**Minimum Design Criteria (MDC) Team  
07/28/2014  
Triangle J COG, Durham**

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| **Attendees** | | | | | |  |
| ***Team Members*** | |  | | |  | ***Others*** |  |
| Eban Bean  Bradley Bennett  Jonathan Bivens Tim Clinkscales Tracy Davis Boyd Devane Hunter Freeman Mike Gallant Joe Hinton  Marc Houle Ron Horvath Bill Hunt  Linda Lewis |  | | Brian Lipscomb Annette Lucas  Mike MacIntyre Todd Miller  Cameron Moore Tom Murray Robert Patterson Derek Pielech Peter Raabe Larry Ragland  JD Solomon Virginia Spillman Toby Vinson Rob Weintraub |  | | Julie Ventaloro, NC DEMLR  Mark Senior, City of Raleigh |

**Eban Bean Presentation on Infiltration Basins**  
Compared infiltration rates to design rates in study basins using double ring infiltrometer (DRI).  
DOT basins more often greater than the design; residential basins tend to be less than design.  
Coarser sands functioned better than fine soils.  
Saw extended periods of ponding. Best performance seen when had long dry periods between rain events.  
Conclusion 1: Subsurface conditions dominated surface conditions.  
Conclusion 2: Mounding recession controlled performance.  
Distributed vs. Concentrated Infiltration – In typical developments, we see stormwater being directed to as small an area as possible instead of directing stormwater to various basins.  
Recommendation: Mounding will interfere with drawdown; if distribute half of that volume elsewhere in watershed, then increase chances of having at least one basin that will be working.

Jonathan – Development industry puts devices on least valuable piece of property; highway department seeks out better, coarser material.  
Eban - Observed that most residential infiltration basins vegetated with turf; DOT ones had intended to be vegetated with turf, but in some, saw larger vegetation starting to grow up.  
Bill H - Were basins with wetland vegetation losing infiltration or not?   
Eban – Yes. When they stayed wet, would get mat of algae sitting on soil surface, reducing infiltration rate or sealing surface.

