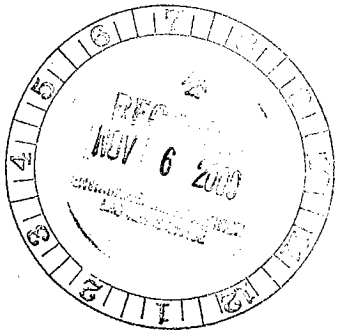
**KERR-McGEE CHEMICAL LLC**
POST OFFICE BOX 55 - HENDERSON, NEVADA 89009

November 2, 2000




Ms. Cathe Pool
Nevada Division of Environmental Protection
Bureau of Water Pollution Control
333 West Nye Lane
Carson City, NV 89706-0851

Dear Ms. Pool:

Subject: Las Vegas Wash Tracer Study

Kerr-McGee Chemical LLC (Kerr-McGee) maintains an NPDES Permit NV 0023060 for discharge of perchlorate treated water related to remediation efforts in the Henderson, Nevada area. As required by Section I.A.16.c of that permit, please find attached the "Work Plan for a Dye Injection Study of the Las Vegas Wash, Nevada," for your review and approval. This Work Plan is proposed to better define the end of the mix zone associated with the Permit noted above. We are hopeful that your office can coordinate any needed input from the Bureau of Water Quality Planning.

It is Kerr-McGee's intent to schedule the work as soon as practicable after NDEP approval of this Work Plan. As always, please feel free to call me at (702) 651-2234 if you have any questions of comments. Thank you.

Sincerely,

SM Crowley

Susan M. Crowley
Staff Environmental Specialist

cc: LKBailey
PSCorbett
K Heim, ENSR
R Simon, ENSR
EMSpore
FRStater
D Urban, ENSR
Brenda Pohlmann, NDEP (Las Vegas)
Doug Zimmerman, NDEP
Mike Goff, SNWA
Virginia Swipas, City of Henderson

C:\DATA\DOCS\SMC\LTR\WASH MIX ZONE TRACER STUDY - CVR LTR.DOC

*Prepared For:*
**Kerr-McGee Chemical Corporation, L.L.C.**

# Work Plan for a Dye Injection Study of the Las Vegas Wash, Nevada

*Prepared By:*
ENSR

October 2000

Document No. 4020-011-100

*Prepared For:*
**Kerr-McGee Chemical Corporation, L.L.C.**

# Work Plan for a Dye Injection Study of the Las Vegas Wash, Nevada

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October 2000

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# 1.0 INTRODUCTION

## 1.1 Purpose of the Investigation

This dye study investigation in the Las Vegas Wash was prompted by a request for a mixing zone characterization by Kerr-McGee Chemical Corporation, LLC. The mixing zone characterization was requested for certain constituents which do not meet water quality standards at the NPDES permitted discharge located at Latitude 36°5'15" and Longitude 114°59'30". As a requirement of NPDES permit No. NV0023060 issued by the Nevada Division of Environmental Protection, Kerr-McGee is required to conduct a tracer study in the Wash to better define the mixing zone. Based on the results of this tracer study, the downstream extent of the mixing zone will be identified.

## 1.2 Synopsis of Proposed Investigation

Fluorescent dye will be used to characterize the downstream mixing of Kerr-McGee discharge water with the ambient waters of the Las Vegas Wash (Figure 1). A continuous stream of dye will be injected into the Kerr-McGee effluent prior to discharge into the Las Vegas Wash. The duration of the dye injection will be sufficient to allow the dye to mix laterally and vertically in the Wash downstream of the longitudinal mixing length. Once distribution of dye in the stream is believed to have reached steady state, fluorescence will be measured at a series of transects downstream of the discharge. Fluorescence will be measured both laterally and vertically in the water column to indicate the distribution of dye in the receiving water. The most downstream transect will be situated far enough away from the discharge so that fluorescence can be measured at a transect where the dye is completely mixed. Transects between the discharge and the furthest downstream transect will be located to effectively characterize mixing of the discharge plume in the water column as the plume moves downstream. Concurrent with the fluorescence measurements, streamflow will be measured at three locations including 1) the most downstream transect, 2) the transect just downstream of the discharge, and 3) at a transect located midway between the discharge and most downstream transect.

