Stormwater Impact Assessments:

Connecting primary, secondary and cumulative impacts to Hawaii's Environmental Review process

Hawaii CZM Program
Coastal Zone Management
HAWAII STATE OFFICE OF PLANNING

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Coastal Zone Management Program by:

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Acronyms & Abbreviations

BMP	Best Management Practices
C-CAP	Coastal Change Analysis Program
CEQ	Council on Environmental Quality
CWRM	Hawaii Commission on Water Resource Management
CZM	Hawaii Coastal Zone Management Program
CZMA	Coastal Zone Management Act of 1972
DOH	Hawaii Department of Health
DLNR	Hawaii Department of Land and Natural Resources
EA	Environmental Assessment
EIS	Environmental Impact Statement
EISPN	Environmental Impact Statement Preparation Notice
EPA	Environmental Protection Agency
FONSI	Finding of No Significant Impact
HAR	Hawaii Administrative Rules
HRS	Hawaii Revised Statues
HSA	Hawaii Stream Assessment
LEED®	Leadership in Energy and Environmental Design
LEED-NC®	Leadership in Energy and Environmental Design for New Construction
LEED-ND®	Leadership in Energy and Environmental Design for Neighborhood Development
LID	Low-Impact Development
LUC	Land Use Commission
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
NRCS	National Resources Conservation Service
OP	State of Hawaii Office of Planning
SLL	Smart Location and Linkage (LEED®)
TDML	Total Maximum Daily Load
TSS	Total Suspended Solids
U	State of Hawaii land use designation, Urban
UH	University of Hawaii
USFWS	United States Fish and Wildlife Service

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1 INTRODUCTION

1.1 Objective

The purpose of this document is to provide guidance on assessing stormwater impacts in the planning phase of project development. The goal is to provide a suggested framework for integrating stormwater impact assessment with the environmental review process established in the State of Hawaii by Hawaii Revised Statutes (HRS) Chapter 343, *Environmental Impact Statements* and Hawaii Administrative Rules (HAR) Chapter 11-200, *Environmental Impact Statement Rules*.

1.2 Intended Audience

The primary audience for the Guidance Document is reviewers of Environmental Assessments (EA) and Environmental Impact Statements (EIS). The assumption is made that the reader has a fundamental understanding of Hawaii's environmental review process and basic awareness of stormwater impacts. This document does not attempt to replicate or summarize the many available resources that describe how stormwater runoff can affect the environment.

1.3 Background

Development and land use activities can create erosion, increased stormwater runoff and pollution that cause direct, secondary and cumulative impacts to Hawaii's resources. In 2006, the Hawaii Office of Planning, Coastal Zone Management (CZM) Program, the State's lead agency for administration of the National Coastal Zone Management Act of 1972, as amended, identified "Cumulative and Secondary Impacts" as a priority issue. To address this, the Office of Planning initiated a project to develop, implement, and institutionalize an integrated planning approach to assess and manage cumulative and secondary stormwater impacts.

1.4 Document Organization

This document is a step toward the Coastal Zone Management (CZM) Program's initiative to develop a planning approach to assess and manage stormwater impacts.

Chapter 1 provides background and briefly articulates the purpose and need.

Chapter 2 articulates the principles underlying the framework including:

- Integrate stormwater impact assessment with the environmental review process;
- Acknowledge stormwater characteristics in Hawaii's varied environments;
- Suggest stormwater management design concepts and creative offsite practices; and
- Translate stormwater management design and mitigation from the planning phase of development into design and construction phase permit conditions

Chapter 3 is a five-step framework for assessing the primary, secondary and cumulative impacts associated with stormwater.

The framework is intended to:

- Suggest the types of background information that an Environmental Assessment or Environmental Impact Statement can include to adequately assess stormwater impacts;
- Suggest a methodology to analyze stormwater impacts that is progressive yet pragmatic; and
- Create a venue for agency reviewers to translate information about impacts and mitigation strategies to balanced and effective permit conditions.

Chapter 4 and the Appendices include the following supporting documentation: resources used to develop this Guidance Document; data resources available for stormwater impact assessment; a table of Best Management Practice (BMP) techniques; and a reviewer's checklist.

1.5 Regulatory Status of the Guidance Document

This Guidance Document has been developed as a tool for reviewers of EA/EIS documents to consider stormwater impacts within the existing framework of environmental review in Hawaii, namely the EA or EIS process. The Guidance Document suggests incorporating design concepts and mitigation measures into the planning phase of development to achieve compliance with existing ordinances, rules, and regulations. No new regulations are proposed with this Guidance Document.

1.6 Guidance Document Purpose and Need

1.6.1 Purpose

The focus of this Guidance Document is to help reviewers of EAs and EISs evaluate stormwater impacts more effectively in Hawaii, whether prepared pursuant to HRS Chapter 343 or the National Environmental Policy Act (NEPA). EAs and EISs are usually prepared in the planning phase of project development when there is flexibility to feasibly incorporate design, construction, or other mitigation strategies to address stormwater impacts. To ensure that design commitment and mitigation concepts are implemented and enforced, this manual suggests that agencies incorporate appropriate mitigation strategies as reasonable permit conditions.

1.6.2 Need

A recent study conducted by the University of Hawaii articulated many concerns about Hawaii's environmental review system, including recognition that cumulative impact analysis is not integrated with the planning process. Similarly, need for guidance to help address stormwater impacts more effectively has been recognized by the Hawaii State Office of Planning. In 2010, the first phase of the Office of Planning Coastal Zone Management Program's *Cumulative and Secondary Impacts* project evaluated EIS documents for their assessment of cumulative impacts. The review found that oftentimes, stormwater impacts, and especially secondary and cumulative impacts, receive only cursory mention with limited analysis (University of Hawaii, 2011).

"Cumulative effects assessment is neither well understood nor well implemented and is not integrated with the planning process" (University of Hawai'i, 2010)

The same study surveyed a sample of Land Use Commission (LUC) petitions to assess the existing state of practice to incorporate EIS stormwater mitigation measures as conditions in LUC decision and order documents. In most cases, conditions simply asserted the need for compliance with other Federal, State or County regulations/codes to be enforced during various project development phases.

Furthermore, over ten years ago, the Council on Environmental Quality (CEQ) recognized the nascent state of knowledge to address cumulative impacts. The CEQ and EPA sought to provide guidance on cumulative impacts (Council on Environmental Quality, 1997; U.S. Environmental Protection Agency, 1999). Based on these guidance documents, a cumulative impact methodology should address the following:

- ***"Cumulative effects need to be analyzed in terms of the specific resource, ecosystem, or human community being affected."*** (Council on Environmental Quality, 1997). For stormwater, the impacted resources include the inland and marine waters that should be protected or restored to be fishable and swimmable.

- ***"Cumulative effects on a given resource, ecosystem, or human community are rarely aligned with political or administrative boundaries... Cumulative effects on natural systems must use natural ecological boundaries..."*** (Council on Environmental Quality, 1997). For stormwater, the natural geographic boundary is the watershed or subwatershed.

- ***"Cumulative effects are caused by the aggregate of past, present, and reasonably foreseeable future actions."*** (Council on Environmental Quality, 1997). For stormwater, land uses are indicators of nonpoint pollution sources. Land cover data sets provide past and present land uses, while land use designations (e.g., State Land Use Districts, county zoning) provide an indication of reasonably foreseeable nonpoint pollutant sources.

- ***"Each affected resource, ecosystem, and human community must be analyzed in terms of its capacity to accommodate additional effects, based on its own time and space parameters."*** (Council on Environmental Quality, 1997). Although State water quality standards provide a reference point, there are certain resources that are more sensitive to pollutants (e.g., coral reefs) that require heightened scrutiny and monitoring.

1.7 Stormwater & Relationship to Planning Policies

An assessment of stormwater impacts should be a component of all EAs and EISs because stormwater issues relate to many State policies and directives. For example, the Hawaii State Plan (HRS Chapter 226) includes an aspirational goal where beautiful and clean natural systems support the well-being of the State's people (HRS §226-4(2)). The supporting goals, objectives and guidelines relating to the health of the physical environment enumerated in HRS §226-11 support this goal and are easily relatable to stormwater concerns.

Hawaii State Plan Goal:
A desired physical environment, characterized by beauty, cleanliness, quiet, stable natural systems, and uniqueness, that enhances the mental and physical well-being of the people. *(HRS § 226-4 (2))*

Additionally, the impacts to natural systems and the human environment from stormwater relate to many key policies and plans set forth by the State, including:

- ***Hawaii State Plan Priority Guideline: Sustainability (HRS§226-108)***
- ***Coastal Zone Management Program; Objectives and Policies (HRS§205A-2)***
- ***Significance Criteria (HAR §11-200-12)***

At the Federal level, the Clean Water Act considers stormwater from a construction site as a "point" (discrete) source of pollution regulated by the National Pollution Discharge Elimination System (NPDES) permit. The Clean Water Act and the Coastal Zone Management Act consider stormwater pollution from other areas within a watershed besides a construction site as "nonpoint source" or "polluted runoff."

Figure 1, Sources of Stormwater Pollution

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2 UNDERLYING PRINCIPLES

2.1 Relate Direct, Secondary, and Cumulative Stormwater Impacts to Stormwater

Hawaii Administrative Rules §11-200-2 (Definitions and Terminology) sets forth definitions for “direct,” “secondary,” and “cumulative” impacts. Within this Guidance Document, the following assumptions are made with respect to stormwater.

"Environmental impact" means an effect of any kind, whether immediate or delayed, on any component of the environment.

“Primary impact" or "primary effect" or "direct impact" or "direct effect" means effects which are caused by the action and occur at the same time and place.

For stormwater, primary impacts mean the effects on the ***project site*** that change the site’s output of runoff and pollutants. Pertinent factors include changes in bare soil, impervious surface, nutrient load from fertilizers or other sources, and peak flow.

“Secondary impact" or "secondary effect" or "indirect impact" or "indirect effect" means effects which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems.

For stormwater, secondary impacts mean the ***offsite*** effects ***down gradient from the project site*** on streams, nearshore coastal waters, or flooding. The term “down gradient” acknowledges that water flows downhill and includes the flow of surface runoff and groundwater.

“Cumulative impact" means the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

For stormwater, cumulative impacts mean the past, present, and reasonably foreseeable effects occurring within the ***boundaries of a watershed***. Where a smaller component of a watershed discretely encompasses an area from the mountains to the ocean, it may be appropriate to confine analysis to the sub-watershed. Groundwater flow may not follow surface features that define a watershed and may require additional hydrogeological analysis.

