STORMWATER ORDINANCE UPDATE
TECHNICAL ADVISORY COMMITTEE (TAC)
Meeting #7: Wednesday, October 31, 2007
Washington Department of Fish and Wildlife
2108 Grand Blvd.
1:30 – 3:30 p.m.

N O T E S

Agenda / Introduction / Updates

Members Attending
Tom Grange, Tim Kraft, Robin Krause, Ryan Billen (for Jennifer McClure), Chad McMurry, Fereidoon Safdari, Mike Soliwoda, Ron Wierenga, Scott Wilson, Mike Misiak, Ali Safayi

Members Absent
Patrick Harbison

Guests
Eric Golemo, Lance Lehto, Dan Trisler

Staff
Trista Kobluskie, Sue Stepan

Audience
Sean Darcy, Andrew Stoeckinger, Huyah Tran, Randy Thrall, Sean Hanrahan

For the TAC 6 notes, Mr. Grange clarified his comment on page 6, 5th paragraph to "and some are Lauren…" Mr. Kraft said that page 2, 9th paragraph, last sentence should read "Mr. Soliwoda will contact Rulle Emry…" The TAC 6 notes were approved as amended.

Mr. Krause stated that draft code 40.380.010 will be presented to the Stakeholders Advisory Committee.

Mr. Krause reminded TAC members to review the documents distributed at the last meeting prior to the next meeting: the concept code for Erosion Control, the rough draft LID Manual and the rough draft rain garden specifications.

Mr. Krause said that he is working on resolving the prairie vs. forested issue. His current understanding is that some mapping has been done based on the cadastral maps, but it is broad and without data-checking.

Mr. Krause invited members to the Development Engineering Advisory Board workshop to formalize recommendations to the SAC on November 1, 2007 from 2:30 p.m. - 4:30 p.m. at the Public Service Center 6th Floor Hearing Room.

Decisions from Last Meeting/Action Items

Mr. Kraft stated that he and staff will begin revising 40.380.040.(D)-(N) based on many comments from TAC. The updated concept code will be presented at the next meeting.

Mr. Soliwoda reviewed his discussion with Rulle Emery at Public Health about setbacks for stormwater facilities from septic drainfields. Health code requires 100' distance between open surface waters (ponds) and septic drainfields. It also requires 10' separation between drainfields and manmade ditches and 30' downgradient separation. A natural ditch is not regulated. Mr. McMurry said that the table he sent addressed the issue.

Infiltration

Mr. Krause invited three members of the ASCE Infiltration Standards Review Committee to the table - Eric Golemo, Lance Lehto, and Dan Trisler. Mr. Golemo is a development engineer. Mr. Lehto and Mr. Trisler are geotechnical engineers. Mr. McMurry is also a member of the committee. The committee produced "A Review of Infiltration Standards and Practices in Clark County" in August.

Mr. Kraft noted that section 3.3 of the *Ecology Manual* deals with infiltration; it contains a lot of "shoulds," so it will be up to the county to enforce what it thinks is necessary. Issues include 1) testing method, 2) allowable infiltration rates and 3) should the county require a test for every facility that will infiltrate? How would that work with rain gardens and dispersion?

Mr. Golemo stated that safety factors vary from the *Ecology Manual*. Mr. Krause: they're ranges in the manual. Do we need to refine those?

Mr. Safdari stated that no jurisdiction has a scientific basis for limiting infiltration rates; it is engineering judgment.

Mr. Darcy asked about a maximum infiltration rate.

Mr. Safdari suggested increasing the safety factor and the warranty period for marginal infiltration sites.

Mr. Trisler stated that the *Ecology Manual* safety factors were developed from infiltration pond data, not from other types of infiltration facilities, such as trenches or drywells. Mr. Lehto agreed. Mr. Trisler said that Clark County sees more underground disposal systems than ponds.

