Vol #	Section & Page #	Commenting on	Concern, Rationale, basis for comment	Suggestion or Alternative Approach
3	2.2.2 page 2-8 second bullet	Local governments are encouraged to use more detailed local precipitation data as it collects 20 years of data.	If local governments are encouraged to use more detailed local precipitation data as it collects 20 years of data, is there a location in the manual that has instructions for adding this information to the program?	If this information is available in the manual please add a please see section x.x.x
3	2.2.2 page 2-8 5th bullet	last paragraph become should be becomes	typo	change become to becomes
3	2.2.2 page 2-10 2nd full bullet	"The credit given under this option is believed to be too small. Ecology anticipates that future versions of WWHM will include LID moedeling features complete with a user manual that provides modeling intstruction for LIDs where, any credit due will be calculated by the model directly."	Any time the word "believed" is used and a credit is given based on a belief without science and testing to back it up, there is an unknown for engineers and local agencies who may take over roads built by developers. If credits are given to developers on roads taken over by local agencies and too much credit is given the tax payers of our agencies end up paying for the fixes and that is not the right way to do things.	This modification should not be made if this is not studied first to verify the credits given are not too much. Suggest deleting the last two sentences of this bullet, starting at the text in black "The credit given. . .". After it is studied if the credit isn't correct WWHM could be modified to the correct amount either less or more.
3	2.2.3 page 2-12 2nd paragraph	"not deviate by more than 20% on a single event basis", 15% monthly	This should be clarified to make clear this is saying if you compare a pre-developed single event (2 year, 25 year, 100 year etc.) to the same event post developed that it is within 20% increase or decrease not just increase if that is the correct interpretation?	"not deviate by more than 20%, increase or decrease, on a single storm event"
3	2.2.3 page 2-12 last paragraph	"…then the LID performance standard not been met"	typo	should read "… then the LID performance standard has not been met"
3	3.1.2 page 3-12 number 6	For purposes of maintaining adequate separation of flows discharged from adjacent dispersion devices, the outer edge of the vegetated flowpath segment for the dispersion trench must not overlap with other flowpath segments, except those associated with sheet flow from a non-native impervious surface.	Why could the flow of a roof runoff by joined with sheet flow from impervious surface, but not runoff from LID non-native surfaces? I would think pavers, pervious pavements or even native or non-native flow paths that infiltrate should be acceptable	add ", or those dispersion areas that infiltrate before reaching any stream."
3	3.1.2 Page 3-15	Note 3 under design criteria for splashblocks (same as above line)	same as above line	same as above line
3	Landscaping #8, 3-28	...except that no trees or shrubs may be planted on berms meeting the criteria of dams regulated for safety	is meeting the criteria of dams regulated for safety defined?	add reference to a WAC, RCW, or something for this definition
3	3.3.2 page 3-65 2nd para.	At a minimum, pre- treatment for removal of TSS is necessary prior to discharge to the infiltration facility.	Doesn't infiltration remove TSS in some situations? With a long linear impervious surface such as a roadway a bioretention system that allows sheet flow directly into a bioretention swale is probably the best way to treat stormwater runoff, is the slope considered pretreatment as the runoff runs over vegetation?	Return to previous wording including the word typically which would allow direct infiltration in soils with appropriate infiltration rates slow enough to remove TSS
3	3.3.4 page 3-68 1st paragraph	Designs of infiltration facilities for larger projects must incorporate the results of a groundwater mounding analysis as described in Section 3.3.8.	For a two 12' lane road project with 5' shoulders a groundwater mounding study would be required in all projects over 1281 LF. In areas where it is known by a local agency to have no groundwater problems this is a waste of money, our Critical Areas Ordinance for our local agency covers groundwater mounding studies in areas with high groundwater	Exempt out roadway projects when an agency has a critical areas ordinance that already covers requirements for groundwater mounding studies in the areas the agency knows have high groundwater and does not include this where there is no groundwater concerns.