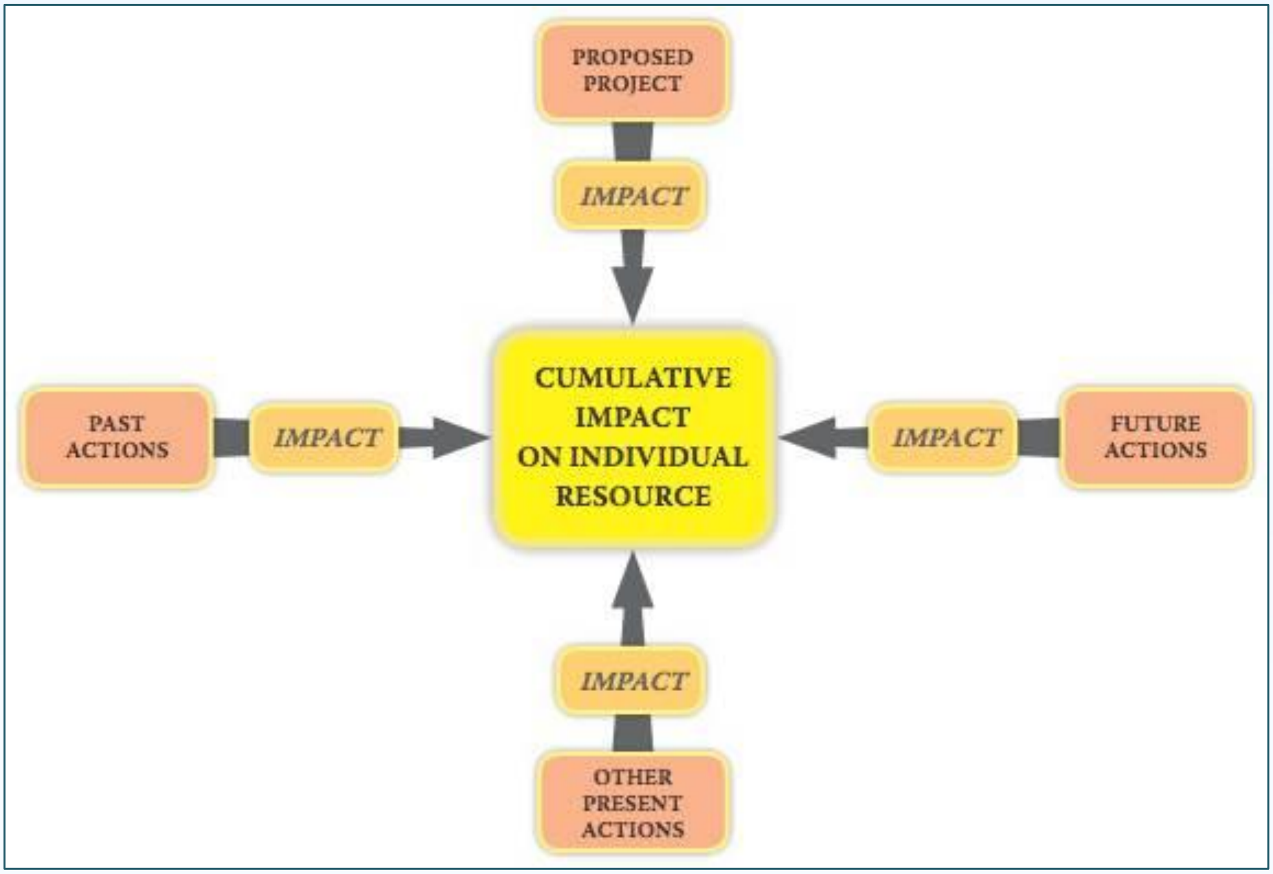


Figure 2, Cumulative Impacts

2.2 Recognize Stormwater Characteristics in Island Environments

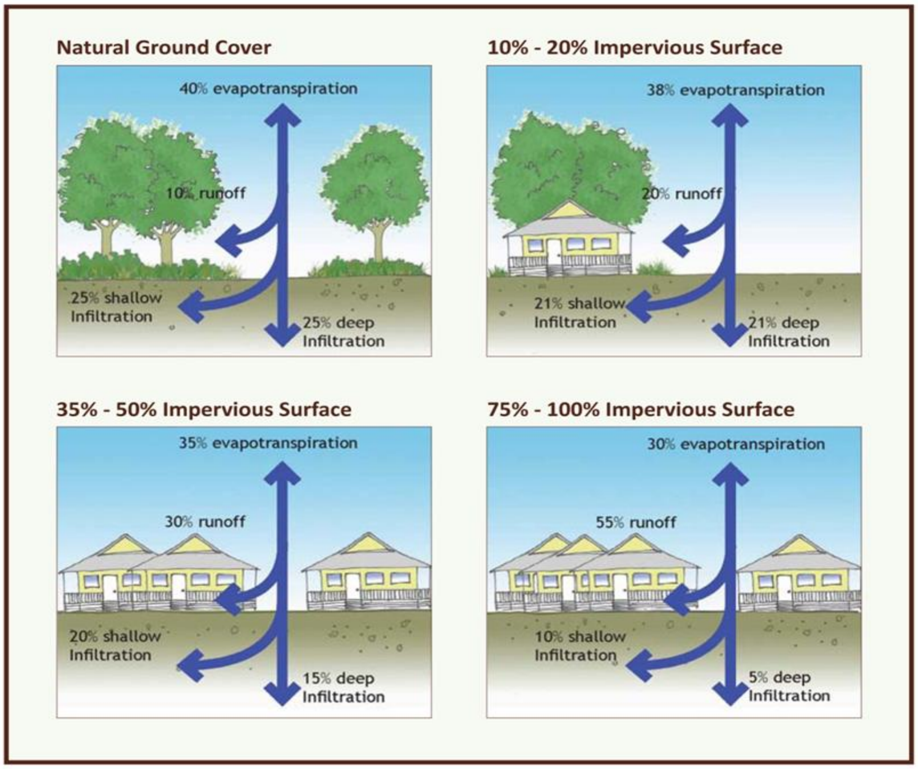
Some stormwater impacts are universal (i.e. water flows downhill) while others are unique to Hawaii's environment. Adjustments to stormwater models and impact analyses may be needed to account for differences between continental and tropical island conditions. The following is an initial list intended to evolve with improved understanding of the various models and island stormwater processes. More technical information about physical processes are listed in Appendix A, Data Resources.

In addition to annual and monthly rainfall it is important to consider rainfall intensity.

Consideration for pollution control prior to infiltration is important.

Recognition of a watershed's geomorphology can be informative when considering an action's secondary impacts.

Photo Credits (top to bottom): Theresa Griffith, PBR HAWAII & Associates, Inc., and Bing Maps

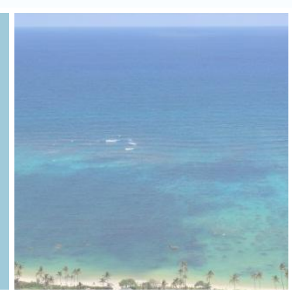


Source: *Environmental Protection Agency, 1993, as adapted by Hui o Ko'olaupoko.*

When new impervious surfaces are proposed, impacts to the hydrologic cycle will be dependent on the unique conditions present at the site and its watershed.

When perennial streams or wetlands are within the watershed, they deserve special attention.

Hawaii's watersheds include nearshore waters and proposed actions should account for secondary impacts to nearshore coastal resources.



2.3 Integrate Stormwater Analysis with the EIS/EA Process.

Stormwater impact analysis can be incorporated into the environmental review process established by HAR Chapter 11-200 Environmental Impact Statement Rules in the following way:

- ***Consultation.*** Before preparing an EA or EIS, the EIS Rules require consultation with stakeholders to "scope" the issues that should be addressed. An EIS Preparation Notice (EISPN) formally initiates a 30-day Consultation Period for an EIS. For an EA, the rules require consultation at the "earliest practicable time" (HAR §11-200-9). Meaningful consultation between EA/EIS preparers and agency staff during this phase can serve to validate the relative sensitivity of the watershed to stormwater impacts, which is key in determining the expected level of analysis in the Draft EA or EIS.
- ***Draft EA or EIS.*** The Draft EA or EIS describes existing conditions, analyzes the impacts, and proposes mitigation measures. The Draft EA or EIS is an opportunity to identify foreseeable stormwater impacts, formulate mitigation strategies, or commit to project design that avoids impacts.
- ***Public Review Period.*** The public review period provides an opportunity for the public and government agencies with stormwater responsibilities or expertise to verify the foreseeable stormwater impacts and validate project design that mitigates or avoids impacts or proposed mitigation measures.
- ***Final EIS or EA.*** The Final EA or EIS is revised as appropriate in response to the comments. A permitting agency may suggest mitigation strategies that can translate to permit conditions as the development process progresses.

2.4 Stormwater Design & Mitigation

2.4.1 Integrate Good Design and Mitigation with Applicable Permits

A development action typically goes through a sequence of planning, design, construction, and operational phases. A requirement to prepare an EA or EIS is usually triggered during the planning phase. Two key permits applicable to stormwater mitigation—the National Pollutant Discharge Elimination System (NPDES) and grading permits—are required during the design phase, which in turn set forth enforceable construction mitigation measures. If a more comprehensive watershed perspective is taken during the planning phase, the EA/EIS can influence the preparation and review of NPDES and grading permit applications as follows:

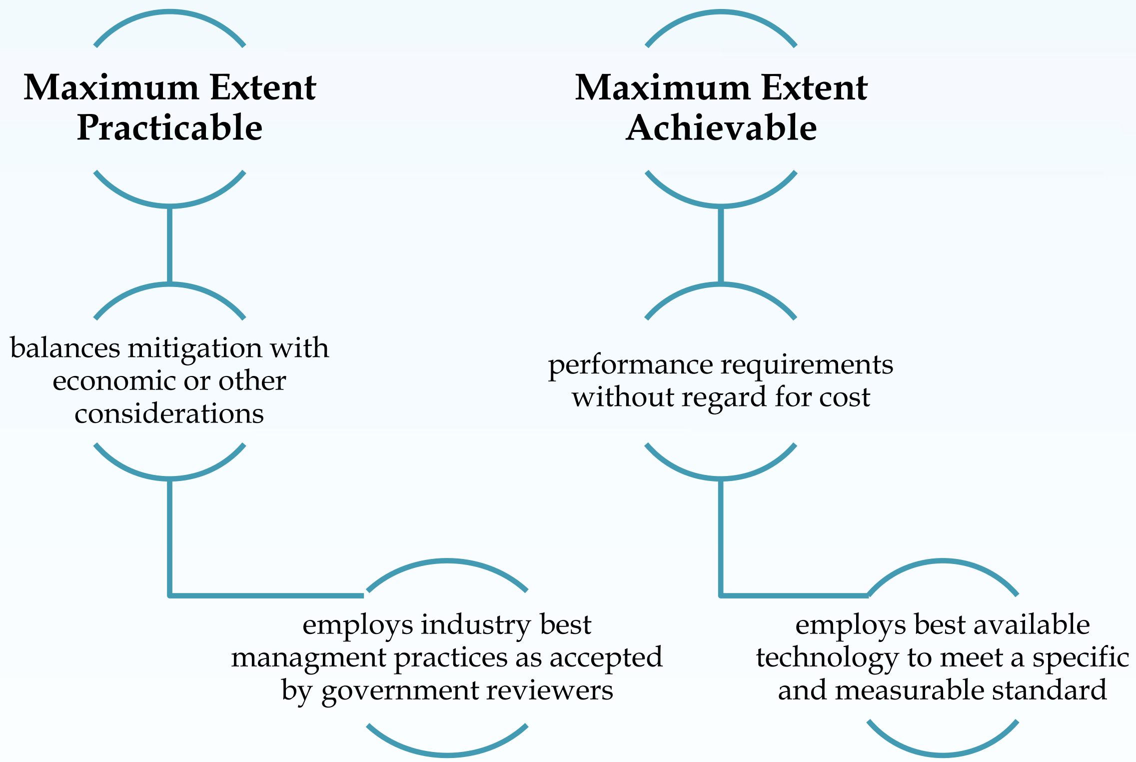
1) Provide pertinent information such as watershed boundaries, land use, rainfall, soils, and proximity to streams and coastal waters;
2) Suggest relevant conditions for construction best management practices (BMPs) due to cumulative impacts on sensitive resources;
3) Suggest permanent BMPs to ensure post-construction development and operations avoid or minimize impacts to resources and comply with specified standards.

For those mitigation concepts specified in an EA/EIS that are not under the purview of the NPDES or grading permits, an EA/EIS should identify another permit(s) applicable to the project during the design phase to verify compliance with requirements such as County zoning, other County approvals, subdivision requirements, or building permits regulations.

2.4.2 Maximum Extent Practicable vs. Maximum Extent Achievable

There are two approaches to establishing the level of mitigation desired:

- ***Maximum Extent Practicable (MEP).*** Also known as, "best practicable measure" or, "best management practice", this approach balances environmental mitigation with economic or other considerations. The concept of best practice is founded on the idea that there is no case for unnecessary waste discharges or degradation of the environment, even where an environmental standard is not exceeded.
- ***Maximum Extent Achievable*** (or best available technology). This approach specifies measurable performance standards without regard to cost or other factors. Total Maximum Daily Loads (TMDLs) are a step in this direction where limits are established and a project proponent cannot exceed their allocation of these limits.



2.4.3 Translation of Design and Mitigation Strategies to Permit Conditions

Stormwater design and mitigation should be integrated with existing permit requirements. During the planning phase of an action, the EA/EIS process sets the foundation for thoughtful stormwater design that avoids impacts. Stormwater management concepts expressed in the EA/EIS should translate to permit conditions in the design and construction phases of the development sequence. Similarly, if adverse effects are anticipated, mitigation strategies as expressed in the environmental review process should carry forward in subsequent permit conditions. Examples of mitigation measures by development phase include:

- ***Planning Phase Mitigation***. An example of a planning phase mitigation strategy is a commitment to minimize impervious surfaces to the maximum extent practicable. This commitment may be expressed in the EA or EIS.
- ***Design Phase Mitigation.*** An example of a design mitigation measure is a commitment to reduce the impervious surfaces to a specified percentage or area. This commitment is documented in county plan review or subdivision conditions of approval. A permit condition to enforce such a measure would direct that the specific mitigation technique be documented in the detailed design and construction documents. To check compliance, the permit condition would need to translate to a subsequent permit (e.g., Grading Permit, Building Permit), or require that the detailed plans be submitted to the agency for approval prior to start of construction.
- ***Construction Phase Mitigation.*** An example of a measure to mitigate short-term impacts during construction is a commitment to use the best available technology (rather than "best management practice") to mitigate erosion and sedimentation due to the proximity of sensitive nearshore coastal waters (e.g., presence of coral reef). A permit condition to enforce such a measure would be directed at the NPDES permit preparer and reviewer and/or the grading permit preparer and reviewer as applicable. Normally, construction contracts incorporate these permits and compliance would thereby be imposed on the contractor.
- ***Operational Phase Mitigation.*** An example of a measure that would be an ongoing post-construction requirement is a commitment to limit impervious surfaces to the percent or area approved in the planning and design phase. A permit condition to enforce such a measure would be directed at the owner and owner's successors. Other operational phase mitigations might be to ensure that drywell filters are cleaned regularly or that pervious pavers are vacuumed routinely. Enforcing compliance with these types of conditions without becoming an unrealistic burden requires creativity. Recordation of operational permit conditions is one way to ensure that subsequent owners are aware of these requirements that run with the land.