**Infiltration – Group Discussion**Annette – This is the last BMP which is described in the Rules.  
  
**Item #1**  
*Siting – Infiltration systems shall be a min of 30 feet from surface waters; 50 feet from SA waters.*   
Brian L. – What are distances based off of?  
Annette – One reason could be to protect vegetated buffer and keep pollutants out of surface water.  
Bradley – Those have been consistent in the rules since they were put in place. Some is probably related to buffers. Conservative number to make sure we’re not impacting surface waters.  
Boyd – It would be hard to justify 30 feet when we allow someone to discharge from a sand filter right to SA waters.   
Linda – The 08 rules says only BMP you can’t have in the buffer is a wet pond. The requirement to keep 30 to 50 feet away has gone away with the 08 rule.  
Peter – How often do these infiltration systems overflow?  
Mike G - They’re supposed to be offline so will have a bypass.  
Peter – I could see that being a reason for having a vegetated buffer.  
Mike G – Do you have to have a vegetated filter strip for overflow?  
Annette – Yes, but we’ll get to that later.  
Jonathan – Buffer won’t function at 100% in large storm event.  
Peter – I don’t even need 100%; maybe even 50% is worth it. There is issue about sheet flow still though.  
Tim – If law is differing, what needs to change?  
Annette – Anyone want to argue to keep #1 in here?  
Todd M -CRC has 30-foot setback as well. Given what we know about sea level rise, importance of protecting shoreline areas.  
Annette – So you’re arguing to keep, but with alternative for design if want to have it closer?  
Todd M – Yes. Outside of sandy areas, do we know how much subsurface treatment we need to keep it from seeping into surface areas?   
Mike G – So what you’re saying is that we need distance from water so won’t go through sidewall?   
Todd M –Most of our coastal shorelines are eroding; don’t want them too close.  
Peter – How much of hindrance is that from doing these practices?  
Mike G – For a stream or lake, not a problem. But for wetlands, it can be an issue since that can be subjective. That 30 feet can be important.   
Rob W – Why are we discussing this if other rules (buffer,coastal) already in place for some areas? If we have steep banks on a non-buffered stream, this is the right tool to have there. Backwards – having bigger impact is required to move basin further away. Much easier to not have the restriction than to put in place special conditions.  
Jonathan – We’re talking about wetlands, waters. I think it goes to what Rob says. It’s going to be about the shape of the channel and if basin can function. Groundwater in wetland will force design away from wetland. Likewise, we’ve had blue line streams that were farm ditches, and we’ve had to put buffers and not disturb them. We had to BushHog the cotton stalks all way to top of bank, then restore buffers on dug ditches. With this type of thing, you could build infiltration basin within 10 feet of ditch and it would function fine. Very site specific. If we exclude it carte blanche, lose opportunities to use infiltration.  
Bill H – How far down is infiltration point?  
Mike G. – Maybe 3 feet? Sometimes have to build sites up to build it.  
Bill H –Part of the purpose of the buffer is to have flow pass through root zone.  
Jonathan – You have to design them so drain where they’re built and still getting to the water table. Except for storage volume, you want them as shallow as you can.  
Annette – Have to have at least 2 feet for basin plus 2 feet separation from SHWT. Probably won’t have that next to wetland or typical stream; maybe next to incised stream.  
Jonathan – Why do we want to eat up more land for no benefit?  
Mark Senior – No sound justification for numbers we have. Do we keep it in or throw it out and decide things on case by case?  
Bill H – Bioretention systems, which are sandy loam, if you get 2 feet of soil for the water to pass thru, it pulls pathogen-indicating species out. Two feet seems to be sufficient.  
Peter – I feel like we should have something, but it’s too complicated to capture in one or two sentences.  
Annette – We’ll talk about SHWT later, so let’s talk about this more then.  
Todd M – There will be operation and maintenance factors too if you site them close to water.  
Bradley – What about flooding? That could be another reason to have some setbacks as MDC.  
Mike G – If storm surge and everything floods, not treating rainwater. Fact that infiltration basin isn’t working at that time is probably not the biggest issue.  
Jonathan – All we have are vertical issues; no need to worry about horizontal issues. We’re restricting our design arbitrarily. I think we’ve got other things that cover horizontal buffer issues.  
Bill H – I agree with Jonathan – it’s a vertical issue.  
Mike G – The easier you make infiltration to do, the more likely they’ll be to do it, and less likely to do wet pond. Even if it’s not working as well as it should, it’s still better than wet pond.  
Group voted to remove Item #1 (siting distances from surface water/SA waters).   
  
**Item #2**  
*Siting – 100 feet from water supply wells*  
Joe – Propose change from 100 feet to 50 feet for private wells; 100 feet for public wells (to be consistent with other rules). Years ago, someone in Health Dept said that bacteria/viruses would live 100 years and travel 1 foot/yr; that’s how we got 100 feet.   
Bill H – You’ll get what you’re going to get in about three feet based on info from France.  
Joe – Health Department won’t know what you’re talking about with infiltration, so need to keep it.  
Group agreed to change: “. . . minimum distance of 50 feet from private water supply wells and 100 feet from public water supply wells.”  
  
