Alluvial Fan Task Force

California Department of Water Resources Project

Plenary Meeting 8

September 19, 2008

DRAFT Executive Summary

Development on Alluvial Fans

AFTF LOCAL PLANNING TOOL KIT

MODEL ORDINANCE GOVERNING PROPOSED DEVELOPMENT ON ALLUVIAL FANS

AFTF IMPLEMENTATION MANUAL

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Introduction

Alluvial fans are gently sloping fan-shaped landforms created over long periods of time by the deposition of eroded sediment from an upland source. They are common in the American West and can be seen at the base of semi-arid mountain ranges. Flooding and debris flow on alluvial fans is a normal function. It is how the natural environment of the fan is sustained with mineral resources and where groundwater basins are recharged. Alluvial fans also offer important environmental services for communities including groundwater recharge, ecosystem diversity, scenic values, and buffers between inhabited valleys and mountains.

What Makes Alluvial Fans special?

Alluvial fans may include areas where the paths of active flooding and debris flow-deposition are uncertain, making them a hazardous environment for human habitation.

Damage to structures and loss of life from this type of flooding in California is historically well documented, and the 10 Southern California counties with development on alluvial fans have been declared a flood disaster area at least three times since 1950. Ecosystem values have not been assessed historically, however.

The advisory map in Figure 1 (not in DRAFT Executive Summary) illustrates that, as a historical landform, areas potentially containing alluvial fans represent more than 40 percent of the landscape in Southern California. Significant areas have already been urbanized.

In contrast to the flooding that occurs near rivers and coasts, where the method of determining the risks of flooding are well-established, flood hazard management on alluvial fans is challenging. Alluvial floodplain management provides opportunities for environmental enhancement.

The greatest drawbacks of alluvial fan development are the potential for serious alluvial flooding and debris flow, even from relatively minor isolated storms. Urbanized areas on alluvial fans are at greatest risk from debris flows triggered by rain events following wildfires that appear to be increasing in frequency, size, and burn severity in Southern California. Fortunately, most alluvial fan surfaces are no longer geologically active in Southern California, meaning that they do not posses a significant risk of alluvial flooding. But other potential hazards still exist, including wildfires, erosion, collapsible soils and seismic issues.

Development on alluvial fans presents a conundrum for property owners, builders, homebuyers, land-use planners, regulators, land-use advocates, and the environmental community. Alluvial fans offer premium building sites with expansive views, access to recreational areas, and untapped land in inland areas, but many of the factors that make alluvial fans attractive also make them prone to floods, debris flows, and other hazards. Development on alluvial fans may also contribute to the loss of beneficial values that function to maintain ecologic, geologic and hydrologic connectivity of watersheds, replenish local groundwater basins, provide critical habitat to threatened and endangered species and buffer potentially hazardous areas from inhabited urban areas.

Historical Lessons Learned

On New Year's Day 1934, nearly 14 inches of rain fell over 24 hours onto recently burned watersheds in the La Canada Valley. The resulting alluvial fan flooding and debris flow on the series of alluvial fans in the valley destroyed hundreds of homes and killed at least 40 people, with another 45 still unaccounted for three years later. Although there had been unsuccessful attempts by the Los Angeles County Chief Engineer to raise bond money and construct flood control facilities, it took a catastrophe of this magnitude to grab the attention of the public and the Federal Government. Response was swift. Construction of debris basins along the San Gabriel Mountain fronts began that very same year, and for nearly three quarters of a century those debris basins have successfully curbed flood and debris-flow related losses to life and property . Unfortunately, people are still dying on alluvial fans where the hazards are not properly recognized or where developments were not adequately designed and constructed.

More common but less spectacular than the major catastrophic debris flows are alluvial fan floods. Alluvial fan flooding is distinctly different from the flooding that occurs near rivers and streams that are not on alluvial fans in that the flow path of alluvial fan floods is uncertain and the area of probable flood inundation cannot easily be predicted from available flood records. FEMA's Appendix G guidelines made flood management on alluvial fans more effective, but without augmentation, these guidelines may be too general and not fully effective in separating sites on alluvial fans that have a high flood risk from those with a low risk.

