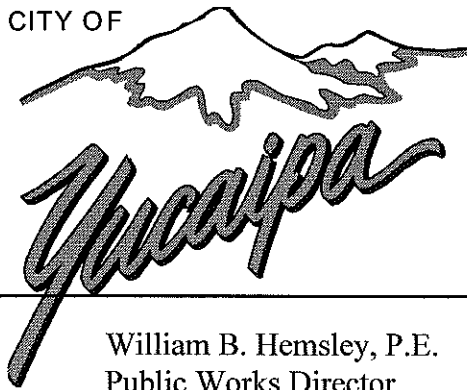


# APPENDIX C

## STREET & STORM DRAIN IMPROVEMENT PLAN PREPARATION

1. IMPROVEMENT PLAN CHECKLIST
2. PROFILE CHECKLIST

CITY OF



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William B. Hemsley, P.E.  
 Public Works Director

**STREET AND STORM DRAIN IMPROVEMENTS**  
Improvement Plan Checklist

**Project:** \_\_\_\_\_ **Checked By:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Prepared By:** \_\_\_\_\_ **Date:** \_\_\_\_\_

This checklist should be considered as a guideline with acceptable minimums to be used for plan preparation by private engineers. Other methods of achieving the desired result can be used and are encouraged.

*(Check When Completed for All Sheets)*

- 1. Plan Check Base Fee required when plans submitted. Totaled bond estimate and complete hydrology study required with first check.
- 2. Plans to be approved by engineer. Engineer's signature, name, address, phone number and registration number and seal to appear. Does the engineer have a current city business license? City case or project number required in title block. For building permits show address of lot.
- 3. North arrow and vicinity map. North arrow to face up or to the right.
- 3. Names of streets checked against final map. Street name sign schedule and construction note.
- 4. Check written conditions for City Council requirements.
- 5. Show horizontal scale and bench mark.
- 7. Bearings of all streets shown. Radial bearings on centerline of all catch basins, etc., in a curve.

- 8. Stationing to conform with established stationing on approved City plans. Centerline stationing to be left to right. No negative stationing. If you have any questions or problems on stationing, contact City Engineer's Office prior to design.
- 9. Check stationing and elevations on consecutive sheets. If more than one sheet, show match lines at identical points on consecutive sheets. Give references to other sheets.
- 10. Stationing of all BCR's said ECR's B.C., E.C., and M.C. of all curves.
- 11. Stations at beginning and end of improvements and at center of catch basins, etc.
- 12. Centerline curve data, also short and long side for curbed sections.
- 13. Minimum 200-foot centerline radius on residential streets unless prior approval is obtained from City Engineer.
- 14. Corner cut-offs required for curb ramps at all curb returns. A Thirty-five (35) Foot Radius of Return Grant of Easement is required for rounding the corner of intersecting roads when the half-width right-of-way of any intersecting road is forty (40) feet or greater. A Twenty (20) Foot Radius of Return Grant of Easement is required for rounding the corners of intersecting roads if the half-width right-of-way of all intersecting roads is less than forty (40) feet.
- 15. Curb return data (delta, tangent, radius and length).
- 16. Show right-of-way and improvement widths (parcel to be improved, adjoining parcels and parcels across the street).
- 17. Show lot lines and lot numbers same as record map.
- 18. Show existing improvements and dimensions with dashed lines, along with plan references. Show existing adjacent driveway and topo in and adjacent to area of proposed construction.
- 19. Show existing pipelines, irrigation lines, structures, power poles, trees, etc., in right-of-way, and include note as to their disposition if encroaching. Label with size, etc., and distance from centerline. Show existing underground structures that may conflict with, or enter into, the design of proposed improvements. Private engineer to have owner controlling utility sign plans after second check if utility is affected in any way.
- 20. Show improvements to be constructed with solid lines. Note connections to existing improvements.

