

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

Project Name:	Map ID:	
Firm Name:	Engineer:	
Address:		
City:	State:	Zip:
Phone Number:	Fax Number:	
Property Owner:		
Address:		
City:	State:	Zip:
Reviewed By:	Date Received:	Date Accepted for Review:

The following checklist is intended as a guide for the engineer preparing a Technical Drainage Study to submit to the local entity and Clark County Regional Flood Control District (if necessary). The listed items are the minimum information required prior to the entity performing a review. The engineer will remain responsible to ensure the Technical Drainage Study is prepared within the guidelines as set forth in the Clark County Regional Flood Control District (CCRFCD) Hydrologic Criteria and Drainage Design Manual (MANUAL).

This document is intended as an aid in preparing Technical Drainage Studies. Each study submitted is reviewed for compliance with local and regional criteria. This form is not intended to be all inclusive and does not limit the extent of the information, calculations or exhibits which may be necessary to properly evaluate the intended land use.

If items are not applicable for the subject site, provide N/A.

I. GENERAL REQUIREMENT

- | Yes | No | |
|-------|-------|--|
| _____ | _____ | Design Manual Standard Form 1 with the engineer's seal and signature. |
| _____ | _____ | Design Manual Standard Form 4 . |
| _____ | _____ | 2 copies of the 24" x 36" Drainage Plan. |
| _____ | _____ | A notarized letter from the adjacent property owner(s) allowing off-site grading or discharge. |

II. MAPS AND EXHIBITS

- | Yes | No | |
|-------|-------|---|
| _____ | _____ | A copy of a current Flood Insurance Rate Map (FIRM) with the site delineated. |
| _____ | _____ | A copy of the current CCRFCD Master Plan Update Figure, (F-x), for Flood Control Facilities and Environmental areas with the site delineated. |

REFERENCE:

STANDARD FORM 2

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II. MAPS AND EXHIBITS (Continued)

- | Yes | No | |
|-------|-------|--|
| _____ | _____ | Off-site drainage basin maps for existing, interim and future conditions showing the existing topography, basin boundaries, concentration points, and flows in cfs. |
| _____ | _____ | On-site drainage basin maps for existing and proposed conditions showing the existing topography, basin boundaries, concentration points, and on-site and off-site flows in cfs. |
| _____ | _____ | Vicinity Map with local and major cross streets identified and a north arrow. |

III. DRAINAGE PLAN

- | Yes | No | |
|-------|-------|---|
| _____ | _____ | Sheet size: 24" x 36" sealed by a registered engineer in the State of Nevada. |
| _____ | _____ | Minimum scale: 1" = 60'. |
| _____ | _____ | Project name. |
| _____ | _____ | Vicinity Map with local and major cross streets. |
| _____ | _____ | Revision box. |
| _____ | _____ | North arrow and bar scale. |
| _____ | _____ | Engineer's/consultant's address and phone number. |
| _____ | _____ | Elevation datum and benchmark. |
| _____ | _____ | Legend for symbols and abbreviations. |
| _____ | _____ | Cut/fill scarps, where applicable. |
| _____ | _____ | Street names, grades, widths. |
| _____ | _____ | Proposed future and existing spot grades for top of curbs and street crowns at lot lines, grade breaks, and along curb returns on both sides of the street. |
| _____ | _____ | Existing contours encompassing the site and 100 feet beyond with spot elevations for important locations, where appropriate. |
| _____ | _____ | Minimum finish floor elevations with top-of-curb elevations at upstream end of lot. |
| _____ | _____ | Proposed typical street sections. |

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III. DRAINAGE PLAN (Continued)

Yes	No	
_____	_____	Streets with off-set crowns.
_____	_____	Proposed contours or spot elevations in sufficient detail to exhibit intended drainage patterns and slopes.
_____	_____	Property lines.
_____	_____	Right-of-way lines and widths, existing and proposed.
_____	_____	Existing improvements and their elevations.
_____	_____	Delineation of proposed on-site drainage basins indicating area and 10-year and 100-year storm peak flows at basin concentration points.
_____	_____	Concentration points and drainage flow direction with Q_{100} and V_{100} and D_{100} in streets.
_____	_____	Cumulative flows, velocity, and direction of flow at upstream and downstream ends of site for the 10-year and 100-year flows.
_____	_____	Location and cross-section of street capacity calculations.
_____	_____	Cross-sectional detail for channels, including cutoff wall locations.
_____	_____	Existing and proposed drainage facilities, appurtenances, and connections (i.e., sidewalk, ditches, swales, storm drain systems, unimproved and improved channels, and culverts, etc.) stating size, material, shape, and slope with plan and profile and HGL calculations.
_____	_____	Existing and proposed drainage easements and widths shown with sufficient detail. A cross sectional detail must be provided that shows appropriate lining and reinforcement.
_____	_____	Location and detail of existing, proposed, and future block wall openings. Minimum size is 16" x 48". Wrought iron gate is required for flows > 10 cfs.
_____	_____	Location and detail of flood walls illustrating depth of flow, proposed grouting height, etc.
_____	_____	Perimeter retaining wall locations. All existing and proposed walls (retaining screen and flood) must be shown with adjacent ground elevations. Flood walls with 8-inch concrete masonry unit.
_____	_____	Building and/or lot numbers.
_____	_____	Alignment of all existing, proposed, or future Regional Facilities adjacent to the site.
_____	_____	Limits of existing floodplain based on current FIRM or best available information; limits of proposed floodplains based on best available information.