For nearly three quarters of a century since that fateful New Year's Day, those debris basins have successfully curbed flood and debris-flow related losses to life and property on the alluvial fans. Throughout Southern California, and much of the semi-arid Southwest, similar flood management infrastructure has been constructed as new development on alluvial fans has continued at a rapid pace. However, in the decades since that New Year's Day tragedy and other disasters elsewhere, a greater understanding of the multiple benefits provided by alluvial fans has emerged. Today,

it is recognized that reducing the risk of loss of life and property must go hand-and-hand with the sustainability of environmental assets in new development.

More recently, a greater understanding of the multiple benefits provided by alluvial fans has emerged. Scientists have shown the need to maintain the ecological, geological, and hydrological connectivity that alluvial fans provide between the mountains and basins—and the consequences when it is severed by the built environment. Hydrologists have learned that the vast majority of alluvial fans serve as recharge zones replenishing local groundwater basins. Biologists point out that the often fragile and delicate ecological settings on alluvial fans are unique and provide critical habitat to a variety of threatened and endangered species. Today, it is recognized that reducing the risk of loss of life and property can go hand-and-hand with the sustainability of environmental assets in new development.

Furthermore, the public has repeatedly demonstrated through the ballot box that quality of life includes the protection of open space near urban centers.

History has demonstrated that the costs of developing on alluvial fans are not merely what it takes to build flood management infrastructure, but also include the costs of maintaining and operating the facilities in perpetuity, responding effectively during emergencies, cleaning up and rebuilding after a disaster, and the loss of ecologic function caused by developments on alluvial fans.

The lessons learned about alluvial fan development suggest that a nuanced, balanced approach to development is vital for the sustained health our economies, cities and environment. Until now, this approach has not translated into consistent practices that balance a potential development's impacts on an entire watershed rather than just the impacts on the site itself. This is an important next step; while individual developments are generally confined to one political boundary, the impacts are not. Sustainability that communities seek can be realized by incorporating multiple objectives into the design process that safeguard life and property from the hazards of alluvial fan flooding and protect the benefits provided by alluvial fans.

Alluvial Fan Task Force

Governor Arnold Schwarzenegger signed AB 2141 in 2004, directing the California Department of Water Resources (DWR) to establish an Alluvial Fan Task Force (AFTF) with broad membership from local governments in Counties of San Bernardino, Riverside, Los Angeles, Ventura, Santa Barbara, San Luis Obispo, Kern, Orange, Imperial, and San Diego (referred to as the 10-County Study Area), state and federal agencies and a diverse representation of stakeholders. The Governor charged the task force to review the state of knowledge regarding alluvial fan floodplains, determine future research needs, and prepare recommendations, including a model

ordinance, for communities subject to alluvial fan flooding that are considering future development. In 2007, DWR Director Lester Snow appointed 33 public members to join federal and state agency representatives to serve on the AFTF.

Public Members	**Affiliation**
Elected Officials	
1) Hon. Paul Biane	San Bernardino County Supervisor
2) Hon. Marion Ashley	Riverside County Supervisor
3) Hon. Jon McQuiston	Kern County Supervisor
4) Hon. Bill Horn	San Diego County Supervisor
5) Hon. Michael Antonovich	Los Angeles County Supervisor
6) Mark Pisano	Southern California Association of Governments
Flood Control/Public Works/Floodplain Managers/Watershed Programs/Land Use	
7) Vana Olson (Mike Fox, alternate)	San Bernardino Co. Flood Control District San Bernardino Co. Flood Control District
8) Rick Iger	Kern County Water Agency
9) Christine Sloan (Sara Agahi, alt.)	San Diego County Watershed Program San Diego County Department of Public Works
10) Sergio Vargas	Ventura County Watershed Protection District
11) Georgia Celehar	Coachella Valley Water District
12) Dusty Williams	Riverside County Flood Control and Water Conservation District
13) Geoff Owu (Christopher Stone)	Los Angeles County Department of Public Works, Water Resources Division
Development Community	
14) Ali Sahabi Brian Moore, alternate)	SCE Corporation SCE Corporation
15) Paul Quill	Innovative Land Concepts
16) Dave Mlynarski	MAPCO
17) Dale Casey	Standard Pacific Homes
18) Mark Grey	BIA of Southern California
19) Tom Davis	Agua Caliente Band of Desert Cahuilla
Land Use Advocates	
20) Ray Torres	Torres Martinez Desert Cahuilla Indians
22) Duane Young	D. Young and Sons (agriculture)
22) Tom Scott	Riverside Land Conservancy
23) Joan Taylor	Coachella Valley Mountains Conservancy
24) Dr. Norman Meek	CSUSB Professor of Geography & Environmental Studies
25) Dr. Stepanie Pincetl	UCLA Urban Center for People and the Environment
At-Large Members	
26) Kathleen Webb	California Office of the Insurance Commissioner