- 21. Show details, dimensions, etc., of all improvements if not city standards. For all standard improvements show standard drawing number. Check standard drawings for those dimensions to be shown on plans.
- 22. If both 6-inch and 8-inch curb and gutter is being used, show limits on plan for each type of transition. Use 8-inch curb face only where needed because of drainage. Use curb only for medians if drainage permits.
- 23. Check general and construction notes against "sample general notes". Show construction notes wherever necessary to clarify construction details.
- 24. Length and location of transitions or super elevations, if used; also, of transitional paved sections for drainage.
- 25. Show limits of new paving, old paving, overlay, and removal. Use appropriate shading to delineate areas. For new paving, an R-Value test to determine the paving section is required prior to the plans being approved. The "Construction Note" should identify the City's required minimum pavement sections for a specific street section as follows:

Major and Secondary	0.5' AC over 1.0' AB
Collector	0.42' AC over 0.67' AB
Local	0.33' AC over 0.5' AB

- 26. A 5' wide sidewalk, 0.5' from property line with landscaped parkways is the city standard. Minimum 4-foot paved clearance required around any obstacle (tree wells, power poles, fire hydrants, etc.).
- 27. Show detail of cross gutter if not standard. Cross gutter and aprons to show direction of flow with arrows. Show flow line elevations along flow line of cross gutter.
- 28. Show T.C. and flow line elevations on all BCR's and ECR's.
- 29. If cross gutter has upstream drainage area greater than 1,000 feet in length, then 10-foot cross gutter required. Otherwise, 6-foot width. Show width on plans.
- 30. No mid-block cross gutters. Cross gutters across major streets need prior approval from City Engineer.

- 31. Typical sections for all streets. Show existing, proposed and ultimate conditions. Show right and left sides of sections, as they would appear looking up-station on the street even if only one side of the street is being improved. Identify property lines. Give level line offsets from centerline to quarter crown and T.C. Show range of slopes on existing and match-up paving. If difference in elevation between top of curb and existing ground at property line exceeds one foot, indicate what slopes are to be constructed outside the right-of-way, 2:1 maximum. Maximum 2:1 slope within street right-of-way.
- 32. Cross-slopes to be in the range of 1% for driving lanes and 3% to 4% for shoulders. 2% driving lane and 6% shoulder absolute maximums. Cross-slopes to be computed from lip of gutter.
- 33. If both driving lane and shoulder have variable cross slopes, the  $\frac{1}{4}$  crown elevations to be shown on plan.  $\frac{1}{4}$  crown located 8 feet from curb face on all streets.
- 34. Show traffic index (T.I.) under typical sections. Residential T.I. = 5; Collector T.I. = 7, Secondary T.I. = 8 and Major T.I. = 9 – Check with City Engineer.
- 35. Barricade needed at temporary dead end streets.
- 36. Widening flare at 2:1, narrowing flare at rate to be determined by the City Engineer, each from the curb face. F-1 flexible delineators 20 feet on center along outgoing taper.
- 37. A 2- by 6-inch header staked with 2" x 2" x 18" stakes, 6' o.c. is required at edges of paving that are not adjacent to gutters or existing paving, except for the tapers.
- 38. At "T" intersections, where no driveway is provided, then a handicap access curb ramp shall be provided.
- 39. Block walls connected with backup lot treatment will be placed at the top of any slopes adjacent to the street. All details of other than standard walls are required on plans. Maximum height wall is 7 feet. All footings to be designed for a minimum 6-foot wall. Show height of wall and top of footing or minimum depth of footing cover on plan. No walls or footings to be placed in Public Rights-of-way.
- 40. Check for existing sewer lateral and show and label any proposed or existing laterals. (Applies to projects where there are existing sewers) Laterals to be built before paving.
- 41. On curb-type entrances on PRD's on major streets, special median may be needed in private street for traffic flow.

- 42. Slope letter needed if cut or fill at end or side of subdivision street adjacent to subdivision boundary exceeds one foot onto private property.
- 43. Alley approaches, which drain a portion of an alley with a valley gutter, will be depressed at the rear of the approach. Show flow line elevation on plans.
- 44. Minimum 20-foot long by 2-foot wide by 2.5-inch thick AC drainage aprons required at downstream end of stub streets.
- 45. For all major street intersections (two or more major streets) 88 feet wide and greater, traffic signal conduit and pullboxes shall be shown on the plans even if no signals are being planned to be installed at this time. Unless otherwise approved to be eliminated by the City Engineer.
- 46. If project conditions require fencing, construction limits of required fence, etc., to be shown on plans.
- 47. Private engineer to have Planning Department initial all plans showing public block walls and landscaping.
- 48. Plan checker to make field inspection of the site of the proposed improvements, if necessary.
- 49. Show flow around tract on index map on title sheet, if necessary.
- 50. If flow is diverted from its existing course onto private property, a recorded drainage release letter from the affected property owners will be required.
- 51. Private engineer to use San Bernardino County method drainage calculations (hydrology and H.G.L.). Assume ultimate upstream development.
- 52. Check to see if new street section will carry same flow as existing street section (critical where there is an existing ditch along street) without diverting flow across centerline.
- 53.  $n = 0.020$  on residential streets (streets with driveways, parked cars, etc.)  
 $n = 0.015$  on major streets (no driveways, little or no parking, etc.)
- 54. Check calculations on non-standard box culverts, etc.
- 55. Drainage structures checked for capacity. Check hydraulic calculations submitted by engineer.
- 56. Note size, length and "D" strength for pipe. Minimum diameter pipe 18 inches.