2.4.4 Best Management Practices, Generally

BMPs are the tools that can be employed to manage stormwater. The tools may be structural measures or management actions to help minimize water pollution and maintain natural flow volumes. Recognizing that no single treatment or management measure can solve problems created by non-point source pollution and drainage problems, the United States Environmental

Protection Agency (EPA) approaches BMPs as a "management systems approach," where a series of practices or management measures in combination achieve maximum effectiveness.

BMPs may be applied on a temporary basis to control drainage during construction or they may be long-term, "permanent BMPs". At times, temporary construction BMPs can also serve a project long-term and, with minor adaptations, become permanent BMPs. BMPs include a variety of techniques and include Low-Impact Development as just one subset. Other BMPs may be engineered controls or management actions. Appendix B includes a table of BMPs that address specific issues and include examples that, with foresight, can transition with a site through construction and into operation. It is not an exhaustive list and several sources for more information are identified in this document's references as well as Appendix A, Data Resources.

2.4.5 Low-Impact Development Concepts

Low-Impact Development (LID) is a stormwater management approach that mimics nature's ability to clean and store stormwater runoff. This is accomplished through use of decentralized micro-scale controls that infiltrate, filter, store, reuse, evaporate, and detain runoff close to its source (Center for Watershed Protection, 2013). Although individual LID techniques may serve as a stormwater flow or pollutant removal tool, the EPA has found that maximum benefit can be achieved by taking a holistic approach to site design through implementation of a suite of LID practices appropriate to a site's conditions (EPA LID Barrier Busters Fact Sheet Series).

Impervious areas that allow stormwater to flow to LID features where runoff is treated and infiltrated do not create the same impacts as impervious surfaces that allow runoff to sheet flow to streams or deliver runoff directly to a piped stormwater system. In some cases, land owners are beginning to "disconnect" existing impervious surfaces and retrofit sites with low impact development technologies.[1] These LID retrofits serve to reduce the volume or speed at which stormwater enters the system and the gross or "effective" impervious areas contributing to stormwater impacts are thus reduced (Arnold, C. et. al. 2011).

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[1] The Center for Watershed Resources developed a Retrofit Reconnaissance Inventory (RRI) survey method to document impervious areas that have been "disconnected" using LID methods. Hui o Koʻolaupoko has adapted this survey technique for Hawaii in their Urban Sub-basin Action Plan (Hui o Koʻolaupoko, 2011). The University of Connecticut used the RRI to identify and develop an implementation plan to disconnect a significant portion of their impervious surfaces on campus.

2.4.5.1 LID Site Design Measures

A project could commit to Low Impact Development (LID) site design measures by preserving natural areas, minimizing impervious surfaces, disconnecting impervious surfaces, and increasing drainage flow paths (Prince George's County, Maryland, Department of Environmental Resources, 1999). Good design can result in beneficial impacts, avoidance of impacts or minimization of impacts. *Low Impact Development: A Practitioner's Guide* (Horsley Witten Group, for Hawaii CZM Program, 2006) provides a series of conservation design strategies for Hawaii, all which can serve as examples of planning phase mitigation strategies, including:

- Preservation of undisturbed areas
- Preservation of riparian (streamside) buffers
- Minimization of clearing and grading
- Locating sites in less sensitive areas
- Open space design

2.4.5.2 LID Stormwater Control Measures

LID techniques that reduce peak flow and increase infiltration can be implemented during construction and become part of the overall site design. These techniques may serve as useful concepts to introduce in the planning phase and further refine in the design phase of project development.

Some LID techniques are incorporated into development to minimize impervious cover, allowing for the opportunity for greater on-site infiltration or evapotranspiration including:

- Roadway and driveway reduction
- Cul-de-sac reduction
- Building footprint reduction
- Parking lot reduction

A report published in 2011 analyzed the economic factors that influence developers' decisions to pursue Low-Impact Development techniques. Among the report's findings was the recognition on the part of developers that implementing LID techniques requires early and on-going site design coordination among the design team.

"Interviewees who successfully implement stronger stormwater controls using infiltration and volume-reduction practices in redevelopment projects emphasize the importance of considering stormwater management at the earliest stages of development, and of integrating professionals' expertise throughout the project. These principles are consistent with the conclusions of the broader literature on green building, which emphasize the importance of collaboration among professionals throughout the design process to achieve reductions in overall costs. These principles are especially important in the success of redevelopment projects, because these projects tend to require more complex, site-specific, and creative solutions to effectively manage stormwater"

(ECONorthwest, 2011).

Other LID techniques that are incorporated into design of the development mimic the natural environment's ability to manage stormwater. As with LID techniques to reduce impervious surfaces, these techniques may serve as useful concepts to introduce in the planning phase and further refine in the design phase of project development (Horsely Witten Group for Hawaii CZM Program, 2006 and State of Hawaii Department of Transportation, 2007):

- Vegetated Filter Strips
- Open Vegetated Swales
- Bioretention and Rain Gardens
- Infiltration trenches
- Rain harvesting from rooftops
- Stream and riparian restoration
- Stormwater Wetlands
- Tree planting

An open swale (Oahu) that accepts parking lot runoff.

2.4.6 LEED® Standards

Some stormwater best management practices can serve to support a development's overall commitment to minimization of environmental impacts. Leadership in Energy and Environmental Design, better known as LEED®, is a green building program that provides third-party verification of green buildings and neighborhoods.

To earn LEED® certification, a building or neighborhood must satisfy prerequisite standards and earn a minimum number of points on a rating system. LEED® certification is voluntary, and serves as an industry benchmark for building or neighborhood developers and managers to establish development practices that employ tools to improve building performance and minimize impacts on the environment. LEED® credits can be earned by planning for and minimizing stormwater impacts.

LEED® for Neighborhood Development (LEED-ND®) focuses not just on the building site but the project's location within the larger watershed. The point systems for both LEED-ND® and LEED-NC® encourage the use of Low-Impact Development (LID) measures, and require at least no net increase in pollutant load generated from the site, and in some cases require a reduction between pre- and post-development conditions. Other LEED® credits can be earned for actions that indirectly support stormwater best management practices or, could be considered "innovative mitigation" (discussed in the next section of this document).

The growth in the number of LEED-NC® and LEED-ND® certified projects reflects a trend in the market's expectations for new development. However, it is not suggested that LEED® certification be imposed as a requirement or permit condition.

A LEED® certified educational facility that features stormwater management techniques (Oahu).

Total Suspended Solids, A Management Measure for New Urban Development

The Hawaii Watershed Guidance (TetraTech EM for Hawaii CZM Program, 2010) and LEED Green Design both suggest a management measure to address the many sources of sediment in urban areas. The target is to reduce the average annual total suspended solid (TSS) loadings by 80%. To achieve 80% removal of the post-development TSS, the Hawaii Watershed Guidance suggests:

1. *By design or performance:*
   A. *Construction has been completed and the site is permanently stabilized, reduce the average annual total suspended solid (TSS) loading by 80%. For the purposes of this measure, an 80% TSS reduction is to be determined on an average annual basis, OR*
   B. *Reduce the post-development loadings of TSS so that the average annual TSS loadings are no greater than predevelopment loadings, AND*
2. *To the extent practicable, maintain post-development peak runoff rate and average volume at levels that are similar to pre-development levels.*

2.4.7 Encourage Innovative Mitigation

When adverse impacts are anticipated, the EA/EIS process can be a means to explore creative mitigation measures such as off-site mitigation, compensatory mitigation and water quality trading.

There may be circumstances where off-site mitigation may be a legitimate means for reducing stormwater impacts. These circumstances may relate to the sensitivity of the potentially affected resource and the level of cumulative impacts to resources from other sources or site constraints that make addressing stormwater impacts on-site difficult or unfeasible. Recognizing the potential for greater stormwater management effectiveness, municipalities elsewhere in the U.S. are beginning to develop off-site mitigation programs (Maupin & Wagner).

One type of off-site mitigation is based on the concept of compensatory mitigation used for wetlands (U.S. Environmental Protection Agency, 2004) or carbon trading. The idea is to offset impacts generated by the project by reducing pollutant loads generated elsewhere in the watershed. The process to determine the proportionate reallocation would require further elaboration and testing that may benefit from EPA's explorations into the concept of water quality trading (U.S. Environmental Protection Agency, 2004). In the absence of a formal institutionalized process for offsetting impacts, EIS preparers can consider the following options:

- Seek load reductions from natural areas by supporting implementation activities of a government-sponsored or community watershed group if one exists in the watershed, or consult with federal or state agencies who have jurisdiction of natural areas within the watershed for their suggestions to support their management needs;
- Seek load reductions from agricultural areas by supporting an agricultural operation to implement nonpoint source management measures (U.S. Environmental Protection Agency);
- Establish and contribute to a fund for watershed monitoring or management. The concept of a fund could be based on a donation to a nonprofit with watershed management responsibilities, utility service charge, impact fee, exaction, or stormwater community facilities district.

The creative dialogue may point to the need for a more collective response where individual landowners or users can contribute their proportionate share to mitigate cumulative impacts. This may be a special fund that would be dedicated to addressing specific identified needs such as monitoring or restoration projects that benefit the entire watershed. Once established, such a program would open up a new mitigation vehicle that enables specific projects to contribute their proportionate share.

The Draft EA/EIS provides a vehicle to propose various alternatives from conventional to creative. Early consultation allows an opportunity to identify potential issues and brainstorm creative solutions. The public review period is a venue for government agencies and experts to comment on the feasibility of the various alternatives. As necessary, the applicant or proposing agency may further communicate with commenters during this period to elaborate or refine the selected alternative. The Final EA/EIS should document the selected mitigation concepts and outline how they will be implemented and enforced through design and construction phase permits.

Lahaina and its location relative to agricultural lands, West Maui Mountains and ocean.

2.4.8 Proportionality

Stormwater impact analyses can range from simple checklists to sophisticated models. Small-scale projects have fewer impacts. But smaller projects in a sensitive watershed may require higher scrutiny. Conversely, a larger project in a resilient watershed may justify less scrutiny. The framework proposed in this document suggests reliance on common sense to match the level of analysis to both the scale of the project and the sensitivity of the watershed. Similarly, mitigation concepts imposed on a development should relate to the anticipated impacts and be proportional to the level of development proposed (Nollan vs. California Coastal Commission, Dolan vs. City of Tigard).

3 SUGGESTED FRAMEWORK

Following is a suggested approach to assessing potential stormwater impacts and formulating mitigation goals. It is intended to closely mirror Hawaii's Environmental Review process.

Step 1: Gather Pertinent Data

Research general background information that provides context; that is relevant to direct, secondary, and cumulative impacts; and provides information about the watershed, namely its condition, importance and status with respect to management programs.

Step 2: Determine the Appropriate Level of Analysis

Determine a means of evaluation appropriate to site conditions, proposed development, watershed sensitivity/impairment, or on-going resource management priorities.

Step 3: Analyze Background Information in Light of the Proposed Project

Document anticipated primary and secondary impacts during construction and the primary, secondary, and cumulative impacts post-development.

a) Project Scale – Analyze Direct Impacts
b) Down Gradient – Analyze Secondary Impacts
c) Watershed Scale – Analyze Cumulative Impacts

Step 4: Identify Mitigation Goals & Propose Mitigation Strategies

Consider the primary, secondary, and cumulative impacts to the site and watershed with respect to the watershed's impairment or sensitivity and resource management priorities to formulate mitigation goals.

Step 5: Summarize Impacts and Mitigation

As applicable to the project, provide explicit discussion of direct, secondary, and cumulative impacts, mitigation goals and how mitigation measures will achieve goals.

3.1 Integrating Stormwater Assessment and Environmental Review

The five steps described in the previous section parallel the environmental documentation process required by Hawaii's Environmental Impact Statement Law, HRS Chapter 343 as shown in Figure 3. Both processes are iterative and benefit from ongoing consultation. For example, Step 1 may be limited to researching available resources. However, agency and public feedback during early consultation and/or publication of an Environmental Impact Statement Preparation Notice (EISPN) help to direct preparers toward pertinent data. A thorough understanding of potentially affected resources and permit requirements will facilitate collection of data that is: 1) relevant to the proposed action throughout the planning process; and 2) transferrable into design development. Early consultation should serve to inform the preparer of site and watershed stressors, sensitive resources, and ongoing planning or policy efforts relating to those resources. Further, early consultation should facilitate an understanding of the suite of permits that the proposed action may trigger in the design and construction phases.