27) Tom O'Keefe	California Dept. of Forestry and Fire Protection
28) Marty Teal	Floodplain Management Association
29) Ralph Wagner	San Bernardino County Flood Control Commission
30) Eric Shamp	American Planning Association
31) Scott Steinmetz	Fireman's Fund Insurance
32) Lee Reeder	Inland Empire WATERKEEPER
33) John McCarthy	Consulting Engineers and Land Surveyors of California

Federal and State Representatives	**Affiliation**
1) Mark Stuart	AFTF Chair, Dept. of Water Resources, Southern District
2) Tammy Conforti	Army Corp of Engineers, Institute for Water Resources
3) Dave Gutierrez	Dept. of Water Resources, FloodSafe
4) Ricardo Pineda 5) Maria Lorenzo-Lee	Dept. of Water Resources, Floodplain Management
6) Ray Lenaburg	FEMA, Region IX
7) Stefan Lorenzato	Dept. of Water Resources, Watershed Management
8) Scott Dawson	California Department of Fish and Game
9) Pete Sorensen	U.S. Fish and Wildlife Service
10) Rebecca Wagoner	Office of Emergency Services, Hazard Mitigation
11) Greg Krzys	Bureau of Reclamation, Watershed Management

Sustainable Approach to Development on Alluvial Fans

The AFTF is proposing a sustainable approach towards land use and attempts to strike a balance between the benefits afforded by new development and those derived from sustaining ecosystem function and preserving natural resources. Applying the sustainable approach to alluvial fans necessarily involves thoughtful consideration of the hazards that may be present including alluvial flooding, debris flows, wildfires, erosion, collapsible soils and seismic issues and the ongoing costs of maintaining public services should those hazards be realized.

The AFTF's sustainable approach also weighs the benefits and gains of development against the potential hazards and losses of future disasters. The advantage of this approach is that it affords decision makers at all levels with the necessary information to fully consider what the true costs of a development may be before deciding the appropriate use of the land. It also affords the opportunity for communities to codify a process to respond effectively to and recovering from multiple storm events, thereby lowering the probability of further losses to life and property.

Development of Local Planning Tools

To help local governments, developers, nonprofit public interest groups, and the public better understand public safety and land use constraints on alluvial fans, as well as the opportunities for more sustainable development, the AFTF developed a suite of Local Planning Tools (tools). These tools summarize the current state of knowledge about evaluating the safety and sustainability of development proposed on alluvial fans and provides methods to identify site-specific opportunities that may exist in site-specific locations on alluvial fans for outcomes that capture and blend the multiple values that affect life in alluvial fan communities.

For example, providing open space in a new development that is capable of conveying the natural flow of large amounts of floodwaters and materials not only reduces risk but also provides an opportunity to transport sediment to sustain critical habitat necessary for threatened and endangered species. This same method can protect groundwater recharge. While narrowed, hardened flood channels and debris basins reduce the risk of flooding, these single purpose practices do nothing more. As such, the tools are designed to help balance the desire for future development with preserving the vital, multiple benefits that alluvial fans offer.

For clarity, the tools are divided into two phases: Phase One involves research and analysis during the investigation phase of a proposed development. Phase two provides a catalogue of considerations for the design and post-construction phase to evaluate the long-term benefits and costs of a development including financing options.

The tools are not intended to duplicate, expand or replace legal requirements or applicable state and federal regulations such as CEQA, the Endangered Species Act, Clean Water Act or California Fish and Game Act. Rather, the tools have been designed to integrate with existing regulations and are offered as a menu of options, not a prescriptive program. The Local Planning Tools should not be interpreted as establishing substantive requirements is not intended as such and parties are advised that only pertinent federal, state or local regulations apply. The Local Planning Tools are designed to assist in identifying the laws, rules, and regulations during the planning stages of proposed developments on alluvial fans.