**Item #3**  
*Siting – Bottom of infiltration systems shall be min of two feet above seasonal HW table (see Handout).*  
Mike G – If infiltrate horizontally through non-native material, counting on infiltration going thru sidewalls, would they entertain that? That would work fine depending on material you chose and how much material. Now is not the time to address it, but could be alternative design. Many sites can’t do infiltration b/c of high water table or poor soils, so alternative design could allow this in future.  
Boyd – We like one foot of masonry sand in our sand filters, so someone thinks that’s good enough to discharge to stream.  
Mike G – If you follow similar guidelines for sand filter (Metcalf and Eddy), you’re going to achieve a high water quality, better than typical sand filter. You could site these in areas where you would normally need a wet pond.  
Todd M – Any projects been approved under this to reduce separation from SHWT?  
Annette – If reduce separation, would that take it out of fast-track permitting process?  
Mike G – I don’t see why it couldn’t be fast tracked.  
Todd M – I thought TRW was reluctant to relax it.  
Annette – It’s a big hoop to jump through.  
Mike G – Not particularly easy or inexpensive to go that route.  
Rob W – Other than soil type, how do you prove it before it’s built that you’re going to have mounding?  
Eban – There’s modeling for it.  
Linda – Do we need to put something in here to require mounding analysis?  
Annette – This will refer to our guidance, so don’t need it to be spelled out in the rule.  
Annette – Proposal on table: Keep 2 feet separation, but add TRW guidance: “However, the separation can be relaxed to one foot when the applicant can prove that the water table will subside to its pre-storm elevation in five days or less.”  
Group agreed to keep Item #3 as is and hammer out wording in above second sentence.

**Item #4**  
*Siting – Soils must have minimum hydraulic connectivity of 0.52 inches per hour.*  
Annette – Should we reduce drawdown requirement from 5 days to 72 hours?  
Joe – 0.52 came from conversion from European units and is used by USDA.  
Eban – When infiltrating into soil, may have only 30% porosity, so will need 3 times depth between water table, so rate being drawed down is controlled by lateral area; when you get mounding, takes a lot longer to draw down/recover.  
Jonathan – The lower the number put in, will give people more flexibility to use infiltration. Why do we want to restrict it for no reason?  
Annette – When you’re talking about porosity/having space, if have 3-foot ponding depth, 2 feet may not be enough pore space.  
Todd M – I think your concept of reducing drawdown time is worth considering.  
Joe – Your siting is dependent on hydraulic conductivity. There are places that you have to dedicate open space anyway, so would be nice to use infiltration instead of wet ponds.  
Boyd – Septic tanks don’t have a lower limit.  
Jonathan – Field has to perc though.  
Boyd – Our own division sprays sewage on land at a lower limit.  
Rob W – This is the premise of what low impact development is about.   
Bill H – Whole Foods in N. Raleigh has infiltration rate of 1 inch/hour under parking lot. They could have eliminated the design storm with a third to a quarter the rate we actually had.  
Annette – Should there be min hydraulic connectivity or lower drawdown rate?  
Group agreed to strike through Item 4 all together. Will lower drawdown to <72 hours elsewhere.

**Item #20** *(out of sequence)*  
*Drawdown 2-5 days*  
Bill H – These [infiltration basins] are very much mosquito basins because there is no permanent pool with predators. Mosquitoes are first to arrive, so big reason to restrict drawdown time. I think 2 day bottom limit should be done away with. I think it can be 12 hours to 3 days.   
Group agreed to change five days to 72 hours: “Infiltration systems must be designed to completely dewater to the bottom of the infiltration device within 72 hours after the design storm.”  
  
**Item #5**  
*Siting - Minimum of one foot of naturally occurring soil above the SHWT and another one foot of fill may be provided.*Mike G – If you’re compacting fill in infiltration basin, you have problems.  
Annette – What if you’re putting in infiltration basin in Durham, and they’re excavating clays and putting in sand between top of SHWT and bottom of infiltration basin -- is that okay?  
Mike G – That would be fine.  
Joe – If you take it out, what’s underneath it? If have crappy soil on side, you’ll either have crappy soil underneath or rock. We do know that if we get below into permeable material, it works great. You have to know what’s underneath it.  
Mike G – I’m thinking where you have hardpan, crazy not to dig that out. If water’s not going into ground, and soil scientist tells you you can’t infiltrate past a certain amount, what’s the difference if it’s natural soil or not? Can’t have him do infiltration study in your sand.  
Joe – One foot of naturally occurring soil has to have suitable properties to allow water to move out.  
Tim – I think this was put in there to make sure you had at least one foot below today’s grade.   
Jonathan – This media has to be able to drain. That’s where we’ve got to be. Doesn’t matter one foot, two feet, natural soil, whatever. Focus on soil that drains.  
Peter – If we put in something about bottom layer connected to groundwater -- Or is that too simple?  
Tim – Then we need to remove this item. If it works, it works.  
Jonathan – Same discussion when we remove that criteria for dirt earlier, same thing here. Everything above groundwater needs to be suitable soil. Layer of clay or rock that’s perching this water, we’re just filling voids and not getting rid of any water.  
Peter – You have to have access to groundwater for infiltration basin.  
Joe – In large subdivisions down east, find water table at 30 inches. Have to figure out whole area first and how to disperse water.  
Todd M – Adjacent properties can also be impacted.  
Annette – How about something like this in place of Item #5? “In-situ soils may be removed and replaced with suitable infiltration media if the applicant can demonstrate that natural conditions will allow for drainage of the infiltration device.”  
Joe – Send me that language and I’ll work on it.  
  
