APPENDIX B

MASTER DRAINAGE PLAN OBJECTIVE, CRITERIA AND COMPONENTS, AND REVIEW PROCESS

OBJECTIVE

The objective of the Master Drainage Plan (MDP) is to propose specific drainage control systems that will prevent significant adverse impacts to the site's natural hydrologic system and to existing and planned off-site drainage systems and resources. Although this is also the objective of the Surface Water Design Manual (SWDM) generally, the County allows smaller-scale projects to rely more heavily on the "cookbook" approach of the Core and Special Requirements specified in the Manual. Land use alterations from larger scale projects have a higher potential to result in resource and flooding impacts if the "cookbook" standards miss their mark. These larger projects, then, are required to take a more detailed, site-specific look at drainage resources and associated management issues.

Larger projects are seen to entail more risk to receiving waters (including groundwater) for two reasons: (a) the relatively large area of the subbasin which is developed and (b) the shorter than typical time frame in which that development occurs. If the same area were developed as smaller parcels, rather than as a large site, development would normally be staggered over a longer period of time. This longer time frame allows a certain "grace" period for problems to be identified and corrective actions incorporated into later development proposals. Not only are formal drainage complaints called in to the County a source of information, but the SEPA public review process accompanying permit review offers an avenue for existing drainage problems to be made known. This longer time frame and input from the affected public offers certain safeguards that any problems resulting from application of the more general drainage planning approach specified in the SWDM are dealt with before additional development in the subbasin proceeds.

Some of the impacts that MDPs would be expected to address include the following:

1. Increase in flow rates and/or volumes that would result in flooding along the natural and/or constructed drainage system, or that would aggravate existing flooding problems, either on-site or downstream.
2. Increase of flow rates and/or volumes, both on- and off-site that would de-stabilize the existing geomorphic balance of the natural drainage systems. Examples would include an increase in the rate or frequency of streambank erosion resulting in bank/slope failures along stream corridors, and downstream sedimentation reducing channel capacity.
3. Alteration of natural topography and/or native vegetation that would result in unstable soil conditions, slopes, or embankments.
4. Alteration of natural hydrologic features or provision of site improvements that would reduce the functional ability of the subbasin to preserve water quality and quantity and/or in-stream and other aquatic habitat values.
5. Alteration of ground water/interflow that would adversely change downstream base flows and/or impair existing water rights.

CRITERIA

The proposed drainage plan, impact analysis and mitigation measures shall be supported by detailed technical analyses and reports as part of the MDP. In addition to the engineering plans, the MDP shall include appropriate geotechnical investigations, water quality and aquatic habitat analysis, and hydrologic computer modeling (see Section 3.2 in Chapter 3). The report shall also include maintenance and operation provisions for the existing natural drainage system and any on-site drainage facilities. Specific maintenance plans and agreements, identifying maintenance responsibilities, must be provided for any facility privately maintained.

The hydrologic and hydraulic analysis of the site, basin, and downstream system shall be done using the methods described in this Manual. Exceptions are for plans required to prepare hydrologic models using rainfall and stream gage data. Any upstream contributing systems or sub-basins shall be analyzed for both existing and future development conditions (as shown in the latest adopted Community Plan, the King County Comprehensive Plan, or other land use maps). Any agreements, contracts or work scopes for the MDP or monitoring plan are also considered a component of the MDP. Specific requirements and the order for submittal of the various components are given in a detached document entitled*: Master Drainage Planning for Large Site Developments - Process and Requirements*, May 1995.

COMPONENTS OF MASTER DRAINAGE PLANS

The MDP consists of several components. These components are typically presented in a drainage plan developed using an approved hydrological model, special reports and studies to identify impacts, mitigation measures to reduce impacts, a technical report containing engineering analyses such as the off-site and flood plain analyses, and a post-development monitoring plan. The drainage plan shall provide a comprehensive analysis of existing and proposed surface and subsurface water quantity and quality conditions for both on and offsite systems. Offsite systems may include upstream and downstream hydrology. Upstream analysis shall include the total drainage area contributing to the site. Downstream analysis shall extend to an acceptable receiving body of water.

