

TECHNICAL GUIDANCE  
FOR  
CLCWA'S DRAINAGE AND FLOOD CONTROL POLICY  
(December 14, 2006)

## 1. INTRODUCTION

The Clear Lake City Water Authority (CLCWA) adopted a drainage and flood control policy on September 8, 2005 for all new development and redevelopment within the boundaries of the CLCWA in an effort to ensure that such development would not worsen any existing flooding problems or create any new flooding problems.

Specifically, the CLCWA adopted criteria that require all new development and redevelopment provide detention ponds in order to mitigate the increases in runoff rates and volume associated with such development. The Maximum Allowable Outflow Rates from the detention pond are to be restricted to 0.125 cfs/acre and 0.075 cfs/acre for the 100-year and 10-year storm events, respectively. Additionally, the Minimum Detention Volume to be provided within the pond is set at 1 acre-foot/acre of area draining into the pond.

After the adoption of this policy and criteria, various technical questions were raised by developers and their engineers concerning certain aspects in the implementation of this policy and criteria. This Technical Guidance is provided in order to address some of these questions and assist developers and their engineers in the implementation of this drainage and flood control policy and its corresponding criteria. This Technical Guidance may be periodically updated as new or better information and/or technology become available.

## 2. VARIANCE REQUESTS

Requests for a variance to the CLCWA policy and criteria presented above can be made in recognition of unusual circumstances or characteristics associated with the proposed development. The following procedures are provided as a recommendation for the type of analyses that will be required in order to obtain such a variance. Other procedures and/or analyses will be considered on a case-by-case basis as appropriate.

## A. BACKGROUND

To determine the Maximum Allowable Outflow Rates for a detention pond serving small areas in unincorporated Harris County, the existing (pre-developed) peak runoff rates for the 10-year and 100-year storm events are generally used and are obtained from the Site Runoff Curves from HCFCD's Policy, Criteria and Procedure Manual. For "undeveloped" areas, the 0% impervious curve is used to obtain the peak runoff rates for this condition. However, these standard curves do not allow for any recognition of differences in drainage characteristics for any particular piece of property to be developed, other than size of area and percent imperviousness. In addition, this 0% impervious curve is based on the assumption that the area already has a well-developed drainage system, which is normally not the case in small areas within the CLCWA boundary. Finally, using the existing peak runoff rate as the release rate for the pond does not prevent downstream flooding due to the increase in runoff volume associated with development and the cumulative effect of small developments on downstream flows.

Therefore, the CLCWA adopted release rates (and a corresponding detention volume) that reflected drainage conditions and characteristics representative of undeveloped conditions in this area, being generally poorly drained, and in recognition of the need to be lower than undeveloped runoff rates in order to prevent downstream impacts. Thus, in the event a tract of land to be developed has drainage characteristics that are significantly different than what was assumed in developing the CLCWA's release rates, then a request for a variance may be considered.

## B. REQUEST FOR NO DETENTION

If the developer/engineer believes that his/her proposed development will not cause any adverse impacts without providing any detention, a request can be made for a variance to the CLCWA's drainage and flood control policy requirements, with an appropriate analysis to be submitted in support of this request. The following is the recommended procedure for such an analysis:

- (1) Evaluate any and all reasonable storm scenarios, including storm surge, demonstrating that no adverse impacts will result from the proposed development without detention.

(2) TSARP models should be used, as may be appropriately updated and/or modified by the CLCWA or other governmental agency, to evaluate any potential impacts within the watershed.

(3) Evaluate the 10-year, 100-year and 500-year rainfalls and storm surges for the watershed area with and without the proposed development.

(4) Consider moving storms across the watershed.

(5) Evaluate all undeveloped areas (and developed areas with detention) within the subarea of the proposed development as being fully developed without detention to determine potential impacts within the watershed down to Clear Lake.