Mr. Safayi suggested setting setbacks for infiltration facilities and addressing conflicts with other codes. Mr. Kraft agreed that setbacks will have to be listed in code because the manual provides only guidance, not requirements. Mr. Krause has researched whether other jurisdictions have adopted less stringent setbacks, but has found none. The county could be liable if closer setbacks cause problems. Mr. Trisler asked if sound engineering judgment could override a "base" setback. Mr. McMurry said that setbacks must be carefully thought out because with tighter development, siting infiltration facilities is difficult.

Mr. Misiak suggested a review of Building Code to see if lesser setbacks would cause violations or special structural requirements. Mr. Safayi stated that building code does not specify a setback, but requires positive drainage from the footing. The 15' setback enforced by the Clark County building department is in a standard detail. Mr. Krause said that Gresham and Portland allow lesser setbacks for rain gardens if there is a barrier.

Mr. Safayi requested that the group address the season in which the infiltration rate testing is done and to require testing in the wet season. At least the geotechnical engineer should include some assumptions about wet season conditions in the test results. Mr. Krause stated that the *2005 Manual* addresses the issue. Mr. Golemo responded that the committee recommended higher safety factors for dry season tests.

Mr. Krause wanted to discuss the lateral extent of the receptor.

Mr. Kraft wanted to discuss monitoring and post-construction testing.

Mr. Darcy asked for a definition of "safety factor." Mr. McMurry: the measured infiltration rate is divided by a safety factor to determine the rate used to design the infiltration facility. Mr. Misiak: the potential for bio-fouling, maintenance concerns, and site variability will affect what safety factor is chosen. Mr. Krause asked if the county should require additive safety factors for poor soils. Mr. McMurry replied that the review committee recommends a methodology that will lower the design rate to begin with, so no. Also, many failures resulted from under-sizing, poor construction practices, or high groundwater – not poor soils.

Mr. Misiak asked if research correlates design infiltration rate with actual infiltration rate over time. Mr. Trisler: Massmann correlated field measurements of current infiltration rate in ponds in the Puget Sound area with soil types and lab tests.

Mr. Lehto defined infiltration, which is sometimes confused with percolation. Infiltration is the one-dimensional vertical movement of water through soil under the force of gravity in a long-term steady-state condition in saturated soil. The saturated coefficient of permeability is the true infiltration rate. Currently, infiltration tests use many different methods with some arbitrary parameters that can significantly affect the results. Therefore, the review committee recommends a test method that removes those arbitrary variations and allows measured results to be mathematically calculated into the coefficient of permeability.

Mr. Trisler stated that Ecology's Pilot Infiltration Test (PIT) method is not feasible in many situations; it requires constant water source, and there are dangers from a saturated open pit.

Mr. Trisler described how current testing methods can produce variable results. The most common method is to dig a pit and embed a standpipe 6" to 1' into the soil. Fill the pipe with water then measure the drop in water level through the soil column with time. This test can produce quite different results depending on the depth of embedment and the height of the water column in the pipe (head). In contrast, the review committee's recommended test method produces consistent results because it mathematically calculates the coefficient of permeability (the true infiltration rate) using the variables of embedment and head (as well as requiring true soil saturation before beginning measurements).

Mr. Safayi asked about using a constant head test method. Mr. Trisler replied that those test are more difficult because the head must be kept at a constant level.

Mr. Lehto verified that in current practice, geotechnical engineers do not commonly provide design engineers with the factors of pipe length and embedment. Mr. Trisler stated that if the recommended method were required, reported infiltration rates would drop automatically.

Mr. Misiak asked if it takes into account the entire soil column down to the water table. Mr. Trisler: the appropriate thing to do is to take the test at about the depth of the facility and to explore below. Mr. McMurry: the committee recommends it as a requirement, similar to the *Ecology Manual*. Mr.Lehto: the committee also recommends that the geotechnical engineer see the site plans before they're resubmitted. Mr. Trisler stated that the engineer should use professional judgment to determine whether more thorough testing and exploration is needed.