By carefully delineating the dye plume using the fluorometric method, a vertical, lateral, and longitudinal picture of the steady-state plume can be developed. The mixing characteristics of the plume can then be identified and a clear understanding of the longitudinal distance to complete mixing can be determined. Results of this dye investigation will be used to define the dimensions of a mixing zone.

Two dye studies will be conducted as part of this investigation. The first will be completed in the fall of 2000 under the flow conditions that exist at the time. This first survey will provide a baseline result. A second survey may be conducted at a later date during 2001 under low flow conditions to identify the mixing length under conditions less favorable to mixing. If conditions during this first investigation are reasonably close to low flow conditions then a second dye study will not be conducted.


**Figure 1 – Photograph of Las Vegas Wash study area. Dye will be injected at approximately LM-2 and transect fluorescence measurements will be made downstream toward LW 5.5 (formerly LM-6).**

## 1.3 Schedule of Proposed Investigation

This dye study will be conducted after the approval of the work plan by the Nevada Division of Environmental Protection (NDEP). Mobilization of the ENSR field team and the necessary equipment can occur within approximately one week of the approval of the work plan. Data collection for the dye study is expected to take approximately one workweek to complete. ENSR will develop a report summarizing the investigation within approximately one-month of the completion of the dye study. A second dye study may be conducted in the future if more information is required to define the mixing length under low flow conditions.

# 2.0 DESCRIPTION OF LAS VEGAS WASH

## 2.1 Physical Overview of the Las Vegas Wash

The Las Vegas Wash was initially formed as a result of the filling of the Las Vegas Valley by sediments that were eroded from the surrounding mountain ranges and from higher elevation areas. The bulk of the sediments that comprise the Las Vegas Wash include easily eroded silts and clays with minor amounts of sand and gravel. While the Wash originates in the far northern and western parts of the basin as ephemeral creeks, smaller Washes, and runoff channels, it becomes more clearly defined in the southeastern part of Las Vegas Valley where the flow is dominated by discharges from POTWs. From the southeastern part of Las Vegas Valley it continues along an approximately 12-mile course to Las Vegas Bay in Lake Mead.

The morphology of the Wash is generally that of a highly eroded stream channel with steep vertical banks confining a constantly changing meandering stream channel. The channel varies from shallow and wide to narrow and deep and is braided in some locations. Figure 2 shows a section of the Las Vegas Wash illustrating the steep vertical banks and the meandering stream within the confines of the main channel.

**Figure 2 – Photograph of Las Vegas Wash showing stream morphology.**

Because of the steep vertical banks adjacent to the Las Vegas Wash, access may present problems during the investigation. Actual transect locations to be used during this investigation will be identified prior to release of the dye stream.

## 2.2 Hydrologic Overview of the Las Vegas Wash

The Las Vegas Wash is the drainage system for the entire Las Vegas Valley Hydrographic Basin. Flows in the Wash originate from tributary flows and treated wastewater return discharges, precipitation associated runoff, and intercepted shallow groundwater. Flows in the Wash have been measured by the USGS since 1957 and are published annually on a water year basis. Since that time the USGS has maintained a total of four separate gages on the Wash. One of these gages (#09419790) is located below Lake Las Vegas below Henderson, several miles downstream of the Kerr-McGee discharge. Wastewater discharge flow to the Wash is from the Clark County Sanitation District and the City of Las Vegas and City of Henderson municipal wastewater treatment plants. Additionally, Basic Management, Incorporated (BMI) discharges once-through cooling water from a site located on the south side of Las Vegas Valley. The combined NPDES permitted discharge from the three municipal wastewater treatment plants in the Valley for 1999 is 174 million gallons per day (MGD); the NPDES permitted discharge from BMI is 10 MGD for a total of 184 MGD (285 cfs). However, actual discharge flow rates are generally much lower.

Daily dry weather flows in the Wash consist primarily of municipal wastewater and vary with changes in discharge from the three-wastewater treatment plants. Average daily flows measured at the USGS gage (#09419790) since 1991 are 194 cfs (Figure 3). Flows are slightly lower during the summer months but do not generally vary much throughout the year. Additionally, daily variations in flow can be as much as 50 cfs as indicated in a recent hydrograph from the USGS gage (Figure 4).

