ENVIRONMENTAL PROTECTION AGENCY

OFFICE OF ENFORCEMENT

REPORT ON

POLLUTION AFFECTING LAS VEGAS WASH, LAKE MEAD & THE LOWER COLORADO RIVER

NEVADA - ARIZONA - CALIFORNIA

DIVISION OF FIELD INVESTIGATIONS - DENVER CENTER

DENVER, COLORADO

AND

REGION IX SAN FRANCISCO, CALIFORNIA

CLEAN WATER

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ENVIRONMENTAL PROTECTION AGENCY
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I. INTRODUCTION

Various technical investigations conducted during the period from 1966 to 1971 have demonstrated that direct and indirect discharges of municipal and industrial wastes to Las Vegas Wash from sources in Las Vegas Valley, Nevada, are causing interstate pollution of Lake Mead and the Lower Colorado River which is deleterious to the health or welfare of persons living in Arizona, California and Nevada. This pollution also causes violations of Federal-State water quality standards applicable to Lake Mead and the Colorado River.

Engineering studies were completed in 1969 which demonstrated that practicable means exist for achieving region-wide abatement of pollution by municipal wastewaters. To date, no positive steps have been taken toward construction of needed region-wide pollution control facilities.

As a result of the continuing delays in securing pollution abatement the Regional Administrator, Region IX, Environmental Protection Agency (EPA) notified municipalities and industries discharging wastes into Las Vegas Valley that such discharges were in violation of established State-Federal water quality standards.

This report summarizes the technical information documenting the interstate pollution and recommends remedial abatement actions.

II. SUMMARY AND CONCLUSIONS

1. Las Vegas Wash, an intrastate tributary of the Colorado River, drains Las Vegas Valley and the Las Vegas, Nevada, metropolitan area. The Wash is an intermittent stream except for the lower 11 miles reaching from Lake Mead to the metropolitan area. A majority of the perennial streamflow in this reach consists of municipal and industrial waste discharges. Water quality in the Wash is characterized by high dissolved solids concentrations and excessive levels of nitrogen and phosphorus, nutrients that stimulate algal growths. Nevada has established water quality standards applicable to the Wash which take effect in 1973, with more stringent requirements to apply in 1980. Present water quality will not meet the 1973 standards.

2. Las Vegas Bay is an arm of the Boulder Basin area of Lake Mead. Las Vegas Wash enters the Bay at its western extremity. The Bay is heavily utilized for water-based recreation including water contact sports. A small craft marina is located on the Bay near the mouth of Las Vegas Wash. The nutrients load discharged by the Wash has produced high nitrogen and phosphorus levels in much of Las Vegas Bay. Excessive algal growths have occurred, producing a distinct green color in the Bay, odors and nuisance conditions. Algal masses 20-25 times greater than background levels in other areas of Lake Mead have been measured in the Bay. These conditions reduce the recreational value of the Bay and interfere with beneficial water uses. Studies have shown that Lake Mead downstream from Las Vegas Bay and the Colorado River below Hoover Dam have a higher algal growth po-

tential than Lake Mead upstream from Las Vegas Bay, indicating that the nutrients discharged by Las Vegas Wash may also be affecting these waters.

3. Lake Mead is an interstate impoundment of the Colorado River. Water quality standards applicable to the lake have been established by Nevada and Arizona and approved as Federal standards. Water quality conditions in Las Vegas Bay are in violation of Nevada standards provisions requiring that the waters be "free from materials attributable to domestic or industrial waste or other controllable sources . . . in amounts sufficient to change the existing color, turbidity, or other conditions in the receiving stream to such a degree as to create a public nuisance, or in amounts sufficient to interfere with any beneficial use of the water".

4. Studies have shown that phosphorus concentrations limit algal growths year around in most of Lake Mead and during most of the year in Las Vegas Bay. Nitrogen concentrations may limit algal growths during the summer in the Bay. To provide maximum assurance that algal growths in the Bay are not stimulated by waste discharges from Las Vegas Valley will require that essentially all waste discharges be eventually removed from Las Vegas Bay.

5. About 21 million gallons per day (mgd) of treated municipal wastes are discharged through a short outfall ditch to Las Vegas Wash by the City of Las Vegas secondary waste treatment plant. This effluent is a major source of dissolved solids and algal nutrients

contributing 52.4, 68.4, and 22.8 percent, respectively, of the known municipal and industrial discharges of nitrogen, phosphorus, and dissolved solids to the Wash. The effluent provides about half of the total flow discharged by Las Vegas Wash into Lake Mead. Present waste inflow is approaching design capacity for existing treatment facilities. Expansion of the plant is planned within the next five years. Existing treatment processes cannot produce an effluent that will meet the 1973 Nevada water quality standards for the Wash.

6. The Clark County Sanitation District discharges about 10 mgd of treated municipal effluent from its secondary waste treatment plant through a mile-long outfall ditch to Las Vegas Wash. This effluent is also a major source of dissolved solids and algal nutrients. Nitrogen, phosphorus, and dissolved solids loads average 29.0, 31.4, and 15.0 percent, respectively, of known municipal and industrial discharges of these substances to the Wash. The effluent contributes about one-fourth of the average flow in the Wash. Present waste inflow to this plant exceeds design capacity, resulting in reduced treatment efficiency. Expansion of treatment facilities to a design capacity of 32 mgd is planned for the immediate future. The Nevada water quality standards implementation plan called for completion of this expansion during 1971. As in the case of Las Vegas, plant effluent after expansion will not meet the 1973 Nevada standards for Las Vegas Wash.

7. Nevada Power Company discharges cooling tower blowdown averaging about 0.9 mgd from two steam electric generating stations to Las Vegas Wash. These discharges are sources of dissolved solids and

nitrogen. Clark Station discharges about 0.7 mgd to Duck Creek about three miles above its confluence with the Wash. Nitrogen and dissolved solids loads discharged are about 1.2 and 4.1 percent, respectively, of known municipal and industrial discharges of these substances. Sunrise Station discharges about 0.2 mgd of blowdown directly to Las Vegas Wash. This effluent contains about 0.5 and 1.1 percent, respectively, of known nitrogen and dissolved solids discharges. Effluents from both power stations will not meet 1973 Nevada standards for Las Vegas Wash. No changes in treatment and/or disposal practices are planned during the next few years.

8. Nevada Rock and Sand Company discharges about 0.5 mgd of wastewater from an asphalt hot mix plant to a small tributary of Las Vegas Wash. This waste discharge contributes about 0.4 and 0.2 percent, respectively, of nitrogen and dissolved solids loads discharged to Las Vegas Wash by municipal and industrial sources. Existing quality of this waste discharge will not meet 1973 Nevada standards for Las Vegas Wash. The Company is constructing a water reuse system which is designed to have no discharge.

9. Basic Management, Incorporated (BMI), operates a waste disposal system that includes a secondary type domestic sewage treatment plant and a large complex of waste disposal ponds covering an area of more than 1300 acres. About 250 acres of the ponds are presently in use. The ponds receive about two mgd of inadequately treated domestic wastes from the City of Henderson municipal plant and the BMI sewage plant and about nine mgd of untreated industrial wastes. Sources of

industrial waste include Kerr-McGee Chemical Corporation; Jones Chemical Company, Incorporated; Montrose Chemical Corporation; State Stove and Manufacturing Company; Stauffer Chemical Company; Titanium Metals Corporation of America, and U.S. Lime Division - Flintkote Company. Industrial waste characteristics are highly variable, ranging from relatively uncontaminated cooling water to highly deleterious wastes. Dissolved solids concentrations as high as 200,000 mg/l, a pH range from 2 to 13, and nitrate concentrations as high as 300 mg/l have been observed in the combined waste stream. Since the disposal ponds are unlined, these wastes percolate into the near-surface aquifer underlying the ponds and enter Las Vegas Wash as groundwater seepage. This seepage presently averages more than five mgd and is a major source of dissolved solids and nitrates. Although the seepage contributes only one-sixth of the total flow in the Wash, it contributes 16.4 and 56.8 percent, respectively, of the nitrogen and dissolved solids loads discharged to the Wash by municipal and industrial sources. The minimal treatment and/or disposal improvements presently planned by the waste sources discharging to the disposal ponds will be inadequate to abate the pollution attributable to these sources.

10. Long-term seepage of industrial wastes from the BMI waste disposal ponds and from waste ponds and conveyance channels in the BMI industrial complex area has resulted in the development of an artificially elevated groundwater mound in the near-surface aquifer. This groundwater is highly contaminated with industrial wastes. Dissolved solids concentrations exceeding 20,000 mg/l and nitrate

concentrations exceeding 150 mg/1 have been measured. Owing to the presence of the groundwater mound, contaminated groundwater seepage would continue for several years after all artificial recharge of the near-surface aquifer was stopped. This seepage could be prevented and residual industrial wastes in the groundwater system recovered by the operation of a shallow well system along Las Vegas Wash to intercept aquifer outflow. Disposal of recovered wastes by evaporation in impermeable impoundments would be required to prevent return flow to the Colorado River system. Elimination of the seepage would substantially reduce the dissolved solids and nitrates loads discharged by Las Vegas Wash.

11. Disposal of all highly mineralized industrial wastes by impoundment and evaporation in impermeable ponds with no discharge would substantially reduce the discharge of dissolved solids into Las Vegas Wash. Use of such disposal methods for all waste discharges from the City of Henderson and the BMI industrial complex would eliminate all artificial recharge of the contaminated near-surface aquifer.

12. Waste treatment technology is currently available that will reduce nitrogen and phosphorus in municipal waste effluents to levels necessary to meet 1973 Water Quality Standards for Las Vegas Wash. Application of such treatment technology to all sources of municipal waste would result in as much as 98 and 90 percent reductions, respectively, in phosphorus and nitrogen loads discharged to Las Vegas Wash by municipal sources. Available technology would not produce an effluent that would meet 1980 water quality standards for Las Vegas Wash.

13. The Las Vegas Valley Water District has been designated by the Nevada Legislature as the agency responsible for elimination of the water pollution problems in Las Vegas Wash and Lake Mead. The District is empowered to conduct feasibility studies and to construct, operate, and maintain pollution control facilities.

14. Total dissolved solids and sulfate concentrations in Lake Mead and the Lower Colorado River presently exceed the recommended limits specified by the Public Health Service Drinking Water Standards. These waters are used for municipal water supplies. They are also used for industrial supplies and irrigation; both uses that are adversely affected by excessive dissolved solids levels. Economic studies have shown that small incremental changes in dissolved solids levels in the Lower Colorado River have a substantial economic impact on water users in Arizona and southern California. The average annual dissolved solids load of 150,000 tons discharged from Las Vegas Wash into Lake Mead increases average total dissolved solids concentrations in the Colorado River at Hoover Dam by 10 mg/l. This increase is estimated to produce a detrimental economic impact on downstream water users of $670,000 per year, which is equivalent to a present worth of $13 million. The increase in total dissolved solids in the Colorado River due to waste discharges from the Las Vegas Wash, and the economic damage sustained therefrom, constitute interstate pollution that is deleterious to the health or welfare of persons living in Arizona and California and, therefore, is subject

to abatement under the provisions of Section 10 of the Federal Water Pollution Control Act.

III. RECOMMENDATIONS

To achieve timely abatement of waste discharges in the Las Vegas Valley that presently cause pollution of the interstate waters of Lake Mead and the Lower Colorado River, it is recommended that:

1) Municipal waste waters from the City of Las Vegas, the Clark County Sanitation District, the City of Henderson, and sanitary wastes from industrial sources be collected, treated, and discharged through a regional waste management system such that established water quality standards for Las Vegas Wash, Lake Mead and the Lower Colorado River are met. This regional municipal waste treatment system shall be implemented and administered by the Las Vegas Valley Water District according to an engineering plan developed by July 1, 1972 and approved by the Environmental Protection Agency and the State of Nevada.

If facilities consistent with the interim regional plan, as adopted by the State of Nevada pursuant to 18 CFR Part 601 (Code of Federal Regulations), are implemented, they should be operated to achieve a maximum practicable removal of phosphorus and nitrogen in the waste effluent, consistent with available technology.

Implementation of waste disposal facilities by the Las Vegas Valley Water District shall proceed according to the following schedule:

a) execute agreement for design services - April 1, 1972

b) secure approval and initiate design of facilities - July 1, 1972

c) advertise for construction bids - April 1, 1973

d) initiate construction - July 1, 1973

e) all facilities in operation - December 31, 1974

2) Industrial process waste waters, boiler blowdown water, cooling system blowdown water, and other highly mineralized wastes be segregated from cooling water and evaporated in impermeable ponds with no discharge,or otherwise disposed of such that established water quality standards for Las Vegas Wash, Lake Mead and the Lower Colorado River are met. The volume of such waste waters should be reduced to the maximum feasible extent by in-plant process control and reuse in order to minimize water use and pond area required. A system of observation wells should be developed to enable monitoring of water quality in the near-surface aquifer in the vicinity of the waste disposal ponds. These facilities should be in operation by December 31, 1972.

3) Once-through cooling water systems either be converted to recirculating systems, or the cooling water be discharged to surface water following treatment as required to assure that the quality of the effluent meets State-Federal water quality standards for Lake Mead and the Lower Colorado River. Discharge to surface waters should be either through a pipeline or impermeable canals. These measures should be in effect by July 1, 1973.

4) Ground water in the near-surface aquifer, presently contaminated by residual industrial waste waters, lying under and down-gradient from the Basic Management, Incorporated (BMI) ponds, be recovered by BMI through

installation and operation of a pumping system with pumpage to be disposed of by evaporation in impermeable ponds or by other means that would meet appropriate water quality standards. All artificial recharge to the near-surface aquifer in Section 36, T. 21 S., R. 62 E.; Section 31, T. 31 S., R. 63 E.; Sections 11, 12, 13 and 14, T. 22 S., R. 62 E.; and Sections 5, 6 and 7, T. 22 S., R. 63 E. should be eliminated. Pumping should be continued until the quality of the pumped water is equal to the quality of water in the near-surface aquifer up-gradient from the BMI ponds, or until it is determined by the Environmental Protection Agency that seepage from the near-surface aquifer will not degrade the quality of the waters of Las Vegas Wash or the Colorado River at Hoover Dam. The pumping system should be in operation by July 1, 1973.

