Pima County Regional Flood Control District
Comment/Response Summary
Draft Stormwater Detention/Retention Manual

1	**Location/Comment**	**Date Rec'd**	**Name/Contact**	**Response**	**Initials**
2	Entire Manual Justify the text.	6/14/2012	Mike Zeller	Change Pending. The text in the final version of the main body of the manual will be justified. Some of the appendices may remain without justification.	AM
3	Throughout Manual Check appendix references for correctness	8/8/2012	Keith Brann Town of Marana kbrann@MARANA.COM	References checked. Some references are specific to the Riparian mitigation guidelines and are not included in this manual.	AM
4	Throughout Manual Reference illustrations by number and avoid use of reference as the following figure. If photos are included, reference or state purpose.	8/8/2012	Keith Brann	References reviewed and corrected	AM
5	Header: Provide an effective date	5/7/2012	Jerry Curless CMG Drainage jcurless@cmgdrainage.com 520-882-4244	Change Pending. Provide on title page in final version	AM
6	General The manual does not generalize to all of the Town of Marana's circumstances or requirements. Amending language may be required in conjunction with Town acceptance of the manual.	8/8/2012	Keith Brann	Revise Introduction to include other floodplain management codes and change authority to Floodplain Administrator throughout.	AM
7	General: There are no methods for determining if a project is located near enough to a major watercourse to qualify for a waiver.	6/14/2012	Mike Zeller Tetra Tech mike.zeller@tetratech.com	Criterion 2 and example problem from the current manual will be included.	AM
8	General: There are no equations for estimating detention volume for site planning purposes.	6/14/2012	Mike Zeller	Equation 3.4 from the current manual will be included.	AM
9	General: The methods for computing peak discharge reduction due to stormwater harvesting basins are convoluted and burdensome.	6/14/2012	Mike Zeller	Clarification added in Section 2.2, Appendix F, and Appendix G. Additional clarification will be inserted to emphasize that stormwater harvesting is optional. The method for stormwater harvesting factors is essentially selecting a value from a table, which is very similar to the basin factor methods in the current PC-Hydro manual. For hydrograph modification, a spreadsheet is provided to perform the calculation. Performing calculations for stormwater harvesting is optional (all first flush and peak reduction may be met using a detention basin, and any stormwater harvesting basins are not required to have the peak reduction calculated). The method for stormwater harvesting basins provides an additional method to reduce peak discharges and is not mandatory.	DS
10	General Consideration of the appropriate requirements for detention and detention waivers for cluster developments is needed.	8/8/2012	Keith Brann	No Change yet. With this manual, appropriate location of first flush retention will apply to cluster and traditional developments. Detention requirements consider downstream pre- and post-developed conditions peak discharges. Demonstration of compatible conditions for either cluster or traditional development is required. It is	AM

				possible that a cluster development could meet the "other engineering justification" criterion for a waiver.	
11	General Permeable pavements may require maintenance and rehabilitation. These activities do not require a permit and could be problematic.	8/8/2012	Keith Brann	Comments on permeable pavements will continue to be collected. The intent of this manual was to encourage use of permeable solutions where feasible. The intent is to promote use of gravel over asphalt or pervious pedestrian paths over concrete or asphalt, for example, where feasible and in accordance with grading/paving standards. Use of engineered permeable pavements requires revisions to transportation and paving/grading standards; therefore, this manual cannot dictate use where not acceptable to other departments and jurisdictions.	AM
12	General Balanced and Critical Basin criteria should be reviewed.	11/1/2012	Mike Zeller	The District will review critical basin designations and will revise the designations where appropriate.	AM
13	General Policies and a List of Symbols are not included up front.	11/1/2012	Mike Zeller	Policies have been included within topic chapters. A List of Symbols will be provided with the final draft.	AM
14	General The draft manual does not include critical elements from the approved manual: A procedure for determining whether property location within a watershed justifies a detention waiver. A Retention Feasibility Map & Depth to Groundwater Map. Table 3.1 with uniform precipitation depths. Calculation procedures for detention and retention are more complicated. Sedimentation calculation. Nothing to address piggyback storms.	11/1/2012	Mike Zeller	 Criterion 2 and example problem from the current manual will be included. Retention will be restricted to 9" maximum depth. It is not anticipated that significant recharge will occur. Most retained water will be removed by evapotranspiration. Extensive use of PC-Hydro allows ready access to rainfall depth. Retention is multiplication. TR-55 curve is used to account for routing factors. Stormwater harvesting is optional. Where flow directed to detention basins emanates from predominantly natural areas, sediment basins will be required. Supporting engineering calculations shall be provided by the design engineer. The approved manual does not require piggyback design. The new manual will not increase the requirement.	AM
15	Section 1.1 Does the manual require BOS approval? Skeptical that first flush provides any flood control benefit. Clear water scour remains an issue.	6/14/2012	Mike Zeller	No Change. Yes. The stormwater harvesting factors are provided to assess peak discharge reduction in distributed, shallow basins.	AM