**Item #6**  
*Siting – Bottom shall be min of 2 feet above underlying impervious soil horizon or bedrock.*  
Eban – Even more restrictive than SHWT.  
Boyd – Can’t we take it out because of re-worded Item 5?  
Annette – If we lean on Item 5, will every special system need to prove there’s drainage?  
Tim – What’s needed to prove it?   
Jonathan – Does it require anything special? Need to do geotech work anyway. They should be able to determine if meets Item 5 without additional work.  
Joe – Can do hand borings and depending on that, determine if need to do hydroconductivity tests. You can determine if there’s drainage/permeability with any of the material. Don’t need a whole lot of complicated analysis at first.  
Tim – Is it hand boring?  
Joe – It all depends on depth.  
Tim – They don’t have to go all the way to groundwater, right?  
Joe – Most can be done with hand auger which can go up to 15 feet.  
Jonathan – The more marginal the material is, the more money you’ll spend on testing it.  
Tim – That’s the question. If we’re changing it to go deeper, then we’re for status quo on this. If we go to SHWT and 2 –feet above, we’re toast.   
Joe - Most of these don’t have to go that deep, 8 to 10 feet. I do it that deep because the auger’s that tall. You figure does it work first, then figure if you need to test it.  
Group agreed to get rid of Item 6. Reason is because design/Item 5 will take care of it.  
  
**Item #7**  
*Siting – BMP shall be located a minimum of 15 feet down gradient of any structure.*Robert P – Rewrite it that design shall not adversely affect any other structures.  
Tim – What does this have to do with state water quality? Not role of stormwater division for this statement.  
Annette – Here’s what we decided. MDC is required for function, protect water quality, or for TSS removal. Does this meet any of those?  
Boyd – Should we remind engineers about this?  
Annette – We could make it a recommendation or make it more vague like Robert said.  
Joe – Can you put one five feet *up* gradient from a structure? Is there a setback on up side of it?  
Brian L – Would keep homeowners from putting rain garden at downspout of gutter.  
Jonathan – We can’t point out every possible pitfall.  
Linda – We get calls from HOAs, other, how could you permit this? This is why some of these items make it into our Manual.   
Group agreed to make it a recommendation: “The designer should consider the potential impacts of the infiltration device on nearby structures from seepage.”  
  
**Item #8**  
*Siting – BMP shall not be located on industrial sites or designated contaminated land use or activities such as areas subject to frequent oil or other petroleum contamination.*Bradley – We don’t want an infiltration basin in area with contaminated soils.  
Eban – If have industrial site with impervious draining to BMP, if you have a spill it’s going to go to device. So I think it’s about the risk --  
Jonathan – Same thing is true on highways, any area we develop. We’ve built these containment basins on highways and they have not maintained them, so there’s no way to contain a spill.  
Eban – Industrial sites need to have stormwater pollution prevention plan anyway.  
Robert P – Concern is if site is *currently* contaminated.  
Ron H – I don’t like “site.” That implies the parcel which can be several hundred acres. How about contaminated area --  
Jonathan – But if it drains contaminated area --   
Peter – Don’t want to move contamination thru soils, don’t want to pour contaminated surface water into groundwater.   
Eban – The second part should be addressed with NPDES SPPP.  
Rob W – If our stormwater will involve brownfields, urban areas, then you’ll have to think about this.  
Annette – How about this? “BMP shall not be located on areas with currently contaminated soils or in areas where stormwater is likely to be contaminated.”  
Brian L – Who makes determination that stormwater is likely to be contaminated? Put period after soils.  
Group agreed to change Item 8 to “BMP shall not be located on areas with currently contaminated soils.”   
  