5) Reports on progress in implementing recommended pollution abatement measures be submitted to the State of Nevada and the Environmental Protection Agency on July 1, 1972, and at six-month intervals thereafter by each of the recipients of water quality standards violation notices.

IV. DESCRIPTION OF AREA

The Las Vegas metropolitan area is located near the southern end of Las Vegas Valley in southeastern Nevada. Lake Mead, an interstate impoundment of the Colorado River created by Hoover Dam, is located to the east of the metropolitan area [See location map inside back cover]. Outflow from Las Vegas Valley enters the Las Vegas Bay arm of Lake Mead via Las Vegas Wash.

Clark County, which encompasses all of the metropolitan area, had a 1970 population of 273,288. This population does not reflect the transient tourist population that is estimated to exceed four million visitors annually. The City of Las Vegas is the major incorporated area within the metropolitan area. Others are North Las Vegas, Henderson and Boulder City.

Tourism and recreation, centered around the gambling casinos and resort hotels of Las Vegas and the scenic resources of Lake Mead and Hoover Dam, are the mainstay of the area's economy. Chemical and metal industries near Henderson, the Nevada Test Site activities of the nuclear program, and military activities centered on Nellis Air Force Base are also important economic factors.

A typical arid desert climate with low rainfall, abundant sunshine, mild winters and long, hot summers characterizes the area. This climate is one reason for the popularity of the area with tourists. The climate also results in heavy water use for air conditioning and lawn irrigation. Little irrigation of crops is practiced in the Valley since cheap water is not readily available.

Prior to the settlement of Las Vegas Valley, Las Vegas Wash was an ephemeral stream. This is still true upstream from the metropolitan area, but below the city, discharges of municipal and industrial wastes sustain a perennial stream.

Las Vegas Valley is underlain by two aquifers, separated by a semi-impermeable formation. The deep aquifer is artesian and springs and artesian wells were commonly used for water supplies during early development of the Valley. Mining of groundwater has reduced artesian pressures and largely eliminated springs and flowing wells.

Las Vegas, North Las Vegas, and Nellis Air Force Base primarily obtain their municipal water supplies from groundwater sources. Some water is obtained from Lake Mead. Henderson, Boulder City, and the Basic Management, Incorporated, industrial complex at Henderson obtain their water supplies from Lake Mead. Completion of the Southern Nevada Water Project in the near future will result in the importation of large volumes of Lake Mead water into the Las Vegas area.

V. WATER QUALITY STANDARDS

A. NEVADA

Water quality standards applicable to the interstate waters of Lake Mead and the Colorado River in Nevada were established by the State in 1967 in accordance with the provisions of the Water Quality Act of 1965. These standards received full Federal approval on June 27, 1968.

Nevada established specific water quality criteria applicable to Lake Mead and the Colorado River below Hoover Dam [See Appendix A, Table A-1] and a second set of criteria applicable to the Colorado River below Davis Dam [See Appendix A, Table A-2]. Nevada also adopted additional water quality requirements for the Colorado River in conformance with guidelines developed by the Colorado River Basin States [See Appendix A, Table A-3].

Two provisions in the Nevada water quality requirements, adopted from the Colorado River Basin States' guidelines, are of special interest. One of the "Basic Principles" provides that" ... all identifiable sources of water pollution will be managed and controlled to the maximum degree practicable with available technology in order to provide water quality suitable for present and potential future uses of the [Colorado River] System's interstate waters."(16)*

The "Minimum Quality Criteria" provide that interstate waters of the Colorado River shall be "free from materials attributable to domestic or industrial waste or other controllable sources ... in amounts sufficient to change the existing color, turbidity or other

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* Numbers in parentheses refer to bibliographical references.

conditions in the receiving stream to such a degree as to create a public nuisance, or in amounts sufficient to interfere with any beneficial use of the water."[16]

On August 26, 1969, the Nevada State Board of Health adopted water quality standards applicable to Las Vegas Wash. Since the Wash is an intrastate stream, these standards are not subject to Federal approval. The standards established two sets of water quality criteria, an interim set to take effect in 1973 and more stringent requirements to take effect in 1980 [See Appendix A, Table A-4].

B. ARIZONA

Water quality standards applicable to Lake Mead and the Lower Colorado River were established by Arizona in 1967. The original Arizona standards were revised on July 18, 1968, and subsequently fully approved as Federal standards on September 27, 1968. The Arizona standards [see Appendix A, Table A-5], contain narrative criteria comparable to the Nevada provision previously quoted.[14]

C. CALIFORNIA

Water quality standards applicable to the Lower Colorado River were established by California in 1967. These standards were approved with some exceptions on January 9, 1969. California standards contain narrative criteria comparable to the Nevada criterion previously quoted [see Appendix A, Table A-6].[15]

VI. WATER QUALITY PROBLEMS

Municipal and industrial sources of pollution in Las Vegas Valley contribute to degradation of water quality in three water bodies, Las Vegas Wash, Lake Mead, and the Lower Colorado River [see the location map inside back cover]. This water quality degradation results in violations of water quality standards and interference with beneficial water uses, with accompanying economic losses to water users. Water quality degradation is most severe in the Las Vegas Bay portion of Lake Mead.

A. LAS VEGAS WASH

Prior to the initiation of waste discharges, Las Vegas Wash was an ephemeral stream. Downstream from the Las Vegas metropolitan area the Wash is now a perennial stream. Except during periods of precipitation, a majority of the streamflow consists of municipal and industrial wastes that are either discharged through surface channels to the Wash or reach the Wash as diffuse groundwater discharges fed by seepage from waste disposal ponds. Limited volumes of natural groundwater augmented by seepage from lawns and irrigated farmland also reach the Wash.

At least five separate studies defining water quality conditions present in Las Vegas Wash and Las Vegas Bay have been conducted since 1965[1,3,9,11,12]. These studies show that water quality in the Wash reflects characteristics of the waste sources from which the majority of flow is derived. Upstream from the vicinity of the BMI waste disposal ponds near Henderson, streamflow in the Wash consists of the effluent from the City of Las Vegas and Clark County Sanitation District municipal waste treatment plants, cooling tower blowdown from the Clark and Sunrise Power Stations of Nevada Power Company, asphalt plant wastewaters from Nevada Rock and Sand Company, and small groundwater contributions. Concentrations of nitrogen and phosphorus, nutrients that stimulate algal growths, are high throughout the upper portion of the Wash, decreasing as the flow moves downstream from the two municipal waste treatment plants as the result of uptake by aquatic growths. Total dissolved solids (TDS) concentrations in the same reach are from three to ten times higher than maximum levels (400 mg/l) found in groundwater used for the Las Vegas municipal supply. [Water quality conditions observed during the various surveys are summarized in Table VI-1. The USGS gage is located near the BMI waste disposal ponds.]

A small increase in streamflow and substantial degradation in water quality occurs between the vicinity of BMI waste disposal ponds and Las Vegas Bay. Seepage from the waste disposal ponds is the primary source of this water quality degradation. Municipal wastes from the City of Henderson and domestic and industrial wastes from seven industrial facilities in the BMI complex are discharged to the ponds for disposal by evaporation and seepage. Nitrogen and TDS loads carried by the Wash more than double in this lower reach. [These water quality changes are reflected in the data presented in Table VI-1.] Some of the waste seepage enters the Wash upstream from the USGS gage.

As Las Vegas Wash enters Las Vegas Bay, the Wash carries a large load of dissolved solids and nutrients. These pollutants are a primary cause of the water quality degradation in Las Vegas Bay that results in violations of applicable water quality standards. As shown in

TABLE VI-1

Summary of Water Quality Conditions in Las Vegas Wash

Location	Flow mgd	Nitrogen mg/l	Nitrogen lb/day	Phosphorus mg/l	Phosphorus lb/day	Total Dissolved Solids mg/l	Total Dissolved Solids lb/day
May 1966 FWPCA Study							
Confluence of STP Effluents (mile 9.3)	15.1	18.2	2300	12.0	1520	1130	143,000
USGS Gage (mile 6.0)	13.7	1.8	210	9.3	1070	2740	315,000
North Shore Road (mile 0.6)	16.9	8.6	1210	4.9	690	5230	740,000
March 1968 Bureau of Reclamation Study							
Mile 9.3	No Measurement	-	-	-	-	-	-
Mile 6.0	18.1	3.5	530	12.8	1890	3342	506,000
Mile 0.6	No Measurement	10.7	-	7.8	-	4778	-
July 1968 Tipton and Kalmbach Study							
Mile 9.3	No Measurement	-	-	-	-	-	-
Mile 6.0	10.0	3.9	330	16.5	1380	3980	334,000
Mile 0.6	14.8	11.9	1480	8.0	990	5480	680,000
December 1968 Boyl - CH_2M Study							
Mile 9.3	No Measurement	23.0	-	10.6	-	1138	-
Mile 6.0	24.4	7.7	1560	7.0	1420	2800	570,000
Mile 0.6	30.0	13.0	3250	4.1	1025	4800	1,200,000
June-December 1970 Desert Research Institute Study							
Mile 9.3	25.3	13.6	2880	8.3	1760	1180	250,000
Mile 6.0	26.9	5.1	1152	6.1	1375	3021	679,000
Mile 0.6	32.3	11.9	3210	3.0	808	4209	1,140,000

Table VI-1, these pollutant loads are increasing with time, primarily as the result of increased municipal waste discharges and increased seepage from the BMI ponds. Under present conditions total dissolved solids carried by the Wash exceed 150,000 tons per year. Nitrogen and phosphorus loads total 600 and 150 tons per year, respectively. Under existing conditions extensive treatment would be required to utilize water from the Wash for most beneficial uses.

Biological conditions in the Wash were observed during the May 1966 field investigations conducted by the Federal Water Pollution Control Administration.(9) Bottom organisms often associated with organic wastes were found in most locations. Below the two municipal waste treatment plants a few sludgeworms and midges were the only organisms present. Sphaerotolis, a sewage associated bacterium, covered sticks and rocks along the Wash. Near its mouth the Wash supported only a pollution tolerant population of midges and snails.

Substantial enhancement of existing water quality conditions in the Las Vegas Wash will be required to meet the applicable Nevada water quality standards that take effect in 1973 [see Appendix A, Table A-4].

B. LAKE MEAD

Three investigations of water quality conditions, between 1966 and 1970, in selected areas of the Boulder Basin reach of Lake Mead demonstrated that water quality in Las Vegas Bay was substantially degraded below conditions observed elsewhere in Lake Mead. In May 1966, algal counts as high as 27,000 per ml were observed in Upper Las Vegas Bay.(9) Algal counts in excess of 9,000 per ml were observed as far as three miles from the mouth of Las Vegas Wash. These counts were in sharp contrast to average and maximum algal counts of 1,000 and 2,100 per ml, respectively, observed elsewhere in Lake Mead. A distinct difference in color and clarity existed between Upper Las Vegas Bay and other areas of Lake Mead.

Total phosphorus concentrations in the areas supporting dense algal growths were substantially higher than in relatively unpolluted areas of Lake Mead (0.06 mg/l in polluted areas vs 0.005 mg/l, expressed as P, at control stations).[9] A direct correlation between algal densities and phosphorus concentrations appears to exist. Total organic nitrogen concentrations were found to be high, ranging from 0.4 to 1.0 mg/l (expressed as N).[9] These values were above levels believed to be limiting for algal growth.

The Bureau of Reclamation sampled four locations in Boulder Basin and Las Vegas Bay during March, May, August and November of 1968.[11] Chlorophyll a concentrations were measured as a means of evaluating living algal populations. Chlorophyll concentrations were found to be 20 to 25 times greater in Las Vegas Bay than in Boulder Basin. Total insoluble phosphate concentrations as high as 0.15 mg/l (expressed as P) were found in Las Vegas Bay in contrast to values of $<$ 0.03 mg/l elsewhere.

The Federal Water Quality Administration conducted a study of the Boulder Basin portion of Lake Mead and the Colorado River between Hoover and Davis Dams during several periods of 1970 to evaluate existing nutrient levels and algal populations and the potential impact of additional nutrient inputs on algal growth.[10] Results of this study were in agreement with previous studies with respect to the relative conditions in Las Vegas Bay and other Lake Mead waters.

Tests of algal growth potential were made on water samples taken from Las Vegas Bay, areas of Lake Mead upstream and downstream from Las Vegas Bay, and from the Colorado River below Hoover Dam. These tests were designed to measure maximum algal growths under favorable conditions at these locations and to evaluate algal growth responses to various levels of nutrients. Samples taken from Las Vegas Bay exhibited maximum algal growth (as measured by peak chlorophyll a concentrations) ranging from two to five times higher than for other locations in Lake Mead. Colorado River waters below Hoover Dam showed slightly higher algal growth potential than Lake Mead waters upstream of Las Vegas Bay. The algal growth potential tests demonstrated that phosphate concentrations limited algal growths in Lake Mead and the Colorado River throughout the year. Nitrogen concentrations may limit algal growths during summer months in Las Vegas Bay.

Las Vegas Bay is heavily used for water-based recreation, including water contact sports. A small craft marina is located on the Bay near the mouth of Las Vegas Wash. Excessive algal growths cause a distinct green color in the Bay and odors and nuisance conditions. These conditions decrease the recreational value of the Bay and interfere with such uses. Water quality conditions in the Bay are in violation of Federal-State water quality standards that require that the waters be "free from materials attributable to domestic or industrial waste or other controllable sources in amounts sufficient to change the existing color, turbidity, or other conditions in the receiving streams to such degree as to create a public nuisance, or in amounts sufficient to interfere with any beneficial use of the water."[16]

Concentrations of dissolved solids in Lake Mead are above recommended limits specified in the Public Health Service Drinking Water Standards.[13] Sulfate concentrations are also above recommended limits. As measured at Hoover Dam, TDS concentrations reached an annual flow weighted average of 809 mg/l in 1965 in comparison with the recommended maximum limit of 500 mg/l.

