California Regional Water Quality Control Board
San Diego Region

Total Maximum Daily Load (TMDL) for Chollas Creek Watershed

Draft Problem Statement
August 3, 1999

What is the problem?

Storm water in Chollas Creek has exhibited toxicity in almost all tests performed on the water flea *Ceriodaphnia* since 1994 and is not meeting the Basin Plan toxicity objective. Toxicity testing is an accepted method for assessment of the potential impact of complex mixtures of pollutants, such as urban storm water runoff, on the aquatic life in the receiving water. The water flea *Ceriodaphnia* is an approved test organism for examination of fresh water samples. The repeated toxicity to the water flea *Ceriodaphnia* in the storm water indicates adverse affects to aquatic organisms, which means that the warm freshwater habitat beneficial use designated in the Basin Plan for Chollas Creek is not fully protected.

A toxicity identification evaluation (TIE) has been conducted to determine which chemical or chemicals are causing toxicity in storm water. Preliminary results from the TIE indicate that the insecticide diazinon is causing toxicity to the water flea *Ceriodaphnia* in storm water. Diazinon has been found in Chollas Creek storm water samples at concentrations from 0.32 ug/l to 0.54 ug/l.

Diazinon is an organophosphorus insecticide that is widely used in residential landscaped areas across the nation and is a very common pollutant in urban storm water runoff. Toxicity in storm water caused by diazinon has also been found in the San Francisco Bay area and the Sacramento-San Joaquin Valleys.

The Chollas Creek Watershed

The Chollas Creek watershed is 16,273 acres and is divided into a north fork (9,276 acres) and a south fork (6,997 acres). The watershed is highly urbanized with contributions from large residential areas as well as commercial and industrial areas. Urban land use is predominantly residential (67%) with a moderate amount of industrial (7%) and commercial (5%) activities. The remaining land in the watershed is largely open space (16%). The watershed also contains a larger than usual amount of roadways (4%). Some sections of Chollas Creek are still natural, but much of the creek has been concrete lined and channelized.

The average annual rainfall in the Chollas Creek watershed is about 9 inches. Rainfall statistics for San Diego International Airport's Lindbergh Field indicate that an average of 18 storms occur each year. Lindbergh Field is about 4 miles north of Chollas Creek near San Diego Bay.

Beneficial Uses and Water Quality Objectives

The Water Quality Control Plan for the San Diego Basin (9) (Basin Plan) establishes beneficial uses and water quality objectives for Chollas Creek and San Diego Bay. The beneficial uses for Chollas Creek are water contact recreation, non-contact water recreation, warm water habitat, and wildlife habitat. Chollas Creek drains into San Diego Bay which has beneficial uses of:

Industrial service supply	Navigation
Water contact recreation	Non-contact water recreation
Commercial and sport fishing	Preservation of biological habitats of special significance
Estuarine habitat	Wildlife habitat
Marine habitat	Migration of aquatic organisms
Shellfish harvesting	Rare, threatened, or endangered species

The Basin Plan contains the following water quality objective for toxicity which is applicable to Chollas Creek and San Diego Bay:

> All waters shall be maintained free of toxic substances in concentrations that are toxic to, or that produce detrimental physiological responses in human, plant, animal, or aquatic life. Compliance with this objective will be determined by use of indicator organisms, analyses of species diversity, population density, growth anomalies, bioassays of appropriate duration, or other appropriate methods as specified by the Regional Board.
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> The survival of aquatic life in surface waters subjected to a waste discharge or other controllable water quality factors, shall not be less than that for the same water body in areas unaffected by the waste discharge or, when necessary, for other control water that is consistent with requirements specified in US EPA, State Water Resources Control Board or other protocol authorized by the Regional Board. As a minimum, compliance with this objective as stated in the previous sentence shall be evaluated with a 96-hour acute bioassay.
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> In addition, effluent limits based upon acute bioassays of effluents will be prescribed where appropriate, additional numerical receiving water objectives for specific toxicants will be established as sufficient data become available, and source control of toxic substances will be encouraged.

