

Overview of Low-Impact Development Methods



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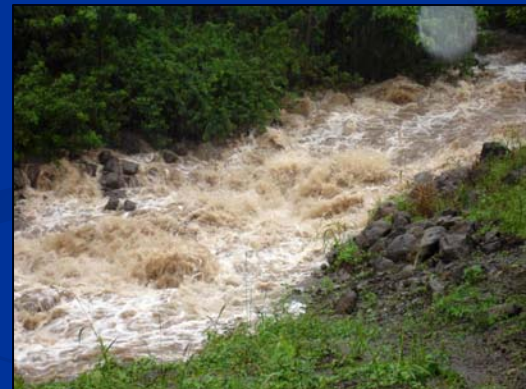
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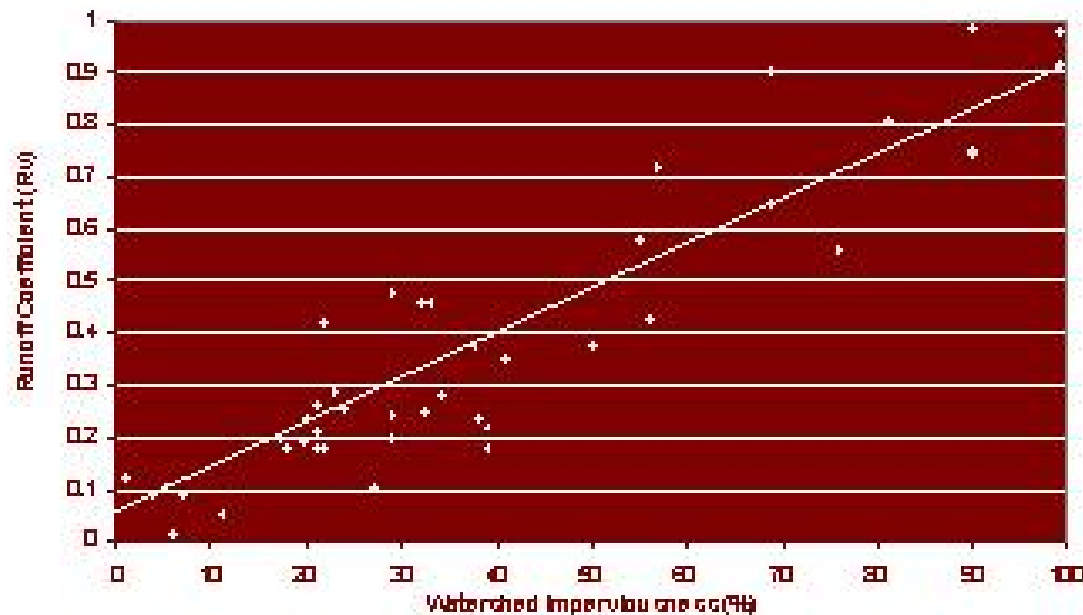
Photo's courtesy of Dr Bill Walsh, DAR



Photo's courtesy of Malama Maunalua

Watershed health related to impervious surface coverage

Relationship between stormwater imperviousness and stormwater runoff co-efficient



This graph shows that as the percentage of watershed imperviousness increases, the volumetric runoff coefficient increases as well.

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Graph courtesy of www.cwp.org



What is Low Impact Development (LID)?

More sustainable land development pattern that results from a site-planning process that:

- ID's critical natural resources & determines appropriate building envelopes
- Incorporates BMP's that preserve the natural hydrology of the land