Waters of Lake Mead are used for municipal and industrial purposes. Increases in TDS levels above 500 mg/l have been shown to be detrimental to such water uses and to create economic losses to water users.[7] Discharges of dissolved solids from Las Vegas Wash cause a 10 mg/l average increase in TDS concentrations at Hoover Dam. This incremental increase in TDS contributes to interference with beneficial uses of Lake Mead water for municipal and industrial purposes, in violation of the water quality criterion quoted above.

LOWER COLORADO RIVER

TDS concentrations in the Lower Colorado River are primarily a function of TDS levels in discharges from Hoover Dam. As a result of high levels in Lake Mead, TDS concentrations are above acceptable limits for municipal, industrial, and agricultural water uses in the entire Lower Colorado River. Water uses and evapotranspiration losses in the lower river tend to magnify any increase in TDS levels at Hoover Dam. At Imperial Dam TDS concentrations for the 1941-1968 period averaged 751 mg/l in comparison to an average of 687 mg/l at Hoover Dam. TDS concentrations reached an annual average of 916 mg/l at Imperial Dam in 1965, far in excess of the 500 mg/l threshold level for physical and economical effects on water uses.

Owing to the large scale of water use in the Colorado River Basin below Hoover Dam, small incremental changes in dissolved solids levels have been shown to produce a large economic impact on water users and the regional economy. Under present conditions, discharges of dissolved solids from Las Vegas Wash to Lake Mead cause an increase in average TDS concentrations of 10 mg/l and 12 mg/l at Hoover and Imperial Dam, respectively. These incremental increases produce an estimated detrimental economic impact of $670,000 per year, distributed among water users and the regional economy in Arizona and Southern California.(7) This economic impact has a present worth of $13 million. This widespread interference with beneficial water uses is in violation of the water quality standards provision quoted above. The interstate movement of dissolved solids discharged into Lake Mead by Las Vegas Wash contributes to these violations.

VII. SOURCES OF POLLUTION

Municipal and industrial waste sources in Las Vegas Valley are the major sources of pollution of Las Vegas Wash and Las Vegas Bay of Lake Mead. An average of about 50 million gallons per day (mgd) of municipal and industrial wastewater is discharged to treatment and/or disposal facilities in Las Vegas Valley by six municipal and domestic sewage collection systems and ten industrial sources. Two large municipal waste treatment facilities discharge about 31 mgd of treated effluent directly to Las Vegas Wash. About one mgd of industrial waste is discharged directly to the Wash. An additional 5-10 mgd of industrial wastes reach the Wash in the form of ground water flow augmented by seepage from waste disposal ponds.

A. MUNICIPAL WASTE SOURCES

Major sewage collection systems in Las Vegas Valley are operated by the City of Las Vegas, the City of North Las Vegas, the Clark County Sanitation District, Nellis Air Force Base, the City of Henderson, and Basic Management, Incorporated (BMI). Sewage treatment facilities are operated by the City of Las Vegas, Clark County Sanitation District, the City of Henderson, and BMI [see map inside back cover for locations of plants]. Other collection systems are connected to these treatment facilities [see Table VII-1 for details of municipal waste sources].

City of Las Vegas

Municipal wastes from the entire sewered portion of the incorporated Cities of Las Vegas and North Las Vegas are discharged to one large waste treatment facility operated by Las Vegas. In 1969, this system served an estimated population of 190,000.

Plant influent in 1967 averaged about 17 mgd, with July 1968 flows averaging 21 mgd.[1] Present plant influent is reported to average about 25 mgd including about 2.5 mgd bypassed by the Clark County Sanitation District facility.[5] The treatment facilities, which utilize the high rate trickling filter process, were expanded in 1967 from a design capacity of 15 mgd to the present capacity of 30 mgd. The City has tentative plans to expand the plant in 1973-74, possibly doubling the capacity to 60 mgd.

A portion of the plant effluent is used for irrigation of farmland and for cooling water supply for the Nevada Power Company's Sunrise Generating Station. In 1967, about 25 percent of the plant effluent or an average of about 4 mgd was used for these purposes [see Table VII-1].[1] An average of about 13 mgd was discharged to Las Vegas Wash in 1967. During winter months, almost the entire plant effluent is discharged to the Wash. Under present conditions, the effluent discharged to the Wash is probably averaging about 21 mgd annually, or about half of the total flow in Las Vegas Wash.

Average effluent characteristics observed in 1967-68 [see Table VII-2] indicate that the plant generally meets the present State of Nevada treatment criteria that require an effluent containing 20 mg/l or less of suspended solids and 20 mg/l or less of five-day biochemical oxygen demand (BOD_5).[1] A BOD_5 removal efficiency of about 92 percent was achieved in 1967-68.[1] The plant also removed about one-third of influent phosphates and minor amounts of nitrogen. TDS, total nitrogen and total phosphorus

TABLE VII-1

Summary of Municipal Waste Sources

Source	Population Served	Plant Influent mgd	Treatment Processes	Plant Effluent mgd	Effluent Disposal	Remarks
City of Las Vegas	190,000	25	Secondary (High rate Trickling Filter)	1.3	Cooling water supply for Sunrise Generating Station	Plant also serves City of North Las Vegas
				2.5	Irrigation	Influent includes 2.5 mgd bypassed by Clark County
				21	Las Vegas Wash	
Clark County Sanitation District	90,000	15-16	Secondary (High rate Trickling Filter)	2.5	Bypassed to City of Las Vegas STP for Treatment	Plant also serves Nellis Air Force Base
				1.5-3.5	Cooling water supply for Clark Generating Station	
				1.4	Irrigation	
				8-10	Las Vegas Wash	
City of Henderson	18,000	1.0	Imhoff Tanks and oxidation ponds	0.8	BMI Lower Ponds	Pond seepage reaches Las Vegas Wash
		1.0	No Treatment	1.0	BMI Sewage Treatment Plant	Half of Henderson municipal waste treated by BMI See Table VII-6.

concentrations similar to 1967-68 levels were observed in the plant effluent by the FWPCA in May 1966 and Desert Research Institute during late 1970 and early 1971.[9,12] A major improvement in effluent quality will be required to meet the interim water quality standards for Las Vegas Wash that take effect in 1973. The present facilities are not capable of producing an effluent that can meet these standards.

Two characteristics of the plant effluent, excessive nutrient concentrations and total dissolved solids, are of major concern. In May 1966, the Las Vegas effluent contained 78.6 and 77.4 percent respectively of the total nitrogen and total phosphorus loads discharged directly to Las Vegas Wash by municipal and industrial waste sources.[9] Based on a flow of 21 mgd and the average December 1968 effluent characteristics in Table VII-2, the Las Vegas plant is estimated to be discharging 52.4, 68.4, and 22.8 percent, respectively, of the nitrogen, phosphorus, and dissolved solids loads carried by known discharges of municipal and industrial wastes to Las Vegas Wash [see Table VII-4]. Several studies have shown that about 38 percent of this phosphorus load reaches Lake Mead.[1] Due to seasonal changes in plant uptake, the amount of nitrogen load remaining in Las Vegas Wash at Mile 6.0 near the BMI waste disposal ponds ranges from 8 to 31 percent of the discharged load.[1] Essentially all of the dissolved solids load reaches Lake Mead.

Clark County Sanitation District

Clark County Sanitation District serves the unincorporated developed areas of Clark County southerly and easterly of the Cities of Las Vegas and North Las Vegas. Population growth in the District's 161 square mile area has been rapid, with the sewered population increasing from 70,000 in 1966 to 84,000 in 1969. Nellis Air Force Base recently connected to the District.

Present treatment facilities, which use the high-rate trickling filter process, have a design capacity of 12 mgd. In 1968, plant influent averaged about 10 mgd with average daily flows in peak months approaching design capacity.(1) At present, the District is reported to be producing about 15-16 mgd of wastes of which about 2.5 mgd are diverted to the City of Las Vegas plant for treatment.(5) The remaining 12.5 to 13.5 mgd are treated at the District plant, producing overload conditions. The District has applied for a Federal construction grant to expand the plant capacity to 32 mgd. A partial grant offer was made in October 1, 1971. The Nevada water quality standards implementation plan called for completion of this plant expansion during FY 1971.

A portion of the plant effluent is utilized for irrigation of the Paradise Valley Country Club and Winterwood Golf Course and for a cooling water supply for Nevada Power Company's Clark Generating Station [see Table VII-1]. In 1967, about three mgd or 33 percent of the average plant effluent of nine mgd were used for these purposes.(1) The remaining six mgd were discharged directly to Las Vegas Wash. If reuse of plant effluent for irrigation has remained constant, the present discharge of effluent to the Wash would average about 8-10 mgd depending upon the amount used for cooling water. This is about one-fourth of the flow in the Wash.

As shown in Table VII-3, characteristics of the waste effluent are similar to the City of Las Vegas effluent. However, owing to the overload conditions, the plant effluent does not meet State of Nevada criteria for

TABLE VII-2

Average Effluent Characteristics
City of Las Vegas Waste Treatment Plant[1]

Parameter	Fiscal Year 1967-68 Tests by STP Personnel Average Value	December 1968 Tests by Boyle-CH_2M Average Value	Range
COD	--	110 mg/l	100-120
BOD_5	15 mg/l	16 mg/l	15-17
NH_3	19 mg/l as N	18 mg/l as N	18
NO_3	--	2.2 mg/l as N	1-3.4
PO_4 (Total)	10 mg/l as P	11.2 mg/l as P	8.0-11.7
TDS	780 mg/l	676 mg/l	660-692
SS	21 mg/l	17 mg/l	17

TABLE VII-3

Average Effluent Characteristics
Clark County Sanitation District Waste Treatment Plant[1]

December 1968

Parameter	Average Value	Range
COD	147 mg/l	91 - 202 mg/l
BOD_5	23 mg/l	21 - 26 mg/l
NH_3	22 mg/l as N	15 - 30 mg/l
NO_3	1.4 mg/l as N	0.2 - 2.6 mg/l
PO_4 (Total)	10.7 mg/l as P	10.4 - 11.0 mg/l
TDS	950 mg/l	706 - 1178 mg/l
SS	17 mg/l	15 - 25 mg/l

BOD_5. An average BOD_5 removal efficiency of 85 percent was observed in 1968. As a result of the increased plant loading, effluent quality has deteriorated from that observed in May 1966.[9] Expansion of present facilities using the same treatment processes will result in a slight improvement in effluent quality. As in the case of Las Vegas, this improvement will not be adequate to meet the 1973 Nevada water quality standards for Las Vegas Wash.

Since high concentrations of nitrogen, phosphorus, and dissolved solids are present in the effluent, the plant discharges substantial loads of these materials to Las Vegas Wash. In 1966, when the plant effluent was much smaller, the District contributed 19.5 and 21.9 percent, respectively, of the nitrogen and phosphorus loads discharged to the Wash.[9] Based on a flow of 10 mgd and the December 1968 average effluent characteristics [see Table VII-3], this source is estimated to be presently contributing 31, 29, and 15 percent, respectively, of the known nitrogen, phosphorus, and dissolved solids loads discharged directly to Las Vegas Wash by municipal and industrial sources [see Table VII-4].

City of Henderson

The City of Henderson is located southeast of the Las Vegas and Clark County Sanitation District service areas adjacent to the BMI industrial complex. Only about two of the City's 50 square miles have a population density requiring a sewer system. The Henderson sewer system is intermingled with small portions of the BMI sewer system. A total waste flow approaching two mgd is collected by the Henderson system from an estimated population of 18,000.[1] About half of this waste flow is treated at the

TABLE VII-4

Summary of Nitrogen, Phosphorus and Dissolved Solids Loads
Discharged to Las Vegas Wash by Municipal and Industrial Waste Sources

Source	Flow		Nitrogen Load		Phosphorus Load		Total Dissolved Solids Load	
	mgd	Percent	Lb/day as N	Percent	Lb/day as P	Percent	Lb/day	Percent
City of Las Vegas Sewage Treatment Plant	21	56.2	3530	52.4	1940	68.4	120,000	22.8
Clark County SD Sewage Treatment Plant	10	26.7	1950	29.0	890	31.4	79,000	15.0
Nevada Rock and Sand Co.	0.5	1.3	30	0.4	-	-	1,000	0.2
Nevada Power Company Clark Generating Station	0.7	1.9	80	1.2	2	0.1	21,000	4.1
Nevada Power Company Sunrise Generating Station	0.2	0.5	37	0.5	5	0.1	6,000	1.1
Basic Management, Inc. Waste Disposal Pond Seepage	5	13.4	1100	16.4	-	-	300,000	56.8
Total	37.4	100.0	6727	100.0	2837	100.0	527,700	100.0

City of Henderson treatment facility and the remainder at the BMI domestic treatment plant discussed in a following section on industrial wastes.

Treatment facilities operated by the City of Henderson were constructed in 1958 and consist of two Imhoff tanks operated in parallel and two oxidation ponds with a total area of 5.4 acres. Effluent from the oxidation ponds is discharged to the BMI lower waste disposal ponds from which there is no surface discharge.

Flow measurements are not routinely made at the plant. In October and November, 1970, measurements by Desert Research Institute showed plant effluent averaged 0.8 mgd.[12] This is only about half of the design capacity of 1.5 mgd. Estimates of evaporation losses from the BMI ponds indicate that only a small fraction of this flow actually evaporates.[1] It is probable that more than 0.5 mgd of effluent from this source seeps into the near-surface aquifer underlying the BMI ponds and eventually discharges as groundwater flow into Las Vegas Wash.

Average characteristics of effluent from the Henderson oxidation ponds in December, 1968, are summarized in Table VII-5. Changes in the quality of the effluent occur as the flow passes through the BMI lower ponds and into the groundwater system. These changes are indeterminate as the Henderson effluent is mixed with industrial waste seepage from other BMI waste disposal ponds. Effluent from the present Henderson treatment facility does not meet Nevada requirements for discharge to surface waters and cannot be discharged to Las Vegas Wash without further treatment.

