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M E M O R A N D U M

Date: June 10, 2008

To: Roger Briggs, Executive Officer, Central Coast Water Board

From: Neil Weinstein, Executive Director, The Low Impact Development Center

Re: LIDC# – L-2197

Subject: Review of the *Draft City of Salinas Stormwater Development Standards for New Development and Significant Redevelopment Projects* dated May 2008

The Low Impact Development Center (Center) is a non-profit 501(c)(3) national research organization that focuses on sustainable storm water management solutions for urban and developing areas. The Center's mission includes the design and implementation of pilot projects, monitoring and modeling to determine the effectiveness of practices, development of manuals of practice, and training. The Center has developed national and local LID technical manuals detailing site design, construction, and maintenance considerations including U.S EPA's *Low Impact Development Training for Western Developers*. In addition, the Center has worked with the State Water Resources Control Board to develop and deliver Low Impact Development (LID) training sessions and prepare a review of LID policies and implementation barriers and opportunities. These technical endeavors are complemented by the Center's contributions to several regulation and policy development efforts intended to encourage LID use.

The Central Coast Water Board posed the following questions to the Center concerning the City of Salinas Stormwater Development Standards for New Development and Significant Redevelopment Projects dated May 2008 (Development Standards):

- Does the document sufficiently require early planning for LID?
- What is missing or incorrect in order for LID practices to be properly designed, constructed, and maintained? Are any of the proposed LID practices unacceptable?
- Are the proposed standards sufficiently prescriptive? If not, which standards must be required? Which standards may be considered guidelines?
- Do the standards provide reasonable alternatives if infiltration is not feasible at a particular site (e.g., due to high clay soils)?
- Is the proposed waiver criteria appropriate?
- How could the document be more user-friendly?

The Center's responses to these questions can be found below. The responses are divided into two categories; comments the Center believes should be addressed before the adoption of the Development Standards, and comments that are advisory, things the Center suggests considering.

The Center's review focused on whether the Development Standards would result in the effective implementation of Low Impact Development in Salinas. The Center concluded that if the matters labeled as *Important to Address* are resolved, the document provides a sufficient start to LID implementation in

Salinas. As the Development Standards are implemented, input and feedback should be solicited from the users to gauge how well the document serves its intended purpose and target audience.

QUESTION 1: Does the document sufficiently require early planning for LID?

Important to Address:
The document requires a pre-application meeting with the City for the purpose of discussing "a strategy for implementing LID planning practices into a conceptual site design" (Section 1.9, titled "Development Review Process," page 1-16). Section 1.9.1, titled "Project Conceptualization and Development," lists on page 1-19 the elements that the applicant must incorporate into the proposed project concept. Other places in the document also list site planning techniques or strategies, however, each of the lists is slightly different. For example, Section 1.5.2, titled "Site Design Planning," states that, "Consideration in the planning process shall be given to the following:" and lists minimizing the amount of impervious surface as one of the considerations. This topic is not found in the list on page 1-19. Section 2.1, titled "What is LID?" gives a list of LID strategies and techniques, not all of which are listed on page 1-19, but may need to be considered in the early planning phase such as directing runoff to areas that support infiltration. In addition, Section 2.4, titled "LID Planning Techniques," has four sub-sections which do not cover all of the LID planning techniques mentioned in other sections of the Development Standards.

Early planning for LID is important and the pre-application meetings provide an excellent opportunity for the applicant and the City to work together to create a successful project that meets the applicant's needs and the City's requirements. However, in order for the pre-application meetings to be productive and effective, the applicant needs to know specifically what is required in order to be adequately prepared for the discussion. For example, if the City is interested in discussing minimization of impervious surfaces at the pre-application meeting, this should be added to the list on page 1-19 so that the applicant is ready to discuss the topic at the meeting.

QUESTION 2: What is missing or incorrect in order for LID practices to be properly designed, constructed, and maintained? Are any of the proposed LID practices unacceptable?