Mr. Misiak asked how the committee recommends establishing design groundwater elevation. Mr. Trisler replied that the report must include an estimate of the *seasonal* high groundwater table. If that cannot be determined, then monitor for it.

Mr. Misiak expressed concern that waiting for a wet season to roll around could cost time and money. Mr. McMurry noted that in most agency review processes, three or four months elapse during review, in which the developer could do additional testing. However, in some cases, the design work is done before the approval. Mr. Trisler: if seasonal high groundwater cannot be determined, then we recommend monitoring wells or testing.

Mr. Misiak asked if defaulting to a really conservative groundwater elevation estimate could substitute for that. Mr. Trisler replied that the geotechnical engineer can recommend an additive correction factor to account for uncertainties.

Mr. Misiak asked the opinion of the development review engineers. Mr. Safayi replied that it is impossible to infiltrate in water. Mr. McMurry advised that the Underground Injection Control (UIC) requirements require a minimum of 5' above groundwater in most cases. Mr. Lehto replied that the test result itself will not change depending on the season because it calls for saturating the soil. However, groundwater depth will change and must be accounted for.

Mr. Kraft asked for the typical time between a pre-application and final design. Mr. Safayi: between two months and two years.

Mr. Kraft: Ecology is requiring piezometers over at least one wet season; that seems like a reasonable recommendation. Mr. Misiak wondered if developers would have to wait a whole year if submitting at the end of a wet season. Mr. Soliwoda recommended hiring a geotechnical engineer immediately upon deciding to develop a property. Mr. Misiak countered that WSDOT is having difficulty finding enough geotechnical engineers and piezometers for its needs.

Mr. McMurry and Mr. Lehto cautioned that piezometers, which are direct conduits to groundwater, must be permitted and then adequately decommissioned.

Mr. Safdari blamed lack of consideration for high groundwater as a reason for some failures of infiltration facilities in the county. Mr. Lehto: infiltration can be slowed by groundwater mounding. Mr. McMurry: the recommended approach accounts for a certain amount of that.

Mr. Trisler described a problem with a prescriptive separation between a facility and groundwater. The separation is too strict in some cases and insufficient in other cases; however the actual needs of the system are never evaluated because meeting the prescribed separation becomes the only consideration. A wide pond needs a greater distance from groundwater than a point source. Mr. Lehto agreed. Pond aspect ratio (area) is the key factor.

Mr. Lehto: it is sometimes difficult to estimate seasonal high groundwater. Mr. Safdari agreed. After three or four dry years, it became difficult to estimate correctly the groundwater level.

Mr. Grange wondered if the recommendation to add a ½ correction factor for systems without an overflow system is adequate. Instead, rethink the system. Mr. McMurry disagreed. Some basins would require a 900' pipe through a 35' deep cut to get gravity outflow. As an alternative, design the facility more conservatively. Mr. Misiak wondered if developing land in a depression with no outlet where infiltration rates are already low is a viable option. Mr. McMurry: the increased factor of safety should balance the risk of failure. Mr. Golemo: if a closed depression has a wetland, and groundwater is at that level, then it wouldn't really be buildable. In a closed depression with no wetland and no evidence of ponding and flooding, then you must mimic the natural condition. It is likely that infiltration is a viable option for

disposal. The new continuous model compensates for it, too. Mr. Grange noted that the groundwater elevation is critical, too. Mr. Krause: that is part of the closed depression analysis; you have to be able to hold a certain volume. Mr. Golemo: the closed depression analysis requires you to look at water surface in a closed depression and look at impact to water surface. It does not say that if you have groundwater in it, you can't build. It says you have to create extra volume for that water and analyze the water that goes into it.

Mr. Grange: it would be incorrect to apply the same standards for a closed depression with little infiltration capacity as to soils that drain easily. That is what makes people unhappy. The problem is that whatever standards we apply in one place, we apply in another. The standards should be relevant to the area or the soils. Mr. McMurry: right, even our recommendations don't apply well to gravelly soil; they must be modified to apply.

