

## City of La Quinta Public Works Department - Storm Drain Plan Review Checklist

### SUBMITTAL REQUIREMENTS

- Approved Tentative Tract Map
- Conditions of Approval
- Storm Drain Plan – provide separate onsite and offsite plans – may combine with street plans
- Hydrology and Hydraulics Report
- Soils report & annual update letter
- Street improvement plans (as applicable)
- Grading plans (as applicable)
- Storm drain plan - Estimates of quantities
- Storm drain plan review checklist (filled out and signed by the EOR)

### HYDROLOGY & HYDRAULICS REPORT - GENERAL

- Use the Rational Method for inlet flow rates, pipe sizing and utilize the Synthetic Unit Hydrograph for retention volume. Check drainage boundary areas and ensure inclusion of tributary street and other offsite areas. Make sure hydrology map is complete and accurate.
- Utilize most current NOAA data (see Public Works Website Engineering Bulletins 06-15, 06-16) for storm flow assumptions. Identify historical flow paths.
- Provide 1 ft freeboard above 100 year water surface elevation to building pads including a surface overflow route or provide 500 year storm analysis. Provide calculations/sections (as required) to show that required freeboard is met.
- Hydrology map - verify that all proposed storm drain catch basins, pipes, drywells & related components are on the hydrology map – show water surface elevations for retention basins, verify that centerline of street is higher than WSE 100.
- Bulking factor per the RCFCDD manual may be required based on site and run off characteristics, i.e. heavy debris.
- Check at subdivision boundaries for any possible problems such as blocking drainage from or discharging to adjacent lands or conflicts with existing or proposed improvements.
- Check hydrology and hydraulic calculations - see Public Works Website Engineering Bulletins 06-15, 06-16.
- No release of flows in excess of pre-developed Q. Design discharge should match historical outlet locations.

### HYDROLOGY & HYDRAULICS REPORT - STREET CAPACITY CALCULATIONS

- Provide street capacity, depths and velocities. 10 year frequency storm event (Q10) is allowed to accumulate in streets to top of curb. 10 year storm maximum allowable arterial street spreads can equal 1 lane (10 - 12 feet) + bike lane (if present 4 – 8 feet). The loss of only 1 City arterial lane of use (in either direction) is desired for 10 year storms. Private residential streets must have one lane clear at centerline in the 10 year storm.
- 100 year frequency storm event (Q100) can be carried up to the street right of way and the combination of both the street and the underground storm drain. Provide calculation of street capacities in hydrology report. On private streets, a separate storm drain easement may be approvable behind curb to accommodate the 100 year storm event.
- Assume  $N=0.015$  on streets, assume  $N = 0.035$  on gutters with low slope, where sediment may accumulate.
- When storm assumption flow exceeds top of curb, call out suitable erosion mitigation for the parkway areas.

### HYDROLOGY & HYDRAULICS REPORT - INLETS AND INLET CALCULATIONS

- Check capacity and HGL for all drainage structures.
- Check capacities of flow-by and sump inlets. Position inlets PRIOR to flow turns. Flow in the street will not overtop curbs or R/W during changes in direction of the open channel conduit (typically the street). Inlets will be required at locations on arterial streets prior to the flow crossing at intersections and major driveways or entrances.
- Sump catch basins and connector drains to be designed for 100 year design storm. Sump conditions require a secondary overland free flow to prevent flooding of buildings should the catch basin or drain

system become plugged. Utilization of flanked inlets in lieu of secondary overland flow is subject to City Engineer review and approval.

