LID ELEMENT #1: MINIMIZE SITE DISTURBANCE

OBJECTIVE

Preserve a site's natural hydrology, ecological integrity and infiltrative capabilities by minimizing soil compaction caused by grading, cutting and filling.

RELATED ELEMENTS

Element 2 Retain and Plant Native Vegetation
Element 22 LID Foundations

TRADITIONAL SITE DEVELOPMENT TECHNIQUES

Traditional grading cut and fill involves reshaping a development site that has uneven or steep topography or easily erodible soils to planned grades which stabilizes slopes and decreases runoff velocity. This provides more suitable topography for buildings, facilities, and other land uses and helps to control surface runoff, soil erosion, and sedimentation during and after construction. Before grading activities begin, a construction site operator must make decisions regarding the steepness of cut-and-fill slopes and how the slopes will be protected from runoff, stabilized and maintained. However, this technique often results in compacted soils, diminished top soil and micro-organisms, and the native soils are often replaced by engineered soils which have less capacity to infiltrate and store water. When vegetated buffers are removed, the chances for offsite transport of sediments and other pollutants are increased.

"Minimizing site disturbance as a primary strategy to control erosion reduces the extent of grading, retains vegetation cover, and is the most cost-efficient and effective method for controlling sediment yield (Corish, 1995)."

Low Impact Development Technical Guidance Manual for Puget Sound, Puget Sound Action Team and Washington State University Extension Pierce County, 2005).

CODES AND STANDARDS REVIEWED

Drainage Design and Erosion Control Manual (DDECM) Volumes 2 and 3
Olympia Municipal Code (OMC) Section 16.48
Olympia Muncipal Code (OMC) Section 16.60
Comprehensive Plan Natural Environment Section

BENEFITS OF MINIMIZING SITE DISTURBANCE

Key elements of using low impact development techniques for clearing and grading include preserving natural terrain and minimizing site disturbance to allow pre-development hydrologic processes to continue once construction is complete. Minimizing site disturbance also:

- preserves existing vegetation
- soils and habitat
- minimizes soil compaction, and
- reduces erosion and sedimentation potential during construction.

When an undisturbed temporary or permanent buffer zone is maintained during the grading operation, it acts as a low-cost sediment control measure that helps reduce runoff and offsite sedimentation. When natural site contours are retained during construction, the lowest elevation of the site acts as a protected stormwater outlet before storm drains or other construction outlets are installed. Additional low impact techniques that can help minimize site disturbance, including (Element 2) Retain and Plant Native Vegetation, (Element 4) Restrict Maximum Impervious Surface Coverage, and (Element 5) Reduce Impervious Surfaces Associated with On-Street Parking are covered in other memos. In order to attain the benefits of LID, development activities such as clearing and grading should be carefully considered during the pre-submittal, design and construction phases to retain the function of those attributes.

OLYMPIA CODE ANALYSIS

Clearing and grading activities are primarily regulated by OMC 16.48 and also by OMC 18.32, OMC 18.36, and OMC 16.60. Most of these regulations are focused on prevention of erosion and siltation, public safety, or location of grading.

The recent update of the Comprehensive Plan (Natural Environment section) includes two polices addressing site disturbance through Olympia's planning, regulatory, and management processes. The first policy (PN 1.5) seeks to preserve the existing topography on a portion of a new development site, integrate existing contours into the project design, and minimize the use of grading and other large-scale land disturbances. The second policy (PN 1.7) seeks to limit hillside development to site designs that incorporate and conform to the existing topography, and minimize the effect on existing hydrology. Current City regulations regarding grading do not yet reflect these polices.

Current regulations do not encourage grading that considers the natural terrain.

Currently, grading activities of less than 50 cubic yards are generally exempt from permit requirements. OMC 16.48.050 also exempts from review agriculture-related clearing, the area within 30 feet of any structure, and up to 20,000 square feet for clearing and grading associated with single-family or duplex construction. Projects that require approval of the site plan review committee or Hearings Examiner do require review of the grading design, but the review does not include an evaluation of cuts and fills or quantity of grading.

OMC 16.60 requires a tree removal permit for undeveloped properties. Tree removal permits only allow tree removal as part of a development permit, through a conversion option harvest on a limited basis, or as part of a forest practice permit which then puts a moratorium on future development for 10 years. There are also allowed exemptions from these requirements. On developing properties, current City practice allows clearing and grading of new lots concurrently with construction of subdivision improvements such as streets and utilities. Seventy-five percent of the required trees for a subdivision must be within set-aside tree tracts. This permits the remainder of the property to be cleared and graded. The remaining trees required can be planted along streets and when new homes are built.

As long as requirements for tree preservation, protection of critical areas, shoreline restrictions, and the recommendations of the geotechnical report are met, there are no restrictions on grading within the allowed development area.