Creating a Linear Process

Shepherding a proposed development project located on an alluvial fan through the land use process that includes myriad layers of review can be confusing, costly and ultimately frustrating. In spite of the abundance of information provided in local General Plans, Development Codes and a multitude of other documents, it is not always apparent to a developer what may be expected by the community until significant resources have been invested in studies and plans inappropriately. To

complicate matters, local government planners are not always familiar with the challenges of development on alluvial fans.

To foster sustainable land use decisions on alluvial fans, the AFTF packages the Local Planning Tools into a step-by-step process contained in a Tool Kit. Each of the four major steps builds on the information gleaned in the previous step. It is a repeatable process that can be used on any alluvial fan. The process will identify specific opportunities for multiple benefit outcomes in any alluvial fan location where it is applied. A copy of the DRAFT Local Planning Tool Kit being completed at this time is posted on the AFTF website at **http://wri.csusb.edu/AFTF/AFTFweb.htm)** under Plenary Meeting 8.

The AFTF designed the tools to provide benefit to all stakeholders that include local governments, flood management agencies, the public, developers and property owners, advocates of sustainable development and environment stewards. The detailed protocol for using every Local Planning Tool in the field is contained in the AFTF Implementation Manual. A copy of the DRAFT Implementation Manual being completed at this time is posted on the AFTF website at http://wri.csusb.edu/AFTF/AFTFweb.htm under Plenary Meeting 8.

The AFTF recognizes that local governments may find that not all proposed developments on alluvial fans or developments on fans with structural flood controls, provide adequate opportunity of benefit for the application of Local Planning Tools. This matter is addressed in the AFTF's proposed Model Ordinance.

A Four-Step Process

Summary of Step 1: Identification of Alluvial Fan and Hazards

The first step begins with identifying whether a proposed project is on an alluvial fan and what the flood and post-fire debris-flow potential is. The objective of Step One is to identify the presence of an alluvial fan, the active and inactive surfaces, the hazards present and protection from the design flood. The **Alluvial Fan (AF)** and **Flood Hazard (FH)** tools build a comprehensive set of step-by-step methods (complying with FEMA regulations) to do this.

The tools in the AFTF Local Planning Tool Kit and Implementation Manual are:

- AF1 Preliminary inspection of DFIRM data (formerly FM1 and GIS1)
- AF2 Identify and Map Presence of Alluvial Fan (formerly GIS 1 and FM2)
- AF3 Research/acquisition of pertinent data (new tool)
- FH1 Map Hazardous Upstream Catchment Areas (formerly MH2)
- FH2 Map Areas of Active Alluvial Fan Surfaces (formerly WS3, FM3)
- FH3 Map disturbed areas (new tool)

Cities and counties that elect to adopt the AFTF's proposed MODEL ORDINANCE GOVERNING PROPOSED DEVELOPMENT ON ALLUVIAL FANS (Model Ordinance) should be able to use the Local Planning Tool Kit to identify if a proposed development is located on an alluvial fan. The identification of the presence of an alluvial fan is the *minimum* amount of investigation that will be required. If it is determined that there is an insufficient opportunity in the proposed development to incorporate multiple-benefit outcomes, the development is exempted from additional regulations in the Model Ordinance.

Summary of Step 2: Assess Multiple Hazards and Benefits

The second step in the process is identifying the non-flood hazards and ecological and aesthetic benefits of the alluvial fan area. The objective of Step Two is to consider how these factors are addressed in a proposed development. The **Multiple-Hazard (MH)** and **Multiple Benefits (MB)** tools identify the other hazards common to the alluvial fan environment and the ecological and aesthetic benefits of alluvial fans.

Alluvial fans provide long-term benefits that can not always be captured in short term land use decision-making. Such decisions can result in an alluvial fan being transformed by a development in a way that permanently comprises the floodplain values provided by the alluvial fan that contributes to long term sustainability. By identifying these benefits on a geospatial database, multiple-benefit measures can be incorporated while a proposed development is still in the concept process. For example, the incorporation of an open space retention area that can accommodate peak flows of water and material can also simultaneously serve as a groundwater recharge area that allows sediment movement to preserve habitat.