In addition, such agency and public feedback during early consultation and/or development of an EISPN provides guidance to EA/EIS preparers in scoping the level of analysis that will be necessary to reasonably foresee potential impacts (Step 2).

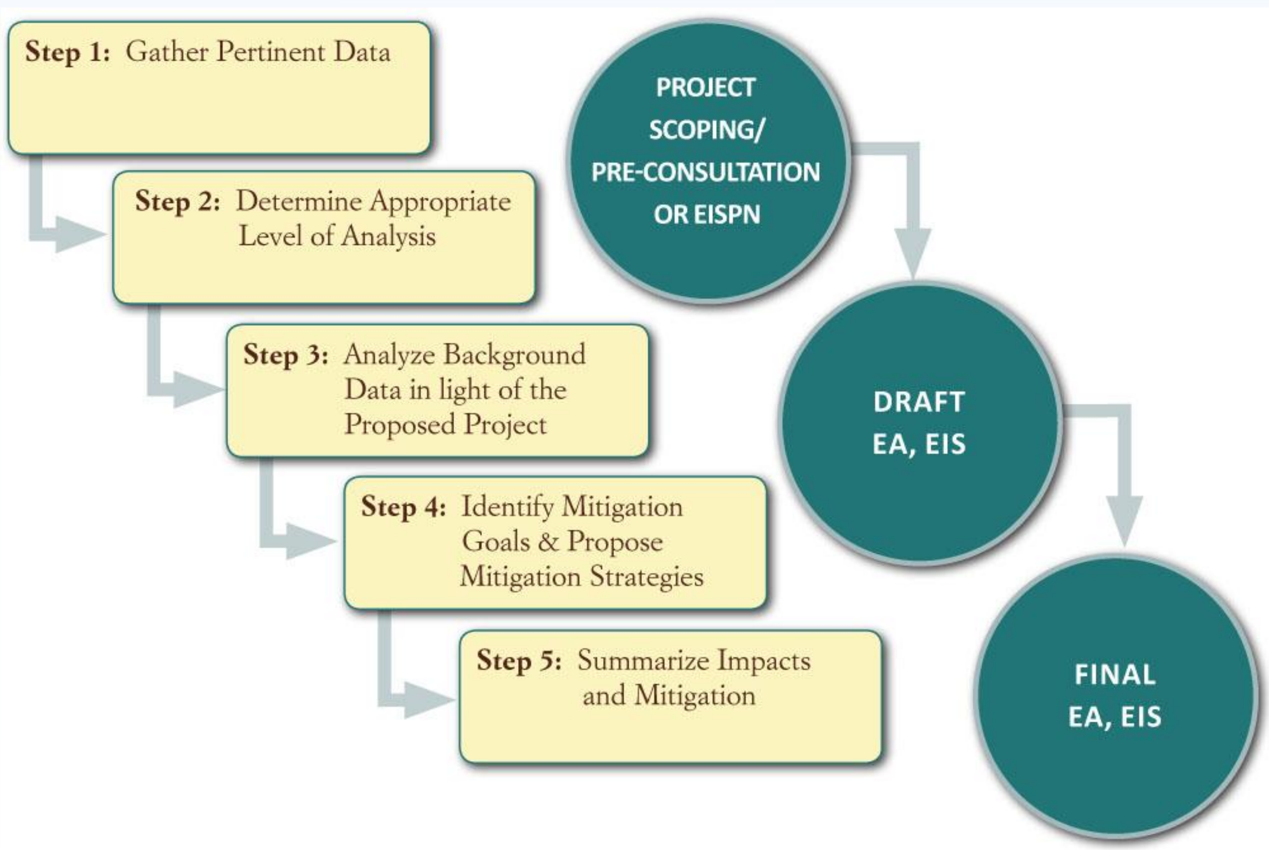


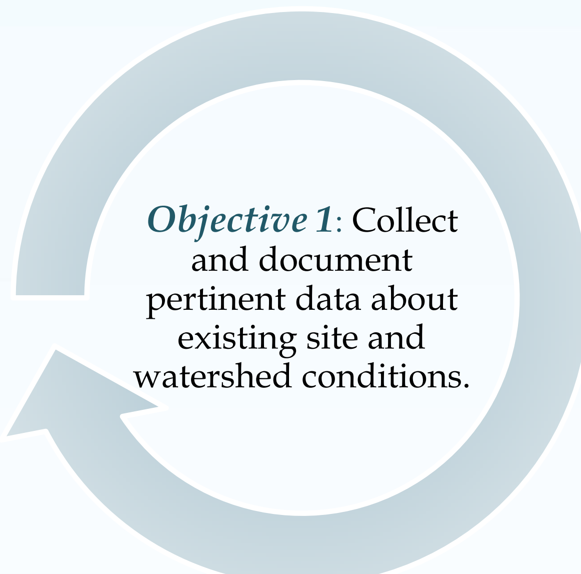
Figure 3, Stormwater Assessment and the Environmental Review Process

A Draft EA or Draft EIS provides a vehicle for analysis of stormwater impacts; consideration of alternatives and associated impacts; as well as a framing of mitigation goals and strategies (Steps 3 and 4). A summary of impacts, alternatives, and mitigation measures should be included in the draft EA/EIS for agency and public comment. The public comment process allows for the opportunity of greater information to come to light and further refinement of the statement of potential impacts, associated mitigation goals, and mitigation strategies to achieve those goals. The assessment culminates in Step 5 when the entire process can be documented in a Final EA or Final Environmental Impact Statement. The information documented in the Final EA/EIS should then inform the conditions of approval that are imposed on the action later in the design and construction phases of development.

3.2 Step 1: Gather Pertinent Data

An EIS or EA should have a separate section that addresses stormwater impacts. The data pertinent to describing the existing conditions and analyzing the impacts should be determined by the following questions relative to the project site and the watershed:

- *"How much and where does the water flow?" (Hydrology)*
- *"What are the potential sources of water pollutants?" ("Stressors")*
- *"How resilient are the down gradient resources to pollutants?" ("Sensitivity")*



Best available data and early consultation can typically document site and watershed hydrology, stressors, and sensitivity. Anticipated stormwater permits should be documented as should management programs that pertain to stormwater at the site level, down gradient, and in the watershed.

3.2.1 Hydrologic Data

In some cases, information pertaining to hydrology of a watershed has already been compiled. A good source for hydrologic information is watershed-based plans that have been prepared to address Section 319 of the Clean Water Act (1987). Appendix A contains a list of watersheds that either have an EPA/DOH Watershed-Based Plan or Total Maximum Daily Load (TMDL) plans. Because new watershed-based plans are currently in development, be sure to check with the Department of Health Clean Water Branch Polluted Runoff Control Program staff to see if a plan has been written and accepted for the watershed of interest. Appendix A contains a link to the Department of Health, Clean Water Branch website.

If a watershed plan is not already prepared, characteristics that should be documented include both the natural physical environment as well as human-induced alterations. The tables found in Appendix C, Reviewer's Checklist list the types of information that help characterize the hydrology of a site and its watershed or sub-watershed. Appendix A includes a list of resources where data can be found.

3.2.2 Water Quality & Pollutant Data

A useful source of detailed information regarding watershed pollutants is an EPA and DOH approved watershed or TMDL plan (see Appendix A) if one exists. Statewide, a primary source of information is water quality data collected by the Department of Health. As required by the Clean Water Act §303(d) and §305(b), the DOH synthesizes its collected data into a report that informs the public about general water quality conditions and documents water bodies that are "impaired" or "threatened". The list of "impaired" or "threatened" waters is commonly referred to as the "303(d) list". Hawaii's report and 303(d) list are available on the Department of Heath website (see references and Appendix A for data resources).

If a waterbody has been identified as impaired or threatened and is on the 303(d) list, it may be that a TMDL has been established. If a TMDL has been established in a site's watershed, it may have bearing on the level of stormwater assessment conducted in the EA/EIS. Measurable mitigation concepts may also be warranted because although TMDLs require 50% to 99% pollutant removal, removal rates for Best Management Practices are actually much lower (Nemura & Powers). The level of data collection should be appropriately scaled to these possibilities.

Additional information that is useful in characterizing the stressors found at a site or in its watershed or sub-watershed is listed in the Reviewer's Checklist, Appendix C.

3.2.3 Sensitivity: Resource Resiliency and Management Programs

In Hawaii, streams are a useful indicator of a watershed's health (Kido 2011). The *Hawaii Stream Assessment* (HSA), which was published by the State of Hawaii Commission on Water Resource

Management (CWRM) in 1990, provides a categorization of the types of resources that make use of Hawaii's streams. The HSA categories include aquatic resources, riparian resources, cultural resources, and recreational resources. The HSA can be consulted to establish historic stream resources (circa 1990). It is important to note that a site's conditions and its watershed and watershed resources may have changed since publication of the document, particularly if significant development within a watershed has occurred. The *Atlas of Hawaiian Watersheds and their Aquatic Resources* developed by the State of Hawaii Division of Aquatic Resources (DAR) in partnership with the Bishop Museum compiles HSA data with other DAR survey data in an on-line format (see Appendix A). The Atlas provides information pertaining to land use, stewardship/management, as well as biological observations. In addition to the resource categories identified by the HSA and Atlas, Hawaii's freshwater resources are used for economic purposes such as agriculture, power generation, and aquifer replenishment. Thus, additional sources of information may need to be consulted depending on the land use activities occurring in the watershed. Appendix C, includes a list of resource categories to consider when documenting the potentially affected resources at a project site and its sub-watershed or watershed.

What is a TMDL?
A Total Maximum Daily Load, or TMDL, is a calculation of the maximum amount of a pollutant that a waterbody can receive and still safely meet water quality standards. (U.S. EPA). In Hawaii, TMDLs have been developed for several water bodies (both stream segments and marine waters) which have been determined under the Clean Water Act to be "impaired" or "threatened". When TMDLs are established, a report documenting the pollutant(s) of concern is developed. These reports are available from the State of Hawaii Department of Health. See Appendix A for data sources.

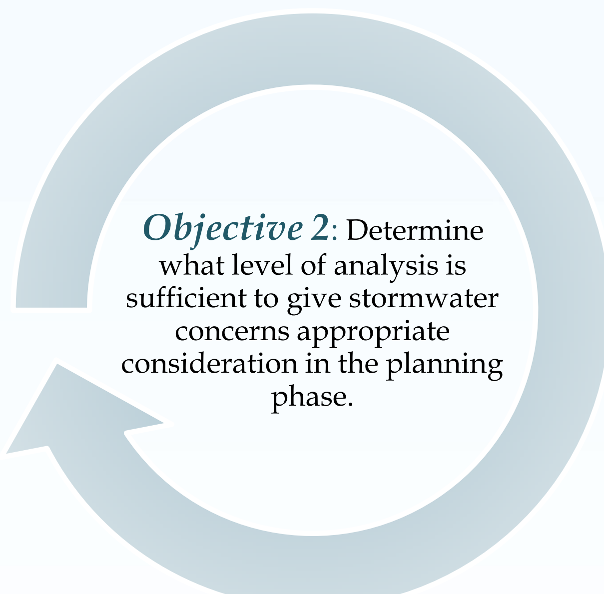
Many watersheds, portions of watersheds, or specific resources within watersheds are subject to management actions, conservation planning, or statutory requirements and regulations. It is important to consider a watershed or a watershed's resources with respect to these existing efforts as it helps put a proposed action in context of the watershed's sensitivity. Through early consultation in the EA/EIS process agencies are afforded the opportunity to provide this information to the preparer. The status of a watershed or its resources will clarify eventual permit requirements; may have a bearing on the level of analysis that should be conducted in an EA or EIS; and help in formulation of mitigation goals (Step 4).

Appendix C, Reviewer's Checklist, offers a list of potential management plans or requirements that may apply to a site's development or may be relevant when considering mitigation measures to protect resources.

3.3 Step 2: Determine the Appropriate Level of Analysis

HRS §343-1 directs the state to, *"establish a system of environmental review which will ensure that environmental concerns are given appropriate consideration in decision making along with economic and technical considerations."* Determining the appropriate level of analysis can be challenging. Should the direct, secondary, and cumulative impacts be assessed based on available information, or is more rigorous analysis appropriate to estimate the pre- and post-development volume of flows or pollutant loads? What is a reasonable level of analysis considering the scale of the development? What is reasonable considering the limited design details available in the planning phase of project development? What is the appropriate level of analysis with respect to the potentially affected resources and their status with relationship to management programs compiled in Step 1?