HURDLES TO MINIMIZING SITE DISTURBANCES

Changing City regulations to minimize site disturbance by limiting clearing and grading could present the following challenges:

Shift in Site Grading Approach - There are typically four main drivers for grading from the developer perspective: site balancing, parking lot slopes, stormwater flow and Americans with Disabilities Act (ADA) considerations. In order to reduce construction costs, a balanced site (where the amount of cut is equal to the amount of fill) is preferred by developers. Parking lot slopes typically have rules of thumb to ensure movement of stormwater while balancing maneuverability and practical elements associated with the use on the property. Stormwater also needs to flow to avoid standing water and parking lot ponding. Ensuring site accessibility and meeting the requirements of the ADA guidelines are also paramount.

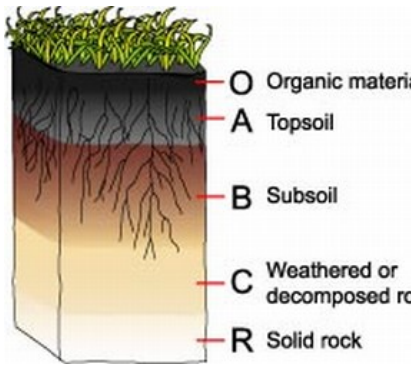
Minimizing site disturbances must be balanced with other criteria, including ADA accessibility, cut/fill balancing and parking lot slopes.

With a shift of focus to minimizing site disturbances, the main drivers of grading will change. For commercial sites, ADA accessibility, stormwater flow and parking lot design will still be paramount, but a design that works with the natural terrain and soils and that minimizes cut and fill activities will also be a key consideration. This approach to grading may increase the need for retaining walls, limit the building area and result in sites that do not have balanced cuts and fills. This would result in increased construction costs. Construction costs would also increase as standard grading methods may not be possible: if areas of development are discontinuous and existing vegetation preservation is required, the mass grading techniques currently employed by contractors may not be feasible and new grading approaches more sensitive to unique site features will be needed.

Grading Design Costs/Duration – Grading design for LID sites tends to be more complicated than traditional design. Discontinuous impervious areas, areas of natural vegetation preservation, and creating a design that works with the natural terrain result in more consideration to grading and more complicated designs, especially on sites where there is a lot of slope or change of topography across the site. This complexity of design will result in higher design costs and longer design duration as complex designs typically require more iterations of design and greater internal review for quality assurance.

Change to Geotechnical Reports – In order to minimize site disturbance, it is critical to have a thorough understanding of site soils. The type of soils on-site will influence where buildings are placed, where infiltration facilities are located, and even which areas should be preserved for natural vegetation. Therefore, a comprehensive profile of site soils is needed to efficiently lay out the site and understand where specific activities should occur. Current practices for preparation of geotechnical reports do not address this need.

For development in the City of Olympia there are typically two focuses for geotechnical reports: estimating the on-site soil's ability to support structures (buildings, paving, etc.), and infiltrative capability of soil for stormwater management. The soil testing is typically targeted based on the site plan, and soil pits are limited to the minimum necessary because they are expensive to dig. Soil pits are generally limited to the areas where buildings and infiltrative facilities are proposed, based on the site layout, with some additional pits dug to establish a general idea of soils outside of those areas. Further pits are generally dug only if poor soils are found in the original locations. A true, comprehensive profile of the on-site soils is not conducted.



A comprehensive site soil profile would allow for better site planning and minimize disturbances, but will increase development costs.

For soils testing on small sites, the current approach might work and a sufficient soil profile could be determined. However, on large sites, the current soil testing approach does not likely result in a comprehensive understanding of site soils. Therefore, planned improvements or areas of tree retention could be planned in areas that are not well suited to that purpose. For instance, a stormwater management facility could be planned in an area where the infiltration was acceptable but an area where the soils drain much better could be missed and planned for placement of fill over good infiltrative soils.

In order to minimize site disturbance, the approach to geotechnical testing and analysis would require change. A preliminary, comprehensive testing program and development of a site soil profile would need to occur prior to the development of the site plan. Per (Element 18) LID Site Assessment, this profile would be developed as part of the LID feasibility and would increase up front project costs.

Once the soil profile is developed, the site plan could be prepared based on findings. Areas of soils that have poor infiltration but have good structural support would be where structures are placed and areas of soils that are good for infiltration would be where stormwater facilities are placed. Once the site plan is developed, a more targeted soil testing could occur to establish design parameters of the soil such as infiltration rates and bearing capacity only in the areas where this information is needed. This approach would ensure that the site layout compliments site soils and could serve to limit site disturbances to where they should occur. Geotechnical

reports prepared in this manner would be more expensive and would take more time than the current methodology.