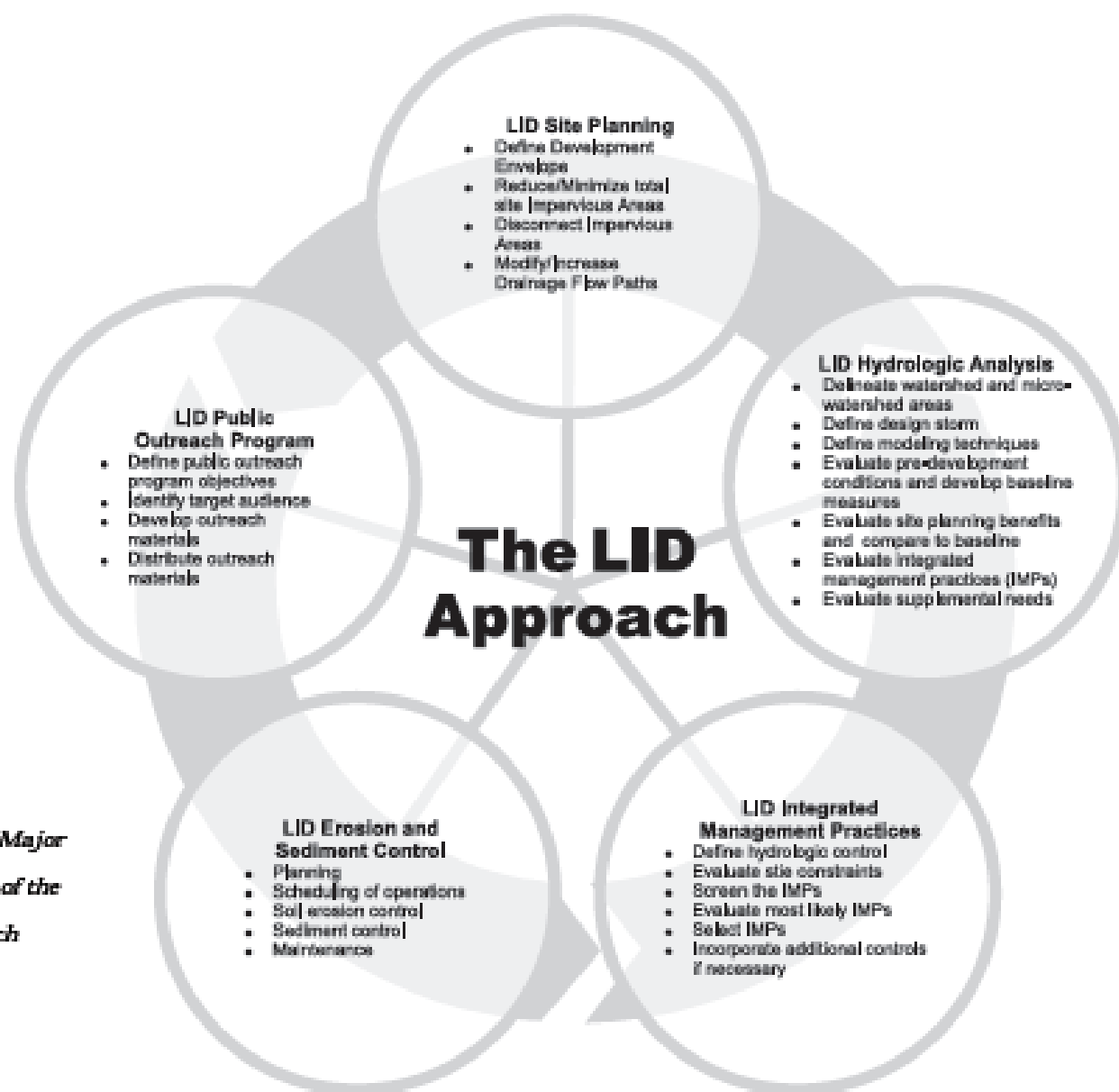
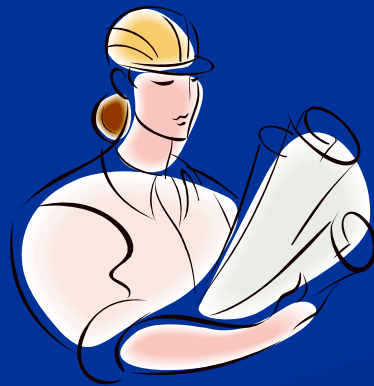


Figure 1-3. Major components of the LID approach

Source: <http://www.toolbase.org/PDF/DesignGuides/LIDstrategies.pdf>

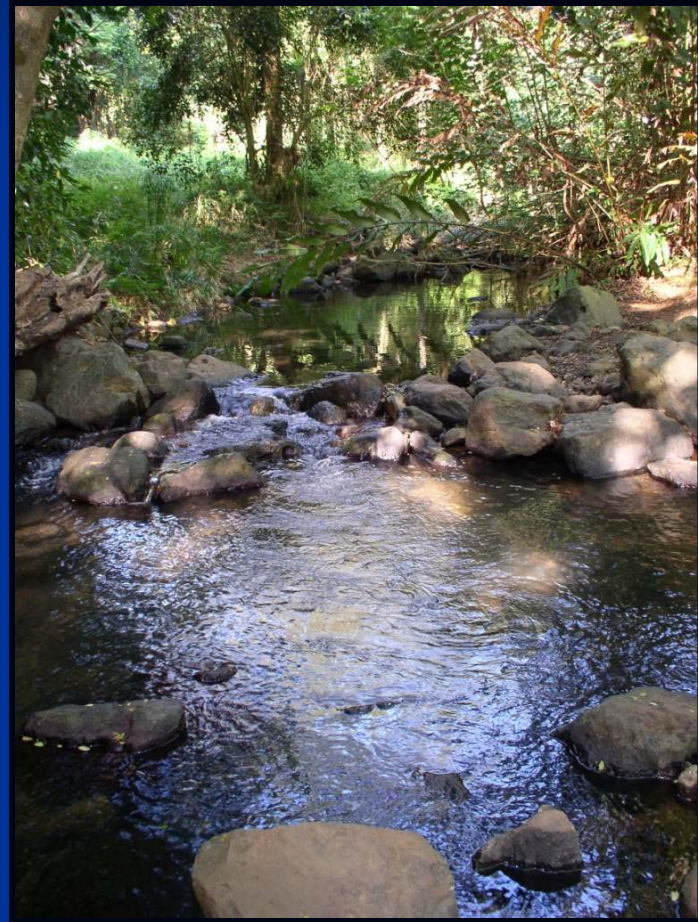
LID planning process

Done in conjunction with design & layout of stormwater and wastewater infrastructure in attaining management and land use goals.



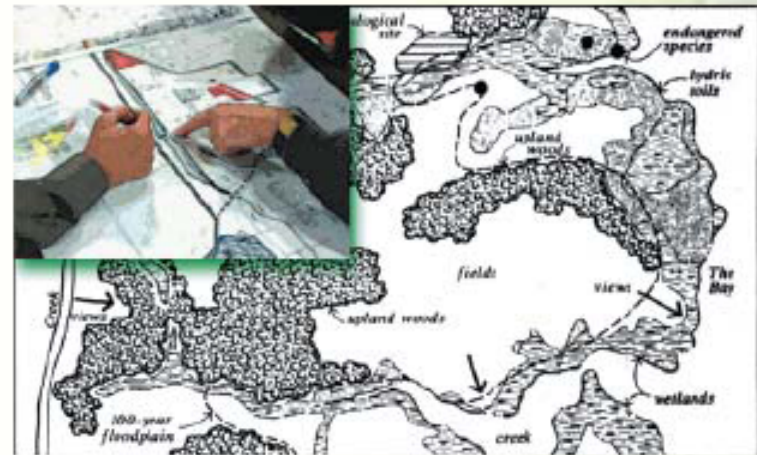
LID planning: 3 step process

- Avoid Impacts –
preserve natural
features
- Reduce impacts –
reduce impervious cover
- Manage Impacts –
stormwater
management



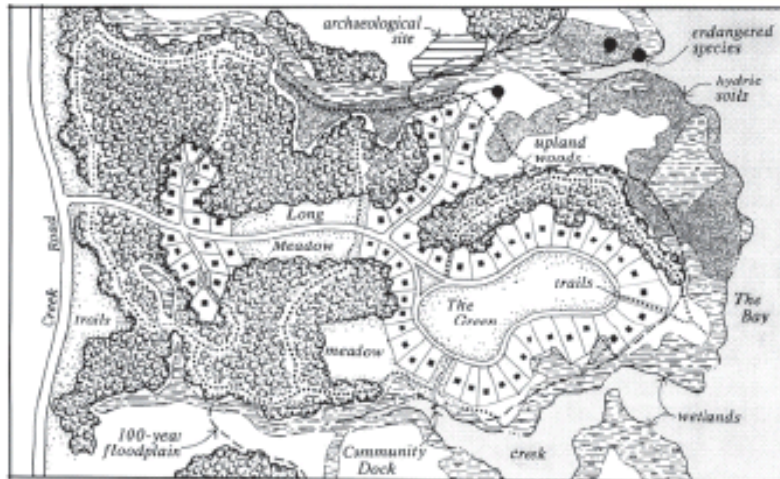
Better Site Design

- The first step is to avoid or minimize disturbance by preserving natural areas or strategically locating development based on resource areas and site constraints.
- Resources can include drinking water supply areas, rivers, wetlands, sensitive habitat areas and scenic views.
- Constraints include poor soils that cannot support septic systems and steep slopes which make construction difficult and expensive.
- Mapping these areas results in “building envelopes,” areas which can support development economically and ecologically.



Better site design cont.

- Step 2:
The second step is to minimize the impact of land alteration by reducing impervious areas.



- Step 3
For impervious areas, alternative and “natural systems” stormwater management techniques are chosen.

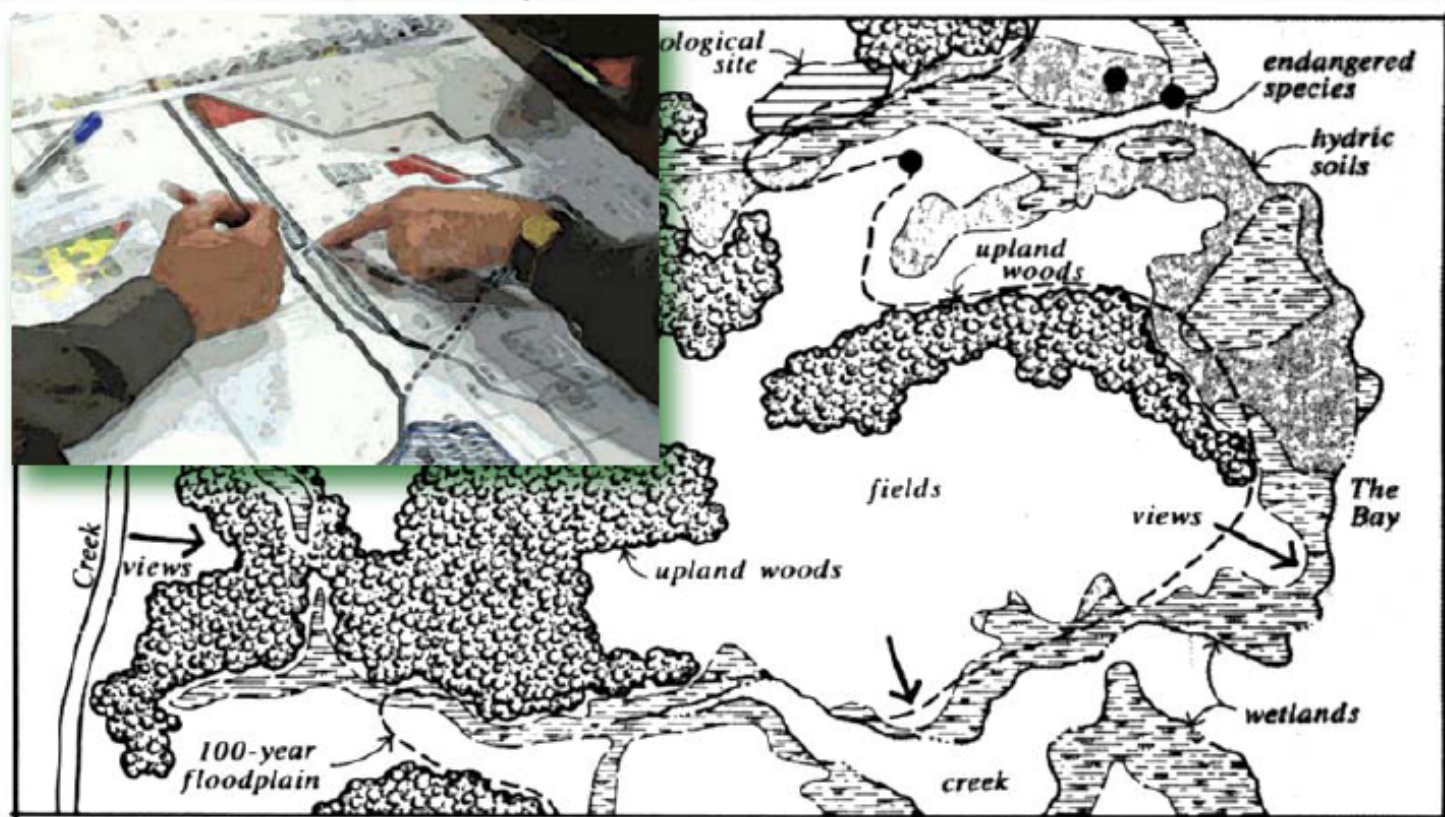
Avoid Impacts

- Preserve undisturbed areas
- Preserve buffers
- Reduce clearing & grading
- Locate sites in less sensitive areas
- Open space residential design



4-step planning process

The process begins with determining how many lots could be developed under conventional zoning; this is the base yield of the property. From that point, the plan development process follows four basic steps:



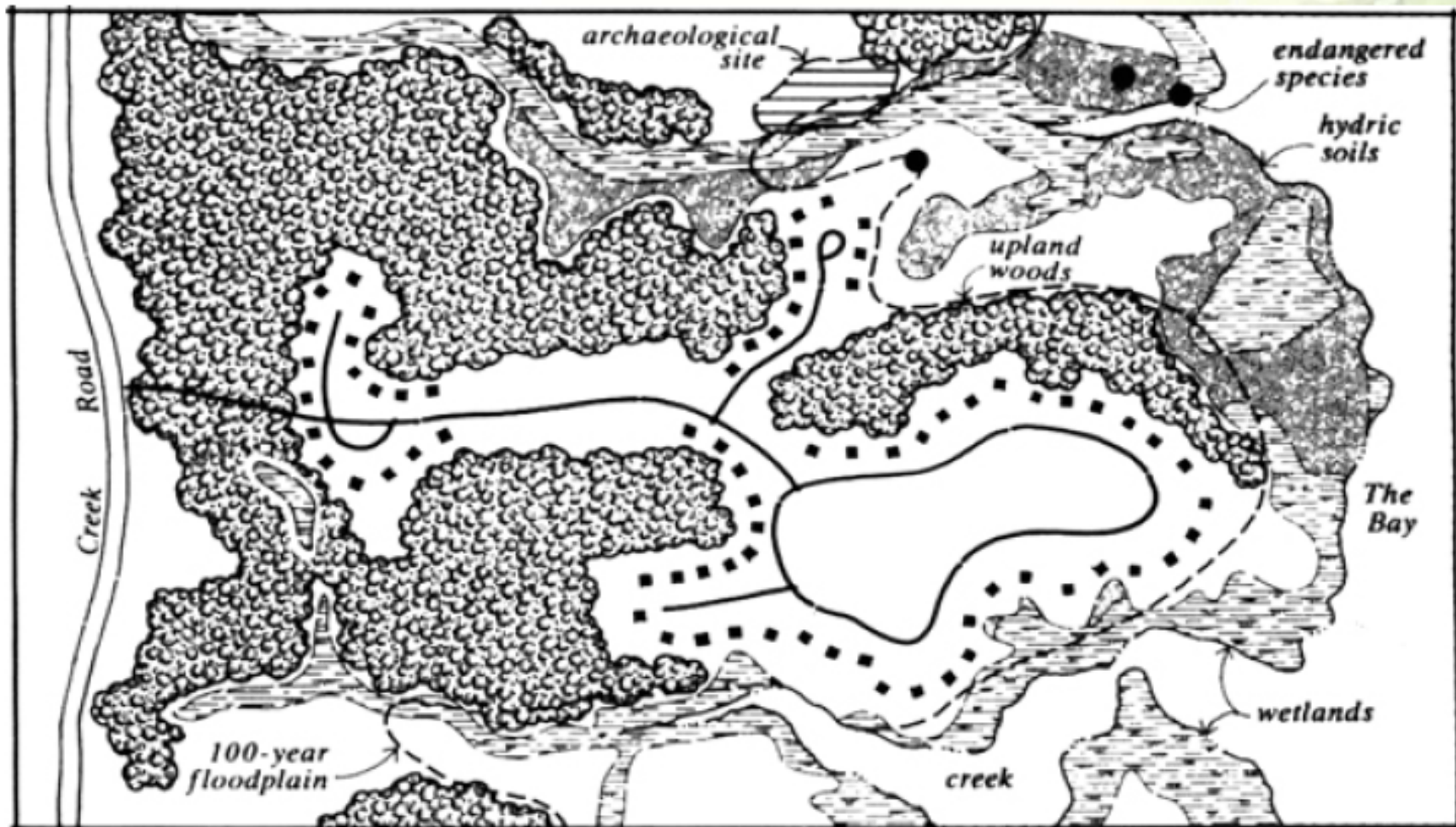
1. Identify Conservation Value Areas on the site such as wetlands, significant trees or tracts of forest, habitat, cultural resources or buffer zones. Remove these from the "developable area".



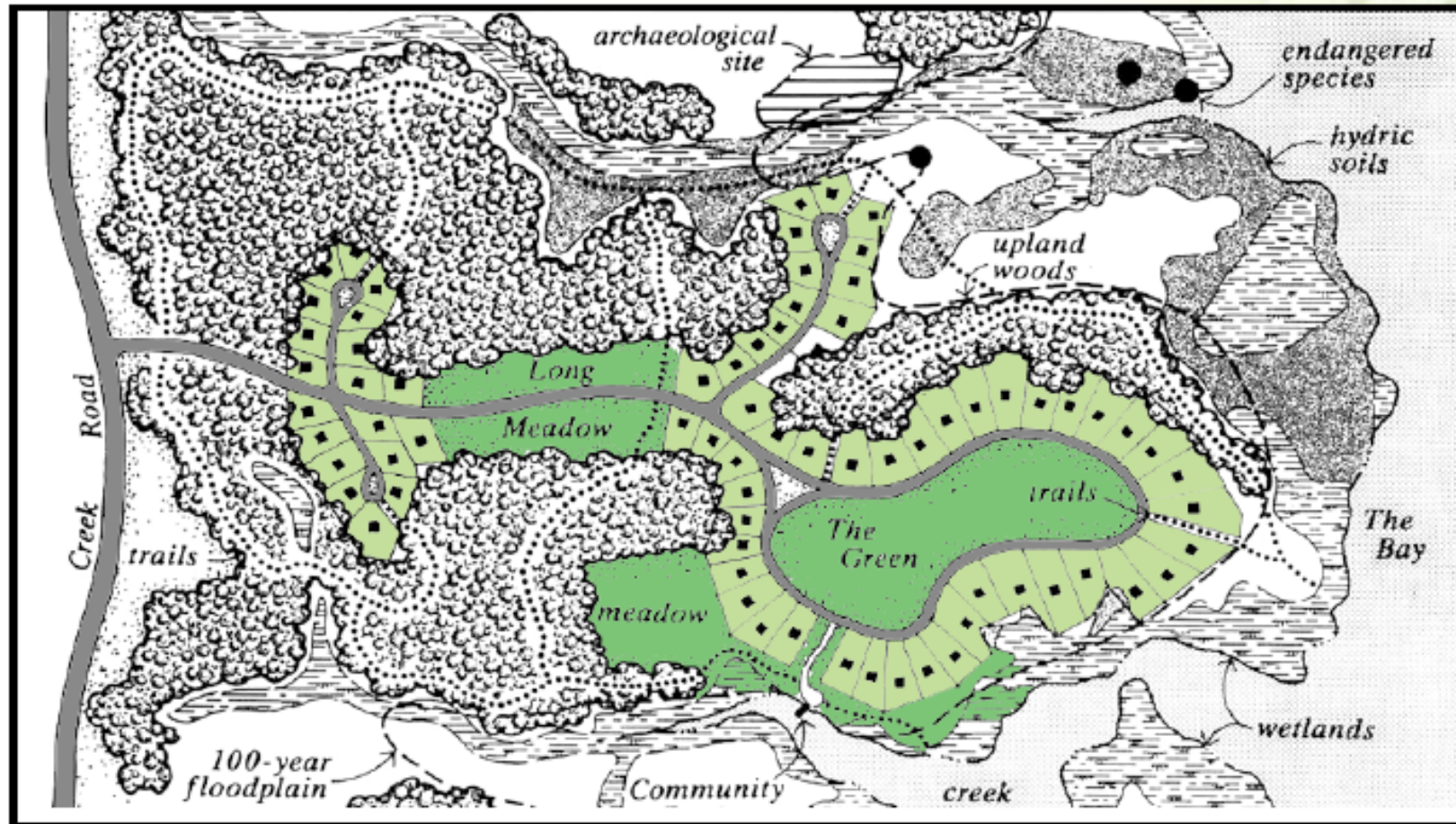
2. Place houses in the remaining area in a way that would maximize residents enjoyment of these areas by providing access to open space and preserving views.



3. Align roads and trails on the site to provide pedestrian and vehicle access.

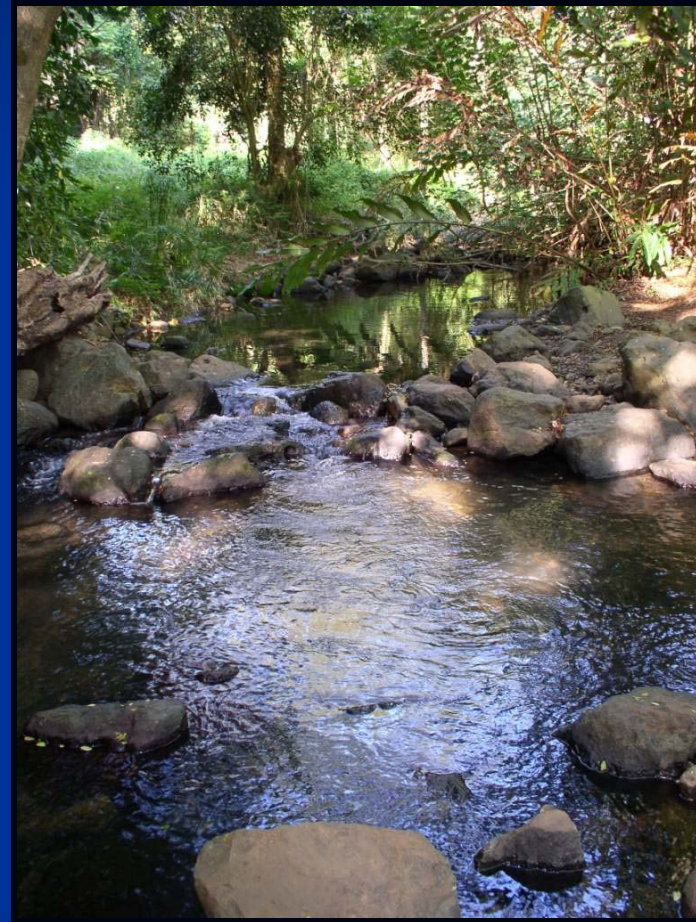


4. Draw lot lines around the homes.



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Reduce roadway



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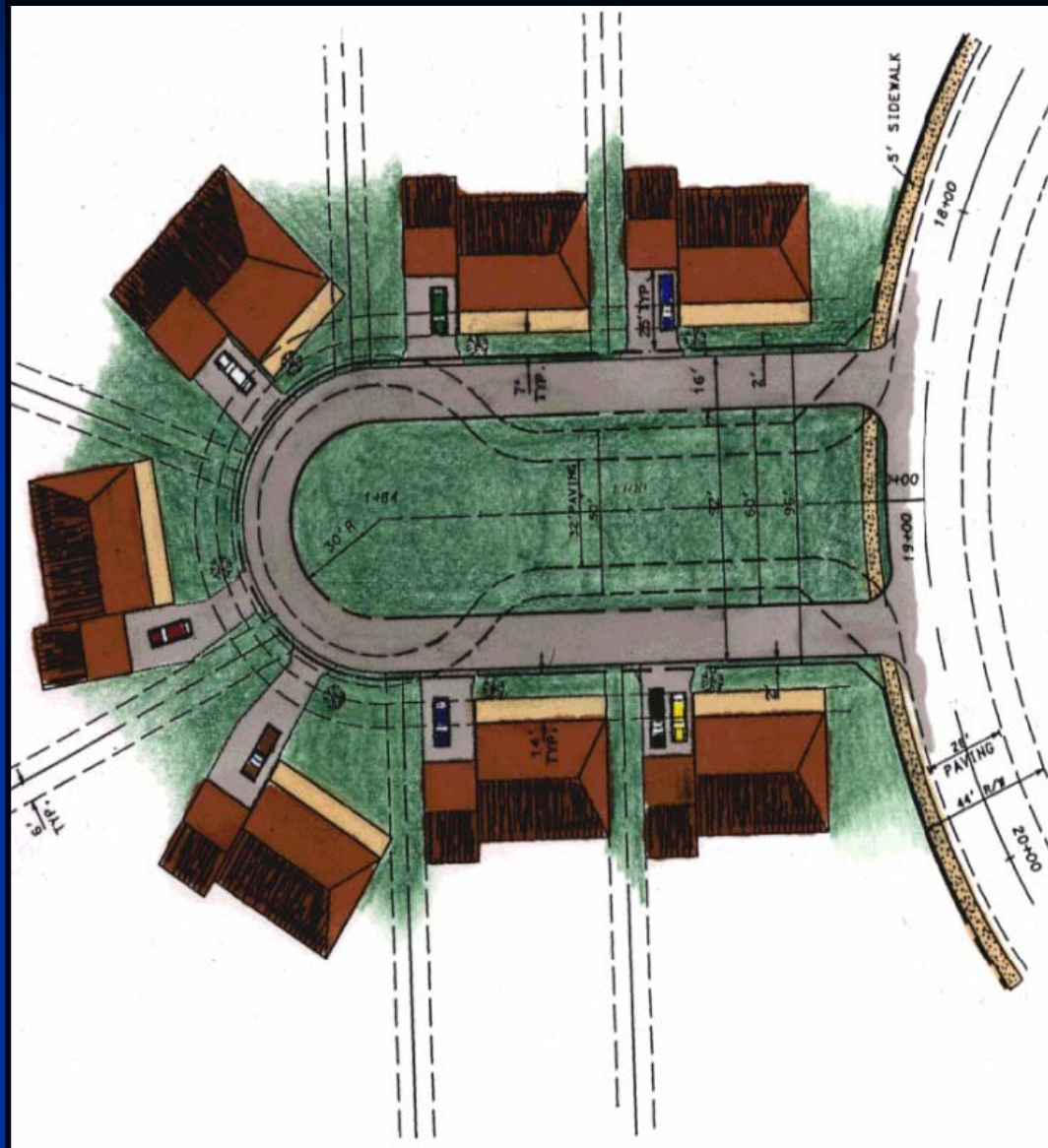


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Reduce side-walks & driveways