Ultimately, determining the appropriate level of analysis is a judgment call that should factor in the information collected in Step 1 through research and consultation. In Hawaii, EAs are used as a tool to determine if a "negative declaration" also known as a Finding of No Significant Impact (FONSI) can be made, or if an Environmental Impact Statement is needed. As a general guideline, if it is determined that the action is of a size or intensity warranting the need to run watershed models to estimate the pre- and post-development volume of flows or pollutant loads, it is likely that the appropriate environmental review document is an EIS rather than an EA.



3.3.1 Stormwater Volume

Development subject to County grading permits[2] must ensure that any increase in stormwater runoff due to development shall be retained on site. For actions that involve grading, a preliminary estimation of the stormwater generated on site should be provided in the EA/EIS. This information is typically calculated by a civil engineer.

3.3.2 Stormwater Quality

Consideration should be given to the on-going impacts or stressors to the watershed, documented by the Department of Health. The EA/EIS should document the watershed's sensitivity as determined by Federal, State or County agencies. The EA/EIS should also consider the development's intensity and list the likely permit requirements. Taken together, this information should help to determine if the "stressors", "sensitivity" and "intensity" necessitate a scientific or engineering analysis to estimate the volume of pollutants generated or if a planning-level analysis and narrative is sufficient.

[2] Counties of Kauai, Maui, Hawaii and City and County of Honolulu.

A Note About Watershed Modeling

For many proposed actions, use of watershed modeling to predict pre-and post-development pollutant loads is an impractical level of analysis. Often, the level of design detail is not sufficiently developed in the formative phases of project development, and the assumptions made to run a model may be highly speculative. Watershed modeling is highly laborious and data intensive. The level of effort may not be justified. If a circumstance arises that a quantitative analysis to fully understand a development's impacts to hydrology or pollutant loads is necessary, a variety of tools are available to estimate or model future hydrology and/or pollutant loads. Different modeling tools have different strengths and weaknesses. While some models focus strictly on volumes of flow in varying rain events and development scenarios, others serve to focus on volumes of particular pollutants. Some models are challenging to use in Hawaii watersheds and may not accommodate or calibrate to account for the islands' steep gradients, rainfall intensities or soil types. Watershed modeling tools are continuously being refined, upgraded and improved upon, so it is important to seek the most appropriate and up-to-date tools if watershed modeling is deemed appropriate.

On the next pages, Table 1 provides a list of circumstances to help evaluate stressors, sensitivity, and intensity when weighing the level of analysis that would provide "appropriate considerations" under HRS Chapter 343.

Table 1, Considerations that may Impact Depth of Analysis

Watershed Impairment/Stressors	Has a TMDL been established for any stream segment in the sub-watershed or for the receiving water body?	Yes. If the proposed action is likely to contribute to an increase in the volume of the TMDL pollutant of concern, consider an analysis that estimates the pre- and post-development volumes of the pollutant(s) of concern. No. Go to the next question.
	Is there an impaired stream segment or waterbody in the sub-watershed or receiving waters that is classified by the Department of Health as category 5?	Yes. Waterbodies classified in Category 5 constitute the Clean Water Act §303(d) List of Impaired Waters. If the proposed action is likely to contribute to an increase in the volume of the TMDL pollutant of concern, consider an analysis that estimates the pre- and post-development volumes of the pollutant(s) of concern. No. Go to the next question
	Is there an impaired stream segment or waterbody in the sub-watershed or receiving waters that is classified by the Department of Health as category 4a, 4b or 4c?	Yes, Category 4a (a TMDL to address a specific segment/pollutant combination has been approved or established by EPA). If the proposed action is likely to contribute to an increase in the volume of the TMDL pollutant of concern, consider an analysis that estimates the pre- and post-development volumes of the pollutant(s) of concern. Yes, Category 4b (a use impairment caused by a pollutants is being addressed by the State through other pollutions control requirements). If the proposed action is likely to contribute to an increase in the volume of the TMDL pollutant of concern, consider an analysis that estimates the pre- and post-development volumes of the pollutant(s) of concern. Yes, Category 4c (a use is impaired but the impairment is not caused by a pollutant). Determine what the impairment is and if the proposed action is likely to exacerbate the impairment. Consider conducting an analysis to estimate the pre- and post- development volume of the pollutant(s) of concern. No. Go to the next question.
	Is there an impaired stream segment or waterbody in the sub-watershed or receiving waters that is classified by the Department of Health as category 3?	Yes. Category 3 classified waterbodies have insufficient data to support a determination. Using existing data and knowledge of the proposed action, document possible pollutant inputs. No. Go to the next question.
Watershed Sensitivity	Is a receiving waterbody designated Class 1 or Class AA? Is the receiving waterbody subject of Hawaii's Local Action Strategy to Address Land Based Pollution Threats to Coral Reefs? Is the watershed identified as sensitive on the *Hawaii Watershed Priority Project*?	Yes. Use existing data and knowledge of the proposed action to document possible pollutant inputs. If potential pollutant inputs are expected to directly impact Class I or Class AA waters, a "sensitive" watershed as defined by the Hawaii Watershed Priority Project or a coral reef subject to a Local Action Strategy, consider an analysis that estimates the pre- and post-development runoff volume and volume of pollutants in the runoff pre- and post-development. No. Go to the next question.
	Do site conditions lend themselves to excessive runoff (i.e. clay or highly erodible soils; steep slopes; high rainfall intensity)?	Yes. Consider an analysis that estimates soil loss. No. Go to the next question.
	Is the site subject to the City and County of Honolulu Stormwater standards (effective June 1, 2013)?	Yes. Conduct an analysis sufficient to satisfy ordinance. No. Go to the next question
	Is the site subject to the Maui County water quality standards (effective November 25, 2012)?	Yes. Conduct an analysis sufficient to satisfy ordinance. No. Go to the next question

Development Intensity	Is the site located in a small urban watershed or sub-watershed (measuring no more than 1 square mile in area and anywhere between 25% and 100% impervious surfaces)?	Yes. Consider conducting a quantitative analysis using the "Simple Method" and national pollutant coefficients to calculate potential post-development pollutant loads. No. Go to the next question.
	Is the site located in a small urban watershed or sub-watershed and does the proposed action add impervious area resulting in watershed imperviousness of over 25%?	Yes. Consider conducting a quantitative analysis using the "Simple Method" and national pollutant coefficients to calculate potential post-development pollutant loads. No. Go to the next question.
	Is the action subject to an NPDES permit?	Yes. Conduct an analysis sufficient to prepare for applicable permit requirements. Utilize available data and resources to conduct a planning-level analysis and narrative discussion. No. Go to the next question.
	Is LEED® certification desired?	Yes. If LEED® credit 6.2 is sought, document or develop monitoring reports sufficient to satisfy this criterion. No. Go to the next question.
	Is the action subject to a County Grading, Grubbing, Tree removal or Erosion and Sediment Control Permit?	Yes. Conduct an analysis sufficient to prepare for applicable permit requirements. Utilize available data and resources to conduct a planning–level analysis and narrative discussion. No. Utilize available data and resources to conduct a planning–level analysis and narrative discussion.

3.4 Step 3: Analyze Background Information in Light of the Proposed Action

Once the level of analysis has been determined, the EA or EIS should document the anticipated primary and secondary impacts during construction and the primary, secondary, and cumulative impacts post-development.

3.4.1 Step 3a: Analyze Primary (Direct) Impacts

To analyze primary (direct) impacts discuss direct construction impacts and long-term direct impacts.

- discuss construction direct impacts
- discuss long-term direct impacts

3.4.1.1 Construction Impacts

Determine whether or not the project will be subject to a NPDES permit (greater than one-acre disturbance). If subject to a NPDES permit, the EA/EIS should highlight site features that merit special attention by the NPDES permit preparer and/or reviewer. Such features include: precipitation patterns (rainy wet season, high intensity rainfall); steep slope areas; highly erodible or poor drainage soils; past soil contamination; natural features that may reduce rainfall impact, reduce flow velocity, or filter runoff. If not subject to a NPDES permit, the EA/EIS should suggest more specific mitigation measures to address special site conditions. If the proposed action is in a sensitive watershed, consider a requirement to monitor performance at the site boundaries.

3.4.1.2 Pre- vs. Post-Development Long-Term Impacts

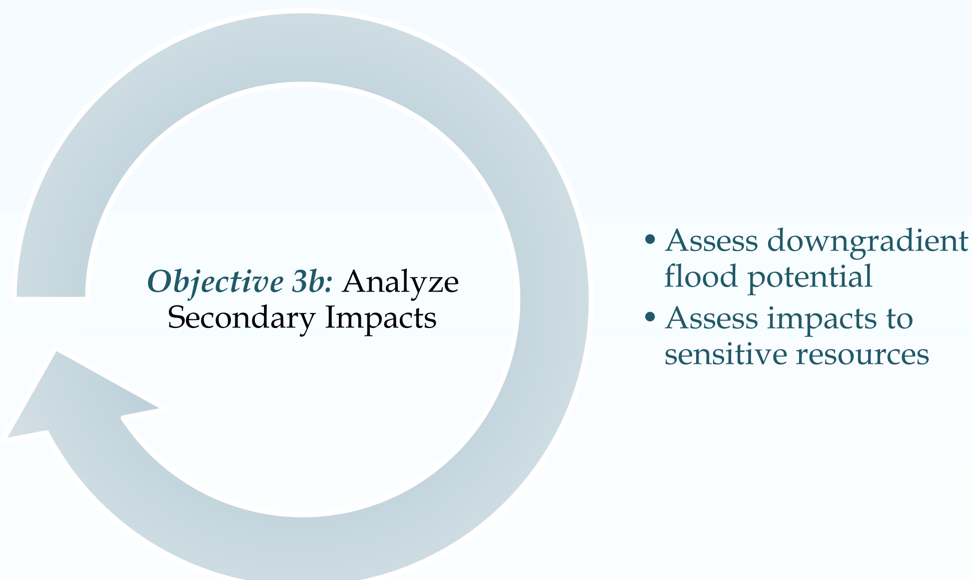
If, in Step 2, use of the Simple Method, soil loss estimate or other models were deemed appropriate tools for analyzing impacts, the appropriate calculations/modeling and results should be summarized.

If a planning-level analysis was deemed the appropriate depth of analysis in Step 2, the site and watershed conditions should be documented, including precipitation patterns (seasonal variations, intensity), steep slope areas, highly erodible soils, poor drainage soils or soils/lava with high infiltration rates, past soil contamination, and natural features that may reduce rainfall impact or otherwise reduce flow velocity, filter runoff or enable evapotranspiration.

When analyzing potential long-term impacts to site hydrology pre- and post- development, take into account Hawaii-specific considerations, such as rainfall intensity, infiltration issues, geomorphology, nearshore resources, and impervious surfaces (see Section 2.2 of this report).

3.4.2 Step 3b: Secondary Impacts (Offsite, Down Gradient Impacts)

The analysis of secondary impacts should assess the risks of the primary impacts on down gradient flooding and watershed sensitivity. For example, if the proposed measure to mitigate surface runoff is to retain the 10-year storm, what are the potential effects of the 100-year storm? If the watershed is impaired or sensitive, what mitigation over and above the mitigation of primary impacts is needed?



3.4.2.1 Down Gradient Flooding Potential

If special flood hazard zones have already been mapped down gradient of the Site, then assume that the flood hazard zone can accommodate the permitted project flows unless otherwise notified by a reviewing agency. If not mapped, flood risk may need to be evaluated by a civil engineer.

3.4.2.2 Down Gradient Sensitive Resources

Upon review of the State Department of Health's *Integrated Report to the U.S. Environmental Protection Agency and the U.S. Congress Pursuant to Sections 303(d) and 305(b), Clean Water Act*[3] and any other pertinent water quality data for down gradient water bodies, the EA/EIS should describe the anticipated contributions of pollutants of concern pre- and post-development. Depending on the site's proximity to nearshore coastal waters, sensitive resources or stream, it may be justified to retain a hydrogeologist and/or marine scientist to assess risk of impacts.

3.4.3 Step 3c: Cumulative Impacts

A watershed's imperviousness can serve as a useful tool for consideration of cumulative impacts in small, urban watersheds. In general, the larger the watershed, the level of impacts associated with imperviousness will diminish. This is particularly true in many of Hawaii's watersheds where large percentage of the land area is used for agricultural or forestry production. In these watersheds, an analysis of cumulative impacts must consider the likely impacts resulting from agricultural practices, forestry practices, or ongoing impacts from fallow farmland or non-native land cover.

[3] This report contains the listing of impaired and threatened waterbodies for the State of Hawaii.