				Acknowledged.	
16	Section 1.1 Language needed to address use by other jurisdictions.			Revise Purpose to read: The purpose of this manual is to provide guidance, design standards and policy direction when runoff detention and retention systems are required for development throughout Pima County. This manual is a supplement to, and has the same regulatory authority as, the Pima County Floodplain Management Ordinance, Title 16 of the Pima County Code, INSERT OTHER FLOODPLAIN MANAGEMENT CODES HERE. Since adoption in 1987, the Stormwater Detention/Retention Manual has required runoff detention systems to: MAKE CONFORMING CHANGES THROUGHOUT TO REFER TO FLOODPLAIN ADMINISTRATOR.	ES, AM
17	Section 1.2, item 1 Is there a threshold project size which is not subject to the requirements?	6/14/2012	Mike Zeller	Discussion ongoing. Marana to provide suggestions. All projects include retention. Applicant can submit a Detention Waiver request.	AM
18	Section 1.2, item 2 Meet detention at all concentration points?	5/7/2012	Jerry Curless	Yes, all concentration points at project boundaries. Clarified.	AM
19	Section 1.3 Recommend applying standards to regional basins. Distinguish between stormwater harvesting and detention basins. Clarify that individual lot harvesting is allowed but not counted toward peak discharge reduction.	6/14/2012	Mike Zeller	No Change. The District continues to distinguish between basins provided for private development and regional detention basins. The manual states that individual lot harvesting is allowed and encouraged, but facilities on individual lots are not included in peak discharge reduction calculations.	AM
20	Section 1.5 Are the LID practices proposed tailored to a semi-arid environment?	6/14/2012	Mike Zeller	No Change. The LID practices included were chosen after a review of practices promoted by other jurisdictions in the Southwest.	AM
21	Section 1.5, paragraph 7 Define all new development	5/7/2012	Jerry Curless	Section 2.1 revised.	AM
22	Section 1.5 , following paragraph 7 Clarify relationship between LID and threshold retention	5/7/2012	Jerry Curless	Removed references to threshold; this is new.	AM
23	Section 1.5, paragraph 8, following item 7 Clarify how to quantify LID flood control benefits, address default time of concentration in PC-Hydro	5/7/2012	Jerry Curless	LID practices with quantifiable flood control benefits identified.	AM
24	Section 1.8 Clarify what type of modeling was conducted.	6/14/2012	Mike Zeller	This modeling occurred prior to any work on revising the manual. It was an attempt to have some confidence that detention within individual developments as a general practice reduces peak discharges on a watershed scale. Because the modeling was preliminary to this draft, references to it have been removed.	AM
25	Section 2.1 Does the District have the legal authority to regulate non-regulatory flows?	6/14/2012	Mike Zeller	No Change. The District has and will continue to regulate non-regulatory flows.	AM

	Why must all development include first-flush retention?		Keith Brann	Marana to provide alternative criteria and/or waiver criteria	
26	Section 2.2 Clarify if basins are part of disturbance.	5/7/2012	Jerry Curless	Basins are part of disturbance.	AM
27	Section 2.2 Bases the first flush retention volumes on soil type but then regulates based on whether an area is in a riparian area. Wording could be added to reflect regulation based on soil type, in accordance with NRCS mapping, where no defined riparian mapping exists within a jurisdiction.	8/8/2012	Keith Brann	Suggestions: Change second column title: Riparian area and other highly permeable soils, OR other resource areas OR ? Suggestion: Provide values in the table for B, C and D soils Marana to provide more input.	DS
28	Section 2.2 Could be enhanced to be made more flexible by allowing geotechnical investigation of infiltration rates to determine soil type and or infiltration rates. First flush retention volume requirements could also be based on this information.	8/8/2012	Keith Brann	Suggestion: Unless site-specific testing shows otherwise, the following table shall be used.	AM
29	Section 2.4 Why not allow on-lot water harvesting facilities to count toward project detention/retention requirements?	11/1/2012	Mike Zeller	No Change. It is not feasible to monitor whether facilities are operable as designed.	AM
30	Section 2.4.2 There appears to be a contradiction in continued conveyance" but "no outlet". Clarify that there is no outlet structure other than the basin top. Section 2.4.2 should require that roadside basins be constructed in accordance with geotechnical report recommendations and that utilities trenches that normally occupy this area be considered as part of these recommendations.	8/8/2012	Keith Brann	Clarified continued conveyance. The design of the roadside basin is to include appropriate elevation of the inlet and ponding depth so that water will follow the path of least resistance when the basin is full; that is, it will flow down the road rather than flowing into the ponded elevation. Locating a roadside basin at a low point would be inappropriate because the flow might continue to be directed into the basin. No change yet about geotechnical reports. Typically, projects provide one, and all aspects of the site should be evaluated by the geotechnical engineer. Added utilities as a consideration in basin layout. Will add language about public rights-of-way.	AM
31	Section 2.4.1 Outlet elevation of stormwater harvesting basins some storm event?	5/7/2012	Jerry Curless	No Change. No. Lowest outlet elevation.	AM
32	Section 2.4.3 Inconsistent with 5.3.4	5/7/2012	Jerry Curless	Added language and called out Types 1 and 2.	AM
33	Section 2.4.4 Who maintains the sediment trap? Who inspects and enforces?	8/8/2012	Keith Brann	No Change. The Owner is responsible for maintenance as discussed in Chapter 5.	AM
34	Section 2.4.5 Where are the periodic maintenance requirements defined?	8/8/2012	Keith Brann	Section re-worked to be a more general introduction to retention. Details found in Sections 5.6 and 5.7.	AM
35	Section 2.4.5, following paragraph 3	5/7/2012	Jerry Curless	All watersheds, demonstrated at downstream limit.	AM