Technical elements

At a minimum, specific technical elements of the MDP include the following:

a) A conceptual or preliminary plan of the proposed drainage collection and flow control systems, based upon accurate field topographic mapping and geologic data, should be provided, along with appropriate cross-sections and details necessary to identify drainage system elements.

b) All assumptions, parameters, and input data used in the hydrologic model. Input and output files from hydrologic and/or hydraulic computer models shall be included as an appendix.

c) Hydraulic performance data (stage, storage, discharge) for all elements of the hydrologic system, whether existing or proposed, including lakes, ponds, and wetlands. This data shall be used to route inflow hydrographs to produce outflow hydrographs.

d) Flow data for all existing and proposed conveyance facilities, including streams, swales, pipes, and ditches which will support the proposed system.

e) Floodplain analysis identifying flows, velocities, and extent of flooding for the existing and proposed conditions. Other backwater analysis required to determine existing and proposed conveyance capacity within the MDP and downstream of the MDP.

f) Erosion analysis of on-site and downstream open-drainage systems, identifying flows, velocities, areas of existing and future deposition and channel erosion, and characterization of sediment.

g) Geotechnical analysis of the site and proposed improvements which specifically addresses soils and slope stability for proposed lakes/ponds, road alignments, channel/ravine conditions, building setbacks from steep slopes, vegetative preservation and controls, existing and proposed drainage facilities, and downstream system stability.

h) Ecological analysis to include the physical and biological features of the streams, lakes, wetlands and swales. The features identified shall be keyed to the map produced in Item (2)(b), below.

i) Method and conceptual design for maintaining existing flow regimes in any swales/ravines that may be altered by the development.

j) Method, conceptual design, and location of water quality compensating facilities that may be necessary to replace naturally occurring "biofiltration" functions of site vegetation, i.e. provision and/or preservation of vegetated swales.

k) Description of maintenance design features and provisions that will ensure reliable and long-term facility operation.

l) Provide construction phasing plan that will ensure stormwater/erosion control during development of individual subbasins.

m) Establish a stream flow/rainfall gauging and stream cross section monitoring plan that will document any changes in the levels of flooding, erosion, and sedimentation, and identify responsible parties for necessary mitigation.

Mapping requirements

Mapping for the MDP must be of adequate scale and detail for accurate definition and location of all system elements, both on-site and off-site, and must provide support for hydrologic model characterization. In general, the following are required:

a) Delineation of sub-basins of appropriate size/land use for computer model characterization and hydraulic analysis of all tributary flows.

b) Location and size of all existing and proposed hydrologic features and facilities in the basins. This includes lakes, ponds, wetlands, swales, streams, pipes, and culverts.

c) Overall plan/profile and cross-sections of conveyance systems and identification of the floodplain and floodway and frequency of flooding for existing and developed conditions.

d) Identify areas of in-stream erosion, sedimentation and/or unstable slopes.

e) Identify site soils for use in hydrologic modeling and preliminary analysis for controlling erosion during construction.

f) Identify upstream and downstream habitat condition, i.e., spawning, rearing, and transport areas; pools, riffles, and other in-stream habitat features; and species and populations observed. Locations shall be keyed to the map produced in Item (2)(b), above.

g) Identify general required building setbacks, clearing limits and Native Growth Protection Easements in areas of steep slopes and drainage features.

REVIEW PROCESS

Master Drainage Plans (MDPs) are submitted directly to the Department of Local Services, Permitting Division (DLS-Permitting) for review. They must, however, be a part of a permit application that has been filed with DLS-Permitting (see Section 1.1.1). The MDP process should commence concurrently with the SEPA process.

King County has prepared MDP guidelines entitled*: Master Drainage Planning for Large Site Developments - Process and Requirements*, May 1995, which provide technical guidance to implement the requirements of Section 1.2.2.5 and this Appendix B. The *MDP Guidelines* may be obtained by contacting DLS-Permitting.

Prior to commencing preparation of the MDP, the applicant and design engineer (including the team that includes other design professionals such as geotechnical engineers and/or biologists, etc.) should request a MDP pre-application meeting for general information followed by a scoping meeting with DLS-Permitting

in order to coordinate the requirements for the hydrologic modeling and other special analysis which may be required. At these meetings, the applicant should present an outline for the proposed MDP that includes a description of the proposed project, a schedule for preparation of the MDP, and a description of any known environmental or regulatory issues related to the proposal.

DLS-Permitting will review the components of the MDP as submitted, in a timely manner. The fees for review of the MDP will be determined from resources required (e.g., consultant, staff, and equipment) and will be billed to the applicant by King County. Review fees shall be paid by the applicant to King County prior to receiving MDP plan approval.

Following approval in concept of all of the MDP components, the applicant will submit four complete final MDP packages to DLS-Permitting for approval. Three copies will be kept by DLS-Permitting, and one copy will be returned to the applicant for their records.

Questions regarding the MDP review process should be directed to DLS-Permitting.