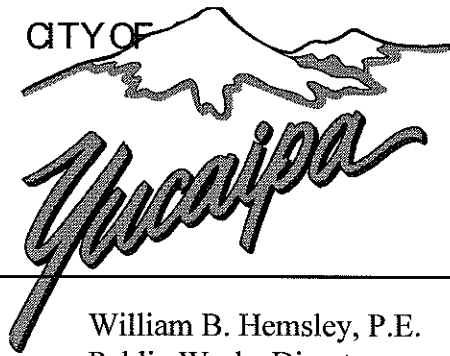
57. Permanent drainage to be in the following preference:
1. Storm Drain Pipe (RCP and (CIPP)
  2. Air Blown Mortar or Similar Open Channel
58. Sump catch basins and drains to be designed for 100-year storm, underground storm drain systems designed for 25-year storm and open channel for 100-year storm. Sump conditions require a secondary overland freeflow to prevent flooding of buildings should catch basin or storm drain system become blocked.
59. For the sizing of roadway storm drains and the locating of catch basins in streets, the storm drain system will be designed to:
- 1) Collect a 25-year Storm Event within the street section (Top of Curb to Top of Curb)
  - 2) Collect and contain the 100-year Storm Event within the roadway's right-of-way.

The Engineer's supporting calculations shall be provided to document that this design criteria has been achieved.

60. No grate catch basins shall be constructed.
61. No cross gutters are to be installed where there are existing storm drains to tie into.
62. A recorded Drainage Encumbrance Agreement shall be provided if property drains drain into an adjacent property owner's land.
63. Any block walls, ditches, etc. needed along tract boundary to prevent flooding shall be shown on the plans.
64. All subdivision or lot boundaries shall be verified for any possible problems such as blocking drainage from or discharging drainage to adjacent land or conflict with existing or proposed improvements.
65. Check for possible ponding on streets and cross gutters and aprons.
66. For storm drains show HGL and elevation of HGL to nearest 0.1' in profile. Show "Q" in streets, into catch basins and into storm drain system and designate  $Q_{25}$ ,  $Q_{100}$ , etc. Show any flowby on catch basins. Show "Q" to nearest 1 CFS. Show time of concentration at catch basins, junction structures, etc.
67. Water surface elevations in catch basins minimum 6 inches below gutter flow line.

- 68. If alternate of C.I.P.P. is shown on plan, show HGL for both R.C.P. (n=.013) and C.I.P.P. (n=.015) and specific alternate size. C.I.P.P. concrete strength to be minimum 3000 p.s.i.
- 69. Check for cutoff walls, energy dissipaters, etc., at outlets of storm drain systems. Also, headwalls, etc. at inlets.
- 70. No storm drain easements centered on property line and no storm drains located on property line. Storm drain easement widths vary 12-25 feet depending on size of facility. Supplemental access easements may be required.
- 71. Encroachment permit needed from San Bernardino County Flood Control if connecting into one of their storm drains.
- 72. Label private drainage system as such. Inlets of private drainage systems to be equal to or above HGL of public storm drain they connect to or if tying into a catch basin, equal to or above the top of curb of the catch basin.
- 73. Standard under-sidewalk parkway drains to be used for private drainage only.
- 74. If proposed construction will affect adjacent driveways in any way, a written approval from adjacent property owners is required.
- 75. Engineer to contact City Engineer to discuss design of street prior to submitting plans for checking when proposed street improvements involve a railroad crossing in any way.
- 76. No "stick on" labels on plan originals.
- 77. Any supporting calculations or pertinent data that would be required to allow complete checking of the entire design development package (including but not limited to closure calculations for maps, hydrology and hydraulic calculations for storm drain studies, etc.) must be submitted with first check.
- 78. All plan notes and details shall be clear and neat.
- 79. Catch basins at major, primary and secondary street intersections shall be designed for 100% interception of storm water flows where adequate capacity exists in the existing storm drain system or in the design of all new storm flow drainage systems.

