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Infiltration maps streamline land-use planning

- ***Developers can now assess a parcel's water quality requirements in hours rather than days.***

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Developers are looking for guidance that is fast and efficient, while city planners are charged with ensuring parcels and lots are developed with the community and environment in mind.

Of the environmental factors cities must consider for land use, planning for where stormwater runoff is discharged is crucial to mitigate its impact on water quality. Municipal NPDES permits require low impact development (LID) for all Phase I and II municipalities, which include the most populated areas of the state.

LID approaches for managing rainfall use natural vegetation and landscape design to infiltrate, filter, store and evaporate stormwater runoff. Using these strategies helps to reduce flash flooding and erosion, improves water quality, helps groundwater recharge and is aesthetically pleasing.

But in today's increasingly urbanizing world, how can municipalities make it easier to create housing and encourage development while protecting water bodies? One new approach led by the city of SeaTac at the early development stage may have some intriguing possibilities.

The city has been proactive in adding new regulated LID stormwater requirements into its building permitting process and has eased the path by producing an online map-based tool that screens for infiltration requirements and infeasibility across the 10 miles of the city's boundaries. This web map is the first of its kind to screen infiltration potential citywide.

Triggering a new approach

The city's Phase II municipal stormwater permit requires that LID be implemented when feasible. The city's LID design follows King County's 2016 Surface Water Design Manual. To minimize the impact of increased stormwater runoff from new development projects, LID best management practices (BMPs) are required to reduce impervious area and piped stormwater runoff from development.

Aspect Consulting and Robin Kirshbaum Inc. partnered with the city to develop 10 LID "infeasibility" maps — essentially showing the known areas where LID projects would not be possible because of a range of factors, such as closeness to steep slopes, proximity to surface water and wetland buffers, or presence of impervious surfaces.

By reviewing the infeasible parcel areas, developers can easily identify potential project sites that are exempt from needing field infiltration rate testing and LID design elements.

City of Seattle photo [enlarge]

Bioretention facilities like this one are a LID feature that Ecology and King County are nudging municipalities towards adopting.

Map methodology

Unlike many projects where the more data we can use the more developed the story becomes, in this project the methods used had a different requirement: adhering to the code behind the analysis.

Within the surface water manual, each LID BMP — the key design practices — has a set of criteria under which the BMP is considered infeasible to implement and therefore is not required or

allowed. To synthesize the relevant infeasibility criteria, hundreds of subsurface, land-use and citizen-sourced data points were reviewed, including over 30 GIS datasets, 45 hard copy or electronic geotechnical reports, 203 service requests from citizens, and 104 recorded drainage problem areas from city staff.

From that, lists of datasets by BMP were created and then fed into GIS analysis to assess 10 different criteria singled out by the surface water manual and city codes as key for good water quality management.

These 10 flow-control BMPs were: full dispersion, basic dispersion, limited infiltration, full infiltration, bioretention, permeable pavement (asphalt), permeable pavement (concrete), permeable pavement (concrete interlocking), perforated pipe and soil amendment.

The result

The synthesized data sets then were used to build each of the LID infeasibility maps into web map form that developers and city planners can use in the design of their projects and the assessment of the building permit applications.

The city encourages developers and property owners to review the property areas within each web map and print out and include each of the LID infeasibility maps when submitting their application packet. Areas not shown as red on those maps are subject to site infiltration assessment.

Connect to web maps

City of SeaTac: tinyurl.com/SeaTac-LIDmap

Aspect Consulting: tinyurl.com/AspectConsultingMaps

With these new maps, developers can assess a parcel's water quality requirements in a few hours rather than a few days. City planners can answer permitting questions efficiently and save upfront time and costs by giving applicants a more defined understanding of the expectations for managing stormwater runoff from the start.

The maps help each group reach the same goal: successful development that's compliant with regulations and protective of Puget Sound's waterways.

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