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III. DRAINAGE PLAN (Continued)

Yes No

- _____ _____ For areas in Zone A, AE, AH, and AO, base flood elevations (BFEs) must be shown for each lot; BFEs may be listed on each lot, or in a table. Finish floor elevations must be a minimum of 18 inches above BFE.
- _____ _____ Appropriately elevated "humps" 6 inches above the 100 year water surface elevation at site accesses where the intent is to protect the site from the Q_{100} flows.
- _____ _____ Street slopes for perimeter and interior streets. The minimum slope is 0.4 percent.
- _____ _____ Location and detail of best management practice (BMP) for parking lots and low impact development (LID) (if required).

IV. HYDROLOGIC ANALYSIS

Yes No

- _____ _____ Appropriate soil information and Soils Map for existing and future conditions with subbasins and property delineated.
- _____ _____ Input and output information for existing conditions from computer models (HEC-1 or TR-55). The flow routing diagram must be provided with HEC-1 models.
- _____ _____ Input and output information for future conditions from computer models (HEC-1 or TR-55). The flow routing diagram must be provided with HEC-1 models.
- _____ _____ Use of correct precipitation values in and around the McCarran Airport rainfall area.
- _____ _____ A discussion in the text of the hydrologic analysis justifying subbasin boundaries and cutoffs, supporting assumptions, and calculations.
- _____ _____ A summary table of stormwater flows showing basin area, Q_{10} and Q_{100} for both individual basins and combined basin flows, where applicable.
- _____ _____ Copies of supporting technical information referenced from a previously approved study and a statement accepting these results.
- _____ _____ On-site facilities must perpetuate flows through or around the site without significantly impacting adjacent property owners in accordance with current Nevada Drainage Law.
- _____ _____ Calculation for impervious area for parking lots and LIDs (if required).

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V. HYDRAULIC ANALYSIS

Yes	No	
_____	_____	Flow split calculations and supporting documentation or reference for the method of flow split calculations used.
_____	_____	Normal depth street flow calculations and cross section diagrams for all interior and perimeter streets. Provide "d x v" products for the Q ₁₀₀ and Q ₁₀ flows representing the worst case for interior and all perimeter streets. Q ₁₀₀ d x v ≤ 8. Q ₁₀ d x v ≤ 6 and 12 foot dry lane for rights-of-way ≥ 80 feet. Calculations must be labeled by street name as indicated on the Grading Plan.
_____	_____	A summary table of interior and exterior street capacity calculations showing the street name, Q ₁₀₀ flow, slope, depth of flow, velocity and depth times velocity product and streets needing to meet 12 foot dry lane criteria.
_____	_____	Appropriate hydraulic calculations for block wall openings assuming a 50 percent vertical clogging factor. (Assume the lower half of the opening is plugged.)
_____	_____	Appropriate hydraulic calculations at drainage easement entrance and discharge locations to set finish floor elevations. Hydraulic calculations must include submerged weir, superelevation and tee intersection losses, where appropriate.
_____	_____	Provide necessary freeboard requirements to set the finished floor elevations of all proposed buildings, 2 x depth of flow or depth of flow plus 18 inches of freeboard, whichever is less. The minimum requirement is 6 inches above adjacent upstream top of curb. Buildings adjacent to drainage easements must always be provided with 18 inches of freeboard above the Q ₁₀₀ weir height or flow depth, whichever is greater.
_____	_____	A complete water surface profile analysis (HEC-2, HEC-RAS, etc.) for channel flows and FEMA Zone A flood zones. <ul style="list-style-type: none">• Field survey data.• Input and output information.• Plotted cross-sections based on survey with proper encroachments.• A map showing the location of the cross-sections.• Analysis of both sub and super-critical flow segments.• A summary table and a discussion of the results in the text of the report.
_____	_____	Provide a 50 percent clogging factor in the capacity calculation for drop inlets.
_____	_____	Hydraulic calculations for culverts and storm drains. D-Load calculations must be provided for storm drain pipes in public rights-of-way, including headwater pool inundation.
_____	_____	The mitigation of nuisance water, both during construction and in the fully developed condition, must be addressed.
_____	_____	Provide BMP type, size and supporting calculations for parking lots and LIDs (if required).

REFERENCE:

STANDARD FORM 2