### C. REQUEST FOR DIFFERENT RELEASE RATES

If the developer/engineer believes that his/her proposed development will not cause any adverse impacts with its proposed detention by releasing more storm water as required under the CLCWA's policy and criteria discussed above, a request can be made for a variance to the CLCWA's drainage and flood control policy requirements, with an appropriate analysis to be submitted in support of this request. The following is the recommended procedure for such an analysis:

(1) Compute the "existing" peak runoff rates from the proposed development for the 10-year and 100-year storm events using the Rational Method. The "existing" runoff is based on land conditions as they existed as of September 8, 2005. (Note: These "existing" peak runoff rates may not be used as the release rates for the proposed detention pond without adjusting them in recognition of the increase in runoff volume associated with the proposed development and the cumulative effect of small developments on downstream flows).

(2) To adjust the "existing" peak runoff rates in order to obtain appropriate release rates for the proposed detention pond, plot the "existing" peak runoff rates on the Site Runoff Curves from HCFCD's Policy, Criteria and Procedure Manual. Extend a line from these plotted points parallel to the lines on these curves (between 20-640 acres) up to the drainage area size of 640 acres (see attached curves for an example). Determine the peak

runoff rate for 640 acres using this extended line, and compute a cfs/acre runoff rate. Apply this cfs/acre runoff rate to the size of the proposed development. This “adjusted” peak runoff rate would become the requested Maximum Allowable Outflow Rate for the 10-year and 100-year storm events, respectively, for use in designing the required detention pond for the proposed development.

(3) Use the Small Watershed Hydrograph Method and the requested 100-year Maximum Allowable Outflow Rate determined above for computing the Minimum Detention Volume to be requested for the proposed pond (see attached example).

### 3. ASSUMED TAIL WATER CONDITIONS

In determining whether the proposed detention pond release rates are in compliance with the Maximum Allowable Outflow Rates as set forth in the CLCWA’s policy discussed above, a tailwater condition must be assumed. The tailwater condition to be assumed should be such that, at the maximum design water level in the pond, the minimum head is 2 feet and 0.7 feet for the 100-year and 10-year events, respectively.