Important to Address:
Sections 4 and 5 of the Development Standards do not address the analysis of an entire site with distributed LID BMPs. Guidelines are given on how to design individual LID BMPs given its micro-watershed, but there is no mention of how a distributed BMP network will work to achieve stormwater management goals or requirements. This task is complex, but can be done with various stormwater modeling programs, like EPA Storm Water Management Model (SWMM) and Bay Area Hydrology Model. This is an area of LID site design that is still developing and jurisdictions have taken different approaches. Regionally, the Bay Area Hydrology Model (based on the Western Washington Hydrology Model) is being used to develop hydromodification plan requirements in the southern San Francisco Bay Area counties.

The Development Standards suggest using the rational method for sites of 25 acres or less. Using the rational method for a site with distributed BMPs will not fully account for the peak reduction from LID practices. Assigning a C value to an LID practice (Table 4-4: Runoff Coefficients (C Factor) for BMP Design, page 4-23), is inappropriate. Depending on design, it is possible for an LID practice to have little to no runoff for large events. If LID is used for credit toward peak reduction and a reduced detention requirement, then a computer routing simulation should be used. The EPA SWMM is capable of modeling most LID BMPs and can simulate flow routing. While it may be unreasonable to demand

computer modeling of small development sites, 25 acres is too large for a simplified rational method approach. These projects are large enough that a more sophisticated model is justified.

Other considerations:
The term swale is not used in Section 5. Swales should be encouraged. Well designed swales can be safe, attractive, reduce flow volumes, and improve water quality. Swales are not included in the Manning's number chart, CASQA assigns swales a Manning's number of 0.25.

QUESTION 3: Are the proposed standards sufficiently prescriptive? If not, which standards must be required? Which standards may be considered guidelines?

Important to Address:
Section 5.4 of the Development Standards states, "Conservative assumptions shall be made regarding the effectiveness of LID techniques, such as lowest realistic long-term infiltration rates and highest reasonable initial water levels in storage areas, for the purpose of calculating discharges for drainage facility design." More specific design criteria are needed. Are the minimum infiltration rates given in Table 5-3, titled "Infiltration Rates from City's Stormwater Master Plan," to be considered the lowest realistic long-term infiltration rate? A drawdown time between storm events might be adequate for estimating the highest reasonable initial water levels. Table 4-3, titled "City of Salinas Stormwater Infiltration System Design Standards," suggests LID BMPs be designed to be free of surface water within a maximum of 72 hours. The standard should be the same as the standard for detention basins. Are detention basins assumed to be empty at the start of a design storm event?

Other Considerations:
Besides sufficiently prescriptive standards in this document, other codes and ordinances are needed to prevent the implementation of LID from being hindered. Documents such as the City's Master Plan, Zoning Restrictions, Recreation Codes, Land Use Regulations and Plumbing Codes (in the case of cistern use) should be reviewed and amended if necessary to ensure consistency with the Development Standards.

QUESTION 4: Do the standards provide reasonable alternatives if infiltration is not feasible at a particular site (e.g. due to high clay soils)?

The Development Standards specify the use of lined LID practices with underdrain systems in areas with poorly draining soils. This design will attenuate peak flows, provide water quality treatment through filtration, and provide a little volume reduction due to evapotranspiration and evaporation. If the native soils are poorly draining soils, the benefits described match the natural condition. Therefore, the alternatives are reasonable, both on the small scale of individual BMP design and on the large scale of maintaining the natural hydrologic condition.

However, in areas where infiltration is not feasible due to soil conditions or dense urban development, cisterns are used to capture and reuse rain water for non-potable uses such as toilet flushing water or irrigation. This document mentions cisterns only briefly.

QUESTION 5: Is the proposed waiver criteria appropriate?