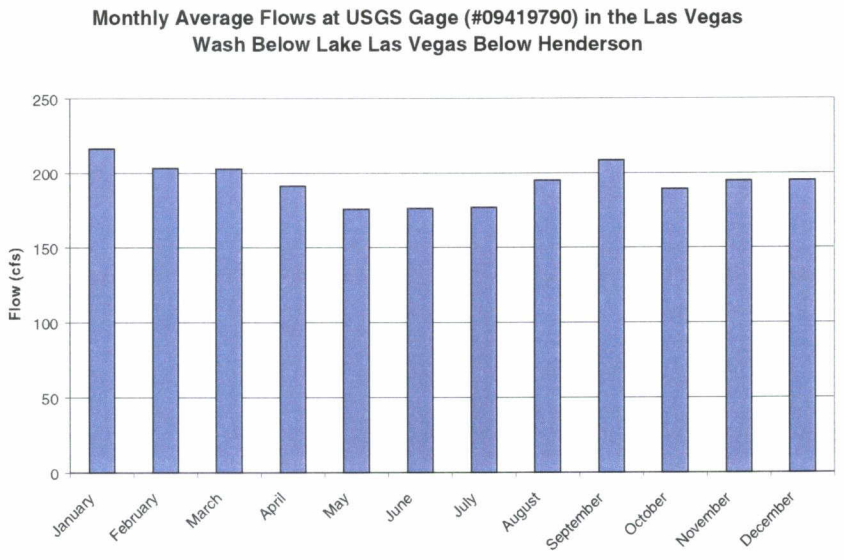



**Figure 3 – Average monthly flows measured in the Las Vegas Wash since 1991.**

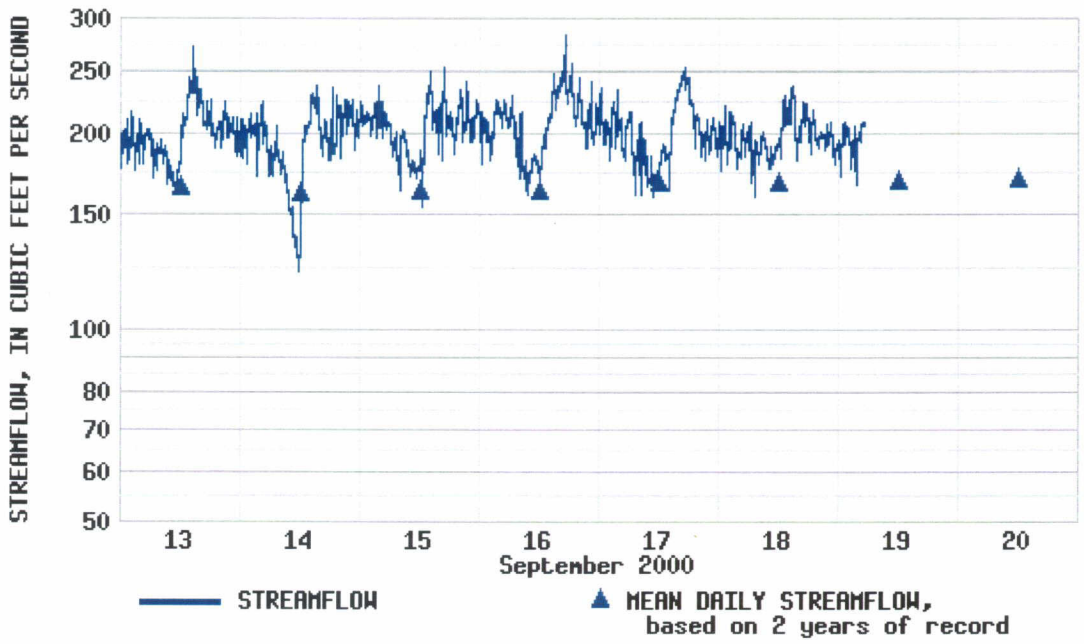



**Figure 4 – Recent hydrograph from gage (#09419790) on Las Vegas Wash.**

Daily variation in flow rate in the Las Vegas Wash is a direct result of the variable discharge rates associated with each of the three POTWs discharging into the Wash. These circumstances cannot be avoided during the dye study and could result in only a quasi-steady state plume during the investigation. As such, the mixing length could change during any given 24-hour period. The potential change in mixing length will be determined at times of expected daily high and low flows to identify any differences associated with the variable discharge. Toward this end, the water level at the approximate downstream location will be recorded throughout the day to indicate the maximum and minimum daily flows.

