)?”</td>
<td><strong>Yes.</strong> This is evident by the range of CWGs, stakeholder participation, and FEIS evaluation of a broad range of issues.</td>
</tr>
<tr>
<td>Perceived risks of failure</td>
<td>“Can stopping rules and clear thresholds identify and/or minimize the perceived risks of failures to species and to institutions?”</td>
<td><strong>In progress.</strong> This is a driving criterion for the design and use of APM. Decision-makers clearly articulated the goal of avoiding or minimizing potential adverse effects on physical and social infrastructure to avoid “breaking Guam.” This is the first priority.</td>
</tr>
</tbody>
</table>

Gregory et al. 2006, p 2414

### Table 8. Critical Questions – Stakeholder and Institutional Support

<table>
<thead>
<tr>
<th>Topic Area Considerations</th>
<th>Critical questions</th>
<th>APM</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stakeholder and institutional support</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leadership</td>
<td>“Is there explicit policy guidance and leadership support for AM? Will stakeholders see AM as an effective way to deal with uncertainty?”</td>
<td><strong>Yes.</strong> Local political and military leadership are fully committed. Stakeholder perceptions have not be assessed or measured.</td>
</tr>
<tr>
<td>Flexibility in decision making</td>
<td>“Is there sufficient management flexibility (and continuity) to incorporate new information in revised experimental designs?”</td>
<td><strong>Yes.</strong> The military construction program will likely run between 5-10 years. There should be adequate time and sustained interest in APM to ensure flexibility.</td>
</tr>
<tr>
<td>Avoidance of taboo trade-offs</td>
<td>Does the proposed AM design involve any trade-offs that might be considered taboo by some stakeholders?</td>
<td><strong>Yes.</strong> There is strong business and political support to push hotel development and significantly expand capacity. The notion that government can or will impose limits on economic development to balance impacts with military development is probably “taboo.” There will likely be opposition to slowing private sector growth.</td>
</tr>
<tr>
<td>Institutional capacity</td>
<td>“Are sufficient analytical skills available (staff or contractors) to design, evaluate, and monitor AM plans?”</td>
<td><strong>Mostly.</strong> There may be some capacity and funding limitations to address within the natural resources areas; however, stakeholders are expected to prioritize program efforts to support APM and derive synergies from collaboration for impact areas of primary interest.</td>
</tr>
</tbody>
</table>

Gregory et al. 2006, p 2414
Research Findings

The research objective for this project was to evaluate APM development over the first two and a half years since the project ROD against the ROD and FEIS described intent, scope, and goals; to assess APM implementation challenges; and provide recommendations to resolve those challenges. This assessment supports the hypothesis that consensus-based environmental impact mitigation management system based on a large, complex and long-duration construction program that integrates voluntary and command and control compliance approaches, will limit APM effectiveness. Proof that this is indeed the case with APM, can be found in the ROD itself and in three other documents, which are the NEPA Task Force guidance of 2003 and the 2009 USFWS Field Manual for AM and an article that proposed a set of refined evaluative questions (or criteria) to guide AM application (Gregory et al. 2006). All three sources provide very similar but varying levels of detail regarding the objectives, criteria, and performance principals for AM/APM approaches to decision making. The CTT also provided insight to APM limitations associated with future implementation and how their agency or other stakeholder agencies might meet their commitments to APM.

The broad implications for the application of APM to the Guam MR are contained in APM implementation recommendations in the next section. As for the five questions posed to support the hypothesis, the following conclusions are provided.

1. Do the APM guidance and the proposed CMCC operating structure satisfy the intent and policy direction envisioned by CEQ’s mitigation and monitoring guidance?
2. Does APM meet the expectations of federal resource agency partners, GovGuam and the USN to address major concerns (deficiencies) from the NEPA process?
3. Is APM, as designed, practical and implementable or does it goes too far/fall short of requirements to manage the military construction program?
4. How effective is APM in identifying and addressing post-NEPA impacts and mitigation?