3	Figure 3-71	Estimate Infiltration Rate : Soul Gradation	typo	should read - soil gradation
3	3.3.5 Note 4	Groundwater monitoring requirements: In general, a minimum of three wells per infiltration facility, or three hydraulically connected surface or ground water features, are needed to determine the direction of flow and gradient.	Could there be a size requirement for how many monitoring wells? Is one continuous swale along each side of the road considered one facility? If someone used multiple smaller bioretention facilities why should they need to do 3 for each location versus someone proposing one large pond having 3 wells.	I think 3 per design for road projects or developments under a certain size would make the appropriate information available and over that size more could be required.
3	3.3.6 page 3-78	Initial saturated hydraulic conductivity Infiltration rates can be determined using either a correlation to grain size distribution from soil samples, textural analysis, or by in-situ field measurements, or, if the site has soils unconsolidated by glacial advance, by a correlation to grain size distribution from soil samples.	It is not always feasible or necessary to do in-situ tests. Especially for road projects in areas with gravelly/sandy soils that will disperse and/or infiltrate water, there is historical data showing no high groundwater necessary and there is not water accessible in the vicinity, where there is not 100 square feet of right of way to complete the test, or there is not 100 square feet without impacting a sensitive area or removing trees alongside proposed road improvements in which case the ASTM D 422 test was very useful the way the manual was previously worded.	Keep the option for the ASTM D422 test for roadway rehabilitation, public works maintenance projects, or remodeling projects.
3	Data Analysis 3-84	Apply appropriate correction factors to determine the site-specific design infiltration rate (see Table 3.X).	Didn't have the correct table number	3.7

3	3. Soil Grain Analysis Method 3-85	For each defined layer below the pond to a depth below the pond bottom of 2.5 times the maximum depth of water in the pond, but not less than 6 feet, estimate the saturated hydraulic conductivity in cm/sec using the following relationship (see Massmann 2003, and Massmann et al., 2003)	This sounds like it is for ponds only? It seems to me like if a pond was going at a site it would be one of the easier locations for one of the pit tests, however maybe this is more for determining where a good location for a pond is on a project site?	
3	10. page 3-102 and 3-103	Ecology is interested in receiving comments concerning the minimum size of a project which should be required to do a groundwater mounding analysis. Also, could there be a basis for exempting projects from the analysis if a site exceeded a certain infiltration rate and depth to a restrictive layer (slower infiltrating soil or seasonal groundwater table)? Comments and suggestions are welcome.	For roadway projects that are linear and provide bioretention in swales with spread out infiltration I believe they should be exempt except in areas with high ground water tables. Our agencies critical areas ordinance already requires mounding studies in areas of high groundwater table and I believe their requirements are sufficient.	Make road projects in all except high ground water areas and developments that leave 85% of their property native.
3	3.3.9 A 2 3-104	(2) Input infiltration rate and safety (rate reduction) factor. When using the Simplified Approach, you may enter the estimated initial saturated hydraulic conductivity and the Total Correction Factor as determined using Section 3.3.8; OR, enter the estimated final design infiltration rate after application of the correction factor and a safety factor of 1. For the Detailed Approach, you should enter your preliminary design infiltration rate after completing Steps 1 through 7. Then enter the correction factor for the pond aspect, as noted in Step 8, as the safety factor in the model input,	This refers again to the "pond aspect" for the infiltration rate. This is just more of a comment and maybe as I read more it will become more clear what the intention is, but I am having a hard time determining when DOE is saying it is fine to use the ASTM D422, PIT and small-scale PIT. It seemed like the PIT was necessary for ponds and small-scale PIT for bioretention based on 3.3.6, but it was not clear to me when the soil grain size analysis method was acceptable accoring to DOE	Please clarify
3	3.4.2 3-115 1st paragraph	the designer must perform sufficient pilot infiltration tests to confirm the feasibility of proposed bioretention and permeable pavement sites,	Section 3.3.6 says bioretention can use small-scale PIT, it is difficult to do the PIT with 100 SF of area exposed when going for a height of 6" or so of stormwater runoff in a bioretention swale for a linear project like a road.	Add "Small-Scale pilot infiltration tests or" in from of pilot infiltration tests