- Grated catch basins are discouraged. Side inlet catch basins (City Standard 300) are preferred with max inlet width of 20 ft allowable. Provide 85% capture as possible with flow by. When required, please use an approved bicycle proof grate.
- AC swales and channels specified for temporary drainage facilities may not be allowable as a result of erosion concerns in larger storm events.
- 1200 ft maximum catch basin spacing is the suggested guideline for public and private streets.
- Install catch basin prior to a street turn with Q10 greater than 2 cfs.
- Any concentrated ribbon gutter or water depth inlet ponding depth at 100 year storm equal to 6 inch maximum.
- 1 parking lot inlet every 50 parking spaces is the suggested guideline for parking lot drainage systems. Inlets are needed for parking lots when depth of flow increases to the top of curb for the 100 year event.
- Area drain design should utilize a safety factor of 2 for inlet sizing. Use of an assumed Q per acre is acceptable for area drain layout. Assumed peak Q's are generally estimated to be approximately 3 to 5 CFS/Acre for the Rational Method. Area drain pipe sizing (less than 12 inches in diameter) may use Manning equation as hydraulic check method.
- Allowable velocity within the street or parking area section shall be determined by the product of depth of flow times velocity and must be less than or equal to 6.
- Flow by catch basin sizing shall be calculated using the FHWA HEC 12 equation  $0.6 \times q^{0.42} \times s^{0.3} (1/n \times sx)^{0.6}$  for total length required.
- Sump catch basins shall be sized using the Weir equation if flow is below TC and the orifice equation for depths above TC.
- Local depression shall be a maximum of 4 inches in depth. See City Standard 300.
- Water surface elevations in catch basins are a minimum of 6 inches below the local depression to 10 year storm event.
- Grated inlets provide a 50% clogging factor. Pedestrian rated grates maximum ½ inch grate opening to be provided. Grates in traffic areas should be traffic rated (H-20). Label all traffic, ADA and bicycle rated grate inlets.
- For flow-by inlets, show intercepted and flow-by values if 100% interception is not achieved. Make sure bypassed flows are accounted for down stream.
- Check sump inlets have an emergency surface over flow route.
- Cross gutters shall not be used where there are existing storm drains - use of cross gutters should be limited.
- Check for energy dissipaters, rip rap, etc. at outlets of storm drain systems and for headwalls etc. at inlets. Riprap shall be provided at inlets for 1 ft minimum above the Q100 water surface elevation if it is above the top of pipe. Show rock riprap (1/4 ton minimum if not grouted) or other erosion control method. Call out required thickness for rock riprap.
- Use of under sidewalk drains (i.e. parkway drains) is discouraged as a result of long term plugging and maintenance concerns.

#### **HYDROLOGY & HYDRAULICS REPORT & DESIGN- HYDRAULIC CALCULATIONS (PIPES, CHANNELS, GUTTERS)**

- Peak Q's are generally estimated to be approximately 3 to 5 CFS/Acre for Rational Method.
- Storm drains shall be reinforced pipe or box structures within public right-of-way (18 inch minimum diameter) and continuing to first junction structure. Provide "D" load strength in construction notes and on profile detail. Utilize standard sizing (6 inch increments above 18" diameter). Check calculations for non standard box culverts.
- Drain pipes into the retention basin shall be sized using the water surface elevation in the basin at the time of concentration for the peak run off for the tributary area for the subject drain pipe.
- Minimum velocity in storm drain systems shall be 2.0 fps with minimum pipe slope of 0.30%. Low Q's (below 5 cfs) will be reviewed for approval with velocities below 2.5 fps.
- Concrete coating on the inside of all reinforced concrete pipes must be increased to provide a minimum of 1 ½ inch over the reinforcing when the design velocities exceed 20 fps. The concrete design strength in these reaches shall be  $f_c=5,000$  psi for velocities exceeding 20 fps and  $f_c=6,000$  psi for velocities exceeding 30 fps. For velocities exceeding 40 fps, velocity reducing rings shall be provided.
- Reinforced concrete, pipe anchors are required on slopes greater than 4:1. Anchors shall be placed at 10 ft vertical intervals and be constructed per RCFTD standard M821.

- Pipes to have water tight joints for HGL greater than 10 ft above top of pipe. For HGL's greater than 25 ft, joints should be designed for pressure applications.
- HDPE storm drain piping should conform to AASHTO Designation M-294, Type S (smooth interior).
- Provide HDPE pipe design (if specified for private streets) similar to RCP with curvilinear pipe layout with equivalent fitting in table format. For 12 inch or greater diameter HDPE pipe, utilize 11 ¼ degree bends for turns to create an equivalent curvilinear pipe layout. Storm drains may be HDPE or RCP in private developments. RCP must be specified within the City R/W.
- High density polyethylene (HDPE) to reinforced concrete pipe (RCP) connection must be detailed. Use RCFCD Standard M803 for typical application.
- No reverse bends on storm drain layout curves per RCFCD.
- Inlet layouts should utilize "wye" connections not "tee" connections.
- Inlet piping should not connect to a catch basin – use manhole structure or equivalent – avoid conditions wherein catch basin plugging would create a project or system wide storm water backup.
- 30 inch minimum cover is required at hinge point from top of pavement (keep out of base material or local depressions).
- Concrete encasement per RCFCD M807 for storm drain/sewer offsets between 6 inches to 18 inches.
- "D" strength shall be per Cal Trans standard A62D - specify watertight joints per Cal Trans guidance (typically specified if head pressure greater than 10 ft).
- Outlet grates (at retention basins or equal) are required for storm drain sizes 36 inches diameter or larger (typical). High risk sites may specific outlet grates on smaller diameter storm drains. APWA Standard 360-1.
- Bulkheads installed at temporary terminations per RCFCD Standard IM816. Termination shall be a minimum of 1 ft beyond the manhole, as applicable.
- Concentrated surface flows not protected with rigid lining shall be designed according to Hydraulic Engineering Circular (HEC) 15 (Design of Roadside Channels with Flexible Linings) which include bare soils.
- When applicable, Energy Dissipators shall be designed according to HEC-14 "Hydraulic Design of Energy Dissipators for Culverts and Channels".