Important to Address:
Section 1.4.6, titled "Waivers for Providing Storm Water Management," allows the City Engineer the flexibility to issue a waiver if compliance with a particular portion(s) of the Development Standards is determined to be infeasible. Instead of complying with the Development Standard section(s) deemed infeasible, the applicant must pay into a City Stormwater Mitigation Fund, 135% of the estimated construction savings. Section 1.4.6 states that, "the City is currently in the process of developing a Waiver Program for approval by the Regional Board." It lists the things that the approved waiver program will, at a minimum, identify. The list does not include "the criteria the City Engineer will use to determine feasibility of compliance," nor does it include "how the 'estimated construction savings' will be calculated."

The "estimated construction savings" calculation method should be created in such a way that prevents the applicant from inflating actual construction costs so that the "estimated construction savings" is zero, thereby avoiding paying into the City Stormwater Mitigation Fund. Alternatively, the City may consider using criteria for payment into the City Stormwater Mitigation Fund that is based on amount of impervious area or the amount of stormwater discharged rather than cost savings (See Washington, DC's Anacostia River Environmental Standards). There are many case studies that show that implementing LID costs less than traditional development (See *Reducing Stormwater Costs through Low Impact Development (LID) Strategies and Practices,* U.S. EPA, December 2007). Ideally, the method used for calculating the amount of money paid into the City Stormwater Mitigation Fund should focus on mitigation for downstream impacts. In other words, what would it cost for the City to mitigate for the amount of water being discharged from a site not implementing peak flow or water quality controls? The calculation method used should ensure that an applicant from receiving a waiver from compliance adequately compensates the City Stormwater Mitigation Fund for the project's long-term environmental impact.

Other Considerations:
Section 1.4.6 also states that, "the City will notify the Regional Board within one month of each waiver issued and shall include the name of the person granting each waiver." The Central Coast Water Board may also want to require that the reason compliance was deemed infeasible, as well as the applicant's name be included in the notification, at least for the first year, to ensure that the waiver system is working as intended.

QUESTION 6: How could the document be more user-friendly?

Important to Address:
Low Impact Development can be thought of as having three steps; hydrologic analysis, site planning, and BMPs. Hydrologic analysis is used to determine the pre-development hydrologic condition for a given site. Maintaining that pre-development, or natural, hydrologic condition is the goal. Site planning strategies use site features as the first step in achieving the goal. The selection, design, and implementation of LID BMPs adds additional volume reduction/peak reduction/water quality features needed to meet the goal of maintaining the natural hydrologic condition. Section 2.1, titled "What is LID?," does not adequately address how and why site planning, as discussed in previous sections, is a part of LID.

Other Considerations:
The "Plan to Avoid the Three Most Common Mistakes" is a very useful section of the Executive Summary that helps the reader know right away what sorts of things they will need to focus on. However,

the "How to Use This Document" section of the Executive Summary in its narrative form is difficult to read. Putting this content into a flow chart or graphic may relay the same information in a format that is easier to follow and reference as one moves through the process.

Figure 1:3, titled "Project Applicability & Applicant Education," does not appear to be mentioned nor explained in the text unless the reference to Figure 1:2 on page 1-19 is meant to refer to Figure 1:3. There is a box on Figure 1:3 that asks, "Is proposed project required to meet stormwater runoff requirements?" It is unclear what is meant by this question. When would a project not be required to meet stormwater runoff requirements? If it is not a new development or significant redevelopment project as specified in Section 1.4? Or is this question referring to the waiver process?

Section 2.5, titled "Stormwater and LID Concepts," is a useful section that briefly and clearly defines many of the terms used throughout the Development Standards. It may benefit the reader to move this section to a location earlier in the document, such as the end of Section 1.

Throughout the Development Standards document, using call-out boxes or bold font for important standards would help the reader locate important information quickly.

Section 3, titled "LID Designs and Practices," houses the bulk of the BMP resource information. In order to make this section a valuable resource to the reader, the web links should be functioning links to useful information. Some of the links are not active links. Attachment A of this document, titled "Section 3 Review Comments," contains a listing of the broken links and the active link to replace it with. Other suggested edits for Section 3 can be found in Attachment A.