	Clarify if all project watersheds have to have first flush. Is there some lower size of watershed that doesn't?			Section 2.1 revised.	
36	Section 3.3.1 Clarify if harvesting volume in detention basins is allowed or prohibited from being included in detention routing. Clarify PC-Hydro runoff volume to use in calculations	5/7/2012	Jerry Curless	Clarified that retention within detention is part of detention routing but not part of peak discharge rate reduction for stormwater harvesting basins. Use volume under the hydrograph.	AM
37	Section 3.3.1 Recommend using equation instead of table. Recommend putting the table in the Appendix. Section 3.3.1 should include an example problem to help clarify what each term refers to. Reference to an Appendix where an example problem has been performed would be helpful also.	6/14/2012 8/8/2012	Mike Zeller Keith Brann	No Change. Equation is available in Appendix D Added a reference to Appendix F.	DS AM
38	Section 3.4 The Town is concerned with the mandate to maximize LID practices.	10/16/12	Keith Brann	Wording changed to remove mandate.	AM
39	Section 3.4.1, paragraph 5 Justify mandating type of software for detention routing.	6/14/2012	Mike Zeller	The District requires standardization of methods for consistency across projects. Reviewer proficiency is required and not possible when software not available to the District is utilized. Other software may be accepted on a case-by-case basis.	AM
40	Section 3.4.1, paragraph 6 What are the new methods for estimating required detention volume to replace the old manual Chapt. 3 manual equations (Eq.3.3, 3.4 & 3.5)?	5/7/2012 6/14/2012	Jerry Curless Mike Zeller	Equation 3.4 from the current manual will be included.	AM
41	Section 4.1 Basin modification should require a Floodplain Use Permit			Add that any modification of a basin that would affect volume or performance requires a floodplain use permit.	ES
42	Section 4.2, item 3 Is on-line detention allowed? Why not allow on-line detention for regulatory flows with sufficient engineering justification?	5/7/2012 6/14/2012	Jerry Curless Mike Zeller	No change. On-line detention is allowed for non-regulatory flows. The District is not in favor of construction of berms or other impoundment structures within regulatory floodplains.	AM
43	Section 4.2, item 4 Is parking lot detention/retention allowed? The Town does not wish to prohibit parking lot detention. This also represents a tightening of the current allowances in the existing manual. Note that section 5.3.4.7 for non-contributing area basins allows parking spaces and PAALs to pond water.	5/7/2012 6/14/2012 8/8/2012	Jerry Curless Mike Zeller Keith Brann	Change. Delete this prohibition. Prohibition has been deleted.	AM
44	Section 4.3.1, item 1 Is "immediately downstream" a guide or requirement? Does this prohibit a basin surrounded by new development? Requires that basins be immediately downstream of new development. Would a scenario where the basin was	5/7/2012 8/8/2012	Jerry Curless Keith Brann	Changed to downstream. Change to allow upstream basins.	AM

	upstream of the development, and the discharge from the upstream basin could be used onsite through a cascade of vegetation in a LID situation not be acceptable? This is harvesting upstream stormwater for onsite use and getting credit for it on the retention side. Section 4.3.1 and figure 4.1 may need to reflect a concrete toe down depth and width relative to the inlet flow width and velocity that protects the soil underneath the concrete inlet weir from eddies or vacuum forces created when water at higher velocities passes from an impermeable surface such as a street to a erosive area such as a detention/retention basin. Clear water flow conditions tend to provide a suction effect at inlet weirs or scuppers and lead to eventual sink holes under streets. Hand set or dumped rip rap has not always been successful in preventing this type of soil suction. It is recommended that such a toe down extend 5 feet on either side of a basin inlet (ie. The width of a single sidewalk panel) and extend 18 to 24" deep below the inlet to prevent nuisance erosion.			No change yet. Evidence for toe downs at inlets was not observed on field visits. Width of riprap appears to be important. A standard for width may be included after further review. Typically, the District requires the drainage design width of 3 x the inlet width, based on the Drainage Design Standards.	
45	Section 4.3.1, Figure 4.1 Figure 4.1 does not comply with section 4.3.1.3: The 10 foot dimension should be from the toe of the slope, not the top.	8/8/2012	Keith Brann	No Change. The setback is intended to allow access. Access could occur on top of riprap, but the intent is to avoid access immediately on top of structures.	AM
46	Sections 4.3.2 and 4.3.3 I would like to see some stronger language regarding lack of maintenance or modification of basins without a floodplain use permit being citable as violations of the floodplain code.	8/8/2012	Keith Brann	Change to require a floodplain use permit.	AM
47	Section 4.3.3 Item 1: Too restrictive Item 2: Too restrictive Should be expanded to indicate that inlets and outlets shall not direct flow over any pedestrian way. This would include decomposed granite, asphalt paths, soil cement and sidewalks. Item 4: Should be allowed with prior approval.	6/14/2012	Mike Zeller	No change. Basin function is not preserved when inundated during the 100-year event. Change to 10-year shall be directed under the sidewalk. Other pedestrian pathway added. Added.	AM
48	Section 4.4.1, Item 5 Explain change from previous standard of 4:1 Is there a basis for reducing the allowable basin slope from 4:1 to 8:1 before a security barrier is required? This will create either a glut of fencing or overly large basins.	6/14/2012 8/8/2012	Mike Zeller Keith Brann	Changed to previous standard.	AM
49	Section 4.4.1. Section 4.4.1 should have an added restriction that detention basins constructed adjacent to regulatory washes with embankments shall have bank protection and scour protection one foot below scour depth where the toe of the	8/8/2012	Keith Brann	Section 4.3.3 prohibits location of a basin within a regulatory floodplain, except for sheet flooding areas Language added to include erosion protection for sheet flood areas.	AM