The **Multiple-Hazard (MH) and Multiple Benefits (MB)** tools in the AFTF Local Planning Tool Kit and Implementation Manual are:

- MH1 Map Active Earthquake Faults (formerly MH3)
- MH2 Map Shake/Liquefaction Potential (new tool w/ parts of old MH3)
- MH3 Map Landslide Potential (new tool w/ parts of old MH4)
- MH4 Map Hazardous Materials (new tools w/ parts of old MH4)
- MH5 Determine Groundwater Quality (new tool)
- MH6 Map Wildfire Hazards (parts of old MH1-4 tools)
- MB1 Determine Groundwater Quantity (new tool)
- MB2 Map Recharge Opportunities (formerly WS5)
- MB3 Map Risk Reduction (formerly WS6)
- MB4 Map Ecological benefits (formerly WS1, 2, 4, 8)
- MB5 Map Mineral Resources (formerly WS9)
- MB6 Map Cultural Resources (formerly WS7)
- MB7 Map Development Potential (new tool)

Summary of Step 3: Using the Sustainable Development Tool (Pulling it all together)

The third step uses the information gleaned in the previous two steps to inform the use of the Sustainable Development Tool. The aforementioned tools are a process to inventory information available about a particular piece of land. The **Multiple Objective Analysis (MA)** tools in Step Three use the information gathered during the inventory for analysis, combining the various maps to determine areas with low, medium and high value for sustainable development.

At this point, the planner is ready to see what other agencies have done with similar conditions. The **Sustainable Development Tool** is a Web-based application designed for the AFTF that allows for the discovery and downloading of jurisdictions' existing methods for meeting multiple objectives alluvial fan areas. The database compiled for this Tool includes regulations, policies, plans, projects and Best Management Practices (BMP's) employed in the 10-county AFTF Study Area and a variety of sustainable development practices that attempt to link the beneficial values of alluvial fans to the built environment.

By using site-specific information gathered during earlier steps of the Local Planning Tools process, the application identifies a consistent and repeatable *Land Class Unit* where specific methods have been effective in meeting multiple objectives. The database can also be used to ascertain the commonalities and differences of regulations, policies, plans, projects and Best Management Practices (BMP's) related to alluvial fans in the 10-county AFTF Study Area. The Sustainable Development Tool is designed to grow and incorporate new technologies and methods as they are developed, allowing decision makers to carry forward existing knowledge.

The **Multiple Analysis (MA)** tools in the AFTF Local Planning Tool Kit and Implementation Manual are:

- MA1 Combination of Step One tools
- MA2 Combination of Multi-Hazard tools
- MA3 Combination of Multi-Benefit tools
- MA4 Combination of MA1, MA2, and MA3

Once the above process is complete, the planner and developer move to Step Four, which is Phase Two of the process.

Summary of Step 4: Design Considerations and Cost/Benefit

Step Four offers a variety of tools for determining the appropriate level of hazard protection, evaluating long term costs, and considering options that will provide for long-term finances to operate and maintain flood management that is associated with

development on alluvial fans. Issues often overlooked, such as ease of evacuation and coordination of post-disaster clean-up efforts, are also included.

The **Design and Construction (DC)** tools allow planners a means to consider adding evacuation routes and other post-development considerations into the proposed design. The **Economic (Econ)** tools provide methods to weigh the benefits of alluvial fan development reflected in increased housing and the attendant benefits of new residents against the costs that may be incurred in new alluvial fan developments such as flood management infrastructure operation and maintenance, decreased groundwater recharge, increased fire protection, loss of ecosystem function affecting the watershed and open space in the close proximity to the already built environment. Because these costs are usually incurred several years after development, they may not be immediately obvious at the time of the decision-making over development on alluvial fans. The tools also identify a variety of sustainable economic strategies.

The **Design and Construction (DC)** and **Economic (Econ)** tools for cost/benefit in the AFTF Local Planning Tool Kit and Implementation Manual are:

- DC1 Asset Management of Flood Facilities
- DC2 Establish Procedures and Protocols for Evaluating Evacuation Routes
- Econ1 Establish appropriate level of hazard protection (formerly FM4)
- Econ2 Benefit analysis of development vs. public safety risks (formerly Econ1)
- Econ3 Estimate long-term costs of alluvial fan development (formerly Econ2)
- Econ4 Evaluate flood risk (formerly Econ3)
- Econ5 Financial strategies for long-term maintenance of flood management facilities (formerly Econ4)
- Econ6 Identify local land use planning tools (formerly Econ5)
- Econ7 No Adverse Impact planning tools (formerly Econ6)
- Econ8 Apply for bond funding for regional alluvial fan projects (formerly Econ7)