### 4. MINIMUM OUTLET PIPE/RESTRICTOR SIZE

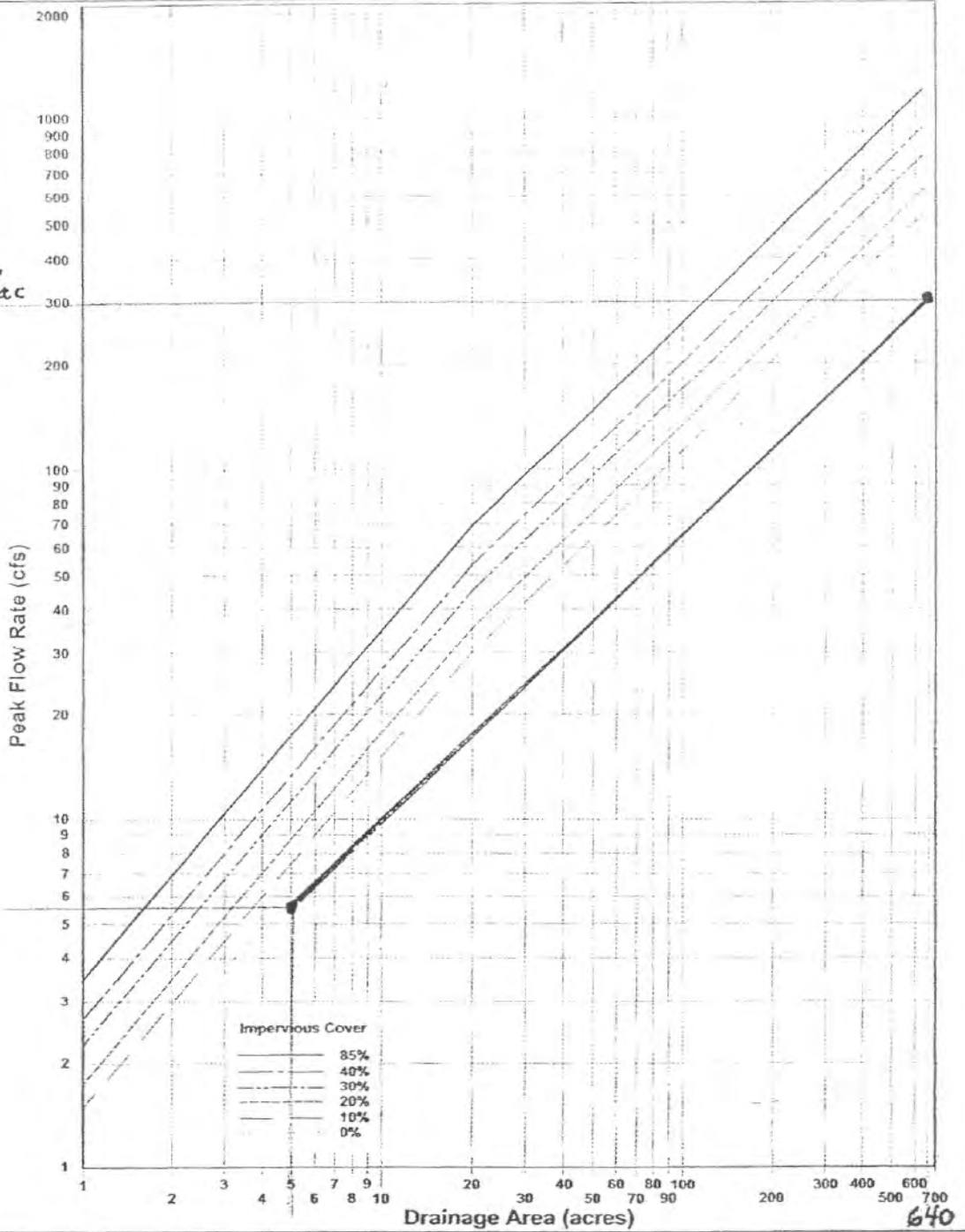
According to the Harris County Flood Control District’s Drainage Criteria Manual, the minimum outlet pipe/restrictor size is a diameter of 6 inches to prevent clogging. However, the CLCWA believes that a smaller pipe size (down to 3 inches in diameter) can be used without causing a serious problem with clogging. Therefore, if the calculated outlet pipe/restrictor size needed to maintain the Maximum Allowable Outflow Rates discussed above is less than 3 inches in diameter, then the outlet pipe/restrictor size should be set to 3 inches.

This adjustment to the outlet pipe/restrictor size can be justification for requesting a variance to the Minimum Detention Volume of 1 acre-foot/acre, by using the Small Watershed Hydrograph Method and demonstrating that a smaller sized pond can handle the design storm.

## 5. FREEBOARD

A minimum of 1 foot of freeboard is required for detention ponds. The Minimum Detention Volume required under the CLCWA's policy and criteria as discussed above is to be measured from the crest of the emergency spillway down to the bottom of the pond, and therefore does not include any freeboard.