An evaluation of the watershed's present and eventual impervious area allows for a planning-level consideration of cumulative impacts, especially in smaller (less than a square mile), urban watersheds, or sub-watersheds. Combining best available land cover GIS data (see data sources in Appendix A) with knowledge of development trends in the watershed can help to formulate a reasonable expectation of future imperviousness. Based on this planning-level analysis some general conclusions about the effects of impervious surfaces on the watershed can be made.

3.4.3.1 Planning-Level Assessment

Cumulative effects are caused by the aggregate of past, present, and reasonably foreseeable future actions (CEQ 1997). To address them, one should assess existing status of the watershed's sensitive resources—e.g., existing condition, monitoring, and status with respect to management programs.

In most cases, an EA or EIS should discuss past actions, particularly those land uses or land cover that may continue to impact the watershed, such as agricultural practices and modifications to waterways or drainage ways. Consideration should be given to past actions' impacts on the watershed's resources with respect to peak flows, runoff volume, erosion, and pollutant loads.

An EA or EIS should also discuss present actions, including land uses and land cover that may impact the watershed. Land cover data may provide insights to peak flow and runoff volumes, while knowledge of existing land uses may serve as reasonable indicators of nonpoint pollution sources. Note that many small, on-going actions in a watershed may cumulatively create impacts that should be acknowledged.

Finally, an EA or EIS should discuss reasonably foreseeable future impacts. General Plan, Community Development Plans and land use designations (e.g., State Land Use districts, county zoning) provide an indication of reasonably foreseeable future development patterns. Some general inferences regarding peak flows, runoff volume, and pollutant sources resulting from anticipated future actions may be reasonably made.

Beneficial Impacts

Project design that results in a net reduction of peak flow, pollutants from the site or cumulatively for the watershed provides beneficial impacts. For example, a site that is bare earth could be contributing significant sediment loads to a watershed's receiving waters. Development scenarios with basic stormwater management and landscaping could minimize the impacts to the watershed from the site (Michaud & Stewart, 2012). Beneficial impacts could offset other adverse impacts, which an EA or EIS should discuss in relation to the EA significance criteria.

3.4.3.2 An Assessment for Small, Urban Watersheds

Stream researchers at the University of Hawaii have established that stream health is a good indicator of a watershed's overall health (Kido, 2008) and in small urban watersheds, there is a connection between the watershed's total impervious cover and stream water quality (Center for Watershed Protection, Undated). If a watershed or sub-watershed is less than a square mile and urbanized, available watershed data and impervious cover data may be suitable indicators of stream and watershed health.

Existing impervious area in the watershed or sub-watershed can be determined using land cover data, information from the *Atlas of Hawaiian Watersheds and their Aquatic Resources*, an approved EPA watershed-based plan (if one exists), or TMDL study (if available). When analyzed against State Land Use District, General Plan, or zoning designations, a sense of a watershed's eventual buildout and potential stress to a watershed can be anticipated. It is important to note that the larger the watershed unit, the influence of impervious cover weakens. Therefore, careful consideration of an action's circumstances and context is always important.

3.4.3.3 Watershed Modeling for Unique Circumstances

If, in Step 2, a watershed model was deemed appropriate tool for analyzing impacts, the EA/EIS should include the appropriate calculations/modeling and summarize the results.

3.5 Step 4: Identify Mitigation Goals & Propose Mitigation Strategies

Formulation of mitigation goals and the strategies to achieve those goals should consider the primary, secondary, and cumulative impacts of the action, together with the desired level of resource avoidance or protection based on the status of the resources. The goals and supporting strategies should be robust enough to support a Finding of No Significant Impact, if applicable. They should also anticipate required permits and acknowledge the necessary role of engineering during design development. Strategies should suggest the types of measures or techniques that may serve to satisfy the mitigation goals, balanced with a discussion of the practicality of implementation of the mitigation measure based on site conditions. ***Therefore, it is important that the mitigation goals and strategies are clear in concept, but not overly prescriptive in the planning phase of the development process.***

The planning phase is an opportune time to consider how site design can provide beneficial impacts and avoid negative impacts from stormwater flow or polluted runoff. If thoughtful design avoids stormwater impacts, the EA/EIS should express this commitment. If negative impacts are expected, the EA/EIS should identify strategies to minimize or otherwise compensate for them. If innovative mitigation strategies such as restoration or contribution to larger watershed improvement are proposed, the *concepts* should be presented in the EA or EIS and on-going work with relevant stakeholders should be documented.

For reference, Appendix B provides a list of site design and stormwater control techniques that could further implement mitigation goals and strategies. Effectiveness of stormwater design and control techniques is dependent upon site conditions. The City and County of Honolulu's Water Quality Infeasibility Criteria (Section 1-5.2 Part II, Water Quality Design Standards) offer insights to factors that will play a role in technique selection.

3.5.1 Identify Mitigation Goals & Strategies

Following is a list of example goals ranging from minimization of primary impacts to compensation for contributions to watershed cumulative impacts. These examples are illustrations of a process for identifying mitigation goals and strategies. They are not intended to be applied to development proposals without consideration of actual site/watershed conditions, permit requirements, and reasonable nexus and proportionality tests.

Example 1: Address NPDES or Grading Permit Requirements to the Maximum Extent Practicable. This common example suggests that industry standard best management practices will be employed to satisfy anticipated permits.

Potential Impact = Polluted runoff will create primary and secondary impacts and will contribute to the watershed's cumulative impacts

Mitigation Goal = No unnecessary pollution should occur

Mitigation Strategy = Use BMPs to control polluted runoff to maximum extent practicable

Figure 4, Impact, Goal and Strategy Diagram

Example 2: Address a TMDL to the Maximum Extent Practicable.

In this example, the pollutants of concern should be documented as described in Steps 2 and 3 and potential impacts should be disclosed. This goal will require a suggestion of the types of BMPs that may be employed to ensure compliance with the TMDL requirements.

Potential Impacts = specific pollutants identified as a concern in the watershed may be found in site runoff

Mitigation Goal = no increase to pollutant of concern

Mitigation Strategy = BMPs that are tailored to address the pollutant of concern to maximum extent practicable

Example 3: Address a site's sensitive resources to the maximum extent achievable.

In some cases it is determined that for all or selected pollutants, there should be no net increase between pre- and post-development conditions. This goal will require a suggestion of the types of BMPs that may be employed to fulfill this mitigation goal. It may also imply monitoring at the site.

Potential Impacts = polluted runoff from site discharging to site's sensitive resource

Mitigation Goal = no net increase in polluted runoff at site

Mitigation Strategy = BMPs to eliminate polluted runoff to site's sensitive resource; pre- and post-development monitoring

Example 4: Address down gradient sensitive resources to the maximum extent achievable.

Beyond no net increase at the Site, in this example there should be no net increase at the receiving waters from contributions throughout the watershed. This goal would imply possible offsite mitigation and/or a proportionate contribution towards regional watershed improvement projects and/or contribution toward monitoring. As a general rule, contributions to regional watershed improvements should not substitute as a BMP to address an action's direct impacts.

Potential Impacts = polluted runoff throughout watershed

Mitigation Goal = no net increase cumulatively

Mitigation Strategies = contribution to offsite mitigation or regional watershed improvement projects and/or regional water quality monitoring

Example 5: Address a site's impacted resources through net reduction.

In this example, there should be a net reduction between pre- and post-development for all or selected pollutants. The mitigation strategies will require a suggestion of the types of BMPs that may be employed to fulfill this mitigation goal. It may also imply monitoring at the site.

Potential Impacts = ongoing polluted runoff from a source on-site

Mitigation Goal = reduce polluted runoff to below pre-construction/development levels

Mitigation Strategies = design and associated BMPs that address pre-construction pollution sources and BMPs that address post-construction polluted runoff

Example 6: Address a watershed's impacted resources through restoration, replacement, or compensation.

In this example, there is reason to require net reductions in receiving water pollutant levels. This goal would imply offsite mitigation, proportionate contribution to regional solutions, and possible concurrency of certain regional actions. Note that in most cases, contributions to regional watershed improvements should not substitute as the only strategy to address an action's direct impacts.

Potential Impacts = ongoing polluted runoff in watershed

Mitigation Goal = reduce the watershed's polluted runoff to below current levels

Mitigation Strategies = Contributions to offsite mitigation or regional watershed improvement projects; coordination of site action with regional efforts to reduce receiving water or ground water pollutant levels

Table 2 on the following page can be used to help determine appropriate mitigation goals and strategies. Again, circumstances on the ground, regulatory requirements, as well as nexus and proportionality should all factor into mitigation goal and strategy development.

Table 2, Formulating Mitigation Goals & Strategies

Potential Impacts Described in EA/EIS	Desired Level of Protection/Avoidance Described in EA/EIS (Mitigation Goals)	Mitigation Strategies Identified in EA/EIS
Polluted runoff or groundwater from site post-development/action	No amount of unnecessary pollution should occur *Management program considerations* *Compliance with HRS Chapter 343* *City and County of Honolulu LID Standards* *Maui County Water Quality Standards*	Avoid or Minimize Primary and Secondary Impacts through Best Management Practice • BMPs to control polluted runoff or groundwater to the maximum extent practicable
Post-development/action runoff may contain specific pollutants identified as a concern in the watershed	No increase to pollutant of concern *Management program considerations:* *TMDL(s) are developed in watershed* *Freshwater or marine resources are listed on 303(d) list*	Avoid or Minimize Primary and Secondary Impacts through TMDL Allocation BMPs tailored to address the pollutant(s) of concern • Compliance with Total Maximum Daily Load (TMDL), if established • Reduce pollutant of concern to the maximum extent practicable
Polluted runoff or groundwater from site post-development/action	No net increase in polluted runoff or groundwater at site *Management program considerations:* *Endangered species down gradient* *Subsistence Fishery or Marine Managed Area down gradient* *Sole Source Aquifer* *Underground Injection Control Line*	Avoid Primary Impacts with No Net Increase at the Site BMPs to eliminate all polluted runoff from site to maximum extent practicable • BMPs to eliminate polluted runoff; • Documentation of pre- and post-development water quality (monitoring)
Post-construction increase in runoff volume	No net increase in runoff from site *Management program considerations* *NPDES permit requirements* *County grading permit requirements* *Floodplain or down gradient flooding concerns* *Streambank erosion concerns*	Avoid Primary Impacts with No Net Increase at the Site • BMPs to eliminate net increase in runoff from site
On-going polluted runoff at site	Reduce polluted runoff to below pre-construction/development levels *Management program considerations* *TMDL(s) are developed in watershed* *Freshwater or marine resources are listed on 303(d) list*	Restore Primary Impacts through Net Reduction at the Site BMPs to address pre-construction (on-going) and long term pollution sources • Development strategies and associated BMPs that address pre-construction pollution sources; and • Permanent BMPs that address post-construction polluted runoff • If sediment is the pollutant of concern, consider using the LEED® Stormwater Design-Quality Control (SS Credit 6.2) as a guide for targeting load reductions

Potential Impacts Described in EA/EIS	Desired Level of Protection/Avoidance Described in EA/EIS (Mitigation Goals)	Mitigation Strategies Identified in EA/EIS
Polluted runoff throughout watershed	No net increase cumulatively *Management program considerations* *TMDL(s) are developed in watershed* *Freshwater or marine resources are listed on 303(d) list* *Receiving waters are designated "Class 1" or "AA"* *Receiving waterbody a subject of* Hawaii's Local Action Strategy to Address Land Based Pollution Threats to Coral Reefs	Avoid Cumulative Impacts with No Net Increase in Watershed Alternative measures to proportionally support no net pollutants in watershed • contribute to offsite mitigation; or • contribute to regional watershed improvement projects; and/or • contribute to regional water quality monitoring
On-going polluted runoff in watershed	Reduce polluted runoff to below current levels *Management program considerations* *Endangered species down gradient* *Subsistence Fishery or Marine Managed Area down gradient*	Restore/Replace/Compensate Cumulative Impacts through Net Reduction in Watershed Alternative measures to proportionally support a reduction to pollutants in the watershed • Contribute to offsite mitigation or regional watershed improvement projects; • Coordination of site action with regional efforts to reduce receiving water or ground water pollutant levels

3.6 Step 5: Summarize Impacts and Mitigation Applicable to the Project

The public review period of the EIS/EA is an opportune time for reviewing agencies to comment on the anticipated impacts, mitigation goals, and adequacy of the proposed mitigation concepts to achieve those goals. The public comment process is an opportunity that allows for greater information to come to light and for further refinement of the statement of potential impacts, associated mitigation goals, and BMPs to achieve those goals. The assessment culminates in Step 5 when the entire process can be documented in a Final EA or Final EIS. The information documented in the Final EA/EIS in turn should then inform the conditions of approval that are imposed on the action later in the development review process.