TABLE VII-5

Average Effluent* Characteristics
Henderson Sewage Treatment Plant

December 1968

Parameter	Average Value	Range
COD	137 mg/l	104 - 169 mg/l
BOD	30 mg/l	30 mg/l
NH_3	10.9 mg/l as N	10.9 mg/l
NO_3	3.7 mg/l as N	0.2 - 7.2 mg/l
PO_4	4.8 mg/l as P	4.5 - 5.0 mg/l
TDS	4534 mg/l	4148 -4920 mg/l
SS	86 mg/l	35 - 137 mg/l

* Effluent is representative of flow leaving the final oxidation pond of the Henderson STP. This flow then enters the BMI lower ponds. No surface discharge to the Las Vegas Wash occurs.

Summary of Municipal Waste Treatment Needs

The City of Las Vegas and Clark County Sanitation District municipal waste treatment plants collectively contribute about 81.4 and 99.8 percent, respectively, of the nitrogen and phosphorus loads discharged to Las Vegas Wash by municipal and industrial sources. Extensive algal growths in Las Vegas Bay are produced by the discharge of algal nutrients (nitrogen and phosphorus) to the Bay from Las Vegas Wash. These algal growths produce water quality conditions that violate applicable Federal-State water quality standards. Both waste sources contribute directly to these violations of standards. Phosphate concentrations have been shown to limit algal growth in Las Vegas Bay during most of the year except the summer months when nitrate concentrations may limit growth. A major reduction in nutrient concentrations in the Bay will be required if algal growths are to be limited to acceptable levels.

Available waste treatment technology (lime coagulation, filtration, and ammonia stripping) is capable of a high degree of nitrogen and phosphorus removal from secondary sewage treatment plant effluent. Application of such treatment technology to the Clark County and Las Vegas discharges could result in 98 and 90 percent reductions, respectively, in phosphorus and nitrogen loads discharged to Las Vegas Wash by municipal sources. Effluent from such a plant would meet the 1973 Nevada water quality standards for Las Vegas Wash but would not meet the 1980 standards. This high level of waste treatment should be provided for the two major municipal sources through a regional collection and treatment facility prior to any discharge to the Colorado River system.

An interim regional waste treatment plan has been adopted by the State of Nevada and accepted by the EPA pursuant to 18 CFR 601. This plan includes valley-wide collection of municipal wastes, a regional waste treatment facility providing a high degree of nutrient removal, and discharge of treated effluent to the Colorado River below Hoover Dam. If waste treatment and disposal practices consistent with this interim plan are implemented, a high degree of nitrogen removal and the maximum practicable removal of phosphorus will be required to insure that the treated effluent will meet established water quality standards.

The City of Henderson effluent does not directly contribute nutrients to Las Vegas Wash. It does, however, contribute to seepage into the Wash of industrial wastes high in nitrates and dissolved solids. To eliminate continued recharge of the contaminated groundwater system, the Henderson effluent should either be discharged to the regional waste treatment facility, or be given the necessary level of waste treatment to achieve the effluent requirements for other municipal waste sources and discharged to surface waters, or be impounded in impermeable ponds for evaporation with no discharge.

Until 1971, the Las Vegas Valley Water District was concerned primarily with providing a water supply for most of the Las Vegas metropolitan area. Its geographical boundaries encompass the entire metropolitan area including Henderson and the BMI complex. In 1971, however, the District was designated by the Nevada Legislature "as the agency to undertake elimination of water pollution problems" in the Lake Mead - Las Vegas Wash Area.[4] The District is empowered to make "any investigations necessary to determine the most feasible solution", and "implement such solution by construction, operation and maintenance of facilities." Implementation of a regional waste treatment and disposal system could thus be undertaken by the District.

B. INDUSTRIAL WASTE SOURCES

Industrial waste sources are located in two general areas of Las Vegas Valley [see map inside back cover for locations]. The largest volumes of waste are generated by seven industries located in the BMI complex near Henderson. These industries discharge waste to disposal ponds operated by BMI. Seepage from the ponds carries a large pollution load into Las Vegas Wash. Three other sources, two thermoelectric power plants operated by Nevada Power Company that discharge cooling tower blowdown directly to Las Vegas Wash, and an asphalt hot mix plant that discharges scrubber water to the Wash, are located just east of Las Vegas.

Basic Management, Incorporated, Industrial Complex

This complex includes seven industries located in close proximity on a site near Henderson. All sanitary and industrial wastes generated by the complex are discharged to the BMI waste disposal facilities. Details of specific industrial waste discharges are summarized in Table VII-6.

Basic Management, Incorporated - Basic Management, Incorporated, a corporation jointly owned by Stauffer Chemical Company; the Flintkote Company; Titanium Metals Corporation of America; and Kerr-McGee Chemical Corporation; was formed to operate the facilities for water supply, waste disposal, electric power, and railroad sidings which serve the plants of the owner corporations located in the old Basic Magnesium, Incorporated, facility at Henderson. With respect to waste disposal, BMI operates two types of facilities, an industrial waste facility, and a secondary sewage treatment plant which receives sanitary wastes from the BMI industrial complex and municipal wastes from about 2500 homes in Henderson.

Flow measurements and influent and effluent quality analyses are not regularly made at the sewage treatment plant. The only known effluent data are a few grab samples and flow measurements taken by Desert Research Institute during late 1970 and early 1971.(12) These data indicate that effluent quality is similar to the three municipal sources previously discussed and that effluent flow averaged 1.0 mgd. This is slightly higher than the reported design capacity of 0.8-0.9 mgd for this trickling filter plant built in 1942. Recent data submitted by BMI indicate that the plant influent may be as high as 1.53 mgd, including 1.0 mgd from Henderson.(4)

BOD_5 and suspended solids data are not available. It is thus not known if the effluent meets Nevada requirements for discharge to surface streams. The plant overload would tend to indicate the plant effluent would not meet requirements. Also, in 1969 it was reported that industrial wastes characterized by low pH were occasionally received at the plant, with detrimental effects on treatment operations.(1)

Effluent from this facility is discharged to the BMI upper waste disposal ponds where it is mixed with industrial wastes. A small fraction of the combined wastes evaporates and the remainder seeps into the ground.

The industrial waste facility operated by BMI consists of waste collection and conveyance pipes and ditches and two large series of waste disposal ponds. The waste disposal ponds were originally constructed as tailing ponds for the magnesium plant operated at this site during World War II. The ponds are divided into two sets of numerous small cells terraced down the land slope between Henderson and Las Vegas Wash. The "lower ponds", with a total area of about 430 acres, are located adjacent to Las Vegas Wash, to the west of Pabco Road. The "upper ponds" are located further uphill to the southeast of Pabco Road and have an area of about 915 acres. Both sets of ponds are unlined and excavated in semi-pervious materials. Ditches conveying industrial wastes to the ponds are also unlined.

Prior to January, 1971, the lower ponds received industrial wastes from the Stauffer Chemical Company and Montrose Chemical Corporation. These wastes are now discharged to the upper ponds. Treated effluent from the City of Henderson municipal waste treatment plant is also discharged to the lower ponds. In early 1969, the surface area of ponded wastes including the Henderson effluent was about 146 acres.(1) Owing to the diversion of Stauffer and Montrose wastes to the upper ponds, the ponded area will probably decrease to about 10 acres.

In addition to the Stauffer and Montrose effluents, the upper ponds receive waste effluents from Kerr-McGee Chemical Company; U.S. Lime Division-Flintkote Company; Titanium Metals Corporation of America; Jones Chemical Company; State Stove and Manufacturing Company; and the BMI sewage treatment plant. In early 1969, the wetted area of the upper ponds was about 96 acres.(1) It is probable that this area has been increased by the addition of the Stauffer and Montrose effluents. Only the upper few tiers of ponds have been used in the past.

An average of about nine mgd of industrial wastes and two mgd of sanitary wastes are discharged to the disposal ponds. Only a fraction of the wastes evaporates. Since there is no surface discharge from the ponds, the majority of the wastes seep into the ground. Recent studies have conclusively demonstrated that this industrial waste seepage has contaminated a large area of the near-surface aquifer underlying the BMI complex and that groundwater flow augmented by this seepage carries a large pollution load into Las Vegas Wash.[12]

Perhaps the most conclusive evidence of the hydraulic connection between the waste disposal ponds and Las Vegas Wash is the high tritium levels found in groundwater and seepage near the ponds. Tritium levels in the near-surface and deep aquifers underlying Las Vegas Valley are uniformily below five tritium units (T.U.). In contrast, Colorado River water supplied to the BMI complex and the City of Henderson has tritium concentrations of more than 300 TU tritium measurements of groundwater from the near-surface aquifer in the vicinity of the BMI complex and of seepage below the waste disposal ponds showed tritium concentrations of 200 to 400 T.U. which indicate this water originated from the Colorado River.[12]

A second indicator of the movement of industrial wastes into Las Vegas Wash is nitrate concentrations in the groundwater and in Las Vegas Wash. Wastes entering the upper ponds have nitrate concentrations greater than 20 mg/l. Nitrate concentrations in the groundwater as high as 150 mg/l were measured down-gradient from the upper ponds.[12] It is estimated that industrial waste seepage from the BMI ponds contributes a seasonally fluctuating load of nitrates of 1000 to 1700 pounds per day (expressed as nitrogen) to Las Vegas Wash.[1] Total nitrogen loads in Las Vegas Wash decrease substantially between the Las Vegas and Clark County waste treatment plants and the vicinity of the BMI ponds. The nitrate load from the pond seepage substantially increases nitrogen loads carried by the Wash flow into Lake Mead. The nitrogen load contributed by pond seepage is about one-sixth of the total discharged to Las Vegas Wash by municipal and industrial sources and about one-third of the nitrogen load entering Lake Mead from the Wash.

Wastes entering the ponds, groundwater in the vicinity, and seepage entering the Wash are all high in dissolved solids. This imposes a large dissolved solids load on the Wash. A number of studies have been made which indicate that this dissolved solids load averages about 300,000 pounds per day.[1] This is about 57 per cent of the total dissolved solids load discharged to the Wash by municipal and industrial waste sources.

Since much of the industrial waste seepage enters Las Vegas Wash as diffuse groundwater discharges, direct flow measurement is not possible. Enough of the flow has been measured, however, to determine that the seepage averages at least five mgd. The TDS and nitrogen loads [see Table VII-4] for the pond seepage are based on increases in observed loads carried by Las Vegas Wash between the Pabco Road gage and the North Shore Road gage. It is highly probable that some waste seepage enters the Wash upstream from Pabco Road. It is also possible that some seepage reaches the Wash downstream from North Shore Road. It is believed the actual waste loads carried into the Wash by pond seepage are considerably higher than the loads actually measured.

The long-term seepage of industrial wastes from the waste disposal ponds, coupled with additional seepage from waste retention ponds and conveyance channels in the BMI industrial complex, has produced an artificially elevated groundwater mound in the near-surface aquifer underlying the BMI facilities. This groundwater is highly contaminated with industrial wastes. TDS concentrations exceeding 20,000 mg/l and nitrate concentrations in excess of 150 mg/l have been observed. If artificial recharge of this aquifer is allowed to continue, further displacement of contaminated groundwater into the surrounding aquifer and Las Vegas Wash will occur. If artificial recharge is stopped, the contaminated groundwater would continue to seep into Las Vegas Wash for a number of years until the groundwater mound has dissipated. This contaminated seepage could be intercepted and the flow to the Wash stopped by operation of a shallow well field along the lower edge of the groundwater mound.

Jones Chemical Company, Incorporated - The Jones Chemical Company operates a small plant manufacturing industrial chemicals. An unknown amount of sanitary wastes are discharged to the BMI treatment plant. A small volume of industrial wastes (300-400 gallons per day), primarily rinse and wash water containing small amounts of chlorides, is discharged from this facility to the BMI upper ponds.[5] The Company has indicated that it plans to install an evaporator by early 1972 to dispose of all of the industrial wastes.

Kerr-McGee Chemical Corporation - Kerr-McGee Chemical Corporation operates an inorganic industrial chemical plant that primarily produces manganese dioxide. Plant operation and associated waste discharges began prior to 1950.

Sanitary wastes are discharged to the BMI sewage treatment plant. Industrial wastes flow through an open unlined ditch to the BMI upper waste disposal ponds. The volume of these wastes ranges from 0.5 to 4.0 mgd with an average of 0.6 mgd.[4] This is about seven percent of industrial waste inflow to the BMI ponds. About half of the industrial waste is cooling water [see Table VII-6]. The wastes are slightly basic (pH = 8) with high dissolved solids (average TDS = 3800 mg/l) and low nutrient concentrations. Other characteristics, such as toxicity, are unknown.

No treatment or control other than in-plant controls is presently provided by Kerr-McGee. The Corporation has no immediate plans for treatment improvements.

<u>State Stove and Manufacturing Company</u> - This company manufactures residential and commercial water heaters. The plant has been in operation since June 1970.

Sanitary wastes from about 200 employees are discharged to the BMI sewage treatment plant. Industrial waste volumes are small. Mixed cooling and process wastes, totalling about 35,000 gallons, are batch dumped about once per month. These wastes have a pH of about five and TDS concentration in excess of 25,000 mg/l.[4] Some neutralization and chemical treatment of the wastes is effected in the plant. Prior to October, 1971, cyanide was used in the manufacturing process, but such use has been discontinued. Industrial wastes are discharged to the BMI upper ponds.

<u>Stauffer Chemical Company and Montrose Chemical Corporation</u> - The Industrial Chemical Division of Stauffer Chemical Company and its subsidiary, Montrose Chemical Corporation, operate a plant that produces industrial organic and inorganic chemicals and agricultural pesticides. Plant oper-

ation began in 1942.

Sanitary wastes are discharged to the BMI sewage treatment plant. Industrial wastes [see Table VII-6] are discharged to the BMI waste disposal ponds. The Company reports these wastes average about 4.2 mgd, with cooling water contributing about 3 mgd of this total.[4] This volume is consistent with measurements of the discharge made in late 1970 and early 1971.[12] This source contributes about 47 percent of the industrial waste inflow to the BMI ponds.