3	3.4.2 3-115 2nd paragraph under bioretention/ rain gardens	On a single, smaller commercial property, one bioretention facility will likely be appropriate.	This should also apply to roadway projects with similar soils along the full project limits and if the soils change then additional tests should be required only where there are different soil characteristics	Add, "or roadway project" after single, smaller commercial property
3	3.4.2 3-115 4th paragraph under bioretention/ rain gardens	Long, narrow bioretention facilities, such as one following the road right-of-way, should have a test location every 50 feet. However, if the site subsurface characterization, including soil borings across the development site, indicate consistent soil characteristics and depths to seasonal high groundwater conditions, the number of test locations may be reduced.	On a one mile roadway project with bioretention swales on each side of the road this would require 210 small-scale PIT's. This does not state how much this can be reduced by if you have consistent soil characteristics and would soil borings every 50' be required to show this? There is soil data available and if investigations are done and show the data is accurate (without 210 borings or small-scale PIT's) then it should be possible to do one or two small-scale PIT's per soil characteristic	Revise to say, "Long, narrow bioretention facilities, such as the one following the road right-of-way, should have a test for each location where the subsurface characterization changes". Or soemthing similar to this.
3	3.4.2 3-115 last paragraph	If a single bioretention facility serves a drainage area exceeding 1 acre, a groundwater mounding analysis should be done in accordance with section 3.3.8.	For a roadway project with 2 12' lanes and 2 5' shoulders this is only 1281 LF of roadway before a groundwater mounding analysis is recommended. It seems like it would be more practicle to require groundwater mounding studies based on areas with high groundwater issues versus based on the size of the development	Suggest groundwater mounding studies be done based on high ground water instead of the size of the development
3	Runoff Credit # 7 B-7	Rainwater Harvesting	I thought there were issues with water rights and rainwater harvesting	Make sure this works with water rights issues and if there is potential for there to be a fine for using this LID method it should be explained.
3	7.2.4 C-9	Full dispersion credit (i.e. no other treatment or flow control required) for sites that meet the following criteria:a) Outwash soils (Type A – sands and sandy gravels, possibly some Type B – loamy sands) that have an initial saturated hydraulic conductivity rate of 4 inches per hour or greater. The saturated hydraulic conductivity must be based on (a Pilot Infiltration Test or the Soil Grain Size Analysis method as identified in Section 3.3.6.)	For road projects looking to use full dispersion and there are Type A soils the small-scale Pilot Infiltration Test would be more appropriate than the PIT as the PIT is (admittedly in section 3.3.6) difficult to do with Type A soils and for areas that will have a water level less than 3-4 feet which would be the case for full dispersion	Replace "Pilot Infiltration Test" with "Small-Scale Pilot Infiltration Test"

3	Bioretention/ Rain Garden 3.4.2 3-116	When multiple bioretention facilities with similar designs (i.e., soil depth, ponding depth, freeboard height) will be located on a project site, the drainage areas and the facility sizes may be summed and represented in the runoff model as one drainage area and one bioretention device. In this case, a weighted average of the design infiltration rates at each location may be used. The averages are weighted by the size of their drainage areas.	This is stated in a few places, but unless the infiltration rates are close to one another (maybe within 10% or something), and the groundwater situation is the same or similar at each bioretention location then it doesn't make sense to add them all together and use an average. The extra work involved to size each one individually vs. the errors that could cause issues over the life of the design are not worth allowing this. For example there is a big difference between 6 in/hr and 12 in/hr but both could use bioretention and average in this case (if they are the same size) of 9 in/hr could cause problems after being built at the location of 6 in/hr infiltration.	Do not allow averaging unless infiltration rates and groundwater elevations are such that it makes sense. Even then it is not that much additional work to design each facility using the areas tributary to the facility and the outcome of the design would be much improved.