The Draft EA or EIS should summarize all anticipated impacts as described in HAR §200-11(I.) as well as proposed mitigation strategy as described in HAR §200-11(M.)

Upon closure of the public comment period, input from the public and agencies should be considered and as appropriate, adjustments to design or mitigation strategies should be made. The Final EA/EIS should include documentation of comments, responses to the comments, and for EISs, documentation of how the document was revised or refined to reflect adjustments that were made.

3.7 Reviewer's Checklist

Appendix C contains a checklist that can be used to review an EA or EIS with respect to stormwater impacts. It is a tool that uses the Five Steps described above to document that reasonable consideration has been given to an action's impacts and mitigation strategies.

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Appendix A

Data Resources

Appendix A: Data Resources

Background Information	Resource[1]	Location[2]
Aquifer geology and status	Department of Health Groundwater Protection Program original mylars digitized in 1995	http://hawaii.gov/dbedt/gis/dohaq.htm
Aquifer name and sustainable yield	Department of Land and Natural Resources island wide maps of varying scales and sizes digitized in 1995	http://hawaii.gov/dbedt/gis/dlnraq.htm
Coastal resources	GIS data, various sources digitized in 1989 for the Office of Planning	http://hawaii.gov/dbedt/gis/cstrsrc.htm
Coral reef and shallow water habitats	NOAA Shallow-Water Benthic Habitats of the Main Hawaiian Islands (interactive maps)	http://ccma.nos.noaa.gov/products/biogeography/hawaii_cd_07/default.aspx
Coral reef near-shore, selected locations	GIS data, various sources (only available for Puako, northeast Lanai, south shore Molokai, north coast Kauai)	http://hawaii.gov/dbedt/gis/corals.htm
Endangered Species Critical Habitat	US Fish and Wildlife Service GIS data layers	http://hawaii.gov/dbedt/gis/criticalhab.htm
Evapotranspiration rates	Estimation of Evapotranspiration in Hawaii – study to conclude in 2013 (DLNR, Commission on Water Resources Management, US Army Corps of Engineers & University of Hawaii)	http://hawaii.gov/dlnr/cwrm/info_climate.htm#evapotranspiration
Fishponds	GIS data	http://hawaii.gov/dbedt/gis/fishponds.htm
Flood hazard zones	1. National Flood Insurance Program Flood Hazard Assessment Tool (interactive map) 2. FEMA Map Service Center 3. Digital Flood Data GIS layers	1. http://gis.hawaiinfip.org/fhat/ 2. https://msc.fema.gov/ 3. http://hawaii.gov/dbedt/gis/dfirm.htm
Groundwater data	USGS National Water Information System	http://nwis.waterdata.usgs.gov/hi/nwis/current/?type=gw&group_key=county_cd
Historical evaporation rates	DLNR Pan Evaporation Report	http://hawaii.gov/dlnr/cwrm/publishedreports/R74_PanEvap.pdf
Impaired waterbodies and category of impairment	2012 State of Hawaii Water Quality Monitoring and Assessment Report: Integrated Report to the U.S. Environmental Protection Agency and the U.S. Congress Pursuant to Sections §303(d) and §305(b), Clean Water Act (P.L.97-117)	http://hawaii.gov/health/environmental/water/cleanwater/integrated%20draft%20report/Integraged Report.pdf
Land cover data	Coastal Change Analysis Program High-Resolution Land Cover (C-CAP)	http://www.csc.noaa.gov/digitalcoast/data/ccaphighres/download
Land use and land cover (historical)	Land use and land cover of Main Hawaiian Islands as of 1976	http://hawaii.gov/dbedt/gis/lulc.htm
Long range water resource development/use plans	Water Use and Development Plans for Kauai, Oahu, Maui and Hawaii Counties	http://www.state.hi.us/dlnr/cwrm/planning_countyplans.htm
Low Impact Development measures	Horsely Witten Group. 2006. *Low Impact Development A Practitioner's Guide*. Prepared for Hawaii Office of Planning Coastal Zone Management Program.	http://planning.hawaii.gov/czm/initiatives/low-impact-development/
Low Impact Development measures	Department of Transportation: 1. *Storm Water Permanent Best Management Practices Manual* 2. *Construction Best Management Practices Field Manual*	1. http://www.coralreef.gov/transportation/permanentmanual.pdf 2. http://www.coralreef.gov/transportation/constructionmanual_022708.pdf

[1] Data prepared by others. The accuracy and completeness of the data has not been verified by the Hawaii CZM Program and the State of Hawaii does not guarantee the positional or thematic accuracy of data. GIS or cartographic digital files are not a legal representation of any features which they depict and the State disclaims any assumption of the legal status which the data represents. Please consult metadata when using GIS data and verify the suitability of any data before use.
[2] Web links are current as of April, 2013. Please note that agencies may adjust locations of data on their websites, effectively breaking the links listed in this table.

Appendix A: Data Resources

Background Information	Resource[1]	Location[2]
Low Impact Development measures	City and County of Honolulu: 1. Rules Relating to Storm Drainage Standards (Amended December 12, 2012) 2. Storm Water Best Management Practice Manual – Construction 3. Storm Water BMP Guide	1. http://www.honoluludpp.org/LinkClick.aspx?fileticket=d28OzJTXcvY%3d&tabid=85&mid=516 2. http://www.cleanwaterhonolulu.com/storm/.../BMP_manual_2011-11.pdf 3. http://www.honoluludpp.org/LinkClick.aspx?fileticket=0v1DHZAbnJc%3d&tabid=156&mid=574
National Hydrography Dataset	1. USGS National Map Viewer interactive map 2. GIS data	1. http://viewer.nationalmap.gov/viewer/ 2. http://hawaii.gov/dbedt/gis/nhd.htm
Protected receiving waters (i.e. Marine Life Conservation Districts)	GIS data compiling various "reserves, preserves, parks, etc."	http://hawaii.gov/dbedt/gis/reserves.htm
Rainfall data	1. Rainfall Atlas of Hawaii 2. Hawaii State Climate Office 3. National Weather Service 4. USGS	1. http://rainfall.geography.hawaii.edu/ 2. http://www.soest.hawaii.edu/MET/Hsco/idlink.html 3. http://www.ncdc.noaa.gov/cdo-web/search http://www.nws.noaa.gov/climate/xmacis.php?wfo=hnl http://www.ncdc.noaa.gov/oa/climate/normals/usnormals.html 4. http://hi.water.usgs.gov/gmaps/rainfall.html
Site soils and their characteristics	NRCS soil survey interactive maps	http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm
Soils	NRCS published soil surveys of 1972 (GIS data)	http://hawaii.gov/dbedt/gis/soils.htm
Sole source aquifer	US Environmental Protection Agency interactive map	http://www.epa.gov/region9/water/groundwater/ssa.html
Streams – aquatic, riparian, cultural and recreational resources	Hawaii Stream Assessment (1990) GIS data	http://hawaii.gov/dbedt/gis/strmsaq.htm http://hawaii.gov/dbedt/gis/strmscult.htm http://hawaii.gov/dbedt/gis/strmsdiv.htm http://hawaii.gov/dbedt/gis/strmsrip.htm
Streams – gauge locations	Gauges as identified by the Commission on Water Resource Management, date unknown (GIS data)	http://hawaii.gov/dbedt/gis/strmgage.htm
Streams – mapped locations and names	Division of Aquatic Resources Stream GIS data	http://hawaii.gov/dbedt/gis/streams.htm
Streams – streamflow	USGS Pacific Islands Water Science Center	http://hi.water.usgs.gov/gmaps/streamflow.html http://hi.water.usgs.gov/gmaps/streamflow_peak.html
Threatened and Endangered plants	Division of Forestry and Wildlife threatened and endangered plant species maps digitized in 1992	http://hawaii.gov/dbedt/gis/teplant.htm
Underground Injection Control line	Department of Health Underground Injection Control Lines GIS data	http://hawaii.gov/dbedt/gis/uic.htm
Water quality classifications	Department of Health Water Quality Classification Maps GIS data and maps online	http://hawaii.gov/dbedt/gis/classwater.htm http://hawaii.gov/health/environmental/water/cleanwater/wqstd/index.html
Watershed Characteristics	Atlas of Hawaiian Watersheds and Their Aquatic Resources	http://www.hawaiiwatershedatlas.com/

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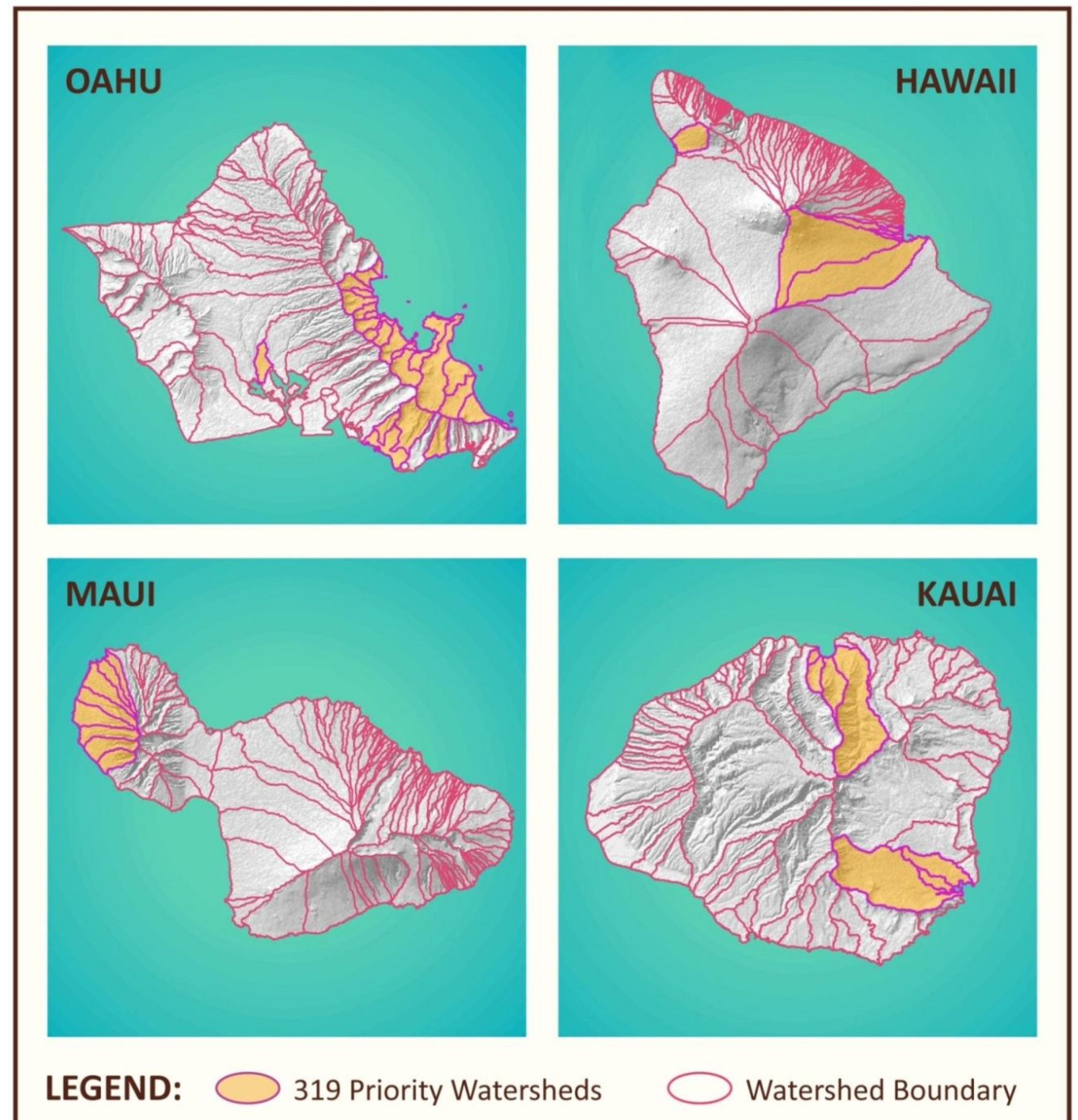
[2] Web links are current as of April, 2013. Please note that agencies may adjust locations of data on their websites, effectively breaking the links listed in this table.