Prior to January, 1971, the Stauffer industrial wastes were conveyed by a long unlined ditch to the BMI lower ponds. The Desert Research Institute groundwater investigations indicate that seepage from the conveyance channel probably caused substantial contamination of groundwater in addition to the contamination caused by seepage from the waste disposal ponds.[12] In January, this waste stream was diverted to the BMI upper ponds. The water level in a well near the abandoned waste channel dropped, indicating that seepage had been maintaining a higher water table.

Information on the characteristics of this waste discharge is limited. Sampling of the industrial wastes in December, 1968, and late 1970 indicated that pH was high (11-12.6) and that specific conductivity was highly variable, ranging from 2,000 to 200,000 μmhos.[1,12] Sodium and chloride concentrations totalling more than 50,000 mg/l have been measured. Stauffer Chemical Company reports a pH range of 8-10 and an average TDS concentration of 3919 mg/l.[4] This corresponds to an average TDS discharge of 137,000 pounds per day. Nutrient levels in the wastes are believed to be low.

TABLE VII-6

Summary of Industrial Waste Sources

Industry	Industry Type	Waste Volume mgd	Waste Type	Waste Characteristics	Treatment	Disposal	Remarks
Basic Management, Inc.	1/	1.53	Sanitary	Normal Sewage	Secondary (High rate Trickling Filter)	BMI Upper Ponds	Includes 1.0 mgd municipal wastes from Henderson
		8.92	Mixed Industrial Cooling & Process wastes	ph range 2-13 High TDS and NO_3	None	BMI Upper Ponds	Seepage from ponds enters Las Vegas Wash
Jones Chemical Co.	Industrial Chemicals (SIC 281)	<0.001	Process	Unknown	None	BMI Upper Ponds	Evaporation system to be completed in 1972
Kerr-McGee Chemical Corp.	Industrial Inorganic chemicals (SIC 2819)	0.03	Sanitary	Normal Sewage	BMI STP	BMI Upper Ponds	
		0.30	Cooling & Boiler Blowdown	Normal Sewage	None	BMI Upper Ponds	
		0.35	Process	High TDS	None	BMI Upper Ponds	
Nevada Power Co. Clark Generating Station	Electric Powerplant (SIC 491)	0.70	Cooling Tower Blowdown & Boiler Blowdown	High TDS, NO_3	None	Las Vegas Wash	
Nevada Power Co. Sunrise Generating Station	Electric Powerplant (SIC 491)	0.20	Cooling Tower Blowdown & Boiler Blowdown	High TDS, NO_3	None	Las Vegas Wash	
Nevada Rock & Sand Co.	Asphalt hot Mix Plant	0.50	Scrubber Wastewater	High TDS, NO_3	Settling Pond	Las Vegas Wash	Water reuse system with no discharge planned.

1/ Basic Management, Inc. operates a sewage treatment plant and waste disposal ponds for sanitary and industrial wastes from Jones Chemical Co., Kerr-McGee Chemical Corp., Montrose Chemical Corp., State Stove and Manufacturing Co., Stauffer Chemical Co., Titanium Metals Corp. of America, and U.S. Lime Division-Flintkote Co.

TABLE VII-6 (Continued)

Summary of Industrial Waste Sources

Industry	Industry Type	Waste Volume mgd	Waste Type	Waste Characteristics	Treatment	Disposal	Remarks
State Stove and Manufacturing Co.	Manufacture Water heaters (SIC 3639)	<0.001	Cooling & Process	High TDS	None	BMI Upper Ponds	Batch dump 35,000 gal. per month
Stauffer Chemical Co. (Incl. Montrose Chemical Corp.)	Industrial inorganic & organic chemicals (SIC 281, 2879)	0.34	Sanitary	Normal Sewage	BMI STP	BMI Upper Ponds	
		3.50	Cooling & Boiler	-	None	BMI Upper Ponds[2]	
		0.70	Process	High pH & TDS	None	BMI Upper Ponds[2]	
Titanium Metals Corp. of America	Produce Titanium Ingots (SIC 3356)	0.16	Sanitary	Normal Sewage	BMI STP	BMI Upper Ponds	
		3.59	Cooling	-	None	BMI Upper Ponds	
		0.40	Process	Low pH, High NO_3	None	BMI Upper Ponds	Recycling or evaporation under study
U.S. Lime Division Flintkote Co.	Hydrated Lime (SIC 2819)	0.06	Cooling & Dust Control	High solids	None	BMI Upper Ponds	

2/ Prior to January, 1971, these wastes were discharged to the BMI lower ponds.

Titanium Metals Corporation of America - This corporation operates a facility for the production of titanium ingot from imported rutile. The plant has been in operation since July, 1951.

Sanitary wastes are discharged to the BMI sewage treatment plant. Industrial wastes [see Table VII-6] averaging about 4.0 mgd are discharged with no treatment to the BMI upper ponds. This is about 45 percent of the industrial waste inflow to the ponds. Only limited data on waste characteristics are available. The main known deleterious characteristics are a very acidic pH (2.15) and high nitrate concentrations (4-256 mg/l with an average of 101 mg/l measured in 1970-71).[12] The Corporation has indicated that most of its waste discharge is cooling water (3.5 mgd) but one process waste stream is very high in nitrates.[5] The Corporation has research underway to develop control for the nitrate wastes. Separation of the waste stream and recycling or discharge to lined evaporation ponds is contemplated.

U. S. Lime Division, Flintkote Company - This company operates a facility for the conversion of magnesium oxide to hydrated lime. The plant has been in operation since 1951.

Sanitary wastes from about 40 employees are discharged to the BMI sewage treatment plant. Industrial wastes from cooling and dust control operations, averaging about 60,000 gallons per day, are discharged without treatment to the BMI upper ponds. These wastes are characterized by high pH (11.8), high temperature (130°F.), and dissolved solids and suspended solids concentrations of about 1500 mg/l each. The wastes are low in nutrients.

Nevada Power Company

Sunrise Steam Electric Generating Station - This power plant, operated by Nevada Power Company, is located near the City of Las Vegas municipal waste treatment plant. The plant is gas fired and has a generating capacity of 85,000 KW. Plant operation began in 1964.

A closed cooling system including cooling towers is used by the plant. Treated effluent averaging 1.3 mgd from the City of Las Vegas municipal waste facility is used for cooling water makeup.[4] The effluent is treated to reduce ammonia and phosphate concentrations.

Cooling tower blowdown is maintained at a rate which results in a five to one concentration of dissolved solids levels in the feed water. An average of 0.2 mgd of cooling tower blowdown and minor amounts of boiler blowdown and wastewater from water softeners and demineralizers are discharged directly to Las Vegas Wash through an unlined ditch.

This discharge has an average pH of 8.4, TDS concentration of 3510 mg/l, total nitrogen concentration of 19.5 mg/l, and total phosphorus concentration of 0.3 mg/l.[4] The average TDS load discharged is about one percent of the TDS load discharged directly to Las Vegas Wash by municipal and industrial waste sources [see Table VII-4]. The discharge will not meet 1973 Nevada nitrogen criteria for Las Vegas Wash.

Clark Steam Electric Generating Station - This power plant, also operated by Nevada Power Company, is located about one-fourth mile south of the Clark County Sanitation District municipal waste facility. Operation of the power plant is very similar to the Sunrise Station. Treated effluent averaging 3.5 mgd is obtained from the Clark County facility, given further treatment, and used in a closed loop cooling system with cooling towers. Cooling system blowdown, which averages about 0.7 mgd, is discharged through an unlined ditch to Las Vegas Wash.

Blowdown TDS concentrations average 3750 mg/l. Other characteristics of the effluent are similar to the Sunrise Station effluent. The average TDS load discharged is about four percent of the total discharged by municipal and industrial sources to Las Vegas Wash [see Table VII-4]. This waste discharge will not meet 1973 Nevada standards for Las Vegas Wash.

Nevada Rock and Sand Company

This company operates an asphalt hot mix plant just east of the Sunrise power plant. The Stewart Brothers gravel washing operation and Nevada Ready-Mix, a concrete plant, are located adjacent to the asphalt plant. Only the asphalt plant has a waste discharge. This discharge (0.5 mgd average) is from the scrubber used for air pollution control. Deleterious constituents include nitrogen and dissolved solids. The wastes flow through a settling pond with overflow going to Las Vegas Wash. This discharge contributes about 0.4 and 0.2 percent, respectively, of nitrogen and dissolved solids loads discharged to Las Vegas Wash by municipal and industrial sources [see Table VII-4].

The existing waste discharge will not meet the 1973 Nevada standards applicable to Las Vegas Wash. The Company plans to construct a water reuse system and install a new hot mix plant with a bag house that will eliminate the wet scrubber discharge in 1972.

Summary of Industrial Pollution Abatement Needs

Highly mineralized industrial wastes and cooling system blowdown waters are major sources of dissolved solids that reach Lake Mead and the Lower Colorado River by way of Las Vegas Wash. Excessive dissolved solids concentrations in Lake Mead and the Lower Colorado River result in economic damages, interference with established water uses, and violations of Federal-State water quality standards. Each of the above industrial waste sources contributes dissolved solids to Lake Mead and the Lower Colorado River.

Disposal of highly mineralized industrial wastes by impoundment in impermeable ponds and evaporation with no discharge would substantially reduce the discharge of dissolved solids from waste sources to Lake Mead through Las Vegas Wash. Such disposal would also eliminate the discharge of other pollutants, such as algal nutrients, from these sources.

About 80 percent of the industrial wastes presently discharged to the BMI waste disposal ponds is relatively uncontaminated cooling water obtained from Lake Mead. Reuse of this water in closed cooling systems would substantially reduce the volume of mineralized wastes to be impounded for evaporation. If reuse is implemented, the cooling system blowdown should be disposed of in the same manner as other mineralized wastes. Alternately, if the quality of once-through cooling water is not degraded below existing water quality in Lake Mead, the cooling water could be returned to surface waters. This should be done in such a manner that no seepage to the near-surface aquifer would occur.

Sanitary wastes from the BMI complex contribute to recharge of the contaminated groundwater system. These wastes should be discharged to the municipal system where practicable, or should be impounded and evaporated.

Unless controlled, residual industrial wastes in the contaminated near-surface aquifer in the vicinity of the BMI waste disposal ponds will continue to seep into Las Vegas Wash for many years after all new additions of waste to the groundwater system have been stopped. This seepage is a major source of the dissolved solids and nitrate loads carried by Las Vegas Wash and causes violations of Federal-State water quality standards for Las Vegas Bay and Lake Mead. Residual industrial waste could be recovered by controlled pumping from the aquifer. This would also control seepage from the aquifer into Las Vegas Wash. All recovered wastes should be impounded in impermeable ponds and evaporated to prevent return flow to the Colorado River system.

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APPENDIX A

WATER QUALITY STANDARDS

Table A-1.
Nevada Water Quality Standards for
Lake Mead and the Colorado River Below Hoover Dam.

Table A-2.
Nevada Water Quality Standards for
the Colorado River Below Davis Dam.

Table A-3.
Additional Nevada Water Quality Requirements
Guidelines for Formulating Water Quality
Standards for the Interstate Waters of the
Colorado River System*
January 13, 1967

Table A-4.
Nevada State Board of Health Water Quality Standards
for Las Vegas Wash

Table A-5.
Arizona Water Quality Standards
Applicable to Lake Mead and the
Lower Colorado River

Table A-6.
California Water Quality Standards
for the Colorado River

Table A-1.

Nevada Water Quality Standards for
Lake Mead and the Colorado River below Hoover Dam.

Control Point - Below Hoover Dam and Various Points in Lake Mead Proper.

Temperature °C		
Summer	Single Value	Not more than 18
Winter	Single Value	Not more than 14
pH Units		
Annual Median		Within Range 7.5-8.2
Single Value		Within Range 7.0-8.5
Dissolved Oxygen - mg/l		
Average (June through September)		Not less than 6.0
Single Value		Not less than 5.0
BOD - mg/l		
Single Value		Not more than 2
Phosphates (PO_4) - mg/l	(Pending Further Analysis)	
Nitrates (NO_3) - mg/l		
Single Value		Not more than 7
Annual Average		Not more than 4

MF Coliform/100 ml (Average of the last five samples)
Maximum value of 1000 if MF Fecal Streptococci are less than 100.
Maximum value of 5000 if MF Fecal Streptococci are less than 20.
To apply to all swimming areas of the Colorado River within Nevada.

The "Guidelines for Formulating Water Quality Standards for the Interstate Waters of the Colorado River System" as adopted January 13, 1967 are incorporated as a supplement to the standards for this stream. (Table A-3)

Table A-2.

Nevada Water Quality Standards for
the Colorado River below Davis Dam.

Control Point - Below Davis Dam	
Temperature °C	
Summer Single Value	Not more than 20
Winter Single Value	Not more than 14
pH Units	
Annual Median	Within Range 7.5-8.0
Single Value	Within Range 6.5-8.5
Dissolved Oxygen - mg/l	
Average (June through September)	Not less than 6.0
Single Value	Not less than 5.0
BOD - mg/l	
Single Value	Not more than 3
Phosphates (PO_4) - mg/l (Pending Further Analysis)	
Nitrates (NO_3) - mg/l - (Tentative)	
Single Value	Not more than 7.0
Annual Average	Not more than 5.0

The "Guidelines for Formulating Water Quality Standards for the Interstate Waters of the Colorado River System" as adopted January 13, 1967 are incorporated as a supplement to the standards for this stream. (Table A-3)

Table A-3.

Additional Nevada Water Quality Requirements.
Guidelines for Formulating Water Quality
Standards for the Interstate Waters of the
Colorado River System*
January 13, 1967

General Considerations

Past and future economic growth of the States served by the Colorado River System** has been and will continue to be dependent upon the development and utilization of its water resources. Appropriate water quality standards will enhance this development by protecting the quality and productivity of the System's waters. Such standards will not be used to restrict reasonable use and development of each State's apportionment of water in the Colorado River System***. Nothing herein is intended to construe the Colorado River Compacts***.

The System's interstate waters are used for municipal and industrial supplies, irrigation, fish and wildlife, and recreation. Maximum effort must be directed toward maintaining the highest possible water quality for these uses consistent with reasonable beneficial future development and utilization of all resources within States served by the System.

