Chapter 2: Site Planning for LIDAs

2.1 Site Analysis

The first step in using LIDAs is a thorough site analysis to learn how water moves through the site and how natural hydrologic functions could be preserved. Inventory conditions on and adjacent to the site, including topography, soils, hydrology, and vegetation. The site analysis includes site visits, topographical and vegetation/habitat surveys, review of maps and reports, and development of a site base map.

In the site analysis, the physical attributes of the development or redevelopment site should be reviewed before placing streets, parking lots and buildings to optimize stormwater management and habitat protection. Existing features should be incorporated into the site design by working with rather than against site attributes and constraints. A site layout that integrates site amenities to manage stormwater and protect habitat may reduce permitting delays.

Site analysis should follow the order depicted in Figure 1 and answer the questions below.

1. Topography

Is the site flat, steep, or moderately sloped?

The steeper the slope, the more likely soil erosion or slides could occur. Generally, slopes greater than 25% should be avoided for clearing, grading and building. Steep slopes and slide prone areas are not advisable for infiltration LIDAs. A geotechnical engineering analysis may be necessary to determine appropriate LIDAs.

2. Soils

What is the site soil type, hydrologic group, infiltration capacity, and are groundwater tables high?

Use soil maps, which are available from the Natural Resources Conservation Service (NRCS) Soil Survey for Washington County. Sizing may be adjusted for some LIDAs based on tested infiltration rates unless high groundwater is an issue.

3. Hydrology

What are the flow patterns into, on, and from the site? Where will runoff drain?
Does the site have FEMA floodplains or floodways, drainage hazard areas, or Water Quality Sensitive Areas, seeps or springs?

Working with the site's flow patterns may reduce grading and associated costs.

4. Vegetation & Habitat

Are there trees and vegetation, especially large trees (6" diameter or larger at 4 foot height) or native vegetation on the site?

Native trees and vegetation should be protected. Check local planning and development codes for habitat and tree protection requirements. Local codes also may offer incentives for protecting and avoiding trees and habitat.

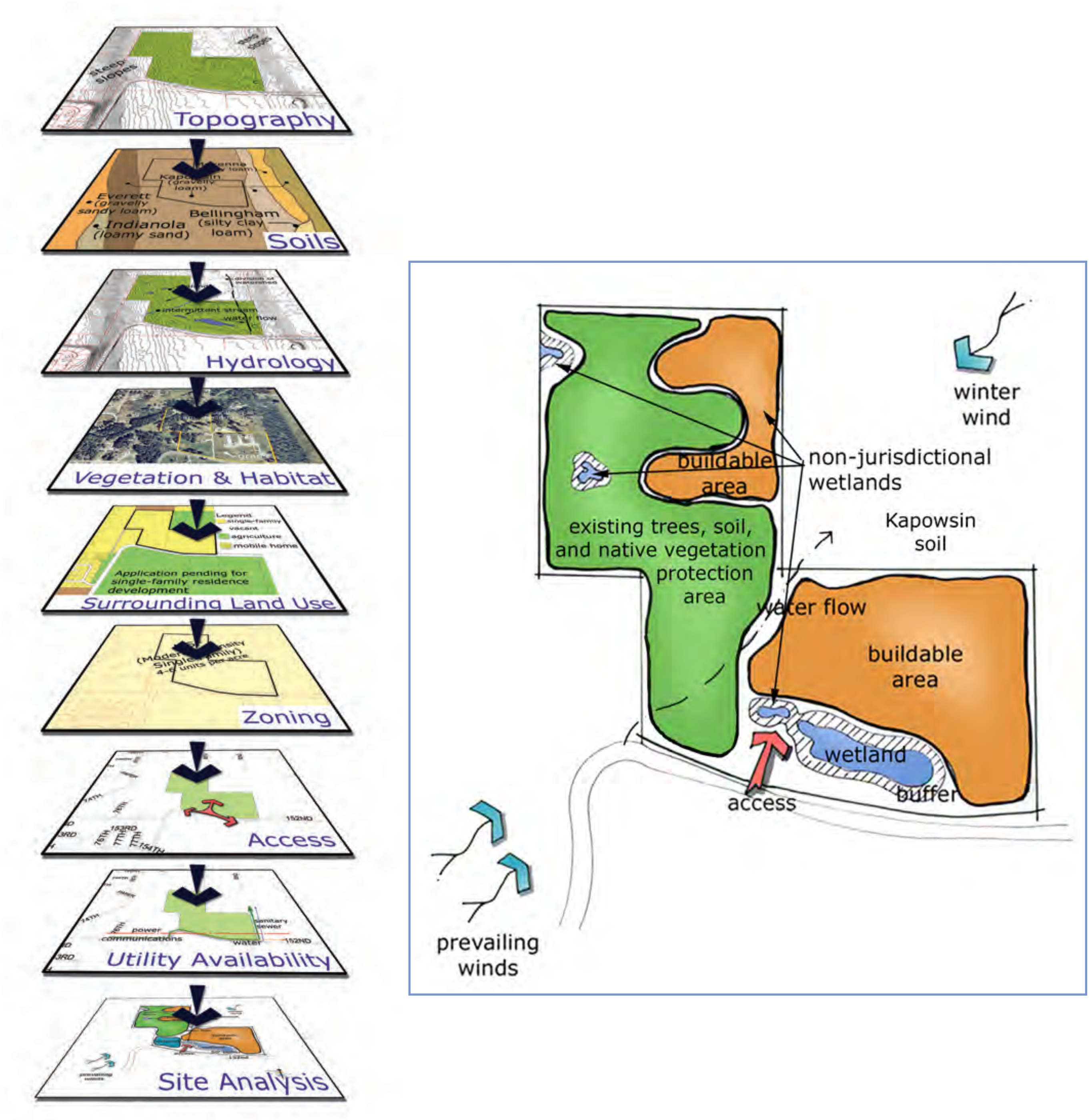

Figure 1 Site Analysis process diagram . Graphic from the LID Technical Guidance Manual for Puget Sound, courtesy of Puget Sound Partnership and AHBC, Inc.

5. Water Quality Sensitive Areas
Are there year-round or intermittent streams or channels or wetlands?
These features are protected by Corps of Engineers or Oregon Department of State Lands (DSL) environmental regulations, and the District Standards require Vegetated Corridors to protect them. Refer to National and Local Wetlands Inventory maps and consult with the District or local jurisdiction.

6. Land Use/Zoning
What type and density of development is allowed/required? Are there special or protective overlay zones? Can development be clustered or lot sizes altered?

7. Access
What are the options for auto, bike and pedestrian access, circulation and parking?

8. Utility Availability and Conflicts
What potential utility conflicts exist? Where are existing utility connections (water, sewer, storm drainage, electricity/phone/cable, etc.)? Where can new utilities be constructed with least impacts?

2.2 Site Planning

After completing the site analysis, prepare a site plan for permit submittal that addresses the five LIDA objectives listed below:

Site planning for LIDAs is based on these objectives, in order of importance:
1. Conserve Existing Resources
2. Minimize Disturbance
3. Minimize Soil Compaction
4. Minimize Imperviousness
5. Direct Runoff from Impervious Areas onto Pervious Areas

1. Conserve Existing Resources
The first and most important step in LIDA site planning is to preserve and protect existing water features and vegetated areas. Although the Standards require permanent protection of Water Quality Sensitive Areas and Vegetated Corridors, protection of other mature trees and vegetation provides habitat, prevents erosion, captures significant rainfall, provides summer shading, and reduces runoff volume and velocity which protects and enhances downstream water quality. Preservation of trees and vegetation may qualify for local incentives, and may reduce a site's ultimate impervious area and the size of required water quality or LIDA facilities.