Appendix A: Data Resources

Background Information	Resource[1]	Location[2]
Watershed name, unit boundary and type	Watershed Unit Boundary Polygons and Attributes	http://hawaii.gov/dbedt/gis/wshed.htm
Watershed partnerships	DLNR Watershed Partnership boundaries	http://hawaii.gov/dbedt/gis/watershed_partnerships.htm
Watershed-based plans & TMDL studies	State of Hawaii, Department of Health Clean Water Branch Polluted Runoff Control program	http://hawaii.gov/health/environmental/water/cleanwater/prc/grants.html
Wetlands	1. National Wetlands Inventory GIS Data 2. National Map interactive map	1. http://hawaii.gov/dbedt/gis/wetlnds.htm 2. http://viewer.nationalmap.gov/viewer/

State of Hawaii "319" Priority Watersheds as of May 2013

Island	Plan/Report Title	Watersheds	
Kauai	Assessment and Protection Plan for the Nawiliwili Watershed	Huleia Puali Nawiliwili	
	Total Maximum Daily Loads for the Hanalei Bay Watershed	Waikoko Waipa Waioli Hanalei River	
Oahu	Ala Wai Watershed Plan TMDL	Manoa-Palolo Makiki Ala Wai	
	Koolaupoko Watershed Restoration Action Strategy Kawa Stream TMDL & Implementation Plan Waimanalo TMDL & Implementation Plan Kapaa Stream TMDL & Implementation Plan	Ahimanu Haiamoa Hakipuu Heeia Kaalaea Kaelepulu Kahaluu Kahwai Kailua North Kaneohe Kawa	Kawainui Keaahala Kualoa Makapuu Maunawili Puu Hawaii Loa Waiahole Waianu Waihee Waikane Waimanalo
	Kapakahi Stream Watershed Plan	Kapakahi	
	Wailupe Stream Watershed Plan	Wailupe	
Maui	West Maui Watershed Plan	Honolua Honokahua Kahana Honokowai	Wahikuli Kahoma Kauaula Launuipoko
Hawaii	Pelekane Bay Watershed Plan	Kawaihae	
	Hilo Bay Watershed Plan	Paukaa Honolii Maili Wainaku	Pukihae Wailuku Wailoa



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Appendix B

BMP Techniques

Appendix B: Best Management Practice Techniques

Development/ Activity	Result	Potential Impacts	Stormwater BMP		
Construction	Erosion	Sedimentation; transports other pollutants	Temporary Construction BMPs[1, 2] (removed or decommissioned upon completion of construction phase): • Employee/Subcontractor training • Earth Dikes and Drainage Swales[3] • Tree Protection[3] • Velocity Dissipation Devices • Slope Drains • Scheduling • Entrance/Outlet Tire Wash	• Silt Fence • Sediment Basin[3] • Sediment Trap • Check Dams • Fiber Rolls • Gravel Bag Berm • Street Sweeping and Vacuuming • Sandbag Barrier • Storm Drain Inlet Protection • Slope Length Shortening[3]	• Chemical Treatment • Locate Potential Sources of Sediment to Minimize Discharges of Pollutants • Level Spreader • Rip-Rap and Gabion Inflow Protection[3] • Vegetated Buffer Strips and Channels • Stabilized Construction Entrance/Exit • Stabilized Construction Roadway • Dust Control • Good Housekeeping Practices[3]
			Permanent Construction BMPs[1] (integrated with design for long-term stormwater management): • Preservation of Existing Vegetation • Topsoil Management • Hydraulic Mulch	• Hydroseeding • Soil Binders • Geotextiles and Mats • Wood Mulching • Seeding, Planting and Sodding • Slope Roughening/Terracing	• Stream bank Stabilization • Wind Erosion Control • Good Housekeeping Practices

Impervious Surfaces	Increased runoff	Transports pollutants; flooding	Site Design:
			• Clustering development to reduce paved surfaces
			• Maintain mature trees & riparian vegetation
			• Vegetated Swales
			  ○ Dry Swales
			  ○ Wet Swales
			• Infiltration Facilities
			  ○ Infiltration Trenches
			  ○ Infiltration Basins
				• Bioretention basins Storm Water Wetlands
				• Storm Water Ponds
				  ○ Extended-Detention Ponds
				  ○ Wet Ponds
				• Raingardens
				• Rainwater harvesting (Rain barrels and cisterns)
				• Green Roofs
				• Drip Irrigation
				• Pervious Pavers, Permeable Pavement & Paving with green joints
					• Filtering Systems
					  ○ Sand Filters
					  ○ Organic Filters
					• "Structural", "Hydrodynamic" and Other Proprietary BMPs
					  ○ Catch Basin Inserts
					  ○ Water Quality Inlets
					  ○ Oil/Grit separators
					  ○ Hydrodynamic Devices

Vehicle Parking, Storage, Maintenance	Oil & heavy metals pollution	Toxicity	Management & Operations Measures: • Street Vacuum • Education • Good Housekeeping Practices	Site Design: • See Impervious Surfaces BMPs (above)	
Hazardous Materials	Pollution	Toxicity	Management & Operations Measures: • Compliance with Hazardous Materials Handling & Storage Best Practices • Education		
Use that may generate litter	Floatable debris	Dissolved Oxygen depletion; aesthetic impacts	Management & Operations Measures: • Solid Waste Control • Street Vacuum • Education • Good Housekeeping Practices		
Fertilizers	Nutrient pollution	Algal growth; Eutrophication	Input Controls & Education		
Pesticides	Toxic pollution	Bioaccumulation	Input Controls & Education		

[1] Sources: City and County of Honolulu *Storm Water Best Management Practice Manual – Construction (Final)*, State of Hawaiʻi Department of Transportation Highways Division *Stormwater Permanent Best Management Practices Manual*. These documents both provide descriptive "fact sheets" with diagrams to illustrate each practice. These documents also contain numerous additional stormwater management best practices for construction pertaining to specific construction activities (i.e. paving, demolition) and pertaining to management of construction materials and waste.
[2] Other sources: Stone, Jay M.K.; USGBC
[3] Can convert to a permanent BMP with proper planning and construction sequencing

Appendix C

Reviewer’s Checklist

STORMWATER IMPACT ASSESSMENT REVIEWER'S CHECKLIST

Project Name: ____Document Type: ________________________

Site Location: ______________________________________ Watershed Name: ________________________________

STEP 1: COLLECT PERTINENT DATA

Instructions: Review the document for pertinent data using the following tables as a guide to information that is often helpful in understanding site and watershed conditions.

HYDROLOGY	Site			Watershed		
	Y	N	N/A	Y	N	N/A
Basic Info – Site size – Watershed or sub-watershed name – Watershed or sub-watershed boundary and area						
Land Use and Land Cover – Existing land use and land cover – Impervious surfaces – Vegetation types – Evapotranspiration and interception transpiration (vegetation)						
Soil and Topography – Soil types – Hydrological soil groups – Slope and topography – Highly erodible soils (NRCS)						
Hydrologic Features – Drainageways – Perennial, intermittent, and ephemeral stream channels – Existing data on peak flows and stream flows – Wetlands, embayments, ponds – Coastal waterbodies – Sensitive ecosystems in receiving waters – Aquifer name and sustainable yield						
Drainage and Flooding – Depth to water table – Direction of subsurface flows – Underground injection control line – Existing stormwater infrastructure – Floodplain and FEMA flood hazard zones – Average annual rainfall and seasonal distribution – Rainfall intensity						

STRESSORS (WATER QUALITY AND POLLUTANTS)	Site			Watershed		
	Y	N	N/A	Y	N	N/A
Pollutants – Presence of contaminated soils – Brownfield or CERCLA site						
Water Quality – Impaired or threatened (303(d) list) waterbodies *immediately adjacent* to site or *receiving runoff* from site ○ Have TMDLs been developed? – Quality and classifications of waterbodies *within*, *immediately adjacent* to, or *receiving runoff* from site						
Other Stressors – Level of habitat fragmentation						

STORMWATER IMPACT ASSESSMENT REVIEWER'S CHECKLIST

Step 1 (Continued): Collect Pertinent Data

SENSITIVITY OF RESOURCES	Site			Watershed		
	Y	N	N/A	Y	N	N/A
Aquatic Resources – Native fish, mollusks, crustaceans, and/or insects – Exceptional habitat quality – Low flushing capacity or high freshwater input – Anchialine ponds, or low-salinity nearshore coastal waters						
Riparian Resources – Wetlands, bird habitat, native plants						
Cultural Resources – Archaeological resources, historic sites, taro cultivation (historical and on-going)						
Recreational Resources – Boating, camping, fishing, hunting, nature study, parks, scenic views, swimming						
Agricultural Demand – Water diversions and volume diverted						
Aquifer – Sole source aquifer						

MANAGEMENT CONSIDERATIONS	Site			Watershed		
	Y	N	N/A	Y	N	N/A
Marine Reserves and Protected Areas						
Water Quality Standards/Classification						
Within jurisdiction of a public entity subject to an NPDES Municipal Separate Storm System (MS-4) permit?						
Is the site subject to City and County of Honolulu stormwater LID requirements?						
Is the site subject to Maui County stormwater quality requirements?						
Will the action be subject to an NPDES Permit?						
Will the action be subject to a County Grading Permit?						
Hawaii Coral Reef Strategy/Local Action Strategy Priority Site						
Presence of threatened or endangered species or their critical habitat						
Other? List below.						

INTENSITY OF PROPOSED ACTION	Site			Watershed		
	Y	N	N/A	Y	N	N/A
Proposed land use(s)						
Is there an estimate of the area (in square feet or acres) of new impervious surfaces?						
Are anticipated permits identified (i.e. NPDES, grading)?						

STEP 2: LEVEL OF ANALYSIS

Instructions: Determine if the document includes an analysis of stormwater impacts sufficient to consider stressors, sensitivity, and development intensity.

Level of Analysis	**Y**	**N**
Was a planning-level analysis conducted (i.e. discussion of pertinent data in Step 1 and potential impacts)?		
Is a preliminary estimate of runoff volume included?		
Were other detailed analyses conducted (i.e. simple method, modeling)?		
Based on the management considerations identified in Step 1, does level of analysis conducted for this review consider stressors, sensitivity and development intensity?		
Notes:		

STEP 3: ANALYZE BACKGROUND INFORMATION IN LIGHT OF THE PROPOSED ACTION.

Instructions: Determine if the background information collected was analyzed to consider the project's primary, secondary, and cumulative impacts

Primary (Direct) Impacts	**Y**	**N**
Are construction impacts analyzed?		
Are long-term impacts analyzed?		
Notes:		
Secondary Impacts	**Y**	**N**
Is flooding potential analyzed? Are down gradient flood zones identified? If area is not mapped, is down gradient flood risk evaluated?		
Are impacts to down gradient resources analyzed?		
Notes:		
Cumulative Impacts	**Y**	**N**
Are aggregate past, present and reasonably foreseeable future actions analyzed?		
Notes:		

STEP 4: IDENTIFY MITIGATION GOALS AND STRATEGIES

Instructions: Determine if the project action avoids negative impacts through design; or, if negative impacts are anticipated if mitigation goals and strategies are documented.

	Y	N
Does the project avoid negative impacts?		
If negative impacts are anticipated, are mitigation goals articulated for each of the following?		
Primary impacts		
Secondary impacts		
Cumulative impacts		
Have BMP strategies been identified to achieve mitigation goals for each of the following?		
Primary impacts		
Secondary impacts		
Cumulative impacts		
Do the BMP strategies account for site and watershed conditions?		

STEP 5: SUMMARIZE IMPACTS AND MITIGATION APPLICABLE TO THE PROJECT

Instructions: Complete the following table based on information in the environmental document.

Impacts (-)	BMP or Mitigation Measure (+)	Result (avoid, minimize or restore/replace/compensate)
Primary		
Secondary		
Cumulative		

STORMWATER IMPACT ASSESSMENT REVIEWER'S CHECKLIST

SUMMARY CHECKLIST

Instructions: Complete the following summary based on your review of the document. Use this summary to make an evaluation of the adequacy of the EA/EISs description and analysis of stormwater impacts and mitigation measures.

PERTINENT DATA

The EA/EIS includes sufficient data on:

☐ Hydrology – Site

☐ Hydrology – Watershed

☐ Stressors – Site

☐ Stressors – Watershed

☐ Sensitivity of Resources

☐ Management Considerations

☐ Development Intensity

LEVEL OF ANALYSIS

☐ The EA/EIS includes an analysis of stormwater impacts sufficient to consider stressors, sensitivity and development intensity.

ANALYSIS ADEQUACY

The EA/EIS adequately analyzes:

☐ Construction impacts

☐ Long-term impacts

☐ Flooding potential/risk

☐ Impacts to down gradient resources

☐ Aggregate past, present, and reasonably foreseeable future actions

MITIGATION GOALS AND STRATEGIES

☐ The project design avoids negative impacts.

☐ The EA/EIS identifies mitigation goals for primary, secondary, and cumulative impacts.

☐ The EA/EIS identifies appropriate BMP strategies.

☐ The identified BMP strategies adequately account for site and watershed conditions.

SUMMARY

☐ The result (avoid, minimize, restore/replace/compensate) of the mitigation measures is appropriate for the identified impacts.

Notes: