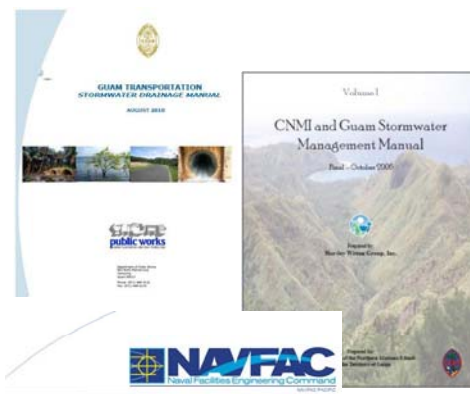


Review of Guam and Federal Storm Water Manuals

Guam Stormwater Workshop
July 28, 2011

Session Objectives

- Provide an overview of the various storm water manuals and regulations
- Provide an overview of common elements and associated design requirements
- Provide guidance regarding their use
- Provide a forum for questions



DPRI Program Overview:
Sustainability &
Stormwater Management

General Topics

- Project Planning
- Design Storms and BMP Sizing
 - Water-Quality Volume, Water-Quality Flow, Recharge Volume
- Hydrology, Channel Protection, and Aquifer Recharge
- Comparison of manuals
- Take Away – when they apply and differences in BMP use and sizing

Applicable Manuals and Regulations

Document Type	Document Name
Guidance	Final CNMI and Guam Storm Water Management Manual, Volumes I and II, October 2006
Guidance	Island Storm Water Practice Design Specifications: A Supplement to the 2006 CNMI & Guam Storm Water Design Manual.
Guidance	Guam Transportation Storm Water Drainage Manual (TSDM) for the Department of Public Works, August 2010
Guidance	Final Storm Water Implementation Plan (SWIP) for the Guam Road Network, June 2010
Guidance	Department of the Navy, Final Comprehensive Drainage and Low Impact Development Implementation Study, April 2010
Guidance	Technical Guidance on Implementing the Storm Water Runoff Requirements for Federal Projects under Section 438 of the Energy Independence and Security Act, December 2009
Draft Guidance	Draft Storm Water Drainage Master Plan (SWDMP), August 2010
DoD Program	DPRI Sustainability Program and related guidance.

Applicable Manuals and Regulations

Document Type	Document Name
Regulation	Title 21 of Guam Code Annotated (GCA): Real Property. Chapter 66: Building Law. Article 2: §66202.1. Clearing and Grading Permit.
Regulation	Title 22 of Guam Annotated Rules and Regulations (GAR): Guam Environmental Protection Agency (GEPA). Chapter 10: Guam Soil Erosion and Sediment Control Regulations, October 2000
Regulation	NPDES Construction General Permit (CGP), Effective June 30, 2008, Modification Effective January 8, 2009
Regulation	Section 438 of the Energy Independence and Security Act of 2007 (EISA)
Draft Regulation	Guam Erosion Control and Storm Water Management Draft Regulations, January 2010

Project Planning

Project Planning

- Stark differences between northern and southern island
- Consider:
 - Soil types, erosivity, and permeability
 - BMP suitability and pros and cons of LID and infiltration
 - Presence and proximity to surface, ground waters, and sinkholes
 - Potential for sediment loss, receiving stream scouring, and sediment TMDLs
 - Changes in impervious cover


Project Planning – All Projects

- Site Planning:
 - Consider full lifecycle (e.g., incorporating low-impact development and utilizing a common basin for construction and post-construction)
- Work Scheduling:
 - The wet season on Guam occurs from August to October
 - The dry season usually occurs from December to June
 - November and July are transitional months
 - Rainfall can (and does) occur in any month
 - During the rainy season, typhoons can drop 10-15 inches of precipitation in one storm event
- Project Phasing - Keep active area as small as possible



Site-specific Considerations for BMP Selection

- When developing a SWPPP, EPP, grading/clearing plan, or other design, consider:
 - Location
 - Land use
 - Topography
 - Hydrology
 - Proximity to and impact on sinkholes
 - Soil characteristics
 - Quantity of impervious area
 - Pollutants of concern to be removed
 - Storm volume
 - Peak flow conditions
 - Receiving water and/or aquifer



Post-Construction Design Storms and BMP Sizing

Sizing Criteria—Resource Protection

- Water Quality Protection
 - Sizing for storm water treatment BMPs
 - Infiltration can meet treatment and recharge goals; however pre-treatment may be required prior to infiltration
- Groundwater Recharge
 - Maintain or enhance groundwater aquifer levels
 - Maintain base flow in streams and wetlands
- Channel Protection
 - Reduce peak flows and high-flow duration to protect streambed morphology, prevent undercutting of stream banks, siltation, and loss of infrastructure

BMP Sizing Considerations

There are numerous design equations contained in regulations and design manuals:

Design Standard	Source
Basin sized for 2-year, 24-hour storm (or 3,600 cubic feet per drainage acre)	Construction General Permit
95 th percentile rain event	Section 438 of the EISA, Federal Facilities
80% TSS Removal	CNMI and Guam Storm water Management Manual 2006, and EPA Coastal Zone Act Reauthorization Amendments of 1990
Water Quality Volume Criteria / 80 & 90% Rules	CNMI and Guam Storm water Management Manual 2006 and Guam Transportation Storm water Drainage Manual 2010
Water Quality Flow Criteria	Storm Water Drainage Master Plan 2010 and Guam Transportation Storm water Drainage Manual 2010
Recharge Recommendations	CNMI and Guam Storm water Management Manual 2006
Channel Protection / 100-year storm	CNMI and Guam Storm water Management Manual 2006 and Guam Transportation Storm water Drainage Manual 2010
Overbank Flood Control Criteria	CNMI and Guam Storm water Management Manual 2006

Example 1 - Recommended Recharge Requirement

- Source: CNMI and Guam Storm Water Management Manual 2006
- At developments, attempts to maintain and/or augment groundwater resources
- Pre-treatment of storm water is required before infiltration for high-risk areas

Recommended Recharge Requirement (Continued)


- Limestone-dominated regions:
 - Recharge volume = 1.5 inches x impervious area (for all land types)
- Volcanic-dominated regions:
 - Recharge volume varies based on hydrologic soil group (attempts to match natural recharge rate; 0.8 [A], 0.5 [B], 0.2 [C], or 0.1 [D] inches x impervious area)

Example 2 - Section 438 of the EISA, Federal Facilities

- Option 1:
 - Control 95th Percentile Rainfall Event, onsite via infiltration or harvesting (e.g., cisterns and rain barrels).
 - Note: The 95th percentile rainfall event is the event whose precipitation total is greater than or equal to 95 percent of all 24-hour storms on an annual basis = 2.2 inches for Guam.
- Option 2:
 - Preserve predevelopment hydrology
- Alternate approaches if options are infeasible


Example 3 - Channel Protection

- Source: CNMI and Guam Storm Water Management Manual 2006
- To minimize overland erosion and downstream channel expansion and erosion
- Runoff is stored and released gradually so that critical erosive velocities are seldom exceeded
- The runoff volume generated by the 1-yr, 24-hour rainfall shall be released over a 24-hr period (a 1-yr, 24-hour storm for Northern Guam corresponds to 3.5 inches per Lander 2004)



Example 4 - Channel Protection / Peak Discharge - Transportation

- Source: Transportation Storm Water Drainage Manual 2010
- Similar to CNMI and Guam Storm Water Manual, but focuses on preventing roadway/hydraulic structure flooding
- Recommends various design storm frequencies for hydraulic structures



