MITIGATION DESIGN ELEMENTS OF THE
159-MGD WEST POINT SECONDARY
TREATMENT PLANT EXPANSION

G. A. Nicholson*, L. G. Suhr* and R. K. Sandaas**

*CH2M HILL, Seattle Office, 777 108th Avenue, N.E., Bellevue, WA 98009, USA
**Municipality of Metropolitan Seattle, WA, USA

INTRODUCTION

Increasingly large wastewater treatment plants must be sensitively designed and operated to mitigate environmental impacts. Mitigation has often assumed a bad connotation for excusing environmental impacts or failing to address them seriously. From the opposite perspective, some believe mitigation is a regulatory device to extract amenities beyond a project's impacts. The Municipality of Metropolitan Seattle’s (Metro) 159-mgd West Point Secondary Treatment Plant expansion takes an objective proactive approach to mitigation defining mitigation primarily in terms of both avoiding and minimizing adverse impacts of site development, odors, and noise by using design measures that are reasonable and capable of being accomplished.

The existing 125-mgd West Point primary treatment plant is being expanded to provide an ultimate secondary treatment capacity of 159-mgd average wet weather flow and peak hydraulic capacity of 440-mgd. Secondary treatment will be accomplished using the high purity oxygen process.

The existing West Point plant is surrounded by the pristine natural setting of Puget Sound and Discovery Park. Panoramic views of this natural environment and the distant Olympic Peninsula characterize the plant surroundings. While the objective of the West Point project is to upgrade the present primary sewage treatment plant to secondary capability, a parallel objective is to accomplish this upgrade without negatively impacting the general character of Discovery Park and its surroundings. In accordance with Metro’s proactive mitigation approach, the plant layout has been designed to avoid environmental impacts wherever reasonably possible, and to minimize impacts that cannot be avoided, such as providing screening, control measures or other physical improvements to address impacts that cannot otherwise be avoided.

Metro’s goals and philosophies have been translated into a series of sensitive site design and mitigation criteria summarized as follows.

- Avoid impacts in the shoreline area where possible by minimizing the plant area requirements and by locating facilities as far from the shoreline as possible.

- Design facilities that will prevent treatment plant odors from developing as much as possible and provide an odor control system so that there are no discernible treatment plant odors at publicly accessible areas outside the plant boundary.
Provide noise control such that noise levels at the publicly accessible areas outside the plant boundary do not exceed 55 dBA, and treatment plant mechanical noises audible at the beach areas do not exceed 52 dBA.

Metro's design approach to implementing these mitigation goals and philosophies is discussed below.

SITE DESIGN

Many efforts have been undertaken by Metro to limit the area requirements and visual presence of the West Point plant. The result has been a compact, low profile, and aesthetically pleasing site plan. Metro's above-ground facilities at West Point have been designed to occupy no more than 32 acres, and no more than 6.1 acres of such facilities are located within 200 feet of the shoreline. As much public open space around the plant as possible has resulted from the many space saving design measures. The facilities are designed to blend with the shoreline, park, and hillside environment at West Point. Texture, facility placement, and color have been used to minimize the visual impact of the West Point treatment facilities. An earthen berm with landscaping screens the West Point treatment facilities from the view of those using the adjacent beaches and tide flats.

ODOR CONTROL

Metro's goal in the design of the treatment facilities and odor control system is to prevent discernible treatment plant odors at publicly accessible areas beyond the treatment plant boundary. To accomplish this goal, odor control equipment has been designed to reduce odors emanating from the plant to a level of no more than five odor units outside the West Point plant boundary. The stringent odor control criteria requires that the odor control system remove a minimum of 90 percent of the odor from the primary processes and 99 percent of the odor from the solids handling processes. The selected scrubbing technology is liquid absorption using a high-performance packed tower. The odor control system will include four single-stage and four dual-stage systems, each capable of treating 30,000 cubic feet per minute of ventilation air. To ensure compliance with the odor control criteria, an intensive atmospheric computer and physical modeling effort was undertaken. The probable atmospheric mixing conditions for each wind direction and wind speed were determined using five years of atmospheric data and computer modeling. Candidate discharge locations were modeled using the discharge characteristics and the assumed atmospheric conditions. The resulting plume footprint and ground-level odor concentrations were then determined. Following the computer modeling, the predicted results were confirmed by placing a 1:360 scale model of the plant in a wind tunnel test.

NOISE CONTROL

Operational plant noise will not exceed 55 dBA as measured at any publicly accessible area outside the West Point plant boundary. In addition, specific identifiable mechanical sounds from operation of fixed equipment will not exceed 52 dBA on the Puget Sound beaches. Computer modeling of the structural and operational noise control measures has been used to ensure compliance with this noise criteria.

Information on equipment noise, along with information on existing plant noise levels, was used to predict the total plant cumulative noise levels at various publicly accessible locations around the perimeter of the plant. Examples of noise reduction methods included in the design as a result of the computer modeling will be presented.