**Item #9**  
*Hydrogeologic investigation – should be performed to establish suitability of infiltration device; one test hole per 5000 SF of infiltrating area, min 2 borings per device.*Peter – This seems like more of a recommendation.  
Joe – Testing should be done because they need that information, not because we say so. Put it as recommendation.  
Tom M – How would this work with LID?  
Joe – May need more borings because of how device is oriented. Very site specific.  
Annette – Sometimes we get structural soil support info instead of soil borings info.  
Jonathan – Keep first sentence; eliminate second sentence.  
Tim – But that’s already in the gig that you have to have a report.  
Joe – More of a recommendation.  
Tim – Does it say in state law have to have soil scientist? In SL 2008?  
Peter – Session Law 2008-211 – didn’t see anything with soil scientist.  
Jonathan – Need something other than soil test.  
Joe – Hydrogeological is a specific discipline. We should broaden this. Need a soil investigation to know soil properties such as infiltration, permeability, soil type. Needs a licensed soil scientist to do it. “Hydraulic properties” would cover it. Disciplines can go across each other. Soil scientists can’t design. Geologists can do a soil report, but don’t deal with water.  
 Group agreed to something like: “A site-specific soil investigation should be performed to establish the hydraulic properties and characteristics of the area in which the infiltration device will be sited.”  
*Annette should send language to Joe, and he’ll work on refining it.*  
**Item #10**  
*Drainage configuration*  
Todd M – Are we telling people they can’t do better than the design storm?  
Bradley – They could design something better as an alternative design.  
Todd M – Would it make it more difficult to get approval?  
Peter – I read this as design of project, not design of the storm.  
Robert – Do you need an inline overflow or bypass?  
Mark Senior – Concern is not overloading system and flushing pollutants. Can we drop part about design volume, and say that runoff in excess does not flush through system?  
Linda – What metric would we use to decide that?  
Todd M – To avoid confusion, make it clear we are talking about BMP design, not design storm.  
Annette – The state rules set minimum design storm, but designer may go above that if infiltration rate would allow it.  
Bradley – Maybe we can say that system designed to avoid flushing pollutants thru system; larger storms may be bypassed. Doesn’t say they *have* to be bypassed, just *may* be.  
Annette – Two issues: Can design storm be bigger than state min? *Yes*. Do we always have to bypass storms that are greater than what the system is designed for?  
Rob W – You can have outlet pipe that would take water out of area where it goes back into ground, but it’s catching it before it flushes thru infiltration.  
Brian L – Why do we want to force infiltration systems to be offline when we allow other BMPs to be online?  
Bill H – The only way pollutants get flushed is if water table saturates bottom two feet. I don’t see this being an issue.  
Jonathan – If there’s no great benefit, why do we want to require bypass? Expensive. If we bypass them or let them flow thru device, the pollutants are not going to get flushed out.   
Bill H – Bypass should not be mandatory, although some states require it.  
Jonathan – Need pipe going around basin, could take 50% more land for small devices.  
Tim – Would promote wet ponds. If do bypass, don’t get credit for local pre/post requirements.   
Annette – You will cause more infiltration to happen when raise water level b/c have more head on it.  
Brian L – We’re not storing more, just letting it pass thru. Why do we have this for infiltration basins but not other devices? Recommend we remove it all together.  
Joe – Theory about building a head, that’s going to keep pollutants down in the soil. That is a benefit of having the head in there, at least for a short periods of time. You have same pipe (overflow pipe in biorention); in infiltration pond, have that pipe before the device (bypass).  
Brian L – If I have to do this, wouldn’t do LID.  
Todd M – Let’s strike it.  
Peter – Can’t come up with reason to keep it.  
Group agreed to strike Item #10.  
  