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William B. Hemsley, P.E.  
Public Works Director

**STREET AND STORM DRAIN IMPROVEMENTS**  
**Profile Checklist**

**Project:** \_\_\_\_\_ **Checked By:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Prepared By:** \_\_\_\_\_ **Date:** \_\_\_\_\_

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*(Check When Completed For All Sheets)*

- 1. Show vertical scale: 4 feet to the inch or 8 feet to the inch (on prior approval)
- 2. Show datum elevation at both ends of each street. Benchmark reference on each sheet.
- 3. Show stationing at bottom of profile.
- 4. Names and stationing of intersecting streets.
- 5. Label and show stations and elevations at the beginning and end of all curb returns, vertical curves, horizontal curves, transition sections, grade breaks and beginning and end of improvements.
- 6. Indicate length of curb returns and length of horizontal curves. Draw curb returns full length, not twice tangent distance.  $\frac{1}{4}$  delta points to be shown on all returns and elevations.
- 7. Label all grade lines and profiles (show the percent of grade on each). Also show size of curb face.
- 8. Profile of existing centerline with elevations at least every 50 feet (except for projects involving mass grading).

- 9. Profile of existing ground at property line (except for projects involving mass grading).
- 10. Profile of existing E.P. with elevations at least every 50 feet.
- 11. Show connection with or future design to existing improvements along with existing elevations. Show grade on existing improvements.
- 12. Check profile of ¼ crown if required. Show grade.
- 13. Grades of major and secondary streets should not exceed 6%. Residential streets should not exceed 8-10% or as required by the Fire Department.
- 14. Check elevations shown in profile against those shown in the plan view.
- 15. Check difference between T.C. and centerline against what typical section shows.
- 16. Minimum centerline and top of curb grade is 0.5%, show grades in profile. If profile on existing street is less than 0.5%, engineer to have prior approval from Public Works. No new streets to have grades less than 0.5%.
- 17. Use vertical curves for all grade breaks in excess of 0.5% (Parabolic V.C.'s only). Do not use portions of vertical curves. Design speeds are 30 miles per hour for local, 45 miles per hour for collectors, 50 miles per hour for secondary and 55 miles per hour for majors.
- 18. Show tangent grades at PRVC or PCVC.
- 19. Show P.I. stationing and elevations on vertical curves.
- 20. Elevations every 25 feet on vertical curves (or fractional part thereof).
- 21. Check sight distance: (both horizontal and vertical)
  - Design Speeds:      30 mph – Residential Local Streets
  - 45 mph – Collector Streets
  - 50 mph – Secondary Streets
  - 55 mph – Major Streets
- 22. Show transition details between different types of curbs.
- 23. Extend profiles beyond end of improvements (as necessary to justify grades) for 300 feet; if new road intersects existing street, for 100 feet each way.
- 24. If future curb is to go over canal, etc., check to see there will be adequate clearance between bottom of curb and top of canal cover.

- 25. Use straight grades for cross gutters unless there are unusual circumstances.
- 26. Maximum 2.5% grade coming into cross gutter. P.I. for vertical curve to be minimum of 50 feet back from flow line of cross gutter. On streets where the grade is 5% or greater, a grade of 4.5% into the cross gutter is acceptable.
- 27. Curb returns to be designed by plane method of top of curb. Show P.I. and elevations. Show tangent grades if different from T.C. grades.
- 28. Absolute minimum fall around or away from curb returns shall be 0.5%. Vary curb face if necessary. (Hold the T.C. elevations and vary the flow line).
- 29. Show profile going into and out of return with grades.
- 30. Check shoulder around curb returns for excessive slope (maximum 6%).
- 31. Check through streets for driveability.
- 32. Show structures to scale (catch basins, etc.). Note critical flow line elevations. Add Details for Local Depression Elevations (in detail or table format).
- 33. Show and label any existing or proposed underground construction that may conflict or enter into the design of the proposed improvements.
- 34. Show existing or proposed flow coming into and going out of new improvements.
- 35. Check for flat spots at high and low points of vertical curves. Vary curb face height to provide minimum flow line grade of 0.5% (vary the flow line, hold the T.C.).
- 36. Use variable curb face height on cul-de-sacs, knuckles, etc., to help alleviate flat slopes. Minimum flow line grade is 0.5%. Maximum street grade into gutter at back of cul-de-sac shall not exceed 3%.
- 37. If curbs are variable height, show T.C. and F.L. elevations and curb height. Show flow line profile with grade.
- 38. Check for car dragging going into driveway or alley.
- 39. On "grading to drain" situations check for sufficient elevations and stations to allow grading to be done (critical where grading is to be done in flat area).
- 40. Proposed grade checked against City plans, if any.