MODEL ORDINANCE GOVERNING PROPOSED DEVELOPMENT ON ALLUVIAL FANS (Model Ordinance)

Finding recognition in the General Plan that land uses on alluvial fans should seek to reduce the risk of life and property to the maximum extent possible is easy. But finding recognition that a nuanced, balanced approach toward development on alluvial fans is vital for the sustained health our economies, cities and environment is not. That is because Goals in required elements tend not to recognize that land use decisions on an alluvial fan may have real and lasting effects. Localities will need to ensure that the Model Ordinance is consistent with the General Plan; however the Model Ordinance

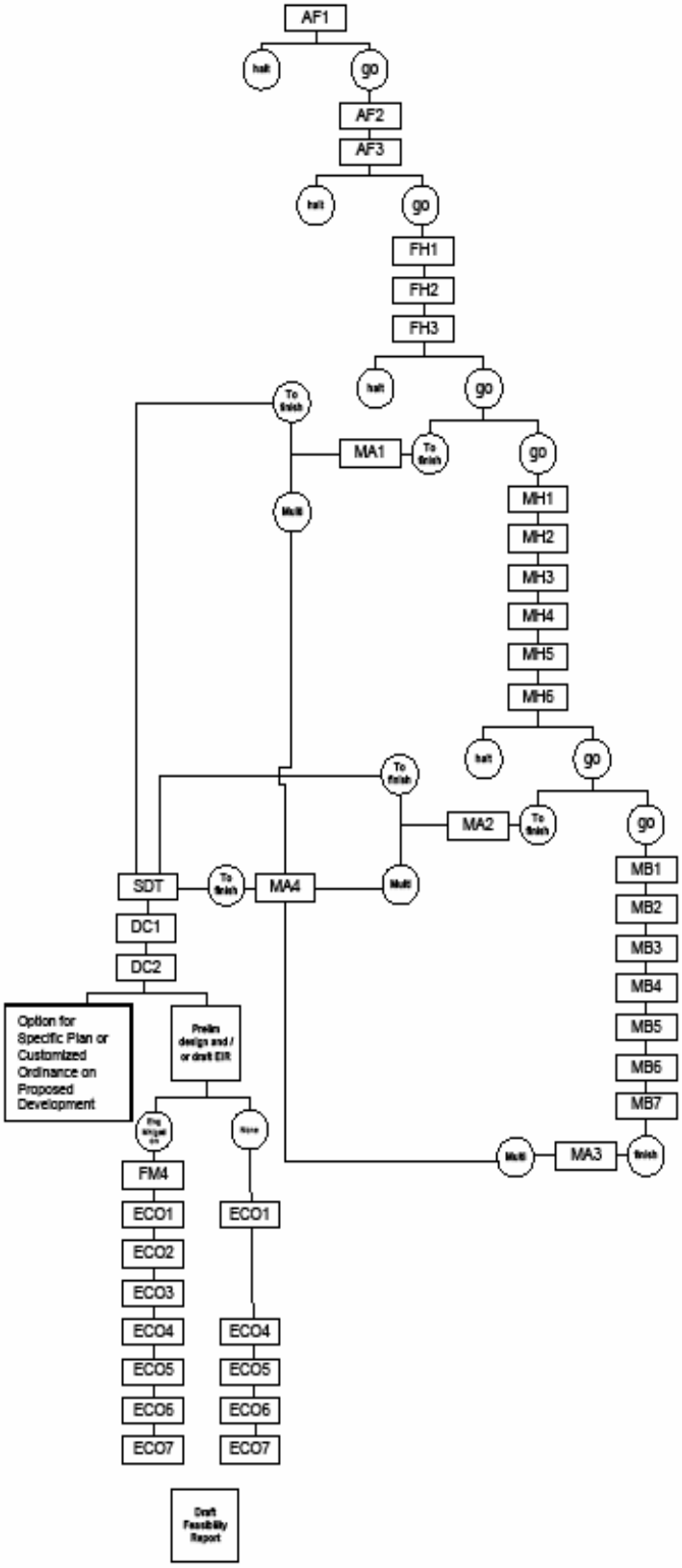
was modeled against the goals in the Conservation and Open Space elements that are required in all General Plans.