2. Minimize Disturbance
Protection of existing vegetation provides more water quality benefits than replanting areas that have been cleared. Undisturbed areas provide more rainfall interception, evapotranspiration and runoff rate attenuation than replanting even with soil amendments. Construction activities that compact native soils significantly reduce infiltration capacity and increase runoff. To minimize disturbances, identify areas required to be protected and other areas that will not be cleared or impacted during construction. On plan submittal drawings, identify site work zones and no-disturbance areas. And, on the site use orange construction fencing to mark work zones, access points, materials storage and areas where no disturbances will be allowed.

3. Minimize Soil Compaction
Avoid any activity that could cause soil compaction in areas designated for infiltration LIDAs. Also avoid or minimize soil compaction where other LIDAs, water quality or detention facilities, or landscaping will be placed. Truck and equipment traffic during construction compacts site soils and areas that will ultimately be landscaped. Clearing, grading and compaction by construction traffic reduces the natural absorption and infiltration capacities of the native soils. Subsequent tilling and/or addition of soil amendments such as compost can help, but will not restore the original infiltration capacity of the soils.

4. Minimize Imperviousness
Site design layout methods that reduce impervious footprints may include: shared parking areas; clustered buildings that require less driveways and pathways; reduced parking stalls, especially in transit-served areas; adding floors to buildings or parking garages; and, reduced street width if allowed by local planning codes. In site design strive to reduce the actual footprint of buildings and paving to reduce and slow runoff from built surfaces. Green roofs and porous pavement are effectively pervious, although they are not water quality facilities, and they reduce the site impervious area and the volume of stormwater to be treated.

5. Direct Runoff from Impervious Areas onto Pervious Areas
This is the last line of defense against downstream impacts. While the first four objectives prevent runoff and pollution transport, this addresses pollutants in runoff from roofs, parking lots, streets and other impervious surfaces. Most LIDA facilities and water quality facilities fulfill this objective, including: planters, swales, vegetated filter strips, extended dry ponds and constructed water quality wetlands that serve as pervious, landscaped areas designed to receive runoff from impervious areas.

2.3 Selecting LIDAs to Match Site Conditions

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LIDA facilities can be constructed on and adjacent to buildings, and integrated into site landscaping and hardscape such as parking lots and along streets. LIDA facilities can be used singly to manage rainfall and runoff from a drainage area, or constructed in a series of multiple facilities. The site analysis helps identify the types of LIDAs best suited to the site. Owners and designers may use Table 1 as a quick reference to match each LIDA with common stormwater management objectives and site constraints to select the most appropriate facilities.

Table 1: LIDA Selection for Site Conditions

	Green Roof	Porous Pavement	Flow-through Planter	Infiltration Planter/ Rain Garden	Vegetated Filter Strip	LIDA Swale	Street Side LIDA Planter
Reduce imperviousness	✓	✓					
Infiltrate		✓		✓	✓	✓	✓
Detention/ flow control		✓		✓			✓
Provide Habitat			✓	✓	✓	✓	✓
Near Vegetated Corridor			✓	✓	✓	✓	✓
Private property	✓	✓	✓	✓	✓	✓	✓
Private street		✓	✓	✓	✓	✓	✓
Public Street/ROW*			✓	✓	✓	✓	✓
On or next to building	✓		✓				
Parking lot		✓	✓	✓	✓	✓	✓
Landscaped area			✓	✓	✓	✓	
Steep slope	✓		✓				✓
Soils with low infiltration rate	✓	✓	✓		✓	✓	✓
High GW table	✓		✓		✓	✓	
Contaminated soils	✓		✓				

* Check with local juristiction about use in ROW

Figures 2, 3 and 4 illustrate how various LIDAs can be integrated into development sites, landscaping and street designs.

LIDAs in Parking Areas

Figure 2

LIDAs for Streets

Figure 3

LIDAs for Buildings and Adjacent Areas

Figure 4

Flow-through planters (next to building) as needed for non-green roof areas

Infiltration planter (minimum 10’ setback from building) or flow-through planter

Stormwater art (sculptural downspout)

Green roof

Disconnected downspout and splash basin

Infiltration or flow-through planters for street, parking areas or sidewalk runoff