3	3.4.2 Permeable Pavement 3-116	On residential developments, permeable pavements should be the first choice for subdivision roads and walks, and for private walks and driveways on residential lots. Small-scale Pilot Infiltration Tests (PIT) should be performed every 150 feet of roadway; and at every proposed lot. Tests at more than one site could reveal the advantages of one location over another. However, if the site subsurface characterization, including soil borings across the development site, have consistent characteristics and depths to seasonal high groundwater conditions, the number of test locations may be reduced.	have little to know known fiscally responsible methods for preservation. You can not chipseal a permeable pavement and you can not overlay it because tack coat application would cause an impermeable layer. The preservation costs associated with this (that would be turned over to local agencies upon final subdivision approval) are not something agencies are prepared to deal with at this time. We do not have the finances to replace whole roads with permeable pavements at the time frame when we could chipseal a standard HMA or WMA road. Some test projects should be done before this is a requirement to look at these issues and determine the feasibility. The same environmental (and possibly better in the case of a spill on the roadway) standards could be met in the LID method of bioretention swales and until there is more information on permeable pavements I would like to see the same bioretention requirements for permeable pavements as impervious pavement in case the test cases are covered with impervious pavement at some future date if tests do not show permeable pavement as a viable option for local agencies. This may also cause	Replace this section with the option of doing test cases to gather more information on permeable pavements and their feasibility.
3	B 8 Guidance for flow-related standards B-13	Minimum Requirement #8 specifies that total discharges to wetlands must not deviate by more than 20% on a single event basis, and must not deviate by more than 15% on a monthly basis. Flow components feeding the wetland under both Pre-and Post-development scenarios are assumed to be the sum of the surface, interflow, and groundwater flows from the project site. The WWHM is being revised to more easily allow this comparison.	Surface flow modifications is what should betaken into account.	delete interflow and groundwater flow
3	Min. Req. 5 B-13	then the LID performance standard not been met.	typo	add word has after standard
3	7.7 C-13 to C-16	whole section	Not enforcable. Enforcing this would put an undo burden on local agencies.	Not enforcable, and for road projects clear zone needs to control over LID
3	7.7.3 C-15	Tree Species: Approved tree species are listed in NEED TO FIND THIS LIST AND REPRODUCE IT HERE the City of Seattle Tree List available via link from the SPU GSI web site (http://www.seattle.gov/util/greeninfrastructure).	Add List	Add List
3	7.8 C-16,17	whole section	If native soil is sufficient for hydroseeding in areas that are cleared to meet minimum clear zone, for sight distance or other safety measures hydroseeding should be sufficient	Add a provision for areas cleared for sight distance, clear zone and other safety measures in areas with good native soils
3	7.9.1 C-19	Mulches should be of shredded or chipped hardwood or softwood and should not exceed XX inches thick.	need to fill in the XX, it would be nice to be able to comment on a completed draft. It is hard to comment when not all the sections are complete and when several drafts are out for comment at the same time (both ecology and fisheries) and since they are all in draft form they can change and they do not all match	Complete the addition

3	7.9.4.3 C-23	Ecology is interested in comments concerning whether and which correction factors, as discussed in Section 3.3.6, should apply to the native soils below bioretention facilities. Where a single Pilot Infiltration Test is used to estimate the infiltration rate for one bioretention device, a correction for site variablility seems unnecessary. But where multiple pilot infiltration tests are averaged to estimate the infiltration rate for one long facility (e.g. alongside the road), or for multiple facilities that will be cumulatively represented as one bioretention facility for modeling purposes, should a correction factor for site variability be considered in setting the design infiltration rate below the bioretention?	If PIT's are required every 50 feet as mentioned earlier in the manual for roadside biofiltration then an additional correction factor seems like these two combined items would make any significant road project simply go with a pond design. This combination could have the ability to make bioretention unfeasible for local agencies. I believe the intent of DOE and the local agencies are to use the best method for both the environment and the tax payer, in this case it seems bioretention where feasible would be the best for both interests. However, making the requirements for LID so much greater than a pond would encourage ponds for roadway projects instead of bioretention on some projects	Good engineering judgement and design practices should be used by the engineer to ensure drainage facilities function properly. The number of tests needs to be reduced and a factor of safety is built in with the freeboard on a bioretention swale. Failures of facilities are much more costly to agencies so they do not want to design systems that will not work. Part of this could be corrected by not allowing averaging for multiple bioretention facilities. A continuous swale should be modeled as a single facility for each soil characteristic and should have a design for each subsurface characteristic change. When the soil is similar throughout a project or for large portions of a project a single test should be sufficient.