The intent of the AFTF's ***DRAFT*** **MODEL ORDINANCE GOVERNING PROPOSED DEVELOPMENT ON ALLUVIAL FANS** is not to create a new set of land-use requirements for a local jurisdiction, and it does not. It establishes that future development on alluvial fans *should* seek to reduce the risk of life and property loss and protect the benefits provided by alluvial fans to the maximum extent possible, but does not prescribe it. Using the Model Ordinance in conjunction with the Sustainable Development Tool allows the local jurisdiction to incorporate local values into the decision-making process, to create customized approach towards more sustainable development on alluvial fans.

For example, if a local jurisdiction determines a need for a floodway, the attributes of the site can be plugged into the SDT, which will sort through the existing statutes, BMPs, ordinances, etc. and provide a set of options to consider for sustainable development. At this point, the local jurisdiction would determine which option best fits its needs and values.

Please refer to the digital copy of the ***DRAFT*** **MODEL ORDINANCE GOVERNING PROPOSED DEVELOPMENT ON ALLUVIAL FANS** that has been provided to AFTF members for discussion at Plenary Meeting 8. Copies are also available on the AFTF website at **http://wri.csusb.edu/AFTF/AFTFweb.htm** under Plenary Meeting 8.

AFTF Local Planning Tool Kit Flow Chart
For Cities and Counties Adopting
MODEL ORDINANCE GOVERNING PROPOSED DEVELOPMENT
ON ALLUVIAL FANS



DRAFT Local Planning Tool Kit
For Flood Managers, Local Governments, Developers and Public Stakeholders

DRAFT Table of Contents (DRAFT document is available on AFTF website at http://wri.csusb.edu/AFTF/AFTFweb.htm under Plenary Meeting 8)

I. Phase One – Pre-Design tools

Step One – Identification of Alluvial Fan

Introduction to Alluvial Fan tools

AF1 Preliminary Inspection of DFIRM data (prior FM1 and GIS1)
AF2 Identify and Map Presence of Alluvial Fan (prior GIS 1 & FM2)
AF3 Research/acquisition of pertinent data (new tool)

Introduction to Flood Hazard tools

FH1 Map Hazardous Upstream Catchment Areas (prior MH2)
FH2 Map Areas Demarked by Active Stream Channels (prior WS3, FM3)
FH3 Map disturbed areas (new tool)

Step Two – Assess Hazards and Benefits

Introduction to Multi Hazard tools

MH1 Map Active Earthquake Faults (prior MH3)
MH2 Map Shake/Liquefaction Potential (new tool w/ parts of old MH3)
MH3 Map Landslide Potential (new tool w/ parts of old MH4)
MH4 Map Hazardous Materials (new tools w/ parts of old MH4)
MH5 Determine Groundwater Quality (new tool)
MH6 Map Wildfire Hazards (parts of prior MH1-4 tools)

Introduction to Multiple Benefit tools

MB1 Determine Groundwater Quantity (new tool)
MB2 Map Recharge Opportunities (formerly WS5)
MB3 Map Risk Reduction (formerly WS6)
MB4 Map Ecological benefits (formerly WS1, 2, 3, 4, 8)
MB5 Map Mineral Resources (formerly WS9)
MB6 Map Cultural Resources (formerly WS7)
MB7 Map Development Potential (new tool)

Step Three – Putting it together with the Sustainable Development Tool

Introduction to Multiple Analysis tools

MA1 Combination of Step One tools
MA2 Combination of Multi-Hazard tools
MA3 Combination of Multi-Benefit tools
MA4 Combination of MA1, MA2, and MA3

Introduction to Sustainable Development Tool

II. Phase Two – Design tools-- Catalogue of considerations for design and post-construction

Step Four – Design considerations and long-term financing options

Introduction to Design and Construction and Economic tools

DC1 Asset Management of Flood Facilities (prior DC2)
DC2 Establish Procedures and Protocols for Evaluating Evacuation Routes (prior DC3)
Econ1 Establish appropriate level of hazard protection (prior FM4)
Econ2 Benefit analysis vs. public safety risks (prior Econ1)
Econ3 Estimate long-term costs of alluvial fan development (prior Econ2)
Econ4 Evaluate flood risk (prior Econ3)
Econ5 Financial strategies for long-term maintenance of flood management facilities (prior Econ4)
Econ6 Identify local land use planning tools (prior Econ5)
Econ7 No Adverse Impact planning tools (prior Econ6)
Econ8 Potential funding for regional alluvial fan projects (prior Econ7)