Small Sites – On small sites, restrictions to on site disturbances can be especially problematic. By the time the requirements of the municipal code are met (setbacks, required densities, critical area buffers, etc.), nearly all of the available area might be slated for development. Limiting grading could create the need for retaining walls for sites with steeper slopes or undulating topography.

LID elements such as infiltration require protection to avoid compaction, further limiting maneuverability on sites during construction.

Construction Challenges – In addition to limiting the ability to mass grade a site, there could be other challenges during construction. The developed area of the site is where the contractor typically stores materials, locates the job site trailer, allows worker parking, etc. Creating smaller areas of site disturbance also limits the areas for these activities. In addition, access around the site might be limited as areas of development could be discontinuous and separated by preservation areas. Further, an LID project will typically have more areas where infiltration is proposed, further limiting maneuverability as these areas need to be protected from compaction.

Specialized Building Design – Working with site terrain, especially on sites with large changes in topography, may create the need for non-traditional building types such as split-level buildings or exposed foundations. It could also result in specialized design for each building at a site as each residential lot or area of a commercial site would be different. Builders often work from prototype buildings to reduce costs and increase efficiency. It is likely that prototype use would be limited, especially on sites with more natural changes in terrain. Therefore, construction costs would increase with the need for specialized designs. In addition, construction durations would also be increased as efficiencies learned over repetition of construction would not occur as frequently.

AVAILABLE LID TECHNIQUES

There are other innovative LID techniques that can lessen the impact of clearing and grading, including:

- stockpile topsoil during construction and replace topsoil after construction
- design smaller building envelopes
- implement minimal foundation excavation techniques
- construct foundation designs that fit the building into the land rather than reshaping the land to fit the building

- deep-till and loosen soils compacted during site grading to restore their natural infiltration capacity for areas intended for stormwater management and infiltration or not required to have a structural capacity
- clearing, grading and heavy construction activity should occur during the driest months of the year to avoid erosion and sediment yield from equipment activity.

OPTIONS CONSIDERED

The options considered are as follows:

- Option 1: No change.
- Option 2: Reduce grading permit exemption level thresholds of OMC 16.48 to:
    - Within 10 (instead of 30) feet of structures
    - 7,000 (instead of 20,000) square feet
    - Less than 10 cubic yards (instead of 50 cubic yards)
- Option 3: Expand regulations in OMC 16.48 to address need for site grading activities to follow existing terrain.

ANALYSIS

Minimizing site disturbance is essential for successful implementation of LID. Thoughtful site planning that locates development in poor soil areas and works with natural terrain maximizes potential for infiltration.

If no change to code is made (Option 1), other LID elements such as Element 2: Retain and Plant Native Vegetation, Element 4: Restrict Maximum Impervious Coverage, and Element 5: Reduce Impervious Surfaces Associated with On-Site Parking could serve to minimize site disturbance. However, grading to work with the existing terrain and soils would not be addressed.

Option 2 (reduce exemption thresholds) would reduce the scale of projects exempted from grading permits while still allowing exemptions for small scale projects. This option increases the number of projects required to get a grading permit, but does not put limitations on the how or where the grading can occur because current regulations do not address how a site is graded. Grading to limit impacts to existing terrain is not currently a requirement.

Option 3 (expand grading regulations) addresses the need for current codes (OMC 16.48, EDDS, DDECM) to be updated to address grading as it relates to natural terrain and soils. Grading requirements to work with existing terrain and soils would be established as none are present in current codes. Currently, grading requirements only limit location of grading activities and require the reduction of erosion and siltation. Grading within allowed development envelopes (areas outside of critical area buffers, tree preservation areas, etc.) has no restriction. How a site is graded and the depth of grading is not addressed. A developer can choose to cut and fill to any depth, change the direction of slopes, and completely alter the site terrain. The only limits to the grading are the requirements specified in the geotechnical analysis. Grading methodologies are similarly unlimited and can include mass grading.

Option 3 would develop restrictions on grading to better work with the natural terrain. Restrictions on grading methodologies might also be considered. This option would fully implement an LID approach to grading and would come with the challenges addressed above. Examples of potential grading restrictions could be: limits to the allowed amount of feet of vertical change (cuts and fills should not exceed some specified amount); limits to allowed alterations of existing slopes to a specified percentage; or there could be a requirement to preserve natural drainage patterns. Existing guidance on LID (such as from the *LID Technical Guidance Manual for Puget Sound*) does not provide direction on limitations to depth of grading or slope change restrictions. The standard is to work with natural terrain. Requiring that existing drainage patterns be preserved could provide specificity.

RECOMMENDATION

Staff recommends Options 2 and 3. Option 2 will reduce the number of projects exempted from grading approval. Option 3 will require that grading work with the natural terrain. Together these options will better preserve existing site hydrology. Code language reflecting this approach will be fully developed as the LID code revision process progresses.