- 41. All plans must be complete within themselves and not contingent on future or adjacent construction.
- 42. On curb inlets or outlets, the top of the curb remains constant with the flow line varying up or down to allow for the facility. Minimum flow line grade is 0.5%.
- 43. Where the property being developed is below the level of the street, a driveway profile is required to show that 100-year street flows will not enter onto private property by way of the driveway.
- 44. If project conditions require fencing, construction limits or required chain link fence, etc. to be shown on plans.
- 45. Private engineer to have Planning Department initial all plans showing public block walls and landscaping.
- 46. Plan checker to make filed inspection of the site of the proposed improvements, if necessary.
- 47. Show flow around tract on index map on title sheet, if necessary.
- 48. If flow is diverted from its existing course onto private property, a recorded drainage release letter from the affected property owners will be required.
- 49. Private engineer to use San Bernardino County method drainage calculations (hydrology and H.G.L.). Assume ultimate upstream development.
- 50. Check to see if new street section will carry same flow as existing street section (critical where there is an existing ditch along street) without diverting flow across centerline.
- 51.  $n = 0.020$  on residential street (streets with driveways, parked cars, etc.)  
 $n = 0.015$  on major streets (no driveways, little or no parking, etc.)
- 52. Check calculations on non-standard box culverts, etc.
- 53. Drainage structures checked for capacity. Check hydraulic calculations submitted by engineer.
- 54. Note size, length and "D" strength for pipe, Minimum diameter pipe 18 inches.
- 55. Permanent drainage to be in the following preferences:
  - 1. Storm Drain Pipe (RCP and CIPP)
  - 2. Air Blown Mortar or Similar Open Channel

- 56. Sump catch basins and drains to be designed for 100-year storm, underground storm drain systems designed for 25-year storm and open channel for 100-year storm. Sump conditions require a secondary overland freeflow to prevent flooding of buildings should catch basin or storm drain system become blocked.
- 57. Twenty-five-year storm to be carried between curbs and 100-year storm between right-of-way lines.
- 58. No grate catch basins.
- 59. No cross gutters where there are existing storm drains to tie into.
- 60. A recorded drainage release letter needed if streets drain onto adjacent property owner's land.
- 61. Any block walls, ditches, etc. needed along tract boundary to prevent flooding (overland, from canals, etc.)? Show on plans.
- 62. Check at subdivision boundaries for any possible problems such as blocking drainage from or discharging drainage to adjacent land or conflict with existing or proposed improvements.
- 63. Check for possible ponding on streets and cross gutters and aprons.
- 64. For storm drains show HGL and elevation of HGL to nearest 0.1' in profile. Show "Q" in streets, into catch basins and into storm drain system and designate Q25, q100, etc. Show any flowby on catch basins. Show " " to nearest 1 CFS. Show time of concentration at catch basins, junction structures, etc.
- 65. Water surface elevations in catch basins minimum 6 inches below gutter flow line.
- 66. If alternate of C.I.P.P. is shown on plan, show HGL for both R.C.P. (n=0.013) and C.I.P.P. (n=0.015) and specific alternate size. C.I.P.P. concrete strength to be minimum 3000 p.s.i.
- 67. Check for cutoff walls, energy dissipaters, etc. at outlets of storm drain systems. Also headwalls, etc. at inlets.
- 68. No storm drain easements centered on property line and no storm drains located on property line. Storm drain easement widths vary 12-25 feet depending on size of facility. Supplemental access easements may be required.
- 69. Encroachment permit needed from San Bernardino County Flood Control if connecting into one of their storm drains. City to apply with data and fee provided by private engineer.

- 70. Label private drainage system as such. Inlets of private drainage systems to be equal to or above HGL of public storm drain they connect to or if tying into a catch basin, equal to or above the tops of the curb of the catch basin.
- 71. Standard under-sidewalk drains to be used for private drainage only.
- 72. If proposed construction will affect adjacent driveways in any way, a written okay from adjacent property owners is required.
- 73. When proposed street improvements involve a railroad crossing in any way, engineer to contact City Engineer to discuss design of street prior to submitting plans for checking.
- 74. No "stick on" labels on plan originals.
- 75. Any supporting calculations or pertinent data that would be required to allow complete checking of the entire design development package (including but not limited to closure calculations for maps, hydrology and hydraulic calculations for storm drain studies, etc.) must be submitted with first check.

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