#### **HYDROLOGY & HYDRAULICS REPORT - RETENTION BASINS**

- The retention basin should be sized for the total run off produced by the controlling 100 year storm event (1 hour, 3 hour, 6 hour or 24 hour) or as required in the approved conditions of approval.
- Retention volume may be roughly estimated to range between 0.12 (residential) to 0.25 (commercial with higher impervious surfaces) acre-ft retention per acre. No individual lot retention under 1 acre lot size.
- Provide a supplemental retention volume above standard 100 year storm requirements equal to 120,000 gallons (16,044 ft<sup>3</sup> or 0.368 acre-ft) for CVWD well site retention blowoff water for applicable projects.
- Minimum retention basin width = 20 ft.
- See Public Works Website Engineering Bulletins 06-15, 06-16 for all surface and underground retention requirements.
- An approved percolation rate may be used over the surface area of the retention basin. Assume zero percolation unless confirmed by soils engineer per Engineering Bulletin 06-16 guidance.
- Check with Public Works for retention requirements at La Quinta Village (also see historical City/PSOMAS study regarding estimated Village street flows).
- Provide buoyancy calculation for underground retention systems.
- Provide 72 hr retention basin drawdown calculations with drywells or confirmed percolation values. Drywells are limited to locations with 200 ft spacing between drywells and a 30 ft setback from buildings.
- Deep retention basins are not allowable adjacent to City arterial curbs but shallow depressions are acceptable.

#### **HYDROLOGY & HYDRAULICS REPORT - NUISANCE WATER**

- Nuisance water handling shall utilize drywells with a maximum assumed injection rate of 0.1 CFS.
- Show disposition of nuisance flow away from street AC. Provide nuisance water dry well (Maxwell Plus or equal) for residential units, landscape & specialized use flows. Provide nuisance water calculations in hydrology report.
- Drywell covers identified as open grates or covered.

## SWALES AND EDGE CONDITIONS

- Freeboard for storm water conveyance by gunite ditch is as follows: 1 ft freeboard if  $Q = 10$  cfs or greater, 0.5 ft freeboard if  $Q$  less than 10 cfs. Freeboard, as measured by excess capacity above peak  $Q$ , shall be no less than 25% greater than the estimated peak  $Q$ .
- No flow crossing property lines is allowed without adjacent property owner permission.
- Install erosion control on earthen swales per Caltrans standards or per geotechnical engineer guidance.
- Provide trapezoidal gunite ditches with flat bottom for improved maintenance capability as applicable. V ditches may be allowable for small flow rates.
- Show on plans any block walls, ditches, etc. that are needed along tract boundaries to prevent flooding.
- A recorded drainage release letter needed if streets or property drains onto adjacent property.
- Minimum gunite ditch sizing 18 inches deep x 3 ft in width.

## EASEMENTS

- Storm drain easements labeled on plan. Storm drain easements shall be provided prior to construction where underground drains are not located in R/W. Storm drain easement width shall be in accordance with Riverside County Standards - in general 20 ft, 10 ft allowable in side yards with use of RCP, per City Engineer.
- No storm drain easements centered on property lines and no storm drains located on property lines. Supplemental access easements may be required.

## MAINTENANCE & AGREEMENTS

- Provide signed maintenance agreement to Public Works for underground retention systems.
- Provide NPDES indemnification agreements from CVWD/City/Developer as required for storm channel discharge to Whitewater or La Quinta Evacuation Channel.
- Assign HOA or equal maintenance responsibility for all storm drain systems, channels and debris basins and provide project note on plan.