5. Are there lessons that could be drawn from similar construction program-related AM efforts across the nation?

**Recommendations**

The following recommendations were developed from the evaluation of APM (interviews, research, and author’s knowledge of the APM development process). These recommendations are made both in the original ROD context and in full recognition that the use of APM may be modified by the new ROD in 2015, or withdrawn as mitigation by the new ROD based on supplemental NEPA analysis which is underway at the writing of this paper. The assumptions for these three possible scenarios require some explanation.

- The decision maker (ASN EI&E) may, based on the SEIS findings, decide that enough uncertainty remains in the implementation of the construction program with regard to IPG, pace, and or scope of construction in any given MILCON year to keep APM as specified in the 2010 ROD. The mitigation commitment would essentially be carried forward unmodified.

- The decision maker may find that APM requires some level of modification based on a reduced number of relocating Marines and dependents, with regard to the IPG, pace, and or scope of construction in any given MILCON year. This scenario would likely result from SEIS findings that certain direct or cumulative impacts remain significant and uncertain (difficult to predict). Notionally, modifications could include the type of recommended APM mitigation such as: removing construction sequence as an option; adding a new mitigation type, such as agency capacity building to improve monitoring.
efforts or changing the focus of CMCC to coordinating and sharing information about the Guam buildup, but not requiring recommendations be made to GovGuam or private sector construction project proponents; or doing away with APM but keeping the CMCC as a forum for collaboration and information sharing. Any number of modifications could be made, but would likely be directly linked to MR impacts.

- The decision maker could determine that the construction-related impacts are not significant at the programmatic level (uncertainties are reduced) such that individual construction projects or phases of construction with direct or cumulative impacts are less than significant and are appropriately mitigated at the individual project level.

The following recommendations are offered to improve APM implementation as originally proposed or may be used to modify APM through the issuance of a new project ROD as discussed above. It is worth mentioning that the author will likely be closely involved in internal Navy discussions leading up to the formulation of the new ROD and may have a direct role in writing the mitigation provisions for APM.

**Refining Induced Population Growth**

The experts involved in developing APM have yet to agree on the definition of IPG for the Guam MR construction period. Methods have not been introduced to distinguish between direct (and indirect) military construction related IPG associated with the visitor industry, the island’s main economic sector. Growth in tourism (use of commercial transportation, rental cars, hotels, and entertainment outlets) would include military personnel permanently relocating, on temporary duty assignments, on port visits, or while on personal leave. Various surface vessel group port calls (including Carrier Task Forces, Marine
Amphibious Ready, or Strike groups) during the buildup have not been discussed in depth but it should be not be a component of IPG because similar port calls have historically been part of military operations on Guam. The added economic activity and associated demand on infrastructure and other public services from relocating, temporary duty, or personnel on leave status would likely be a very small percentage of an industry that averages around one million visitors per year.

Recommendation 1 – IPG Refinement

The CMCC CTT should convene a meeting, specifically to address the following: the need to refine IPG; establish the operational definition of IPG; and how the data used to assess IPG will be gathered and shared.

Trigger Development

The various CWGs have made initial attempts to develop triggers during one workshop held 2011. Some progress was made but the workshop ultimately served more to introduce APM concepts with an emphasis on triggers, metrics and monitoring plans. Since 2011 the CWGs have not met to continue trigger development because the APM development priority shifted to drafting the CMCC operating charter and APM guidance.

Recommendation 2 – Trigger Development

Conduct additional CWG workshops to develop APM triggers and related metrics, especially the Cultural and Natural Resources CWG.

Monitoring

Similar to trigger development monitoring requirements are largely unspecified at this time. There were concerns from the cultural and natural resources CWG that agency capacity was lacking and
that monitoring above and beyond current efforts may require additional funding. One of the main reasons for requesting funding for monitoring is that existing monitoring networks may not align with MR construction projects geographically, temporally, or with regard to potential target parameters.

**Recommendation 3 – Monitoring**

Provide additional guidance on monitoring methodology to sharply focus the monitoring of triggers with an emphasis on cost containment, identifying capacity gaps based on focused monitoring proposals, and exploring funding sources to design and implement monitoring.