cfs/ac



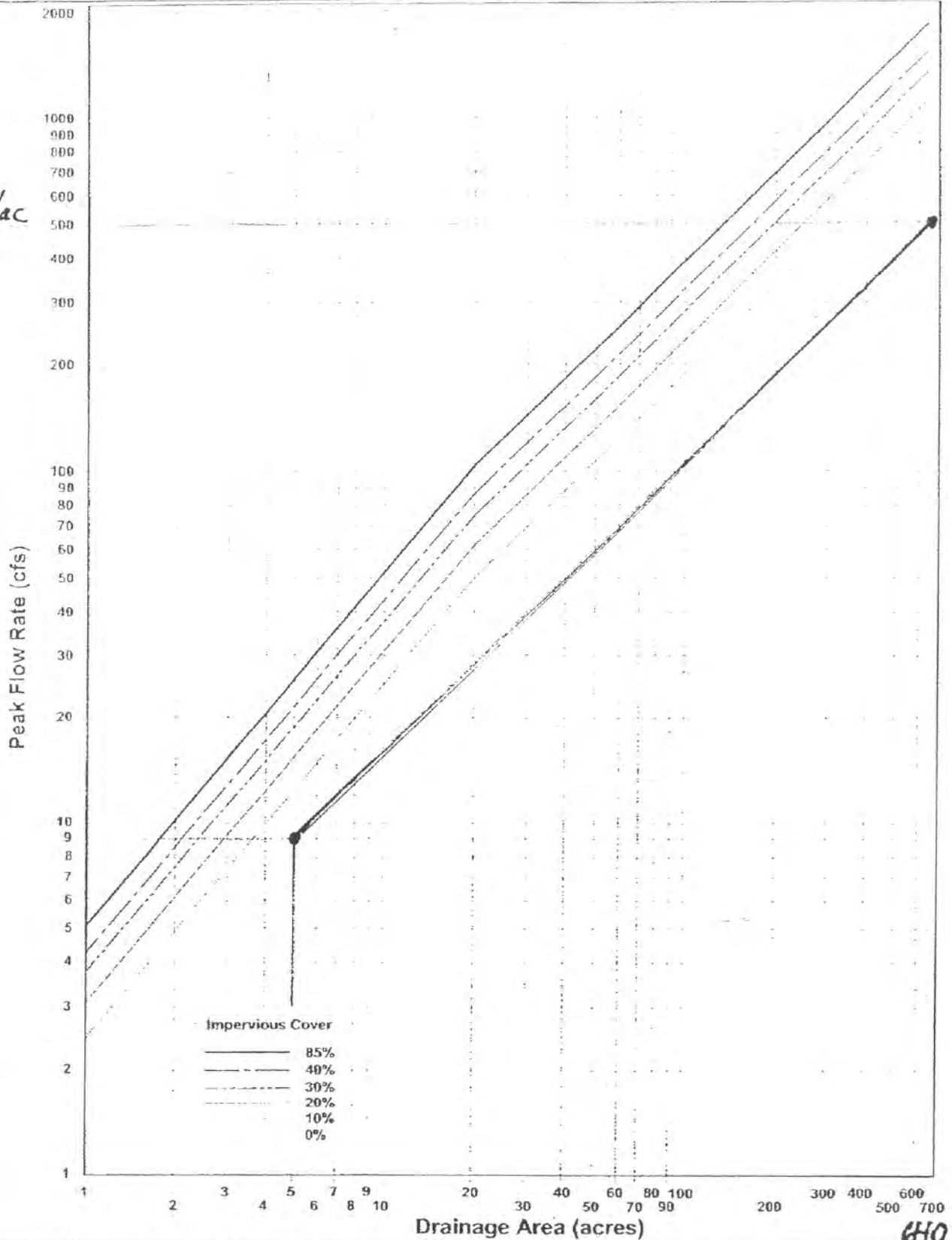
**POLICY,  
CRITERIA, &  
PROCEDURE  
MANUAL**