Flood control structures have been built within the Wash to reduce channel down cutting during episodic high flow events. Erosion is controlled by increasing the channel width with the use of erosion control structures (low head dams) located along the length of the watercourse. In addition to widening the flow in the channel, the erosion control structures pool water upstream. The Pabco Road erosion control structure (Figure 5) located a short distance downstream from the Kerr-McGee discharge will likely affect mixing to some degree and provide a measurement transect location.

**Figure 5 – Photograph of Pabco Road erosion control structure downstream of Kerr-McGee discharge.**

In summary, the Las Vegas Wash downstream of the Kerr-McGee discharge of 1 MGD is characterized by a relatively variable width and depth main channel within a wide floodplain with steep vertical banks. The presence of a low head dam flood control structure downstream of the Kerr-McGee discharge could act to increase mixing and provide a transect location for measurement during the dye study. Flows vary throughout a daily cycle but generally average approximately 200 cfs. The flow variability is a direct result of discharge from water treatment facilities that discharge into the Wash.

# 3.0 FIELD PROGRAM DESIGN

## 3.1 Selection of Measurement Stations

This program will involve injection of Rhodamine WT fluorescent dye (see MSDS attached) into the Las Vegas Wash at the Kerr-McGee discharge and the measurement of fluorescence at a series of 5 downstream transects. The most upstream transect will be located immediately downstream of the discharge, where the dye is likely not well mixed. The most downstream transect will be located far downstream where the dye is completely mixed across the channel. Based on previous calculations of mixing length and the physical characteristics of the Las Vegas Wash, complete mixing of the Kerr-McGee discharge is assumed to occur upstream of station LW 5.5 (formerly LM-6) (Figure 1). Therefore, station LW 5.5 will be used to define the extent of fluorescence variability that is due to natural scatter in the data. The variability will be determined by collecting several samples at station LW 5.5 and identifying the 95% confidence interval of the fluorescence values at this location. The range of natural variability will be defined as the average fluorescence ±2 standard deviations as measured at station LW 5.5.

## 3.2 Location of Complete Mixing

Once the plume has reached equilibrium and the variability has been defined at transect LW 5.5, a second transect will be measured at station LW 6.05 (formerly LM-5) (Figure 1). The variability in the results at station LW 6.05 will be compared with the variability measured at station LW 5.5. If the fluorescence values measured at LW 6.05 vary by less than the ±2 standard deviations as measured at station LW 5.5, then the variability will be assumed to be acceptable and the transect will be assumed to be completely mixed. If this is the case, the next transect will be measured upstream of station LW 6.05. If the variability of the fluorescence values at station LW 6.05 is more than that measured at station LW 5.5, the transect will be assumed to be incompletely mixed and a downstream transect will be measured next. Once the most downstream, completely mixed transect is identified, the additional 4 transects will be located between the discharge and the most downstream location. At least 5 fluorescence measurements will be made laterally and 2 will be made vertically across the main flow in the channel in an evenly distributed fashion. The transect locations will be selected based on the likelihood of complete mixing at the downstream station, accessibility, and safety. These factors are described in the following sub-sections.

## 3.3 Accessibility

### 3.3.1.1 Wading

An effort will be made to locate transects where the water is wide and shallow enough (maximum 4 feet) to wade across. Wading would be the easiest sampling approach and significant effort will be made to identify transects that are shallow enough to be waded.

#### 3.3.1.2 Watercraft

If the channel is too deep to wade across, then a boat may be used to traverse the channel. The boat may be a canoe or raft that may be tethered to the shore. The method will be successfully tested at the Wash before the dye investigation begins.

### 3.3.2 Safety

Safety will be an important consideration when selecting transects. The following precautions will be taken to prevent accidents during the investigation. Life jackets will be used in any watercraft and when wading in either deep or fast moving water. To avoid slips and falls, steep channel banks will be avoided when selecting access points to the Wash. The investigation will involve a team of two ENSR staff that will be in direct communication at all times. The field team will also have access to a cellular phone throughout the investigation and a list of emergency telephone numbers. ENSR staff will also carry basic first aid equipment during the investigation. Additionally, ENSR will develop a Health and Safety Plan (HASP) for the investigation that will be available throughout the course of fieldwork.