Section 3 (Calculations and BMP Description) and Section 6 (BMP selection description) of Appendix D should be merged. The information requested in these two sections overlap.

Appendix G, titled "LID Planting Zones and Plant List," is meant to be a resource for vegetation selection for LID practices. Attachment B of this document, titled "Appendix G Review Comments," contains suggestions to make Appendix G a more practical resource.

Suggested Edits for Section 3:

I. **Images without credit information**
II. **Tables that need a label**
III. **Equations**
IV. **Broken links**

I. Images without credit information

Figure #	Page #
3-1	3-2
3-5	3-7
3-6	3-8
3-7	3-9
3-14	3-25
3-16	3-26
3-17	3-26
3-29	3-49
3-30	3-49
3-31	3-50
3-32	3-50
3-33	3-51

Bottom of Page 3-93

- Photograph Sources – Does not note which photos they are referring to.

II. Tables that need a label (e.g., Table 3-1. Description., Table 3-2. Description.)

Page #:
3-10, 3-20, 3-21, 3-22, 3-23, 3-24, 3-29, 3-35, 3-41, 3-59, 3-62, 3-67, 3-73, 3-77, 3-80, 3-84, 3-94

III. Equations

- It would be helpful to add label to equations (e.g. Equation 1. —)
- Indent "Where: …"

III. Broken Links

Page 3-5

Broken URL:
http://www.toolbase.org/tertiaryT.asp?TrackID=&DocumentID=2160&CategoryID=38
New URL: http://www.toolbase.org/Technology-Inventory/Sitework/permeable-pavement

Page 3-7

Broken URL:
http://www.psat.wa.gov/Publications/LID_tech_manual05/LID_manual2005.pdf

New URL: http://www.psp.wa.gov/downloads/LID/LID_manual2005.pdf

Page 3-11

Broken URL: http://www.nemo.uconn.edu/publications/tech_papers/tech_paper_9.pdf
New URL: http://www.nemo.uconn.edu/tools/publications/tech_papers/tech_paper_9.pdf

Page 3-12

No URL given for: Site Planning for Urban Stream Protection
URL to add: http://www.cwp.org/SPSP/TOC.htm

Page 3-13

Broken URL: http://www.unce.unr.edu/Western/SubWebs/NEMO/index.htm
New URL: Found it in this document (Figure 3-47), which looks like it was created by Kennedy/Jenks
http://www.cityofreno.com/Modules/ShowDocument.aspx?documentid=10752

Page 3-14

Broken URL: http://www.unce.unr.edu/Western/SubWebs/NEMO/index.htm
New URL: Unable to find a new link

Page 3-15

Broken URL: www.nemo.uconn.edu/publications/tech_papers/tech_paper_6.pdf
New URL: http://www.nemo.uconn.edu/tools/publications/tech_papers/tech_paper_6.pdf

Page 3-16

Broken URL:
http://www.psat.wa.gov/Publications/LID_tech_manual05/LID_manual2005.pdf
New URL: http://www.psp.wa.gov/downloads/LID/LID_manual2005.pdf

Link associated with image works: http://www.forester.net/sw_0103_porous.html
About URL: I did not find the corresponding picture on that page.

Page 3-18

Hyperlink is incorrect because of text wrapping:
http://www.seattle.gov/util/About_SPU/Drainage_&_Sewer_System/Natural_Drainage_Systems/Street_Edge_Alternatives/index.asp
Correct:
http://www.seattle.gov/util/About_SPU/Drainage_&_Sewer_System/Natural_Drainage_Systems/Street_Edge_Alternatives/index.asp

Page 3-28 [no URLs given on this page, not critical]

No URL given for: Suppliers of Beneficial Organisms in North America
URL to add: http://www.cdpr.ca.gov/docs/pestmgt/ipminov/bensuppl.htm

No URL given for: Directory of Least-toxic Pest Control Products
URL to add: http://www.birc.org/

Page 3-32 [no URLs given on this page, not critical]