3	7.10 C-26	Whole Section	I hope there is an opportunity for review once the remainder of the guidance is updated.	Allow review time after this is updated.
5	1.4.3 1-3 2nd bullet	A listing and descriptions are available at Ecology's Emerging Technologies website.	What is the website?	Please give the website link or refer to chap. 12 sect. 6
5	Table 4.5 1st Condition when maintenance is needed	Any trash and debris which exceed 1 cubic feet per 1,000 square feet (this is about equal to the amount of trash it would take to fill up one standard size garbage can). In general, there should be no visual evidence of dumping.	Because 5 was changed to 1 the reference to the equivalency to the garbage can needs to be modified as well	Remove reference to standard trash can
5	page 4-50	Maintenance Standards to be added for newly listed stormwater facility options, including: etc.	This needs to be put out for review before incorporated both for the manual and the permit	
5	5.1 p.4-51	http://www.psat.wa.gov/Publications/Publications.htm	This does not go directly to the publication, you have to go through two other links from this link	A direct link would be more convenient to make sure the appropriate document is referenced
5	5.3.1 p. 5-2	BMP T5.14 Rain Gardens	Should include bioretention as well	include bioretention in list
5	5.3.2 p. 5-2	Sites that can fully infiltrate (see Volume III, Chapter 3) or fully disperse (see BMP T5.30) are not required to provide runoff treatment or flow control facilities. Full dispersion credit is limited to sites (or sub-areas of sites) with a maximum of 10% effective impervious area that is dispersed through 65% of the site maintained in natural vegetation.	Reference to BMP T5.30 Full Dispersion was removed from list of Site Design BMP's just above this, but references for full dispersion still remain in manual	If BMP T5.30 Full Dispersion is removed all references need to be removed
5	5.3.1 p. 5-8	For purposes of maintaining adequate separation of flows discharged from adjacent dispersion devices, the outer edge of the vegetated flowpath segment for the dispersion trench must not overlap with other flowpath segments, except those associated with sheet flow from a non-native impervious surface	I believe this or something similar was also in Volume III and does not make sense that sheet flow from non-native impervious surface is excepted out as runoff that can overlap flowpaths, but runoff from permeable pavement or other LID methods would not be acceptable	Remove or allow native and permeable as well as non-native impervious
5	5.3.1 p. 5.8	For purposes of maintaining adequate separation of flows discharged from adjacent dispersion devices, the vegetated flowpath segment for the splashblock must not overlap with other flowpath segments, except those associated with sheet flow from a non-native impervious surface.	same comment	same comment
5	maintenance p. 5-16	Plans and mulch soil after installation.	Does not make sense	reword
5	BMP T5.15 p 5-17	The design guidance from the Low Impact Development Technical Guidance Manual should be used for design details. Local governments can adopt alternative design criteria. As long as those criteria do not conflict with the critical design criteria identified in Appendix III-C, the permeable pavement may be entered into approved runoff models as indicated in Appendix III-C.	This needs to have draft language available for review before the final comes out	Please allow review time after draft language is written
5	BMP T5.30 Full Dispersion p. 5-22	This section to be completed in the final to identify critical soil, vegetation, topographic, and runoff characteristics that are typical in a native landscape. The purpose is to allow a re-claimed site to serve as the "preserved area" in a full dispersion proposal.	Full section needs to be available for review before final document is put together	Need all information available for review

5	7.1 p. 7-4	Design details regarding BMP T7.30, Bioretention -infiltration swales and planter boxes	missing bioretention cells	add word cell after bioretention
5	General Comment on BMP section	Differences in Volume III and V	Put all BMP purpose, description etc. in same volume instead of making references back and forth. It would be easier to find BMP information and seems like a better organized structure	Organize volumes so BMP information is in Volume III or V, but not mixed between the volumes or with duplicate information.