Mr. Grange would like to test systems in Hillsboro soils and see if any are functioning as designed. With Hillsboro soils and limited control over the facility, it could be silted in easily just by a homeowner ripping out their lawn.

Mr. Darcy stated that this is not addressing treatment.

Mr. Krause: The *Ecology Manual's* primary method is gradation analysis using ASTM or USDA, then correlate the soil type to an infiltration rate. For sites that are varied or unusual, use the PIT for confirmation. Mr. Trisler: gradation tests generally are more conservative than field measurements. Mr. Lehto: according to Massmann, the gradation test could be off as much as an order of magnitude, and field tests should be given more weight.

Mr. Safayi asked how it compares to AASHTO. He asked which lab test the geotechnical engineers would recommend. Mr. Trisler: the one required right now is just a gradation analysis. Mr. Lehto: ASTM D422 requires you to measure plasticity. We did not recommend using AASHTO because it is primarily for road design. Mr. Safayi stated that the review engineers prefer analysis for the long term. Mr. Lehto: the ASTM test method tells you the same thing. Mr. Trisler: there is an ASTM test for determining plasticity. Mr. Lehto: the county's current method is to give you an AASHTO result.

Mr. Krause asked about the USDA triangle, where infiltrating soils are in the lower corner. Would the Hillsboro fall into that corner or fall outside of it? Mr. Trisler: few geotechnical engineers will use that USDA triangle because it is agriculture-based and not relevant. The gradation testing for USDA is different than for ASTM or AASHTO. Mr. Safayi: the county and Puget Sound have a clay content requirement. Mr. Lehto: the county requires both the minimum infiltration rate and certain soils in the AASHTO spec. The method we recommend does not specify soil type. Pervious pavement, for instance, would never be permitted if soil type is required. We contend that all soils are capable of taking some amount of infiltration, and proper testing will ascertain how much.

Mr. Grange asked for the range of reliable long-term infiltration rates in Hillsboro soils. Mr. Trisler replied that short-term is under 10" hour to ½" per hour. Systems installed with a safety factor of 2 are still working. Mr. Grange questioned if systems designed for 100-year storms can be considered "working" when they've only been put through 2-year storms.

Mr. Safdari asked how to define the long-term rate. Mr. Trisler replied that the recommended testing method finds the short-term rate in situ and the safety factors compensate for the long term.

Mr. Trisler stated that geotechnical engineers must pay attention to layering. Hillsboro soils can tend to be sandier or siltier. The site must be characterized and delineated. Test results from different parts of the site should not be averaged.

Mr. Golemo contended that infiltration is the only choice for tight soils under the *Ecology Manual* because allowable release rates are almost 0 cfs, or require a 40-acre pond. Mr. Krause disagreed. Appendix 3, B4 of the *Ecology Manual* allows for modeling B soils that do not infiltrate as till rather than as outwash. Mr. Grange asked if Clark County's Hillsboro soils would be considered C. Mr. McMurry: if you can get 4" per hour, Ecology is considering that a B.

Mr. Golemo said that the manual should consider the differences between the topsoil and the subsurface. Surface conditions might be C soils, while the subsurface might be B with infiltration.

Mr. Lehto asked how modeling as till compares to modeling as outwash. Mr. Krause replied that the HSPF model uses 16 parameters to describe soil. The model was calibrated in the King County area, which is primarily glacial soils. Clark County is primarily flood-deposited soils. The model lumps A & B soils and shows very little interflow, while C soils show mostly interflow. Clark County may have something in between. The county is exploring the cost of calibrating the model locally.

Mr. Trisler clarified a previous statement. The geotechnical engineer should report a measured field rate as the short term rate. The geotechnical engineer should not recommend a long term rate because those are related to the civil design of the system – treatment, fouling, etc. There have been times when his firm recommended increased safety factors because it could not get an absolute rate. Now we are using the equation to get coefficient of permeability.