DRAFT Implementation Manual
For Flood Managers, Local Governments, Developers and Public Stakeholders

Table of Contents (DRAFT document is available on AFTF website at http://wri.csusb.edu/AFTF/AFTFweb.htm)

I. Phase One—Pre-Design

Introduction to Step One Protocols

Protocols for Alluvial Fan Tools

AF1 Preliminary Inspection of DFIRM data (prior FM1 and GIS1)
AF2 Identify and Map Presence of Alluvial Fan (prior GIS 1 & FM2)
AF3 Research/acquisition of pertinent data (new tool)

Protocols for Flood Hazard Tools

FH1 Map Hazardous Upstream Catchment Areas (prior MH2)
FH2 Map Areas Demarked by Active Stream Channels (prior WS3, FM3)
FH3 Map disturbed areas (new tool)

Introduction to Step Two Protocols

Protocols for Multi Hazard Tools

MH1 Map Active Earthquake Faults (prior MH3)
MH2 Map Shake/Liquefaction Potential (new tool w/ parts of old MH3)
MH3 Map Landslide Potential (new tool w/ parts of old MH4)
MH4 Map Hazardous Materials (new tools w/ parts of old MH4)
MH5 Determine Groundwater Quality (new tool)
MH6 Map Wildfire Hazards (parts of prior MH1-4 tools)

Protocols for Multiple Benefit Tools

MB1 Determine Groundwater Quantity (new tool)
MB2 Map Recharge Opportunities (formerly WS5)
MB3 Map Risk Reduction (formerly WS6)
MB4 Map Ecological benefits (formerly WS1, 2, 3, 4, 8)
MB5 Map Mineral Resources (formerly WS9)
MB6 Map Cultural Resources (formerly WS7)
MB7 Map Development Potential (new tool)

Introduction to Step Three Protocols

Protocols for Multiple Analysis Tools

MA1 Combination of Step One tools
MA2 Combination of Multi-Hazard tools
MA3 Combination of Multi-Benefit tools
MA4 Combination of MA1, MA2, and MA3

Introduction to Sustainable Development Tool

II. Phase Two – Design tools-- Catalogue of considerations for design and post-construction

Introduction to Step Four Protocols

Protocols for Design and Construction Tools

DC1 Asset Management of Flood Facilities (prior DC2)
DC2 Establish Procedures for Evacuation Routes of sediment (prior DC3)

Protocols for Economic Tools

Econ1 Establish appropriate level of hazard protection (prior FM4)
Econ2 Benefit analysis vs. public safety risks (prior Econ1)
Econ3 Estimate long-term costs of alluvial fan development (prior Econ2)
Econ4 Evaluate flood risk (prior Econ3)
Econ5 Financial strategies for long-term maintenance of flood management facilities (prior Econ4)
Econ6 Identify local land use planning tools (prior Econ5)
Econ7 No Adverse Impact planning tools (prior Econ6)
Econ8 Potential funding for regional alluvial fan projects (prior Econ7)

Case Study demonstrating application of AFTF Process

To illustrate how the AFTF's Local Planning Tool Kit, Implementation Manual and **MODEL ORDINANCE GOVERNING PROPOSED DEVELOPMENT ON ALLUVIAL FANS** could be applied in a real project, a case study of a proposed project was identified in the Coachella Valley known as Travertine Point. With permission from the property owners and the developer, the AFTF Technical Team has been given full access to all studies commissioned on the project thus far that are have been completed for the preparation of a DRAFT Environmental Impact Report that is scheduled to be presented to local governments in 2009.

It should be noted that several AFTF members are vested stakeholders in this project, representing public agencies and private concerns. These stakeholders have cited the caliber of the local planning tools and the process developed by the AFTF as an analysis that would provide benefit to the proposed project.

Travertine Point is envisioned as a mixed-used community on the northwestern shore of the Salton Sea. The majority of the approximately 4,918-acre site is located in Riverside County, with the remainder in Imperial County. The project would include a town center, a resort area, a marina and a cultural preserve and living desert.