## MANHOLES

- Provide continuous grade (positive drainage – prefer 2% minimum) across the manhole floor or flow line.
- Drop manholes are prohibited.
- Manhole sizing per City Standard 340, 24" cover is typical, with 36 inch minimum manhole. Manholes may be cast-in-place or prefabricated.
- Manhole spacing guidance - use RCPCD manhole spacing based on pipe size as follows:

<u>Pipe Size</u>	<u>Manhole Spacing</u>
< 30" diameter	300 ft maximum
< 42" diameter	400 ft maximum
< 60" diameter	600 ft maximum
≥ 60" diameter	800 ft maximum

## STORM DRAIN PLANS

### Title sheet on index map:

- Show all storm drain systems (catch basins, retention basins, dry wells, culverts, cross gutters, inlets, retaining wall drains, etc.).
- Show direction of drainage in streets and channels.
- Label Q10 and Q100 at all catch basins, inlets and outlets.
- Label WSE 100 at retention basins.
- Check storm drain system layout, Q's, etc. match the hydrology/hydraulics report.

### Plan view shows:

- North arrow (preferred to point up or to the right or left).
- 4 inch bar scale – scale to be a typically used scale, i.e. 1 inch = 20 ft or 1 inch = 40 ft. Not smaller than 1 inch = 40 ft.
- Storm drain stationing to be shown on both plan and profile.
- Stationing at 100' intervals and at all catch basins, junction structures, manholes, collars, etc. Show catch basin flow line elevations.
- Stations of all BC's, EC's, PRC's, and PCC's of curves.
- Show centerline station of catch basins with "W", "V", TC, and FL clearly labeled.
- Show storm drain easements. Width of easements in accordance with riverside county standards.

- Show match lines on consecutive sheets at even 50 ft stations.
- Dimension storm drains from street centerline and adjacent median curb, curb and gutter, and/or edge of pavement.
- Show easements, right of way, parkway and curb lines dimensioned from centerline – consistent with typical sections. Lettered lots preferred in lieu of drainage easements.
- P.U.E. and other easements dimensioned and labeled.
- Street names shown on plan.
- City limit lines labeled at adjoining cities.
- Lot numbers and lot lines shown.
- Show proposed improvements with solid lines and existing improvements with dashed lines.
- Include disposition notes for existing facilities. The term “by others” shall not be used but the other party shall be identified.
- Include construction notes on each sheet w/o quantities. Do not refer back to construction notes on the title sheet. Include summary quantities on construction notes on title sheet. Please ensure notes match plan-profile details.
- Refer to City Standard Drawing No. if applicable to work. Provide specifications, notes, details or other approved standard drawing no. If different from City Standard.
- Centerline bearing text shown on centerline.
- Curve and line data table for all storm drain segments to include length and bearing, delta, length of arc, radius, and tangent.
- Show proposed waterlines, valves, fire hydrants and services with dimensions to proposed & existing storm drain. Call out stations for design components.
- Show proposed sewer lines, manholes, cleanouts and laterals with dimensions to proposed storm drain.
- Show existing utilities with dimensions to proposed storm drain.
- Eliminate unused construction notes per sheet.
- Cross check profile detail with plan view detail.
- Invert elevations shown for storm drain inlet locations (all inlets including small 4 inch and 6 inch area drains) Provide profile and HGL calculations on lines 12 inch diameter or larger.
- Show 100 year storm elevations on all retention basins.
- Include local depressions on street plans, not storm drain plans if plans provided separately.
- Storm drain is not shown in P.U.E.

Profile shows:

- Profile scale shall match plan view scale. Typically, 1 inch = 40 ft horizontal and 1 inch = 4 ft vertical or 1 inch = 20 ft horizontal and 1 inch = 2 ft vertical.
- Show profile for all pipes & culverts, ditches, and channels with stations, lengths and invert elevations. Callout size, length of storm drain pipe, HGL100, V100 and Q100, HGL10, V10 and Q10.
- Show existing/proposed ground or pavement profile over storm drain.
- Show right-of-way, roadway sections and existing ground profile grade for the entire length of culvert and beyond and utility crossings on the culvert profile. Address any clearance problems.
- Show and label all utility crossings (existing or proposed) by type. Show utility crossings to scale and dimension clearance between the proposed storm drain and existing utility. Show concrete encasement as required by CVWD or equal.
- Stations and elevations shown at catch basins, junction structures, manholes, collars, headwalls, and outlet structures. B.C.'s, E.C.'s, and grade breaks at 100' intervals on long pipe segments – at even stations.
- Dimension pipe segments between manhole and junction structures.
- Note size, length and “D” strength for pipe.