In order to develop practicable and reasonable quality standards for interstate waters of the Colorado River System, full consideration must be given to the numerous factors and variables connected with the control, development, utilization, conservation, and protection of the System's water resources. It is evident that future development and utilization of the System's water resources for expansion of irrigated agriculture, increases in population, and industrial growth will be accompanied by progressive increases in consumptive losses of water and attendant increases in concentrations of dissolved solids.

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* Developed by the State Conferees in the Matter of Pollution of the Interstate Waters of the Colorado River and its Tributaries at a series of meetings during 1966 and 1967, in the interest of compatible State water quality standards. Several water resource interests of each State were involved in most meetings, particularly the last two, held in Scottsdale, Arizona on December 7, 1966 and January 13, 1967.

** The Colorado River and all those streams contributing water thereto.

*** California and Nevada do not agree with these two sentences, but propose that there be further negotiations and discussions to resolve this issue.

In view of the anticipated increase in consumptive use of water, augmentation of the Colorado River is essential just to maintain the existing water quality. Enhancement, as contemplated by the Guidelines of the Federal Water Pollution Control Administration, of the present water quality of the Lower Colorado River is most practicable by a major water augmentation program. One objective of a major water augmentation program would be to approach the limits for total dissolved solids, chlorides, and sulfates recommended by the U.S. Public Health Service Drinking Water Standards of 1962.

Basic Principles

1. The States served by the Colorado River System recognize that answers to important questions regarding total dissolved solids, chlorides, sulfates and sodium are lacking or are based on factors that are not yet well-defined. In respect of this recognition the States agree that pending the development of acceptable answers to enable the setting of criteria for total dissolved solids, chlorides, sulfates and sodium for the interstate waters of the Colorado River System, such criteria should be stated in qualitative terms. At the same time it is agreed that all identifiable sources of water pollution will be managed and controlled to the maximum degree practicable with available technology in order to provide water quality suitable for present and potential future uses of the System's interstate waters.

2. Reviews of all available technical knowledge* pertaining to the water quality problem and evaluation of new pollution potentials will be made at intervals of not greater than 3 years by representatives of the seven System States with the view and intent of improving, strengthening, or otherwise modifying the quality standards.

3. Monitoring of the quality of interstate waters will be carried out at designated points near State lines and other key locations for all constituents covered by the standards. In addition, measurements will be made at these locations for total dissolved solids, sulfates, chlorides, and sodium.

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* During the periodic reviews of technical knowledge full consideration will be given to all new technological or other developments and research which may be utilized to upgrade the standards to provide for the protection and enhancement of water quality. This will include possibilities such as: (1) importation of water of better quality from outside the System; (2) control or management of natural sources of salinity; (3) reduction of total dissolved solids in irrigation return flows through reasonable and practicable means; and (4) other suitable measures.

4. Any State may convene a meeting of all seven States to discuss remedies in those instances where the quality of water available to that State has been adversely affected or threatened by pollutants discharged into the Colorado River System.

<u>Minimum Quality Criteria Applicable to Interstate Water at Agreed State Line Sampling Points</u>

1. Free from substances attributable to domestic or industrial waste or other controllable sources that will settle to form sludge or bottom deposits in amounts sufficient to be unsightly, putrescent or odorous, or in amounts sufficient to interfere with any beneficial use of the water.

2. Free from floating debris, oil, grease, scum, and other floating materials attributable to domestic or industrial waste or other controllable sources in amounts sufficient to be unsightly or in amounts sufficient to interfere with any beneficial use of the water.

3. Free from materials attributable to domestic or industrial waste or other controllable sources in amounts sufficient to produce taste or odor in the water or detectable off-flavor in the flesh of fish, or in amounts sufficient to change the existing color, turbidity or other conditions in the receiving streams to such degree as to create a public nuisance, or in amounts sufficient to interfere with any beneficial use of the water.

4. Free from high temperature, biocides, organisms pathogenic to human beings, toxic, corrosive, or other deleterious substances attributable to domestic or industrial waste or other controllable sources at levels or combinations sufficient to be toxic to human, animal, plant or aquatic life or in amounts sufficient to interfere with any beneficial use of the water.

5. Radioactive materials attributable to municipal, industrial or other controllable sources shall be minimum concentrations which are physically and economically feasible to achieve. In no case shall such materials exceed the limits established in the 1962 Public Health Service Drinking Water Standards or 1/30 of the 168-hr values for other radioactive substances specified in National Bureau of Standards Handbook 69.

6. No waste from municipal or industrial or other controllable sources containing arsenic, barium, boron, cadmium, chromium, cyanide, fluoride, lead, selenium, silver, copper and zinc, that are reasonably amenable to treatment or control will be discharged untreated or uncontrolled into the Colorado River System. At agreed points of sampling above Imperial Dam in the Colorado River System the limits for concentrations of these chemical constituents will be set at values that recognize their cumulative

effects and which will provide River Water quality consistent with the mandatory requirements of the 1962 Public Health Service Drinking Water Standards.

7. The dissolved oxygen content and pH value of the waters of the Colorado River System shall be maintained at levels necessary to support the natural and developed fisheries.

****

These regulations, adopted by the Nevada State Board of Health, became effective July 1, 1967.

Table A-4.

Nevada State Board of Health Water Quality Standards
for Las Vegas Wash

Parameter		Interim (1973) Standard	1980 Standards
Temp.	°C	<=30	<=30
pH	Units	6.5 - 8.3	6.5 - 8.3
D.O.	mg/l	>=6.0	>=6.0
BOD	mg/l	<=10.0	<=3.0
SS	mg/l	<=10.0	<=2.0
MBAS	mg/l	<=0.5	<=0.5
P (Total)	mg/l as P	<=1.0	<=0.05
N (Total)	mg/l as N	<=7.0	<=0.05
Coliform	mpn/100 ml	<=1000,(1) 5000(2)	<=100(3)
Taste - Odor		No Adverse Effect on Fish	No Adverse Effect on Fish
Turbidity	JTU	No Adverse Effect	<=5.0
Oil		No Visible Floating Oil	No Visible Floating Oil
Floating Solids		None Other Than Natural	None Other Than Natural
Bottom Deposits		None Other Than Natural	None Other Than Natural
Miscellaneous Contaminants and Radionuclides		Conform to PHS 1962 DWS	Conform to PHS 1962 DWS
COD	mg/l	N/A	15 mg/l
Color		None Other Than Natural	None Other Than Natural

(1) If M.F. Fecal Coliform <=200
(2) If M.F. Fecal Coliform <=40
(3) Arithmetic mean; coliform colonies per standard samples <=4/100 ml in 95% of all samples; 5 consecutive daily samples per week required.

Table A-5.

Arizona Water Quality Standards
Applicable to Lake Mead and the
Lower Colorado River

Basic Standards Applicable to All Waters

All waters of the State shall be:

1. Free from substances attributable to domestic or industrial waste or other controllable sources that will settle to form sludge or bottom deposits in amounts sufficient to be unsightly, putrescent or odorous, or in amounts sufficient to interfere with any beneficial use of the water.

2. Free from floating debris, oil, grease, scum, and other floating materials attributable to domestic or industrial waste or other controllable sources in amounts sufficient to be unsightly or in amounts sufficient to interfere with any beneficial use of the water.

3. Free from materials attributable to domestic or industrial waste or other controllable sources in amounts sufficient to produce taste or odor in the water or detectable off-flavor in the flesh of fish, or in amounts sufficient to change the existing color, turbidity or other conditions in the receiving stream to such degree as to create a public nuisance, or in amounts sufficient to interfere with any beneficial use of the water.

4. Free from toxic, corrosive, or other deleterious substances attributable to domestic or industrial waste or other controllable sources at levels or combinations sufficient to be toxic to human, animal, plant or aquatic life or in amounts sufficient to interfere with any beneficial use of the water.

Most Restrictive Additional Water Quality Standards Applicable to Lake Mead and the Lower Colorado River.

1. Bacteriological Quality - The fecal coliform content of primary contact recreation waters shall not exceed a geometric mean of 200/100 ml, nor shall more than 10% of the total samples during any 30-day period exceed 400/100 ml, as determined by multiple-tube fermentation or membrane filter procedures, and based on a minimum of not less than five samples taken over not more than a 30-day period.

2. pH - The pH shall remain within the limits of 6.5 and 8.6 at all times. The maximum change permitted as a result of waste discharges shall not exceed 0.5 pH units.

3. Dissolved Oxygen - The discharge of wastes that lower the dissolved oxygen content below 6 mg/l is prohibited where the receiving body of water is a fishery.

4. Temperature

   (a) Warm water fisheries - Heat added to any warm water fishery shall be the lowest practical value. In no case shall heat be added in excess of that amount that would raise the temperature of the minimum daily flow of record for that month more than 5° F above the monthly average of the maximum daily water temperature prevailing in the water or stream section under consideration; nor shall heat be added in excess of that amount that would raise the stream temperature above 93° F. This provision shall not apply to lakes or impoundments owned by a firm or individual for the express purpose of providing and/or receiving heat wastes.

   (b) Cold water fisheries - Heat added to cold water fisheries shall be the lowest practical value. In no case shall heated wastes be discharged in the vicinity of spawning areas. In other areas, winter temperatures (November through March) shall not be raised above 55° F and summer temperatures (April through October) shall not be raised above 70° F. In both winter and summer, heat shall not be added in excess of that amount that would raise the temperature of the minimum daily flow of record for that month more than 2° F above the monthly average of the maximum daily water temperature prevailing in the water or stream section under consideration. These provisions shall not apply to lakes or impoundments owned by a firm or individual for the express purpose of providing cooling water and/or receiving heat wastes.

5. Turbidity - Turbidity of the water will be maintained at the lowest practicable values possible, but in no case shall:

   (a) Turbidity in the receiving waters due to the discharge of wastes exceed 50 Jackson units in warm water streams or 10 Jackson units in cold water streams.

   (b) Discharge to warm water lakes cause turbidities to exceed 25 Jackson units, and discharge to cold water or oligotrophic lakes cause turbidities to exceed 10 Jackson units.

   A violation of the above numerical turbidity standards resulting from construction, mining, logging, and related land uses shall be grounds for abatement in accordance with ARS 36-1851 to 1868 inclusive.

6. Biocides - Biocides concentrations shall be kept below levels which are deleterious to human, animal, plant or aquatic life, or in amounts sufficient to interfere with this beneficial use of the water.

7. Radioactivity - The concentration of radioactivity in the surface waters of the State shall not:

   (a) Exceed 1/30th of the MPC_w values given for continuous occupational exposure in National Bureau of Standards Handbook No. 69.

   (b) Exceed the Public Health Service Drinking Water Standards for water used for domestic supplies.

   (c) Result in the accumulation of radioactivity in edible plants or animals that present a hazard to consumers.

   (d) Be harmful to aquatic life.

   Since any human exposure to ionizing radiation is undesirable, the concentration of radioactivity in natural waters will be maintained at the lowest practicable level.

Table A-6.

California Water Quality Standards
for the Colorado River

WATER QUALITY OBJECTIVES

Objectives for controlling the quality of Colorado River water in California are divided into two categories, viz:

1. General Water Quality Objectives

2. Specific Water Quality Objectives

General Water Quality Objectives

1. Waste discharges into Colorado River water shall not endanger the public health.

2. Waste discharges shall not adversely affect the esthetic condition of waters, including their clarity, and freedom from unsightliness, odors, and adverse taste.

3. Wastes discharged from municipal, industrial, and other controllable sources which are reasonably amenable to treatment shall be controlled with the objective of not increasing the mineralization or adversely affecting the existing chemical, physical, and biological characteristics of the waters for agricultural, raw domestic, recreational, and industrial purposes, and its suitability as a habitat for aquatic plant and animal life (including waterfowl).

Specific Water Quality Objectives

Colorado River water shall conform to the following water quality objectives:

Bacteriological

Colorado River waters shall remain free of organisms pathogenic to human beings.

Physical Characteristics

1. Waste discharges shall not cause such change in the temperature of Colorado River water as may adversely affect any beneficial use.

2. The following objectives shall be maintained in Colorado River water in the entire California reach, subject only to river control operations

of the Bureau of Reclamation in the reach between Imperial Dam and Laguna Dam.

(a) The waters shall be free from substances attributable to domestic or industrial waste or other controllable sources, that will settle to form sludge or bottom deposits, or that may cause putrescence or odors, or that may otherwise interfere with any beneficial use of water.

(b) The waters shall be free from floating debris, oil, grease, scum, or other carried or floating materials.

(c) The waters shall be free from materials attributable to domestic or industrial waste or other controllable sources, which may produce taste or odor in the water or detectable off-flavor in the flesh of fish, that may alter the water's existing color or turbidity, or that may adversely affect other conditions in the river.

Chemical Characteristics

General

Colorado River water shall be free from biocides, corrosive substances, and other substances which may be considered toxic or deleterious to humans, to stock animals, or to aquatic or wildlife resources.

1. Constituents contributing to salinity and to increase in sodium percentage.

Deterioration in water quality will result from increased intensity of beneficial usage of water within the Colorado River system. Although such water quality deterioration is expected to increase, the magnitude cannot presently be determined quantitatively with reasonable precision. Therefore, pending the development of more definitive information on water quality deterioration associated with the in-system developments, quantitative objectives are not presently prescribed for constituents which contribute to salinity and which cause increase in sodium percentage. Concurrently, all identifiable sources of water pollution will be managed and controlled to the degree reasonably practicable with available technology.

2. Heavy metals and associated chemicals.

Wastes, from municipal, industrial, or other controllable sources, containing heavy metals or associated chemicals shall not be discharged into the Colorado River in amounts such that their cumulative effects may interfere with any beneficial use. In no event shall wastes be discharged into the River in quantities that will, at any time, cause the concentrations of these constituents to exceed the following limits at Imperial Dam.