## 3.4 Estimation of Travel Time

There will be a lag time between the time the dye is injected in the discharge stream and the time it takes for the dye to equilibrate in the Wash. The rate of travel is expected to be approximately 1.5 ft/sec based on information included in the investigation by the LVWCAMP (1999[1]). However, two measurements will be taken to insure that dye plume has come to a quasi-steady state equilibrium in the Wash after the dye injection has begun. First, the dye injection will begin at least 12 hours before the sampling of transects. At an average velocity of 1.5 ft/sec, a parcel of water will move 4 miles downstream in approximately 4 hours; therefore, waiting 12 hours for the dye to reach steady state should be more than adequate. Second, after 12 hours of injection, dye fluorescence will be measured during three hourly intervals at a transect located approximately 3,200 feet downstream of the discharge (LW 5.5, Figure 1) to identify the plateau of the dye fluorescence curve. This plateau will indicate that the dye distribution is at steady state. If the fluorescence values are uniform across the transect, then the survey can begin. Upstream transects will not be measured until the downstream location has reached a uniform temporal and spatial distribution.

## 3.5 Calculation of Dye Injection Rate

A Turner fluorometer that will be used for this investigation can detect tracer concentrations as low as 0.01 ppb; however, the minimum required instream concentration will be dictated by the error associated with the "blank" measurements. Prior to the start of dye injection, the variability of

[1] Las Vegas Wash Comprehensive Adaptive Management Plan (LVWCAMP). Presented for approval by the Las Vegas Wash Coordination Committee on December 28, 1999.

background fluorescence will be determined using a calibrated fluorometer. Based on this variability, a minimum required concentration would be determined. A concentration of 2 ppb will be considered as a first cut at the minimum concentration expected in the Wash. The amount of dye required is determined with the following equation: QC = qc; where: Q = Streamflow rate ($L^3/T$); C = Stream concentration ($M/L^3$); q = Injection rate ($L^3/T$); and c = dye concentration ($M/L^3$). Assuming an instream flow rate of 200 cfs an injection rate of 0.68 ml/min of dye will be necessary throughout the injection period. The resulting amount of dye required for a 24-hour injection is therefore 980 ml or approximately 1 liter. However, since the pump that will be used to inject the dye operates over a range of 4.8 to 48 ml/min the dye will be diluted by a factor of 10 and the solution will be injected at 10 times the calculated rate or 6.8 ml/min.

The extremely low concentrations of Rhodamine WT in the Las Vegas Wash will not present a visible change in the color of the water. Additionally, these low concentrations will not change the taste or odor of the water in either the Wash or any part of Lake Mead. Once the dye enters Lake Mead with the water from the Las Vegas Wash it will be diluted several-fold and concentrations will diminish as a result of photodegradation.

# 4.0 FIELD PROGRAM METHODS

## 4.1 Dye Injection

Dye will be injected to the discharge stream using a Turner Designs dye injection pump. The pump is reportedly accurate to 1% over a pumping range of 4.8 to 48 ml/min. The pump has a maximum injection rate of 48 ml/min, which is far greater than the injection rate of 6.8 ml/min that will be used during this investigation. The pump will be calibrated using a graduated cylinder at the start and end of the test to insure that the dye injection rate has remained constant.

The dye injection will likely occur at the outlet of the sandbag dam that pools the treated water discharge shown at the right in Figure 6. Injecting dye at the outlet of the pool will result in a constant stream of dye leaving the pool and entering the channel originally occupied by the seep. Additionally, injecting the dye into a relatively small, fast moving stream of water will insure that the dye is completely mixed in the channel prior to entering the Wash.

**Figure 6 – Photograph showing Kerr-McGee discharge into a pool and discharge from that pool through a low point in a dam.**

Once the dye is injected in the discharge stream it will flow downstream through the original seep channel and toward the Wash.

## 4.2 Fluorescence Measuring Using a Portable Fluorometer

A Turner 10-AU portable fluorometer will be used to measure the fluorescence of dye in the river. This instrument is the industry standard for field fluorometric measurements. The instrument has a sensitivity of 10 parts per trillion (ppt) of Rhodamine WT in potable water and manually or automatically changes range in response to changing concentration levels. The relationship between dye concentration and fluorescence is linear up to 100 ppb, and a curve can be developed to interpret results at higher concentrations. The instrument can operate over a wide range of temperatures. The Turner 10-AU is portable enough to be used in the field and has been extensively used by ENSR staff in the past during similar investigations.