	embankment is below the regulatory stormwater surface elevation of the regulatory wash. Bank and scour protection should extend past the erosion hazard setback of the wash as measured from the regulatory floodplain limits. This is partially addressed by Section 4.11.1, item 7 and Section 9.3, item 10.			Discussion needed on erosion hazard setback.	
50	Section 4.4.2, Item 1 Who performs the annual inspection?	8/8/2012	Keith Brann	No Change. The inspection is at the discretion of the property owner. If an enforcement action related to maintenance is undertaken, records of the inspection will be requested.	AM
51	Section 4.4.2, item 2 Make consistent with Section 5.4	5/7/2012	Jerry Curless	Changed to 6" from as-built elevation for detention basins; 1" for stormwater harvesting basins	AM
52	Section 4.4.3 What is the basis for reducing the maximum ponding depth from 10 feet to 6 feet? This would not appear to improve the safety of challenged individuals. The Town would prefer to see a table of allowable depth related to required fencing or other treatments.	8/8/2012	Keith Brann	No Change. Because de-centralization of detention basins is being encouraged and the previous manual required benching for basins in excess of 6 feet deep with a wide bench required (that is, to get the extra 4 feet of depth, with one bench, a 12-foot wide bench is required) it is the District's position that the goal of reducing excavation and footprints of basins is compatible with a maximum depth of 6 feet. One Pima County project since 2005.	AM
53	Section 4.5.1, items 1 and 2 How is drain time calculated?	5/7/2012	Jerry Curless	No Change. The outlet design provides for outflow within the required time; ponding enforcement may be required as a practical matter	AM
54	Section 4.5.2, Item 1 Define storm event	5/7/2012 8/8/2012	Jerry Curless Keith Brann	Change to significant storm event.	AM
55	Section 4.6.1, item 1 Bottom slope to outlet when retention?	5/7/2012	Jerry Curless	Changed to clarify. Ponding allowed; positive drainage slope for detention basins without retention; no positive drainage pipe since maximum retention is 9"	AM
56	Section 4.6.3 The prohibition of decomposed granite in the bottoms of basins will be difficult to support in the Town. Is there a performance issue with the standard ¾" rock used regionally?	8/8/2012	Keith Brann	No Change yet. The performance issue noted for decomposed granite is the reduction in permeability of surfaces with this type of treatment. 4" is a place holder for minimum rock size as a size assumed to be not subject to dislodging by flowing water.	AM
57	Section 4.7.1, Please clarify: what distinguishes a positive drainage pipe from an outlet orifice?	5/7/2012	Jerry Curless	Positive drainage pipe removed.	AM
58	Section 4.8.1, item 1 (now 4.7.1) Please include explicit treatment for slopes flatter than 3:1 ARU's on 1:5:1	5/7/2012 6/14/2012	Jerry Curless Mike Zeller	Table revised.	AM
59	Section 4.8.1, Item 7 (now 4.7.1.6) Wall design can be by registrant other than structural	6/14/2012	Mike Zeller	Removed the restriction.	AM
60	Section 4.8.3, item 1 (now 4.7.3.1) Please consider allowing some free-standing walls with limits on impoundment depths (say 2') and basin volume	5/7/2012	Jerry Curless	No change. No free-standing walls for detention basin sides will be allowed.	AM
61	Section 4.8.3, Item 2 (now 4.7.3.2)	6/14/2012	Mike Zeller	Changed to allow with prior approval.	AM