Constituent	Limiting Concentration (mg/1)
Arsenic (As)	0.05
Barium (Ba)	0.5
Cadmium (Cd)	0.01
Chromium (Hexavalent) (Cr^{+6})	0.05
Copper (Cu)	0.05
Cyanide (CN)	0.10
Lead (Pb)	0.05
Selenium (Se)	0.01
Silver (Ag)	0.05
Zinc (Zn)	0.5

3. Biocides

Biocide concentrations in Colorado River waters shall be kept below levels which are deleterious to domestic water use and to fish and wildlife.

4. Radioactivity

Concentrations of radioactive substances in Colorado River water shall not exceed the following limits:

(a)	Radium - 226	-	1 μμ/liter
(b)	Strontium - 90	-	2 μμ/liter
(c)	Alpha emitters	-	8 μμ/liter
(d)	Gross Beta	-	50 μμ/liter

5. Dissolved Oxygen

The dissolved oxygen concentrations in Colorado River water shall at all times be maintained above 6 mg/1.*

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* In the reach between Imperial Dam and Laguna Dam achievement of the objective for dissolved oxygen shall remain subject to river control operations of the Bureau of Reclamation.

6. Other Chemical Characteristics

Concentrations of the below-listed chemical characteristics in Colorado River water, as determined by the annual average of analyses under the surveillance schedule, shall not exceed the following limits:

Chemical Indicator	Unit of Measure	Allowable limits of annual average of analyses under the surveillance schedule
Methylene blue anionic surfactant (MBAS)	mg/l	0.1
Boron (at Imperial Dam)	mg/l	0.4
Nitrate	mg/l	5
Iron	mg/l	0.2
Manganese	mg/l	0.05
Ammonia (NH_3)	mg/l	1
pH	mg/l	8.0

Precise maximum limits are not being prescribed on concentrations of the above-listed constituents as may be indicated by the analyses of a single sample. However, in general, single-sample maximum limits shall not exceed the average limits by more than ten percent; except that pH shall remain within the limits of 6.5 and 8.6.

APPENDIX B

Summary of Meeting of Region IX
Enforcement Office Representatives
with
Representatives of Las Vegas Valley
Municipal and Industrial Waste Sources

September 28, 1971

Summary of Meeting Held at Western Environmental Research Laboratory, Environmental Protection Agency, University of Nevada Campus, Las Vegas, Nevada, at 9:30 a.m. September 28, 1971. Prepared by EPA, Region IX, Enforcement Division

Representatives of the invited attendees were as follows:

<u>Clark County Sanitation District</u>

James Parrott

<u>City of Las Vegas</u>

V. B. Uehling
William E. Adams
Louis A. Anton

<u>City of Henderson</u>

R. T. Whitney
S. C. Ditsworth

<u>Nevada Power Company</u>

M. H. Crum
B. V. Quinn
J. H. Zornes
G. Barney

<u>Basic Management, Inc.</u>

Rex R. Lloyd
Glen C. Taylor

<u>Titanium Metals Corporation of America</u>

Rex R. Lloyd

<u>Stauffer Chemical Company</u>

John Rohnan
James Wiseman
George Stewart
G. Barney

<u>Montrose Chemical Company</u>

John Rohnan
H. J. Wurzer

U. S. Lime Division, Flintkote Company

Dan Walker

Kerr-McGee Chemical Corporation

C. B. Armstrong

Jones Chemical Company, Inc.

Gerald Derthick

Las Vegas Valley Water District

T. R. Rice

Nevada Commission of Environmental Protection

Roland D. Westergard
Wendell D. McCurry

Office of the Governor

Thomas Wilson

Others Present:

Mary Manning	Clark County District Health Department
Dorothy Eisenberg	League of Women Voters, Las Vegas
Roy B. Evans	Western Environmental Research Lab. L. V.
Daisy J. Talvitie	League of Women Voters, Las Vegas
Thorne Butler	State Board of Health

Environmental Protection Agency:

R. L. O'Connell,	Director, Enforcement Division, Region IX
Elise K. Guevara	Secretary, Enforcement Division, Region IX
James D. Russell	Chief, Enforcement Branch, Region IX
David S. Mowday	Attorney, Enforcement Branch, Region IX

Mr. R. L. O'Connell reviewed the purpose of the meeting. The Environmental Protection Agency believes that State-Federal water quality standards for the waters of Lake Mead are being violated, and that this condition of pollution is subject to abatement under the Federal Water Pollution Control Act. EPA has participated in attempts to find solutions to this water quality problem over a long period of time. This participation has been through grants for construction of water pollution control facilities, through grants to assist water quality management planning, through grants to carry out research, and through technical assistance to develop information necessary to bring about solutions to the problem. EPA is now exploring the situation to determine whether or not further Federal action is warranted and what type of action may be required. Therefore, EPA's purpose in calling the meeting was to learn from those invited, their views on the situation and what water pollution control actions they are planning to take.

Mr. James Parrott, Manager, Clark County Sanitation District, stated that the District collects about 15 mgd - 16 mgd of municipal wastewaters and has 12 mgd of capacity for treatment. About 2-1/2 mgd is exported to the City of Las Vegas. The District has applied for a Federal grant to expand its existing treatment facility, but as of the present, has not yet received the grant. Also they have sold their bonds and are ready to award contracts. The District feels that from a practical standpoint, additional secondary treatment capacity is essential now, and they want to go ahead with their expansion project. The question of tertiary treatment should be deferred until the decision to provide adequate secondary treatment is made. They are waiting expectantly for Federal assistance.

Mr. V. Uehling stated that at present the City of Las Vegas has a treatment capacity of 30 mgd and is utilizing 25 mgd of that capacity. They have tentative plans to enlarge the plant in 1973-74, possibly doubling the capacity to 60 mgd. They now provide secondary treatment and the plant meets requirements of the State as far as present standards are concerned. However, new State requirements are expected to take effect in 1973 and additional treatment will be necessary in order to meet these new requirements. At that time it is expected the City will need a grant from EPA in order to provide the improved treatment by 1974. They may also need additional grants for export.

Mr. O'Connell noted that EPA regulations preclude making grants for construction of projects that are not consistent with water quality standards. If a particular project will not produce compliance with water quality standards, EPA cannot make a grant for that project. However, if a project is one of a series of staged construction projects, the completion of which will lead to compliance with water quality standards, EPA may support such a construction program.

Mr. R. T. Whitney, Director of Public Works, City of Henderson, introduced Mr. S. C. Ditsworth of Boyle Engineering, who presented the view of the City. The City of Henderson now has a 2 mgd sewage flow. 1 mgd passes through the Basic Management, Inc. domestic sewage treatment plant and 1 mgd Henderson treats itself (Imhoff tank and oxidation ponds). They realize this process will not meet standards and Henderson will either have to join with other municipalities on a larger project or give additional treatment at their own plant.

They have no project planning under way, but have retained Boyle Engineering to provide a study of their wastewater problems.

Mr. J. H. Zornes stated that the Nevada Power Company currently utilizes a part of the waste water effluent from the Clark County Sanitation District and the City of Las Vegas treatment plants, for cooling water at two power plants in the Las Vegas area. They are trying to put together a program whereby all of the effluent from the City of Las Vegas and the Clark County Sanitation District will be used for power generation at a proposed new plant in Arrow Canyon, a closed basin. A contract toward that end is under negotiation at the present time with the District and the City. They have not yet formally applied to the State Engineer for a secondary permit to use these waste waters. According to State law, a contract is required in order to proceed, and they do not yet have a signed contract. There is no fixed timetable for carrying out this plan. At the present time no industrial waste waters are being considered for use under this program. However, the BMI industries and City of Henderson could conceivably be included. The Power Company believes that the blowdown waste waters from its existing two Las Vegas power plants could be mixed with the municipal waste waters and exported to Arrow Canyon for re-use in cooling. They have no other plans for changes in the treatment or disposal practices presently applied to blowdown waters from their two existing plants.

Mr. Rex Lloyd stated that BMI is a service organization, and is responsible for collection of effluent and disposal by means of ponds. BMI has no control over what is in the waste waters, nor do they have any authority under the charter to treat the industrial wastes. BMI is 100 percent owned by four principal operation companies: Titanium Metals Corporation of America, Stauffer Chemical Company, Kerr-McGee Chemical Corporation and U.S. Lime Division-Flintkote Company. The amount of effluent fluctuates from time to time, but runs around 10 - 12 mgd. An investigation by Desert Research Institute corroborates this flow. BMI's evaporating ponds are not very tight. They do not have a flow measuring weir, nor do they know how much of their waste waters contribute to pollution of the Las Vegas Wash. Las Vegas Wash drains the whole valley and presumably some of the effluents which come from the BMI ponds do find their way to the Wash.

BMI also operates a domestic waste water treatment facility from which effluent is discharged to the upper BMI ponds. These facilities are also used by the City of Henderson. The owner Companies have all filed with the Corps of Engineers for permits and will have to meet requirements to obtain permits. BMI does not have in progress any planning for improvements in waste water disposal practices nor does it have any studies going or planned on ground water conditions. It is definitely understood that BMI's function is limited to collection of effluent and diverting it into ponds. Any responsibility for planning, or studies, rests with the Companies. BMI does not know whether their wastes are causing pollution or not.

Mr. Zornes, Nevada Power Company, stated that in the letter Nevada Power received from EPA there is mention about water quality standards violation in the Colorado River System and asked what standards are being violated. Mr. Parrott, CCSD, also asked the same question.

Mr. O'Connell replied that the water quality standards referred to were those adopted in 1968 under the provisions of the Water Quality Act of 1965. These standards were adopted by each of the States and when approved by the Federal government, became Federal standards also. The standards include general narrative criteria and specific numerical criteria for certain water quality indicators. The general narrative criteria for the Colorado River include the "five freedoms" covering substances attributable to domestic or industrial waste, floating debris, color and turbidity, which apply to all waters. In addition there are specific numerical criteria, for pH, DO, nitrates, etc. which vary according to location within the Colorado River System. The specific standard that appears to be violated in Lake Mead is the following:

....

3. Free from materials attributable to domestic or industrial waste or other controllable sources in amounts sufficient to produce taste or odor in the water or detectable off-flavor in the flesh of fish, or in amounts sufficient to change the existing color, turbidity or other conditions in the receiving stream to such degree as to create a public nuisance, or in amounts sufficient to interfere with any beneficial use of the water."

What EPA is concerned with here is nutrients such as nitrogen and phosphorous which contribute to algal blooms in Las Vegas Bay and mineral salts that add to an already severe water quality problem in the Colorado River System.

John Rohnan, Legal Counsel, speaking for Stauffer Chemical Company and their subsidiary, Montrose Chemical Company, assured EPA that they will cooperate fully to the extent that they are capable. They will take all practical steps to eliminate pollution. However, to take effective action, they feel they should have a clearer understanding about the water quality standards, and would appreciate if they could be advised of the specific water quality standards applicable and how they are applicable. They feel that clarification of these points would be of great help in forming plans for corrective steps. At the present time they have a limited ground water survey under way, but they have no plans for improvement and feel that they cannot formulate plans until they have better information of what the problem is.

Dan Walker, U. S. Lime Division-Flintkote Company, stated that Flintkote uses about .25 mgd of water; 60,000 gallons per day are used in cooling and dust control. The water goes through two settling ponds and the effluent has a pH of 11 or 11.5. The only problem that they see is solids which they will attempt to take out of their waste stream. The pH may be neutralized by acids from other industries at BMI; they are not sure.

Mr. O'Connell asked if BMI or any particular industry took positive steps to insure that acid and alkaline waste waters were combined for neutralization. From the answer given, it appeared that no one assumes that responsibility and any neutralization which takes place through mixing of waste waters from different industries would occur by chance. No one present had any plans for neutralization by this means.

Mr. R. R. Lloyd, speaking for Titanium Metals Corporation of America, stated that at the present time the Titanium Metals Corporation plant is shut down. Normally they produce an effluent of 4 mgd, most of which is cooling water which meets the same specifications as Lake Mead. However they do have one waste stream which they know is bad: it is very high in nitrates. They have been working on processes to take care of the nitrates for the last year, but so far without success. They anticipate that they will separate this nitrate stream from the other waste waters, re-cycle it, or discharge it into separate rubber-lined ponds, where it would be evaporated. This heavy nitrate stream contributes 80 percent of their pollution of water; what the remainder is, they do not know. The main streams are acid.

Titanium realizes and understands that they have a problem in the nitrates, but they do not know how much of this gets to the Wash. They know they have to do something about it, but they do not have a time schedule. They say that everybody is tied up in air pollution now, and they do not know when they will do this other job.

Mr. Lloyd stated that there were no phosphates in Titanium's effluent.

Mr. C. B. Armstrong, Plant Manager of Kerr-McGee Chemical Corporation, stated that Kerr-McGee's position is much the same as the other companies. They are working with the Corps of Engineers and have filed an application for permit. They do not know what the standards are which will have to be met, or whether there is a problem with their effluent. Their effluent goes into the BMI System.

Mr. O'Connell asked the individual industrial representatives and BMI to what extent they are committed to the concepts of the Boyle - CH_2M Water Quality Management Plan, and if they were seriously looking into the recommended plan. Had they considered joint action with the municipalities in treatment and disposal and had they looked into the system of using waste water for cooling?

Mr. Lloyd stated that they had given the plan serious consideration, had not examined the alternatives but that, as a group, they feel there are many problems, particularly when the criteria get down to parts per billion. They are all concerned with the fact that they can spend a great deal of money and still not solve the problem of Las Vegas Wash. And they wonder whether a group solution is better than an individual solution. The companies have filed with the Corps of Engineers and will have to meet specifications of the State and the Corps of Engineers.

They would like to participate in using waste waters for cooling. Mr. Parrott added that Nevada Power Company purchases some of the effluent from Clark County SD and the City of Las Vegas to use for power generation. A contract is under negotiation between these three for the Power Company to receive almost all of the effluent for power generation. The Power Company will furnish 67 percent of the capital for the export. The contract will only be between the City of Las Vegas, Clark County and Nevada Power. They have not reached the stage of negotiation with the other industries. Nevada Power cannot use water high in dissolved salts; however, this could be taken care of with some processing.