Diazinon in Chollas Creek storm water runoff is causing violations of the toxicity water quality objective and adverse affects to the warm water habitat beneficial use. The water flea is one example of aquatic life in Chollas Creek that is affected by diazinon. Diazinon concentrations which cause toxicity to the water flea *Ceriodaphnia* may also cause direct toxicity to other aquatic life, such as aquatic insects. Direct toxicity of the storm water to aquatic insects or other aquatic life is of concern because the function of the stream for supporting life is reduced. Aquatic insects are necessary to support and maintain ecosystem balance. Frogs, fish, birds, and other creatures rely on these aquatic insects for food.

Sampling History in the Watershed

San Diego Municipal NPDES Storm Water Permit Sampling

Storm water monitoring of Chollas Creek began in the 1993-94 rainy season under the San Diego Municipal National Pollutant Discharge Elimination System (NPDES) storm water permit. Each rainy season, storm water samples are collected from two or three storms at a station located on the north fork of Chollas Creek near the intersection of 33rd and Durant Streets. To avoid tidal influence, the monitoring station is installed on the north fork above the north and south fork confluence. Runoff from approximately 57% of the entire watershed is sampled at the monitoring site. This is considered to be representative of the entire watershed because the land use distribution in the north fork portion of the watershed is nearly identical to the land use distribution of the entire watershed as shown in the table below.

Land Use	Percent of Total Acreage (Entire Watershed)	Percent of Sampled Acreage (North Fork Watershed)
Residential	67%	62%
Commercial	5%	9%
Industrial	7%	10%
Open Space	16%	14%
Roadways	4%	5%

Since the 1993-94 rainy season, storm water samples are analyzed for general physical constituents, nutrients, biochemical oxygen demand, chemical oxygen demand, bacteriological constituents, organic constituents, and total recoverable metals. Some samples are also analyzed for dissolved metals. Unfortunately, storm water was not analyzed for diazinon until the 1998-99 rainy season. Toxicity testing began with the 1994-95 rainy season and is conducted using the water flea (*Ceriodaphnia dubia*) and the fish commonly known as a fathead minnow (*Pimephales promelas*). Toxicity as indicated by mortality was found in every test run on the water flea *Ceriodaphnia* for the municipal storm water program. Reproduction of the water flea *Ceriodaphnia* was generally not impaired, even in individuals that died later in the test. Toxicity was generally not found in tests run on the fathead minnow, but some inhibition of growth was found frequently.

Toxicity Identification Evaluation (TIE)

A toxicity identification evaluation (TIE) was conducted to determine the cause of the toxicity in storm water runoff in Chollas Creek. The TIE was conducted by the Southern California Coastal Water Research Project (SCCWRP) and Ogden Environmental, Energy, and Remediation Division (Ogden) under an agreement by the Regional Board, the City of San Diego, the Port District, and the California Department of Transportation (CalTrans). The TIE effort was initiated in March of 1999 and a final report is expected in September of 1999. Storm water from three storms in Chollas Creek during 1999 was evaluated in the TIE. The first task was to compare toxic responses of three commonly used test organisms; one freshwater (the water flea *Ceriodaphnia dubia)* and two marine species (the purple sea urchin *Strongylocentrotus purpuratus* and the mysid shrimp *Mysidopsis bahia*). The salinity of the storm water samples used for the marine organisms was adjusted to approximate seawater salinity levels. A Phase I TIE was conducted to ascertain the class or group of constituents responsible for the observed toxicity. A Phase II TIE was conducted in an effort to determine the primary constituent(s) responsible for the observed toxicity. A Phase III TIE was conducted to confirm the primary constituent(s).

The water from the first two storms was found to be toxic to *Ceriodaphnia.* The water from the third storm was not toxic to *Ceriodaphnia*. Toxicity was found in all three storms for the purple sea urchin. No toxicity occurred for the mysid shrimp for the three storms which were tested. The preliminary results of the TIE indicate that the toxicity to the water flea is caused by diazinon which was found in concentrations from 0.32 ug/l to 0.54 ug/l. The preliminary TIE results also indicate that toxicity to the purple sea urchin is caused by zinc. The Regional Board plans to focus on diazinon for the current TMDL for submittal to EPA by April of 2000. Work on a separate TMDL for metals, including zinc, from the Chollas Creek watershed which may be affecting San Diego Bay, is expected to begin in the next several months.