Mr. Grange: if it is difficult for a geotechnical engineer to find the long-term rate, think about the design engineers. What if you tell a homeowner that there is a drywell next to the house, and you have to protect it or pay to replace it?

Mr. Trisler replied that the committee's recommendations are meant to address concerns, including failures of past systems. At the same time, using rates designed for King County end up being too conservative for Clark County. The recommended method should provide more technical accuracy and more conservative results than current methods.

Mr. McMurry contended that increased treatment standard for suspended solids, better enforcement of erosion control during and after construction, and higher requirements for long-term monitoring and testing help safeguard infiltration facilities. The committee specifically recommended addressing the development and construction phases.

Mr. Krause asked how to define the lateral receptor, which may vary depending on the type of soil. Mr. Trisler replied that an infiltration system must be designed for the lower-permeability layers or confining layers. It is difficult to define the lateral edges of the receptor. Twenty explorations on a 20-acre site still leaves a lot of space in between. Confirmation testing is a good idea for ponds and trenches, which cover a greater area than a drywell. He stated that he has never designed a system to make use of lateral storage subsurface. Mr. Krause asked how far down it is necessary to look for a confining layer. Mr. Trisler: in good practice, you should search for those confining layers.

Mr. Safdari noted that the committee recommends allowing a sacrificial layer of sand at the bottom of a permanent infiltration facility in order to allow use of the facility during development and construction. Prior to putting the system online for permanent use, the sand would be removed. How effective will that method be? Mr. Lehto replied that the method is recommended for an open pond, but not for a trench, drywell, or infiltration gallery. The technique is to scarify the soil and place the sacrificial layer of sand. At the end of construction, scrape off a little of the sand and the trapped trash and silt and put in fresh.

Mr. Safayi asked how the geotechnical engineers feel about the rule allowing an infiltration test from within ¼ mile at the pre-conference. Mr. Lehto: sometimes the whole world can change within a ¼ of mile. Mr. Grange suggested allowing the ¼ mile rule in gravelly soils, but disallowing in tight soils. Mr. Golemo suggested that it may have a place for a short-plat only. Mt. Trisler: at least correlate the Soil Service soils, but even then it is not a guarantee.

Mr. Safayi said that the rule causes problems when infiltration on the site is actually limited. On a project, the whole area may be deducted if infiltration is shown to be feasible. If the county accepts a test done within ¼ of a mile, then it may not require any stormwater management. We end up with a homeowner trying to do a roof downspout infiltration system in soil that does not infiltrate.

Mr. Krause noted that TAC seems to agree to discard that rule.

Mr. Krause asked what were the expectations of the Infiltration Standards Review Committee. Mr. McMurry: 1) demonstrate that lower rate soils could infiltrate successfully with appropriate precautions 2) bring into practice use of the coefficient of permeability to improve accuracy and consistency of results. Mr. Lehto: create a standardized process that is verifiable and reviewable and to help agencies review them.

Mr. Krause asked if the PIT is unreasonable. Mr. McMurry: in certain circumstances it is reasonable, but in many cases the additional cost and risk are not justifiable. In most of the failures, the test method would not have made a difference.

Mr. McMurry suggested writing a manual around the report and adopting it in code. Ask DEAB for peer review. Then the standards would not be subject to policy whim. Mr. Kraft asked if the ASCE report would be the preferred manual. Mr. McMurry responded that parts of the report would be appropriate for use in the manual.

Mr. Golemo questioned whether the WWHM continuous model is the right method to model infiltration.

Mr. McMurry stated that there is not a lot of guidance for doing a mounding analysis. Mr. Krause replied that the *Ecology Manual* refers to ModFlow.

Adjourn

The meeting adjourned at 3:40 p.m.

Respectfully Submitted,
Trista Kobluskie