**CWG Standard Operating Procedures (SOP)**

The CMCC CTT identified the need to establish a mechanism or procedure to bring CWG chairs and co-chairs together on a periodic basis to compare data, trends, and potential recommendations and share new information to ensure a coordinated perspective of how construction was progressing and what pressing concerns are emerging. The SOP should be included in the CMCC concept of operations.

**Recommendation 4 – CWG Standard Operating Procedure**

Develop a SOP to ensure intra-CWG collaboration and that information sharing occurs within the CMCC concept of operations.

**Delegated Authority**

During the first CMCC meeting in 2011 the CMCC discussed expanding its membership by adding eight (8) additional Guam agencies in addition to the four (4) agencies identified in the initial chart contained in the ROD. A legal review of this CMCC decision found that the expanded membership was unauthorized as the ROD does not delegated authority to expand CMCC membership in the same manner that it does for modifications to the number and types of CWGs. This procedural misstep
should be corrected as soon as possible and it would be most appropriate to request delegated authority for future CMCC membership modifications.

**Recommendation 5 – Delegated Authority**

Request delegated authority from the ASN EI&E to CJRM.

**Next Steps**

The CTT, which serves as the main guiding body for APM development, has identified three next steps that should be taken in the next 12 months, well before a new ROD is issued in 2015. These steps will prepare the CMCC and its CWGs for APM implementation, especially in the area of collecting baseline data that will be used to inform the CMCC about risks and potential recommendations prior to the start of new construction which could occur as soon as calendar year 2015 but definitely by 2016, assuming federal budget negotiations run smoothly. Of course all of the next steps are based on the assumption that the ASN EI&E carries APM forward in the new ROD. The next steps are described below.

- Complete the CMCC operating charter drafting process in 2013. The CTT has collected all final review comments on the draft charter from senior leadership and legal counsels and is finalizing the document.

- Conduct at least one is not a series of workshops to 1) introduce the final draft charter in detail, 2) present the CAR for the first time and review the tool in detail. The workshop should also conduct a table top exercise utilizing the CAR to identify gaps and receive feedback for a second version of the tool, and 3) provide further trigger and metric development guidance and allow CWGs to advance initial trigger concepts.
• Route the CMCC operating charter for signature informally as opposed to calling a special CMCC meeting or delaying endorsement until the CMCC’s next regular meeting which is likely to occur in the summer 2015 based on SEIS development schedule. The need to collect baseline data and prepare the first actual CAR is crucial.

CONCLUSIONS

APM has substantially met the intent and guidance from the literature cited. The CTT has developed an APM framework that, with some additional refinements to 1) better define the concept of IPG; 2) conduct additional workshop-level efforts to develop impact triggers and investigate low-cost yet adequately monitoring to better inform triggers; 3) formulate an SOP to enhance collaboration among practitioners; and 4) obtain full delegated authority to the CMCC to determine an optimal mix of membership and make other necessary revisions or updates to its charter will allow for effective implementation.

The CTT did not have the benefit of a deliberate and stepwise process for developing the draft CMCC operating charter that could have been drawn from excellent literature such as the DOI APM field guide, the Gregory, et al. 2006 paper, and the NEPA Taskforce report, to guide its collaborative effort. This may have contributed to the long negotiation process. CTT members, while committed to effective APM design were often entrenched in their respective interests, especially during the first six months of negotiations. This entrenchment is also likely to resurface on occasion as the CMCC implements APM given that each member retains its authorities while striving for consensus to adaptively manage the MR construction program – a realistic APM limitation. The key to managing biases and addressing any of a
number of short-term concerns about the construction program will be to refer them from the APM process to the regulatory arena yet allowing members to openly present concerns at the CMCC.

APM application to other large, complex and long-duration construction projects is promising. Such projects will benefit from organizing and managing environmental and social impacts by replacing traditional management frameworks without adding a new level of management.
REFERENCES


NAVFAC MAR. 2013. Draft status brief: CMCC operating charter.


Notes

Interviews were conducted (in person) as part of the research for this paper. Individuals interviewed have had substantial involvement as Charter Tiger Team members and with the development of APM. Participation by the members listed here is greatly appreciated.

Barbara Alberti, Superintendent War in the Pacific National Historic Park, National Park Service

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