**Item #11**  
Pretreatment – prevent clogging; include filter strips, swales, forebays  
Linda – Infiltration relies on bottom of system staying open. Extends life of basin before having to clean it out. Important especially since eliminating Item 10.  
Tim – Where does it say in rule you have to have pretreatment?   
Brian L – Good practice, but not an MDC.  
Mark Senior – Reality is all these devices will require maintenance. Pretreatment reduces frequency of maintenance. Good idea, but shouldn’t be required.  
Joe – Many will wait for pretreatment to clog before it gets cleaned anyway.  
Jonathan – Pretreatment device not as big as main device; how often does that pretreatment need maintenance? More often?  
Bill H – It depends. Forebays can last a year, some for 30.  
Brian L – If draining parking lot from unstable area, it’s a good practice, but not required.  
Jonathan – If you’re in area where you’ll generate high flows of sediment, pretreatment recommended to elongate periods between maintenance.  
Bill H – Concern that when these are given to property owners, it’s more expensive to clean full basin than pretreatment area. I believe pretreatment is a good idea. I think it makes them work better, even if they’re clogged. It helps with long-term function of devices. Making pretreatment a recommendation and not a requirement is a bad idea.  
Brian L. – What is pretreatment?  
Bill H – Designer can choose swales, rainwater harvesting system, proprietary system. From DOT perspective, swales, filter stripes, forebays.  
Tim – No advantage for doing infiltration then since will make it same size as wet pond. State requirement is 85% TSS removal, then that’s what the device has to be.  
Linda – But it’s a *maintained* infiltration device that gets 85% TSS.  
Tim – But that doesn’t mean you have to do extra stuff because people don’t maintain their devices.  
Linda – But that’s the reality.  
Bill H – A sump might be sufficient depending on size of watershed.  
Mark Senior – Unless we put criteria on what pretreatment means, I think it should be a recommendation only. Up to engineer as to whether it will function.  
Bill H – Benefit of pretreatment if owner contracts with landscaper, they can keep practices running for a longer period of time. Pretreatment is accessible to landscaper – don’t have to be specialized company to take care of it. Other advantage is from the moment device is installed, it will work longer even if it’s totally neglected.  
Peter – Some level of pretreatment helps to get to goal of maintaining device in perpetuity.   
Tim – If nobody’s doing O&M, they shouldn’t have to put something else in for pretreatment. Have one or the other.  
Annette – Pretreatment doesn’t include maintenance. It makes maintenance less costly and easier for end user.  
Bill H – The landscape community can handle majority of pretreatment maintenance tasks.  
Marc H – Will this pretreatment be required if offline?  
Bill – If this practice drains a watershed. It need not take up a lot of space. It can be a two to three foot filter strip.  
Tim – How do you prove what the answer is? Government always makes it bigger.   
Bill – We’ve come up with a simple tool to figure out how big filter strips/swales need to be from a pretreatment standpoint. We need the State to use it and endorse it.  
Bill – Pretreatment not necessary for rooftop-only runoff.  
Group agreed to changing Item #11 to “Pretreatment devices for non-rooftop water must be provided to prevent clogging. Pretreatment devices include items such as sumps in catch basins, gravel verges, screens on patio drains, filters, filter strips, grassed swales and forebays.”

**Action Items**Annette – Send Joe proposed language for Item 5 and Item 9.  
Joe – Will work on language for Item 5 and Item 9.  
Annette –Send Team additional homework in 2 weeks.  
Team – Review infiltration chapter, General MDC#7, and additional homework as assigned.

**Next Meeting – August 25, 2014   
 - Infiltration continued  
 - General MDC#7 (Certification)  
 - Stormwater Wetlands (time permitting)  
- Optional afternoon session – Updating the Stormwater Rules**