	Add prior approval condition for more flexibility What is the reason for prohibiting retaining walls greater than 4 feet?	 8/8/2012	 Keith Bran		
62	Section 4.8.3 (now 4.7.3), Item 4 and 5.5 How often shall the invasive non-native plants be removed?	8/8/2012	Keith Brann	No Change. The schedule is at the property owner's discretion. Presumably plant control will occur during regular landscape maintenance. Property owners may have different schedules, and some properties may require more frequent removal than others.	AM
63	Section 4.9.1, item 3 Do the scuppers need to be designed to convey a certain return period storm, e.g. 10-yr? Section 4.9.1, item 3 should reflect all pedestrian way crossings. See comment above regarding section 4.3.3, item 2.	5/7/2012 8/8/2012	Jerry Curless Keith Brann	Revised to 10-year. Changed to include all pedestrian pathways.	AM
64	Section 4.9.1, Item 4 Size creates access issues	6/14/2012	Mike Zeller	Revised to 12 inches.	AM
65	Section 4.9.1, Item 5 "downstream" appears confusing	6/14/2012	Mike Zeller	Removed.	AM
66	Section 4.9.2, 4.17.2, 4.19.2 Provide guidance as to what constitutes a storm event which triggers the maintenance inspection.	10/16/12	Keith Brann	Change to significant storm event.	AM
67	Section 4.11.1, item 4 95% of max Modified Proctor is a tough density spec. The Pima Co Std Specs call for 95% of applicable ADOT Materials Testing Manual method for embankment fill compaction. Suggest changing to 95% Standard Proctor or revising language to be consistent with Pima Co Std. Specs.	5/7/2012	Jerry Curless	Changed to Standard Proctor.	AM
68	Section 4.ll.1, item 6b Section 4.11.1, item 6b seems to conflict with figures 4.9 and 4.4.	8/8/2012	Keith Brann	Figure 4.8 revised.	AM
69	Section 4.11.1, item 6,d Clarify basin overflow Specify storm of 500-year, 1000-year	5/7/2012 6/14/2012	Jerry Curless Mike Zeller	Revised to clarify100-year basin design outflow, no routing required. No change at this time; would lead to possibly excessive widths for the overflow weir.	AM
70	Section 4.14.1, Item 2 Registrant other than structural can be qualified	6/14/2012	Mike Zeller	Remove reference to structural.	AM
71	Section 4.14.1, Item 5 What is justification for 1.5 storage volume for underground storage?	11/1/2012 8/8/2012	Mike Zeller Keith Brann	Suggestion: One foot of freeboard from 100-yr WSEL to outlet.	AM
72	Section 4.14.1, Item 8 This item states an engineer should prepare a report; then adds that a geotechnical should provide a certification; therefore, two engineers would have to be involved. Is this necessary?	11/1/2012	Mike Zeller	Removed reference to geotechnical.	AM
73	Section 4.15 (now 4.14) Is there a need to require permission for underground detention?	8/8/2012	Keith Brann	No Change The District does not encourage the use of underground systems and is requiring a pre-submittal review to	AM

				assure that underground is the feasible option and that standards can be met for a particular site.	
74	Section 4.15.1.6 (now 4.14.1.6) Could be better communicated with a diagram or figure. Does it mean that the lid on the underground storage tank or disposal structure shall be 12" above the crown of the inlet pipe and that any building foundations will be 25' away from the underground storage structure with a minimum 2% drainage slope (of the inlet pipe) towards the underground storage structure? - See comment 31.	8/8/2012	Keith Brann	No Change The ordinance language for this requirement was used. An attempt to illustrate the elevation and setback requirement is provided in Figure 4.11. The basin inlet would generalize to underground or above-ground. Added reference to Figure 4.11.	AM
75	Sections 4.15,1.6, 4.16.1.3, 4.17, Figure 4.12 It appears that sections 4.15.1.6, 4.16.1.3, 4.17 and figure 4.12 should all be reconciled into one uniform requirement ("The minimum setback of a structure from a basin shall be 25 feet").	8/8/2012	Keith Brann	No change. The manual is sometimes repetitive to cover items within a section. The standard here also includes the elevation at a minimum slope of 2%.	AM
76	Section 4.17, Item 2 (now 4.16, Item 2) Section 4.17, item 2 precludes submersible pumps from being less than 1 foot above the 100 year water surface elevation. By definition these pumps are submersible. Why prohibit them below the 100 year water surface elevation?	8/8/2012	Keith Brann	No Change. The wording of this item is "excluding" pumps, not "including". You are right, the submersible is submerged.	AM
77	Section 4.21, now Section 4.20 If drywells are the sole method of outflow, then the basin must be sized to fully contain the base flood hydrograph without outflow (current manual requirement 3.5.5.4). The Town has for several years required basins with drywells to have the basin floor sloped into "zones" similar to a parking lot to assure that all wells are utilized for lower water levels. Per ADEQ, multiple drywells should be spaced a minimum of 100 feet apart, 20 feet or more from the basin inlet and raised 3 inches above a landscaped basin floor. The Town requires retesting and if necessary cleaning of drywells compromised by silt infiltration during construction.	8/8/2012	Keith Brann	Section will be re-written to include basins with drywells, noting slope to drywells, 100-year storage volume Item 3 requires conformance to ADEQ guidelines. Marana will provide protocols.	AM
78	Section 5 Section 5, page 55 requires the planner to identify hydrologic features including existing flow paths, areas with high permeability soils, riparian areas and other areas with high biological resource value. Identification of areas with high permeability soils should be better defined.	8/8/2012	Keith Brann	Changed to say "higher" permeability soils. This introductory language is intended to be a general guide to site design and to encourage location of new impervious on any areas that may have been previously compacted rather than undisturbed areas, for example.	AM
79	Section 5, fifth paragraph Clarify what is maximum use of LID	5/7/2012	Jerry Curless	Phrase deleted.	AM
80	Section 5.1 This section, especially numbers 2,3,4, does not provide quantifiable methods. Is this guidance or policy?	5/7/2012	Jerry Curless	Discusses general requirement, no change yet.	AM
81	Section 5.1, Item 4 Placement of features should be decided by design team.	11/1/2012	Mike Zeller	No change yet. Intent is to require location of practices within project subwatersheds and not have all at the most downstream point.	AM