Mr. G. J. Derthick stated that Jones Chemical Co. Inc. is not affected by the law because of their type of operation: repackaging and distributing. They only use 300 or 400 gallons/day, mainly rinse and wash water, which might contain a small amount of chlorides. They decided to use a new method of disposal. They are going to put in their own evaporator, and the sanitary waste will go to BMI. They will start operating in about 2-1/2 months and they will not discharge anything but sewage. Industrial waste will be taken care of on their own property and solids residue will be disposed of in a Class 1 dumping area. They will haul it to California if necessary to find a suitable dump site.

Mr. T. R. Rice, Manager, Las Vegas Valley Water District stated that the State legislation has directed that the Water District undertake to find a feasible solution to the pollution problem. There was a start on this some years ago which came to nothing. Now the Colorado River Commission is funding the effort and the District is trying again. The District does not have a solution. They need more information, advice and help. They have employed a group of consultants to look at the information and determine whether the information is sufficient and what additional information is needed. A Scientific Evaluation Committee is composed of Jack McKee, Harvey Banks, Andrew Gaufen and Dr. Otto Ravenholt. This Committee has met several times, developed some information and made some recommendations, and the District is working on their advice. The District hopes it will have some progress to report back to the Legislature's 1973 session. They feel if time and money permit, they will do something.

In response to Mr. O'Connell's question, Mr. Rice said that consideration would be given to what needed to be done not only by municipalities but by industries as well.

Mr. O'Connell asked what consideration had been or would be given to the conclusions and recommendations of the Boyle report.

Mr. Rice stated that it was felt that the Boyle report contains very good recommendations, based on the constraints and concerned with total water use and total pollution considerations, but the population was probably too high. This has a profound effect on any interim solution or on any permanent solution. Since the report, there are a number of new considerations. The problem of termperature is important: it is a matter of mixing, and this will have to be done on a controlled basis. Fish and Game is concerned with temperature.

Mr. O'Connell asked if there was a time schedule for the Water District's planned work. Mr. Rice stated that they will make a recommendation of the most feasible solution. If they are ahead of time, so much the better, but they are unable to say at the moment how soon this will be.

Mr. Roland Westergard of the State Commission of Environmental Protection stated that the Commission was established effective July 1 and has authority but the Division of Environmental Health has standard-setting authority until December 31, 1971. Mr. Westergard said he is concerned about the deficiencies as to what has been done; there is too much of a tendency to "fluctuate". Another consideration is the proposed amendments EPA might make if it is assigned to take over the application of the 1899 Act. The local people find themselves unable to know what direction to take. Mr. Westergard asked for EPA's comment on any pending legislation that was germane.

Mr. O'Connell replied that at present the permit provisions of the 1899 Act are administered by the Corps of Engineers, with guidance from EPA. Thus, if legislation took CE out of the picture and EPA had sole responsibility, there would not be any change in the substance of the program. Some of the administrative procedures would probably be modified, and it would probably be an improvement to eliminate one Agency.

Mr. Westergard recalled the EPA changed position regarding air. Were there any other Congressional changes that might affect them?

Mr. O'Connell cited some proposals. Some of them propose higher levels for grants. What is now 30% or 55% Federal grants for treatment plant construction might go up to 75% or even higher. Also, Congress is considering increased support for State programs. There are many, many proposals under consideration at this time. Mr. Westergard stated that the serious part of the problem is not knowing what to expect next from the Federal government.

Mr. Thomas Wilson of the Office of the Governor stated that he feels that there is some 'fluctuation" in direction. The Colorado River Commission provides assistance to the City and Clark County, but the dilemma is not only lack of information, but legislation. The Governor is quite aware of the roadblocks in local laws. He would like to know about Nevada Power Company, can it be cited with air pollution; can this really be done? Is it the answer to convert water pollution to air pollution?

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Mr. Rice asked if the EPA through current legislation is going to impose effluent standards. If local municipalities knew what quantity might be allowed and what quality, they might know what to do. There might be different handling. They feel that generally requirements are becoming more severe.

Mr. O'Connell replied that EPA has applications for permits from industries and will be required to tell them what kind of effluent quality they must achieve in order to discharge. EPA does not have the same responsibility for municipalities; however, this has been proposed in pending legislation. The absence of a regional plan creates problems in acting on the industrial permit applications. Without a regional approach EPA would have to give industry individual requirements, which in some cases could be a less cost effective solution than a regional approach.

Mr. Rice asked if grant money would be controlled by these considerations.

Mr. O'Connell said that was correct. Legislation gives EPA responsibility to see that Federal grant money is spent in a proper way. EPA is looking for the most cost effective solutions to pollution problems before making grants of Federal funds.

Mr. Parrott asked if in the absence of a regional plan, Federal funds would not be forthcoming.

Mr. O'Connell stated that what EPA needs is assurance that spending is sound and at least a step in a logical program leading toward ultimate solution of pollution problems. Each individual project must be viewed in that context.

Mr. Parrott stated that he felt that due to economic circumstances their District had come to a very critical position which could result in gross pollution of the Lake, should their plant expansion project be delayed. He feels that an emergency situation exists and this should be the primary consideration. All agree on the ultimate objective, but at the moment it is more important to consider immediate needs than future planning.

Wendell McCurry said that the State water quality standards implementation plan requires that the Clark County SD expand their existing plant. The State used the Boyle report as an interim basin plan so that the District would be eligible for Federal grant funds, and in the meantime municipalities and industry continue to pollute. As far as Corps of Engineers permits are concerned, the State certifies as to compliance with the requirements, implementation plans and schedules adopted by the Commission. They feel discharge standards should be handled at the local level.

Mr. Rice stated that the old Interagency Task Force asked for Federal approval of a contract to have Boyle conduct additional studies under their Section 3c grant concerning exportation of waste waters to Arrow Canyon, and wanted to know the status of the request.

Mr. Parrott said that it was turned down.

Mr. O'Connell explained that it was also a request for extension of the grant time period. EPA has not been awarding grants for longer than 2 years, and has not been awarding extensions either. The tendency, if extensions are granted, is for such planning studies to go on and on. EPA's objective is to reach a final decision point, in a reasonable period of time and then to embark upon an action program to correct the problem.

He re-stated that EPA's purpose now is to look into the situation to determine what pollution control projects are scheduled and what kind of Federal action might now be warranted in the situation. This meeting has indicated that in general the needed control projects have not yet been identified and scheduled.

Mr. Westergard inquired what role the State Agency would have.

Mr. O'Connell assured him EPA would consult with the State, as always, before taking further action.

Mr. O'Connell told the attendees that EPA would be pleased to receive from any of the invited participants in the meeting a written statement expanding on their remarks within the next seven days.

CITY OF LAS VEGAS

October 12, 1971

Environmental Protection Agency
Region IX
760 Market Street
San Francisco, California 94102

Attention: Paul DeFalco, Jr., Acting
Regional Administrator

Dear Sir:

At the meeting called by your agency held under the direction of Mr. Richard O'Connell on September 28, 1971 at the U.N.L.V. campus, certain statements were given by parties responsible for the discharge of wastes into the Vegas Wash arm of the Colorado River. In addition to the statement made orally by the City of Las Vegas at this meeting, the following additional comment is offered for the record:

Realizing that the abatement of conditions which contribute to the pollution of waters draining into the Vegas Wash arm of Lake Mead are complex and the waters involve many sources, consideration must be made for a complete plan to accomplish the desired results. The task force committee which was engaged in the engineering studies and review of reports has accepted the Boyle CH_2M report as being a general plan of attack for the Las Vegas Valley. The report, as adopted, does not recommend any single method of solution, but includes information toward: 1. an export of all waste waters; 2. the treatment of waste waters to a standard that insures no effect on receiving waters; or 3. a reuse of all current waste waters, or a combination of these.

It is therefore proposed that the end result be accomplished in a planned stage development in which each stage is thoroughly investigated as to conformance with the master plan abatement and is properly financed.

As a step in this direction the City of Las Vegas, in coordination with the

Clark County Sanitation District, are negotiating with the Nevada Power Co. for a beneficial use of 48 mgd of sewer effluent based upon the maximum discharge of effluents from the two plants, which is estimated to be available after June, 1979.

It will be of primary importance that the EPA give full cooperation toward assistance on financing of the water pollution control facilities proposed for the Las Vegas Valley.

Very truly yours,

R. P. SAUER, P.E.
Director of Public Works

RPS:VBU:lm

LAS VEGAS VALLEY WATER DISTRICT
3700 WEST CHARLESTON BOULEVARD
BOX 4427 P. O ANNEX
LAS VEGAS, NEVADA 89102
TELEPHONE 870-2011

October 19, 1971

Mr. R. L. O'Connell
Director, Enforcement Division
Environmental Protection Agency
760 Market Street
San Francisco, California 94102

Dear Mr. O'Connell:

This is in reply to your letter of October 13, 1971, received in this office on October 15, 1971. On Page No. 8 of the attached summary of the meeting is the report of commission made by me at the meeting. I think that the summary of my statement should perhaps be rewritten along the following lines:

"Mr. T. R. Rice, Manager of the Las Vegas Valley Water District, stated that the 1971 State Legislation has directed that the Water District undertake to find a feasible solution to the pollution problem. There was a start in this direction a year ago by the Colorado River Commission, but this came to nothing because of state politics. Now, as a result of the 1971 legislation, the District is trying to find a solution using funds supplied by the Colorado River Commission. At present the District does not have a solution. More information, advice, and help is needed. The District has employed a group of consultants to look at existing information to determine whether this information is sufficient and what additional information is needed in the decision-making process. This group is known as the Scientific Evaluation Committee and is composed of Jack McKee, Harvey O. Banks, Arden Gaufin, and Dr. Otto Ravenholt. The committee has met several times, has digested much of the available information, and has made some recommendations to the District for additional information to be obtained, and the District is working on this matter at present. The

District is required to prepare a report with its recommendations to the 1973 session of the State Legislature. If a solution to the problem, either interim or final, is at hand before that time and money is available, work will be started prior to the submission of such report."

The next two paragraphs are all right as written. The following paragraph should be changed as follows:

"Mr. Rice stated that it was felt the Boyle Report contains much good information and basic data but that the recommendations made were based on constraints as to total water use, population, and effluent standards at that time. This influenced ~~our~~ the recommendations. The population projections used were probably too high in light of the 1971 census and the registered growth in that area since that time. This will have a profound effect on any solution, either interim or permanent. Since the Boyle Report there have been a number of new suggested solutions to the problem. These need to be explored. The recommendation of the Boyle Report regarding dumping the Vegas Wash discharges below Hoover Dam produced a concern over the temperature effect as well as the nutrient problem. The Fish and Game Commission was more concerned with the temperature effect on the fishery below Hoover Dam."

The remainder of the statements appear to be sufficiently accurate to suffice.

Sincerely,

Thomas R. Rice
General Manager

NEVADA POWER COMPANY
FOURTH STREET AND STEWART AVENUE
P.O. BOX 230 • LAS VEGAS, NEVADA • 89101

October 15, 1971

Mr. R. L. O'Connell
Director, Enforcement Division
Environmental Protection Agency
Region IX 760 Market Street
San Francisco, California 94102

Dear Mr. O'Connell:

Referring to your letter of October 13, 1971, we do have several comments regarding our statement made on September 28, 1971.

In the second sentence the actual statement made was that a major part of the effluent generated would be used upon completion of the plant in 1979 or 1980, depending on the final construction schedule. From that point-in-time the surplus effluent would be impounded in the Dry Lake area or utilized for agricultural or other purposes if possible.

Although the plant has been named the Arrow Canyon Plant, its proposed location is in Hidden Valley, a closed basin which is immediately north of Dry Lake.

In the fourth sentence, Nevada Power Company actually made application to the State Engineer for secondary permits in November of 1970. As stated in the following sentence, the State law states that a signed contract with the persons or agency holding the primary permit is required in order for the State Engineer to proceed with the processing of the applications. We have appeared before a number of public agencies during the past few months in order to more fully explain our plan. Contract negotiations are being actively pursued at the present time.

A question was asked regarding the inclusion of BMI industries and Henderson into the overall export planning. Our reply was that if it were determined by the experts that the Dry Lake area is in fact a closed basin, it should be possible to impound the more highly polluted waters in a reservoir in the Las Vegas Valley and intermittently export them through the pipeline to Dry Lake for disposal.

A question was also asked with regard to time table. Two public bodies must act on the contract for the effluent and the State Engineer then must carry out the hearing and decision making processes with regard to granting the permits for the water for the plant. Finally, environmental impact studies must be made for use by the State and Federal bodies, therefore, it is extremely difficult to fix a time table. It is expected, however, that all these procedures can be completed in time for pipeline installation within the next several years.

We have attached a rough draft of your condensation of the statement with minor changes that make it correct. With the clarification above we believe the plan is reasonably clear.

Finally, under the list of people in attendance from Nevada Power Company, Mr. D. Barneby was present rather than Mr. Barney as shown.

Very truly yours,

James H. Zornes
Vice President,
Production

JHZ:jsb

Enclosure

NEVADA POWER COMPANY

Statement made at Meeting held at Western Environmental Research Laboratory, Environmental Protection Agency, Las Vegas, Nevada. September 28, 1971.

Mr. J. H. Zornes stated that the Nevada Power Company currently utilizes a part of the waste water effluent from the Clark County Sanitation District and the City of Las Vegas treatment plants, for cooling water at two power plants in the Las Vegas area. They are trying to put together a program whereby a major portion of the effluent from the City of Las Vegas and the Clark County Sanitation District will be used for power generation at a proposed new plant in Hidden Valley, a closed basin north of Dry Lake. A contract toward that end is under negotiation at the present time with the District and the City. They have applied to the State Engineer for a secondary permit to use these waste waters. According to State law, contracts are required in order to proceed, and they do not yet have signed contracts. There is no fixed timetable for carrying out this plan. At the present time no industrial waste waters are being considered for use under this program. However, the BMI industries and City of Henderson could conceivably be included. The Power Company believes that the blowdown waste waters from its existing two Las Vegas power plants could be mixed with the municipal waste waters and exported to Arrow Canyon for re-use in cooling. They have no other plans for changes in the treatment or disposal practices presently applied to blowdown waters from their two existing plants.

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