Reduce cul-de-sac's



Source Horsley &
Witten



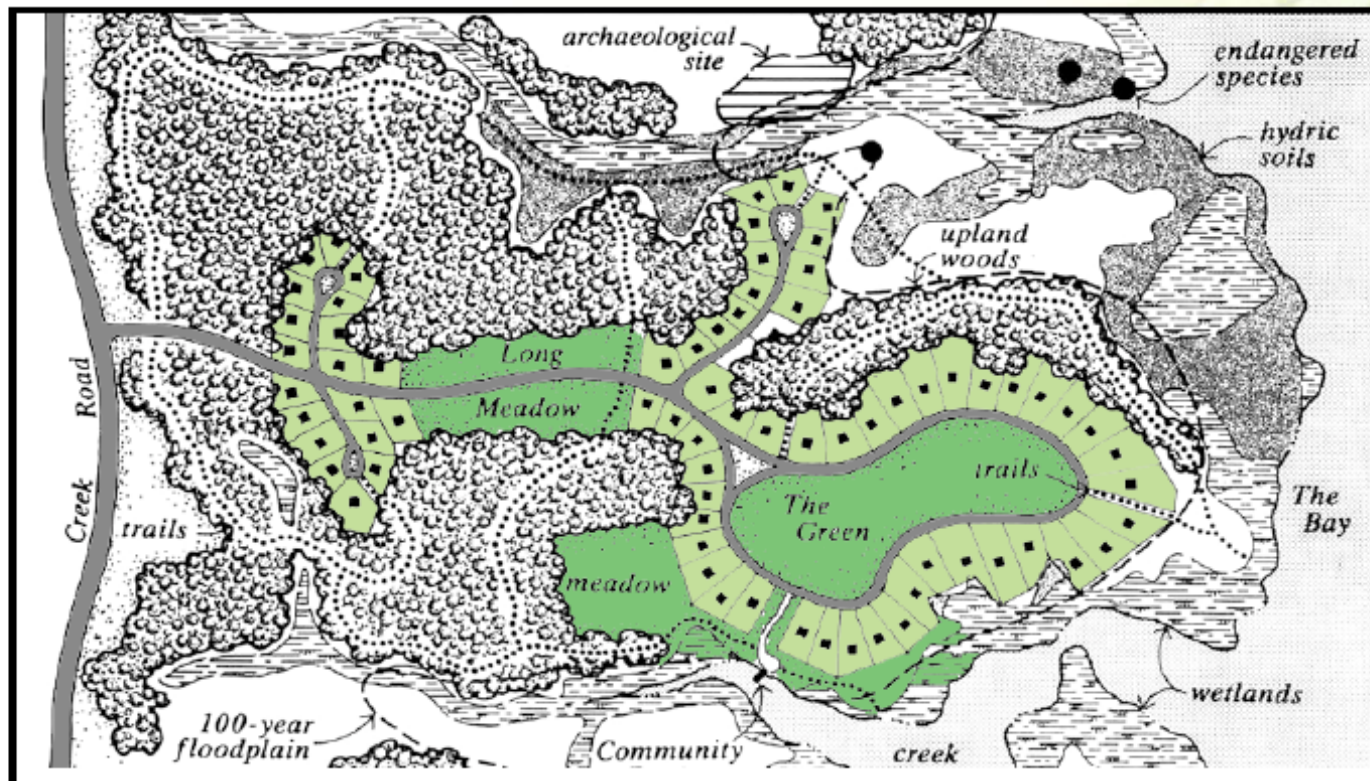
Source: Horsley Witten Group

Reduce Building Footprint



Cluster development

4. Draw lot lines around the homes.



Reduce Carparks





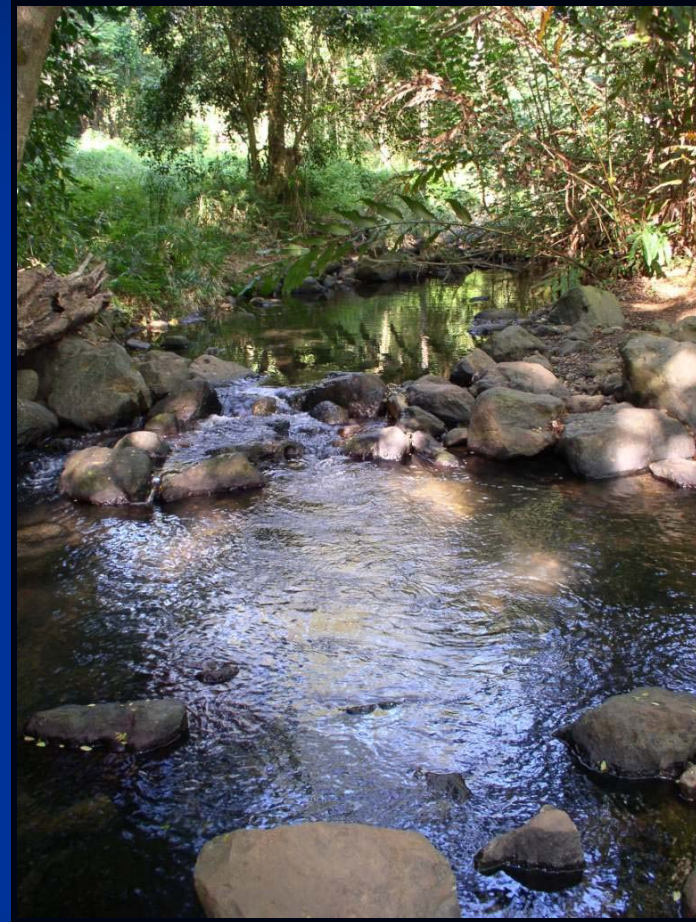
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LID planning: 3 step process

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- **Manage Impacts –
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Manage Stormwater

Utilize natural features and control source of stormwater:

- Vegetated buffer strips
- Open vegetated swales/channels
- Bioretention and rain gardens
- Infiltration
- Rooftop runoff mitigation
- Tree planting



Rooftop runoff and storm water planters



Rain gardens



Stormwater Best Management Practices (BMP's)

- Prevent, reduce or treat run-off
- Highly specific to location
- Basic BMP concepts:
 - Slow runoff
 - Avoid direct connections
 - Ensure regular maintenance
 - Enforcement and education



Erosion and Sediment Control:

Scheduling

- Schedule earth moving and grading activities to expose minimum amount of area possible for shortest amount of time
- Schedule land disturbance activities during the dry seasons or periods.



Comparison of Conventional Versus LID Construction Costs

	Med. Density Residential	Low Density Residential	Shopping Center	Office Park
Conv. Design	\$1,539,000	\$143,000	\$782,000	\$948,000
LID Design	\$1,239,000	\$126,000	\$746,000	\$788,000
Cost Savings	\$300,000	\$17,000	\$36,000	\$160,000
Percent Savings	20%	12%	5%	17%



Low Impact Design Tools

- Whole Building Design Guide:
<http://www.wbdg.org/design/lidsitedesign.php>
- Low Impact Design Strategies
<http://www.toolbase.org/PDF/DesignGuides/LIDstrategies.pdf>
- Low Impact Development Center
<http://www.lowimpactdevelopment.org/>

Polluted Runoff Tools

- Center for Watershed Protection

<http://www.cwp.org/>

- Stormwater Center

<http://www.stormwatercenter.net>

- International Stormwater Best Management Practices Database

<http://www.bmpdatabase.org/>

Outreach Toolbox

- EPA Non-point Source Toolbox
<http://www.epa.gov/nps/toolbox/>
- Hawaii's Coral Reef Outreach Network
<http://www.hawaiireef.net/>
- Non-point Education for Municipal Officials
<http://web.uconn.edu/nemo>

Mahalo!

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