**SITE RUNOFF CURVES FOR 10% EXCEEDANCE  
PROBABILITY (10-YEAR FREQUENCY) STORM**

DATE: 10/5/04

EXHIBIT 3-1

0.8 cfs/ac



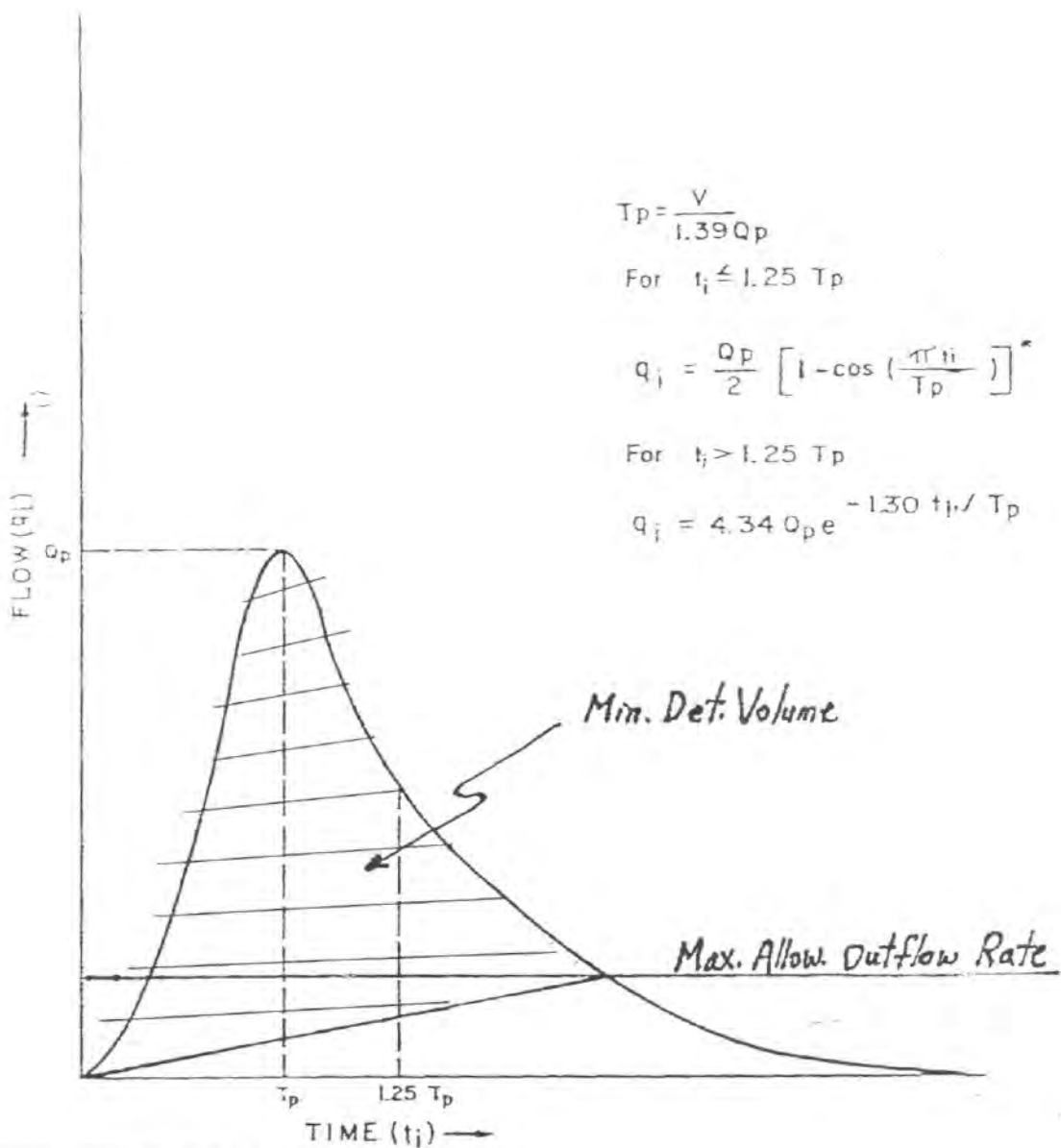
Harris County  
Flood Control District

POLICY,  
CRITERIA, &  
PROCEDURE  
MANUAL

SITE RUNOFF CURVES FOR 1% EXCEEDANCE  
PROBABILITY (100-YEAR FREQUENCY) STORM

DATE: 10/5/04

EXHIBIT 3-2



\* With calculator in radian mode.



**SMALL WATERSHED METHOD  
OF  
HYDROGRAPH DEVELOPMENT**

EXHIBIT B-2