82	Section 5.3.1 Roadside basins should require ROW permissions			Add language about ROW permission, utility constraints and other location constraints	AM
83	Section 5.3.1, Item 6 Rip-rap not suitable for slopes steeper than 3:1. Why is the OK for stormwater harvesting basins?	11/1/2012	Mike Zeller	No change. Stormwater harvesting basins are about a foot deep. "Rip-rap" will consist of one rock placed up against the soil. The intent is to protect earthen slopes steeper than 3:1.	AM
84	Section 5.3.1.8.b.i and 5.3.1.9.b.1 Should this reference be to a D50 size of 4 inch?	8/8/2012	Keith Brann	No change. The intent is to require minimum 4-inch.	AM
85	Section 5.3.1, item 9 (now Item 8) Clarify criteria for overflow structures for water harvesting basin, such as water depth, width of weir, etc. 4-inch rock is small for steep slopes, may be removed	5/7/2012 6/14/2012	Jerry Curless Mike Zeller	Detail provided about overflow outlets. Call it minimum.	AM
86	Section 5.3.1, item 9, b, ii (now Item 8) Figure does not show case of flow to pavement	5/7/2012 8/8/2012	Jerry Curless Keith Brann	Figure revised.	AM
87	Section 5.3.1, Item 10.a. (now Item 9) Description of the 3" minimum measurement being taken to the lowest finished grade adjacent to each cell does not seem to match figure 5.1 (2).	8/8/2012	Keith Brann	A figure will be added before final version, if this provision as is is accepted by other reviewers.	AM
88	Section 5.3.2, Item 2.c. Why a 2-foot maximum curb opening and not designed for a Q?	6/14/2012	Mike Zeller	No change. Intent is to provide minimal water to roadside basins while maintaining overall street drainage design.	
89	Section 5.3.3, item 3 Which criteria controls?	5/7/2012	Jerry Curless	Detail added about curb openings for roadside basins.	AM
90	Section 5.3.4 Clarify minimum depth for Non-Contributing Area Basins	5/7/2012	Jerry Curless	Minimum depths called out and shown on figures.	AM
91	Section 5.3.4, Item 6 What is the rationale behind 2:1 ratio?	6/14/2012	Mike Zeller	No Change. A drainage area larger than 2:1 does not ensure complete retention of 3" rain for 9-inch ponding depth without additional calculations.	DS
92	Section 5.3.5 Why provide detailed standards?	6/14/2012	Mike Zeller	No change. Where practicable, the manual provides minimum standards obtained from a review of LID literature; alternative designs can be submitted for review.	AM
93	Section 5.3.6, first paragraph, second sentence Clarify retention within detention and where vegetation is acceptable	5/7/2012	Jerry Curless	Retention within detention separated from stormwater harvesting basins because retention within detention affects detention routing; stormwater harvesting basins are upstream of detention basins and factor into peak discharge rate reduction through the stormwater harvesting factors developed by RFCD; vegetation language revised and figure revised	AM
94	Section 5.3.6, item 1 What about concerns about West Nile virus?	6/14/2012	Mike Zeller	No change. Retention depths which resulted in extended ponding were generally several feet. Nine inches of ponding will rapidly dissipate due to infiltration and evapotranspiration. If ponding is not removed within the storage times, amendments to the basin can be enforced.	AM
95	Section 5.4 Is maintenance warranted for just 1 inch of sediment?	6/14/2012	Mike Zeller	Maintenance requirement will be changed to "maintain design volume."	AM