No URL given for: California Stormwater Best Management Practice Handbook
URL to add: http://www.cabmphandbooks.com/

No URL given for: Guidance Manual for Onsite Stormwater Quality Control Measures
URL to add:
http://www.sacramentostormwater.org/documents/newdevelopment/Jan2000_On-site_GuideMan.pdf

**Note: correct the spelling of Onsite (change to On-Site as written on the document.) There are several instances of this reference.*

No URL given for: Stormwater Treatment, Biological, Chemical and Engineering Principles
URL to add: http://www.stormwaterbook.com/

No URL given for: Stormwater Quality Design Manual for the Sacramento and South Placer Regions
URL to add:
http://www.msa.saccounty.net/sactostormwater/SSQP/documents/DesignManual/SWQ_DesignManual_May07_073107.pdf

No URL given for: Urban Storm Drainage Criteria Manual, Volume 3
URL to add: http://www.udfcd.org/downloads/down_critmanual.htm

Page 3-38 [no URLs given on this page, not critical]
No URL given for: California Stormwater Best Management Practice Handbook
URL to add: http://www.cabmphandbooks.com/

Page 3-38
Broken URL: http://www.deq.state.id.us/water/stormwater_catalog/doc_bmp39.asp
New URL:
http://www.deq.state.id.us/water/data_reports/storm_water/catalog/sec_4/bmps/3.pdf

Page 3-56 [no URLs given on this page, not critical]
No URL given for: California Stormwater Best Management Practice Handbook
URL to add: http://www.cabmphandbooks.com/

Broken URL: http://www.wbdg.org/design/lidtech.php?r=park_basement
New URL: http://www.wbdg.org/resources/lidtech.php

Broken URL:
http://www.lowimpactdevelopment.org/lidpercent20articles/stormwater_feb2003.pdf
New URL: http://www.lowimpactdevelopment.org/lid%20articles/stormwater_feb2003.pdf

Broken URL: http://www.deq.state.id.us/water/stormwater_catalog/doc_bmp44.asp
New URL:
http://www.deq.state.id.us/water/data_reports/storm_water/catalog/sec_4/bmps/9.pdf

Broken URL: http://www.cityofreno.com/gov/pub_works/storm water/management/controls/
New URL: http://www.cityofreno.com/Index.aspx?page=1007

No URL given for: Urban Storm Drainage Criteria Manual, Volume 3
URL to add: http://www.udfcd.org/downloads/down_critmanual.htm

Page 3-61 [no URLs given on this page, not critical]

No URL given for: California Stormwater Best Management Practice Handbook
URL to add: http://www.cabmphandbooks.com/

No URL given for: Guidance Manual for Onsite Stormwater Quality Control Measures
URL to add:
http://www.sacramentostormwater.org/documents/newdevelopment/Jan2000_On-site_GuideMan.pdf

Page 3-62

No URL given for: Urban Storm Drainage Criteria Manual, Volume 3
URL to add: http://www.udfcd.org/downloads/down_critmanual.htm

No URL given for: California Stormwater Best Management Practice Handbook
URL to add: http://www.cabmphandbooks.com/

No URL given for: Urban Storm Drainage Criteria Manual, Volume 3
URL to add: http://www.udfcd.org/downloads/down_critmanual.htm

Page 3-70 [no URLs given on this page, not critical]

No URL given for: California Stormwater Best Management Practice Handbook
URL to add: http://www.cabmphandbooks.com/

No URL given for: Urban Storm Drainage Criteria Manual, Volume 3
URL to add: http://www.udfcd.org/downloads/down_critmanual.htm

Page 3-76

No URL given for: Stormwater Technology Fact Sheet: Porous Pavement
URL to add: http://www.epa.gov/npdes/pubs/porouspa.pdf

Broken URL:
http://www.psat.wa.gov/Publications/LID_tech_manual05/LID_manual2005.pdf
New URL: http://www.psp.wa.gov/downloads/LID/LID_manual2005.pdf