Comparison of Manuals

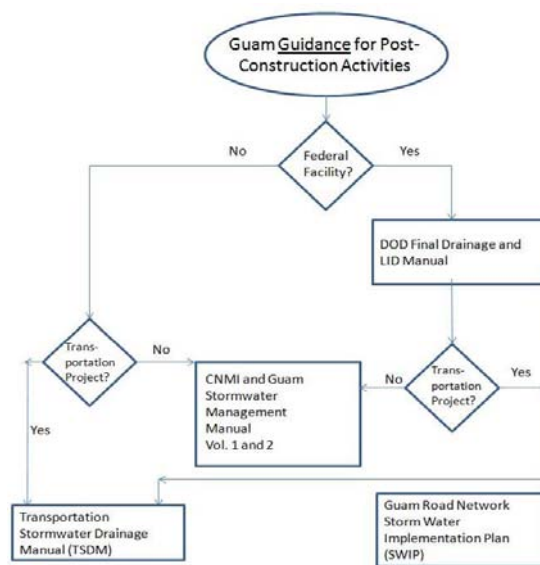
Manual	Water Quality		Recharge	Water Quantity Peak Discharge	Other
	Volume	Flow			
CNMI and Guam Storm Water Manual (GSM) and the Island Storm Water Practice Design Specifications: A Supplement to the 2006 CNMI & Guam Storm Water Design Manual (Supplement)	<ul style="list-style-type: none"> WQ_v = 90th percentile rainfall event (1.5 inches) in high quality waters; 80th percentile (0.8 inches) in moderate quality areas. Minimum WQ_v of 0.1267 ft. x total area in acres required for pervious areas (0.2 watershed inches). 80% TSS removal (compliance assumed if meeting WQ_v and using design standards in GSM and GSM Supplement) 	<p>Supplement provides design considerations for various flow-based conveyances and treatment BMPs. Note: Importance of properly sizing conveyances to Treatment/ Detention BMPs.</p>	<ul style="list-style-type: none"> Re_v=1.5 inch rainfall in limestone areas. Re_v=match natural rate based on soils in volcanic areas. “Hot spot” areas require pretreatment of 100% of the WQ_v or Re_v, whichever is greater. 	<ul style="list-style-type: none"> Maintain pre-development peak discharge rate for 25-year, 24-hour rainfall event (20 inches). Large projects require downstream analysis 	<ul style="list-style-type: none"> 13 standards. Encourage structural and non-structural BMPs. Channel Protection. New development >1 acre shall limit IC to no more than 70% of site; waived for infill projects meeting other standards on or off-site. Redevelopment projects that reduce IC by at least 40% meet both WQ_v and Re_v requirements, otherwise must provide control for at least 40% of IC.

Manual	Water Quality		Recharge	Water Quantity Peak Discharge	Other
	Volume	Flow			
Guam Transportation Storm Water Drainage Manual (TSDM)	<ul style="list-style-type: none"> Uses same 80/90th percentile rainfall events as the CNMI and Guam Storm Water Manual for water quality design. 	<p>Defines sizing criteria for flow-based storm water BMPs (e.g. grass channel), 2-year, 1-hour storm event (1.1 inches).</p>		<ul style="list-style-type: none"> Must not exceed pre-development peak discharge rates for the 25-year, 1-hour rainfall event (~2.5 inches). Recommends various design storm frequencies for hydraulic structures 	<ul style="list-style-type: none"> Provide storm water treatment BMPs where they do not currently exist for at least 40 percent of the impervious cover. Channel Protection.
Energy Independence and Security Act (EISA)	<p>Option 1 is to retain the runoff from impervious surfaces that occurs during the 95th percentile rainfall event (~2.2 inches) OR Option2.</p>			<p>Option 2. Maintain pre-development hydrology from the 1-, 2-, 10- and 100-year, 24-hour rainfall events or the 95 percentile storm (2.2) inches.</p>	

Information compliments of Horsley Witten Group and Parsons Transportation Group

Summary Points: When do the Manuals Apply

Applicability – When Do They Apply





Applicability – When Do They Apply

- Adhere to Guam Transportation Storm Water Drainage Manual (TSDM) for DPW-sponsored Transportation and Linear Projects
- Adhere to DOD Manuals and DPRI for DOD-sponsored projects
- Adhere with 2006 CNMI and Guam Storm Water Manual (and supplement) for private development projects
- Always adhere with Federal Construction General Permit requirements when disturbing more than 1 acre



Applicability – When Do They Apply

- Future MS4 programs administered by DPW and DoD will likely provide enhanced consistency and guidance for the development community
- Federal Post-Construction Rule and Construction General Permit will also have a bearing



Resources

- CNMI and Guam Storm Water Manual Volumes I and II
<http://www.deq.gov.mp/article.aspx?secID=6&artID=55>
- DPW Storm Water Program and TSDM Manual
<http://www.guamtransportationprogram.com/about-the-program/supportive-initiatives>