96	Section 5.6 Increase allowable velocity to 4 fps.	6/14/2012	Mike Zeller	The allowable value will be 2 fps, unless a project site soils sieve analysis and engineering justification to use a higher value are submitted. Acceptable engineering justification shall be based on acceptable methods such as those provided in FHWA's Highways in the River Environment or adopted by NRCS. Tables 3.4 and 3.5 in FHWA's Highways in the River Environment include several values of nonscour velocities below 4 fps. From the USDA/NRCS Soil Survey of Pima County, Arizona, Eastern, Part 1, approximate average values for D_{50} = 2 mm and D_{75} = 3.5 mm were determined for soil units comprising 73% of the survey area. Calculating the critical velocity by Equation 3.48 of the HIRE manual results in a critical velocity of 3 fps, assuming $D_s = D_{75}$ = 3.5 mm and depth of flow = 3 feet. The Pima County Drainage and Channel Design Standards for Local Drainage assumes D_{75} = 4mm, while the value can range from .4 mm to 2mm for soil units comprising 40% of the survey area. Assuming D_{75} = 4 mm in the Pima County method in the example provided on page V-12, returns an allowable velocity of 2.2 fps for sediment-free flow, The allowable velocity for this example is reported as 4 fps for sediment-laden flow. Because the D_{75} of many project soils is expected to be less than 4 mm, and because most flows from developed, impervious areas are not sediment-laden, it is expected that the Pima County method will return a value of allowable velocity less than 4 fps. The HIRE method is expected to return a value less than 4 fps as well.	AM
	Figure 5.6 shows terracing where a minimum bottom width of 4 feet is required. The terrace detention basin floor does not have a minimum terrace width called out. Should something be called out as a minimum?	8/8/2012	Keith Brann	Callout has been added for retention bottom. Open to input on minimum terrace width.	
97	Section 6.1.1, item 3 Scupper design too conservative.	6/14/2012	Mike Zeller	Changed to 10-year event.	AM
98	Section 8.1, item 1, c No equations for location within watershed	6/14/2012	Mike Zeller	Criterion 2 and example problem will be included.	AM
99	Section 8.1, item 2 Measured how?	5/7/2012	Jerry Curless	Will clarify that the requirement for all projects refers to First Flush Retention. Marana may provide input on exceptions to First Flush.	AM

100	Section 9.2, next to the last paragraph Distinguish between a LID swale and a non-LID swale	5/7/2012	Jerry Curless	More detail about LID swales added.	AM
101	Section 9.2, Item 2b Section 9.2, item 2b should include proposed wildlife corridors such as those found in draft and final Habitat conservation plans.	8/8/2012	Keith Brann	Reference to natural areas added.	AM
102	Section 9.2, Item 4 Should include a requirement that the basin IDs used in the summary tables match the IDs on the development plan, preliminary plat and improvement plans as well as calculations contained in an appendix dedicated only to detention/retention analysis and design. Other drainage related calculations should be contained in a separately labeled appendix.	8/8/2012	Keith Brann	Description requirement added. In the District's Technical Policy 114 which states requirements for Drainage Reports, a separate section for detention/retention is called out, but the policy does not explicity state that the calculations shall be in a separate appendix. The policy will be reviewed and revised as necessary after the adoption of the new manual.	AM
103	Section 9.2, Item 5 should also require the provision of the thickness at the top and base of any embankments.	8/8/2012	Keith Brann	No change. Per Section 5.3.1, Item 5, stormwater harvesting basins shall be constructed below grade.	AM
104	Section 9.3, item 5, b Section 3.4.1 stated that HEC-1 was also suitable.	5/7/2012	Jerry Curless	No Change. HEC-HMS is standard usage for training and modeling at the District.	AM
105	Section 9.3,end of item 5 Why not open this up to allow other commercially available detention routing software	5/7/2012	Jerry Curless	No Change. Software limit for consistent results and because RFCD does not own some of the products	AM
106	Section 9.3.7 The Town would like to see any required fencing shown.	8/8/2012	Keith Brann	Added.	AM
107	Section 10.1.2.1 Define "engineered basin side".	8/8/2012	Keith Brann	A definition has been added to the Glossary.	AM
108	Section 10.1.3, Item 9 (now Item 8) Should clarify what preliminary design means for a retaining wall. Does it mean a full design stamped preliminary instead of sealed? Does it have the concrete type and dimensions shown? Does it show the rebar and tie sizes, grade of steel and placement? Does it need to discuss pre-stressing specifications?	8/8/2012	Keith Brann	At a minimum, the wall and footing dimensions shall be provided. Material specifications not required. The engineer providing the dimensions shall be named, but the seal is not required if different from the engineer sealing the overall development plan or plat.	AM
109	Section 10.1.3, Item 9 Implies that both structural and geotechnical engineers provide a report.	11/1/2012	Mike Zeller	Removed reference to engineering specialty.	AM
110	Section 10.2.2.3 The Town has had legal issues with the definition of "release of assurances" and whether it can be construed to be partial release or first release of assurances. There have been instances where without clarity, a default definition of "release of assurances" means the final release at the end of a project. It is clear that the intent here is to require offsite mitigation before the release of any assurances so I would recommend making the note clear to that effect.	8/8/2012	Keith Brann	The note language has been changed to match the Floodplain Ordinance which reads "final Release of Assurances."	AM
111	Section 11.1 Should give the level of accuracy to the survey measurements required (hundredth?)	8/8/2012	Keith Brann	No Change. The District's as-built form requires reasonably close conformity to the plan with "reasonable and customary	AM