5	BMP T7.30 p 7-7 to 7-25	Whole Section	Remove duplicate information from Volume III from either this volume or volume III. Possibly have all information for BMP in only one location and reference the other volume	
5	Site Suitability 7-10,11	Site growing characteristics and plant selection: Appropriate plants should be selected for sun exposure, soil moisture, and adjacent plant communities. Native species or hardy cultivars are recommended and can flourish in the properly designed and placed BSM with no nutrient or pesticide inputs and 2-3 years irrigation for establishment. Invasive species control may be necessary.	I could read this two ways, 1) 2-3 years irrigation is not required (by selecting appropriate plants and the rain quantities we get in western wa they won't need it) for flourishment or 2) irrigation is necessary for establishment	If appropriate plants are selected for normal years watering when necessary, but not irrigation should be fine so long as there is monitoring and plants are replaced if plant survivability drops below 70% or some other threshold.
5	p. 7-12	Curb cut width <need recommendation on this>	We have used 1' cuts every 20' in the past and it has worked well, however this was not in a high use parking lot	1' wide curb cuts every 20' on center
5	Bottom Area and Side Slopesp.7-12	• Maximum planted sides slopes: 3H:1V.	This should specify it is for the foreslope coming off the road for presettling of the stormwater before it reaches the bottom of the swale, if in areas of small right of way or large elevation gain in a short distance a back slope of 1.5:1 or 2:1 can be very helpful without impacting the bioretention gained by a 3:1 or flatter foreslope (in most cases it will be at least 4:1 to meet road standards).	Make mention that this is referencing the slope from the pollution generating surface to the bioretention and not from the bioretention to match into native.
5	Determining subgrade infiltration rates 7-24 2nd unfilled bullet	Bioretention swales: approximately 1 small--scale PIT per 50 feet of swale.	This is not realistic for roadway projects, in road projects (often over 1 mile in length) soils can often go quite a distance without much change to infiltration rate. Soil investigation should be able to be conducted every say 250-500 feet and intermediate investigations when there is soil characteristic changes. Then small-scale PIT should be conducted for the different soil characteristics for the project to best use resources and have the best available information to complete the design of the bioretention swale. For a one mile project with bioretention on both sides of the road in a rural area this could require 210 smale-scale PIT which is not realistic for design.	Change this completely to make sense. Same comment on last bullet of Method 2: Soil Grain Size Analysis Method
5	Determining Bioretention soil mix infiltration rate:	Option 1: If using the BSM recommended herein, the default infiltration rate of 1.5 inches per hour or 3 inches per hour may be used. 1.5 inches per hour is used where the drainage area to the bioretention device exceeds any of the following: 10,000 sq. ft. of impervious surface 5,000 sq. ft. of pollution-generating impervious surface ¾ acres of native vegetation converted to lawn/landscaping 2.5 acres of native vegetation converted to pasture.	For a road project it seems as if this should be based on the width of the roadway tributary to the bioretention swale and not the total impervious PGIS or converted area. By this method if an agency added 5,000 sq. ft of road at a time they could use 3 inches/hour and if they add 10,000 sq. ft. of road they can only use 1.5 inches/hour, but if the road width is the same and the biofiltration swale cross section looks the same for both the only difference is the length of road, but the ratio of road to bioretention area required is doubled for the 10,000 sq. ft. project. The infiltration rate used should be based on testing not the total area of a project	
5	last bullet p. 10-6	The first cell must be lined in accordance with the liner requirements contained in Section 4.4.	prefer the previous manual's language	"The first cell may be lined…"
5	Appendix V-B title p. B-1	Hdraulic	Should be Hydraulic	correct typo