Broken URL:
http://www.toolbase.org/tertiaryT.asp?TrackID=&DocumentID=2160&CategoryID=38
New URL: http://www.toolbase.org/Technology-Inventory/Sitework/permeable-pavement

Page 3-80

Broken URL: http://www.unce.unr.edu/publications/SP93/SP9302.pdf
New URL: http://www.unce.unr.edu/publications/files/ho/other/sp9302.pdf

Broken URL:
http://www.psat.wa.gov/Publications/LID_tech_manual05/LID_manual2005.pdf
New URL: http://www.psp.wa.gov/downloads/LID/LID_manual2005.pdf

Page 3-83 [no URLs given on this page, not critical]

No URL given for: California Stormwater Best Management Practice Handbook
URL to add: http://www.cabmphandbooks.com/

No URL given for: Guidance Manual for Onsite Stormwater Quality Control Measures
URL to add:
http://www.sacramentostormwater.org/documents/newdevelopment/Jan2000_On-site_GuideMan.pdf

No URL given for: Urban Storm Drainage Criteria Manual, Volume 3
URL to add: http://www.udfcd.org/downloads/down_critmanual.htm

Page 3-87 [no URLs given on this page, not critical]

No URL given for: LID Technical Guidance Manual for the Puget Sound
URL to add: http://www.psp.wa.gov/downloads/LID/LID_manual2005.pdf

No URL given for: Urban Storm Drainage Criteria Manual, Volume 3
URL to add: http://www.udfcd.org/downloads/down_critmanual.htm

Page 3-93

No URL given: Sustainable Site Design
Possible URL to add: http://www.thcahill.com/documents/apwa-optimized-2pg-screen.pdf

No URL given: Raising the Bar on Green Roof Design
URL to add: http://www.asla.org/land/050205/pdf/Greenroof_articleLAM11_06.pdf

No URL given: ECOROOFS – Questions and Answers
URL to add: http://www.portlandonline.com/shared/cfm/image.cfm?id=53987

Page 3-97 [no URLs given on this page, not critical]

No URL given for: California Stormwater Best Management Practice Handbook
URL to add: http://www.cabmphandbooks.com/

No URL given for: Guidance Manual for Onsite Stormwater Quality Control Measures
URL to add:
http://www.sacramentostormwater.org/documents/newdevelopment/Jan2000_On-site_GuideMan.pdf

Suggested Edits for Appendix G:

Appendix G Title Page: LID Planting Zones and Plant List

Consider expanding the title to something more inclusive such as, "LID Planting Zones, Plant List and Planting Guidelines." Later in the document, the terminology "LID Plant Palette" is used. Consider using that term as part of the section title.

The term Planting Zone is usually used for larger scale (i.e. Sunset Zone 10). Rather than Low Impact Development Planting Zones, a more precise term would be Low Impact Development Moisture Zones.

Page G-1:

Consider adding "LID" (or Low Impact Development) in front of Planting Zones.

Clarify that "LID Planting Zones" do not address green roofs or street trees, which are also LID practices. These LID Planting Zones refer to the planting position in a cross section profile of a bioretention basin, bioswale, or vegetated swale. Plants suitable for green roof or street trees are designated as such in the plant list, but the plant list is not a complete list of green roof plants or street trees for Salinas.

Consider adding a sentence at end of the second paragraph that states, "All planting zones in bioretention areas or vegetated areas will be subject to periods of extreme dryness. The purpose of rating the zones within the profile is to provide a relative moisture range and to define the typical moisture regime which plants will experience."

LOW ZONE - A better description would refer to its moisture status so that a practitioner would understand the growing conditions within a profile by its nomenclature. (i.e., Floodplain/Wet/Hydric)

At the end of the "Low Zone" paragraph consider adding, "All plants selected should be tolerant of periods of drought. Typically, facultative wetland species have this biological capability."