				construction tolerances."	
112	Section 11.1.1 Verification of ADEQ drywell registration should also be a deliverable.	8/8/2012	Keith Brann	Added	AM
113	Section 12 The floodplain ordinance definition for base flood should be copied into this manual. The definition of Riparian Habitat does not match the floodplain ordinance. The definition of Regulatory Floodplain does not match the floodplain ordinance. Retention should be defined. The definition of Variance does not match the floodplain ordinance, and there is no variance procedure in the manual other than the fee in lieu waiver protocol. Ensure that the definition of Invasive Plants matches other county documents	8/8/2012	Keith Brann	Definition added Definition revised. It appears to be the same. Definition added. The term variance was omitted to avoid confusion with the formal Board process. Replaced with definition based on the administrative draft of the Pima County Multi-species Conservation Plan.	AM
114	Appendix D The methodology presented is too complex for the quantity of stormwater being analyzed	6/14/2012	Mike Zeller	No Change. Appendix D is not the methodology to be used by engineers. Appendix D documents the initial development of simple factors for reducing peak discharges based on stormwater harvesting basins that may be distributed in a watershed and the result is the table of stormwater harvesting factors that can be used by engineers, similar to the table of basin factors in the PC-Hydro User Guide. The factors are provided as a streamlined alternative to performing basin routing on multiple, distributed basins. Alternate methods to the stormwater harvesting factors may be proposed with an example for review by the District.	DS
115	Appendix F Watersheds smaller than an acre do not require detention. Explain why the example is for a smaller watershed. Page 4, mentions an Appendix X for a PC-Route spreadsheet. Is "X" a placeholder? Page 4 mentions the use of a storage-depth curve without mentioning a reference for where the storage-depth curve can be found or how it is used. Page 8 mentions an appendix X and a Figure X. Is "X" a placeholder?	6/14/2012 8/8/2012	Mike Zeller Keith Brann	An example with larger watersheds has been substituted. Appendix reference revised. No Change.The engineer develops the storage-depth curve for the basin being designed from the dimensions of the basin. Appendix and Figure references revised.	AM

	Page 8, step 8, parts a to c, mention entering information into cells B2- B5 and cell A21 and cells H9 to H15. The spreadsheets provided do not seem to work with data entered into these cells. Page 9, step 8, part d, mentions cells AK9 and AK 11, AK 12 and AK 13. These cells are hidden in the spreadsheet and not available for data entry. Page 9, step 9, mentions a Figure X2 and an Appendix X. Is "X" a placeholder?			Corrected. The cell references were no longer accurate and have been removed. Corrected. The cell references were no longer accurate and have been removed. References have been revised.	
116	Appendix F, page 8 Explain why the reduction is at the front of the hydrograph, as this does not represent the attenuation process which results from detention features.	6/14/2012	Mike Zeller	No Change A new PC-Hydro hydrograph is created using the reduced peak discharge due to stormwater harvesting, which means that the hydrograph is reduced (has a lower outflow) at all points (front, peak, and back of the hydrograph). Any additional retention volume provided by stormwater harvesting basins is removed out of the front of the hydrograph in the spreadsheet because the basins are "depression storage" and are assumed to provide no detention effects once full for simplicity. Considering detention effects of distributed stormwater harvesting basins would require extensive modeling due to the distribution of stormwater harvesting basins within a watershed on a case-by-case basis. The method presented avoids such modeling.	DS
117	Appendix G The procedure presented is convoluted and will be difficult to follow and apply correctly. Detention routing appears less complicated.	6/14/2012	Mike Zeller	A few simplifications have been made. An example will be presented and discussion will continue. A spreadsheet is available that performs all calculations necessary to modify hydrographs. Using stormwater harvesting to reduce hydrographs is optional and provided as an additional method of meeting peak discharge and first flush requirements. Other acceptable routing methods may be used instead of the spreadsheet.	DS AM
118	Appendix G, page 1 The approach appears technically incorrect since the peak of the intermediate hydrograph will lag slightly behind the peak of the original hydrograph, and thus have a slightly different rise time.	6/14/2012	Mike Zeller	No Change. In reality the peak of the hydrograph will lag slightly behind the peak of the original hydrograph. However, the amount of lag will depend on the distribution of stormwater harvesting within a watershed on a case-by-case basis. The time of the reduced peak is assumed to remain the same as the original hydrograph for simplicity to avoid excessive modeling and as a conservative estimate.	DS
119	Appendix G, page 3 Recommend providing an equation for the volume of the	6/14/2012	Mike Zeller	Equation provided.	DS

	hydrograph.				
120	Appendix G, page 3 The resultant hydrograph peak should slightly lag the original hydrograph peak and be slightly smaller. Otherwise, the impact of stormwater harvesting basins on flood peaks would be "de minimis" ... and what then would be the point, from a community-wide stormwater detention/retention perspective, of incorporating such features into new development?"	6/14/2012	Mike Zeller	No Change. The resultant hydrograph is smaller than the original hydrograph at all points based on the stormwater harvesting factor calculated by the engineer for their design. When only a small portion of the watershed is directed to stormwater harvesting, the design is relatively ineffective and the reduction in peak discharge and volume is small (Appendix F, Case 3). When stormwater harvesting is used effectively with large areas of the watershed directed to SWH basins, the reduction in peak discharge can avoid the need for a detention basin altogether (Appendix F, Case 4).	DS
121	Maintenance			Final draft of manual will consolidate maintenance requirements in a separate chapter or appendix.	ES