MID ZONE – Mesic – moist, well drained conditions with periods of drought. Depending on orientation, this will either be an extremely dry slope (facing S/SW) or moderately dry slope (facing N/NE)

HIGH ZONE – Upland/Dry/Xeric - This area will be very dry relative to the profile. Deep rooted plants should be preferred as they will be most drought tolerant. Typically Facultative Upland plants perform best under these conditions. Depending on the plant selection throughout the swale, plants in this area may or may not have shaded roots from the lower lying plants.

Pages G-2 & G-3:

Consider moving the green roofs and the two planting strips to precede the three moisture zone columns. Indicate that the green roof list is not a full list. Most plants that qualify for consideration for a green roof would qualify for inclusion in the "High Zone" based on moisture, but some may need to be excluded due to root structure.

Add minimum soil volume requirements for tree health (varies by tree).

Include the criteria (water requirements, tolerance for inundation, root and leaf structure and ability to filter pollutants (and which pollutants, if known)) in the Notes column or add columns.

Create a finer division of plant materials. Divide trees, shrubs and grasses/perennials into height/size categories so that appropriate height/spread decisions may be made for plant selections (or include in a column).

Add visual aspect information (habit, feature of interest, etc).

Add exposure (i.e. Full Sun, part sun/shade, shade) to descriptions.

Indicate desirable spacing range for each plant.

Populus fremontii will thrive in the low lying areas due to the moisture and the sandy bioretention mix. They are a pioneer species and may cause maintenance issues as they "move" themselves into their preferred habitat. Their root volume may be too large for the bioretention cell.

While Pseudotsuga menziesii spp menziensii (Coast Douglas Fir) is indigenous to this area, it may be too large a tree for bioretention areas and may not tolerate the extremes of conditions in a bioretention setting in the Salinas area.

Salix coulteri (Salix sitchensis) Sitka Willow (name has changed http://plants.usda.gov/java/nameSearch)

Omit any plants with descriptions such as "can be invasive" (i.e. Rosa californica) or at least note its other description "thorny Velcro."

Salvia spp -- Needs a note "requires good drainage" (check box)

Vitis californica grows well with plenty of moisture but the notes indicate it should not be planted in at a low point. Omit the reference to placing it in the "Low Zone" and only show it as for the mid and high zones.

Pages G-4 & G-5:

Design Criteria
Add to planting criteria list:

- Tolerance to pollutant surges

Define "Adaptability"; many plants that are adaptable are invasive.

In the second paragraph, second column, "Trees and large shrubs are best planted in the high zone where their roots can absorb the infiltration". What is meant by this statement? As shown in the profile, planting media soils are deepest in the "low" zone. "Absorb the infiltration" is not what plants do; they evopotranspire, they uptake moisture, but they do not absorb infiltration. The Populus would be just as vigorous in the low areas as the high areas and may show less drought stress. Many of the shrubs listed would do well in the wettest areas, and some of the trees too.

Plant Layout
A note should be added indicating the desirability of closer spacing using smaller plants to ensure rapid cover and plant adaptation to the growing conditions.

Sections which would be desirable to include:

- Native Plant associations which have appropriate species (i.e. Coastal Sage Scrub, Riparian, etc)
- Planting media specification/ installation
- Plant size recommendations and spacing
- Planting detail
- Planting staking detail
- Plant mature size
- Plant attributes – this could be added to the plant list , see notes above and a graphic silhouette detailing desirable attributes (branching structure, root structure etc) added
- Planting procedures:
  - Plant condition/ inspection
  - Hole size / shape
  - Position of root ball at time of installation
  - Risk of compaction during installation
  - Staking
  - Mulching procedure
- Watering procedure during establishment phase and beyond
- Maintenance of vegetated BMPs
- Recommended monitoring for plant health/ how to divide plants (perennials) in a bioretention area without disrupting the SW function
- Inspection criteria
- Resource list for more information on plants for these conditions (or divide references by topic area)
  - i.e., calflora http://www.calflora.org/index0.html

Page G-6:

See notes on page G-5 regarding the resource list.