## 4.3 Measurement of Stage and Streamflow

The water level will be measured at the upstream and downstream locations during the investigation to develop a correlation between streamflow maximum and/or minimum between the two locations. This information will be useful in determining average stream velocity in the Wash. Streamflow will be measured at a minimum of three locations on the Las Vegas Wash between the discharge and the most downstream transect according to the following procedures.

1. Select a cross-section from a straight, uniform reach with parallel streamlines and a relatively uniform bottom. If possible, the section should be free of large eddies with upstream circulation near the banks, slack water, or excessive turbulence caused by upstream bends, radical changes in cross-section shape, and irregular obstructions such as boulders, trees, vegetation, and other debris in the vicinity.

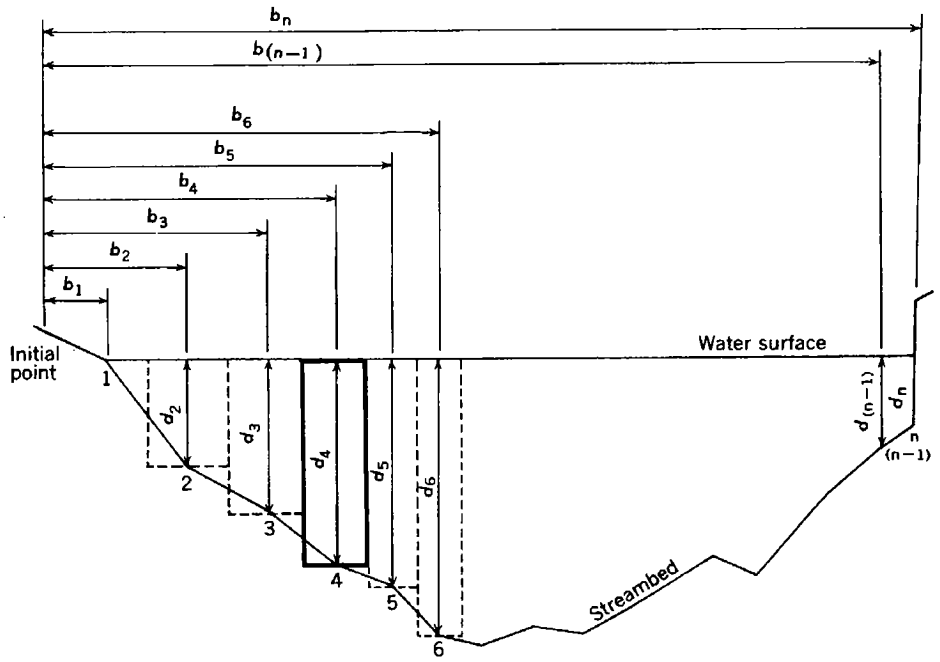
2. String a tape measure across the stream channel perpendicular to flow. This will allow for a record of the transverse location of the current meter during a measurement. Visually divide up the flow through the cross-section into at least 20 compartments (depending on the width of the channel) such that each compartment has roughly the same amount of flow passing.

3. According the channel cross-section diagram illustrated in Figure 7, measure the distances (b) and depths (d) for each average velocity measurement. The mean velocity is measured at a point six-tenths of the depth from the stream surface at each location (b). The partial area flows are calculated by multiplying the width of the individual areas by the corresponding depths in those areas. This calculation is made according to the following equation with locations of the variables defined in Figure 7.

$$q_x = v_x \left[ \frac{b_x - b_{(x-1)}}{2} + \frac{b_{(x+1)} - b_x}{2} \right] d_x \quad (see\ Figure\ 7)$$

4. Compute the total flow as the sum of the partial flows using the equation:

$$Q = \Sigma q_x$$




EXPLANATION

| | |
|---|---|
| 1, 2, 3, . . . . . n | Observation points |
| $b_1, b_2, b_3, \ldots . b_n$ | Distance, in feet, from the initial point to the observation point |
| $d_1, d_2, d_3, \ldots . d_n$ | Depth of water, in feet, at the observation point |
| Dashed lines | Boundary of partial sections; one heavily outlined discussed in text |

**Figure 7 – Illustration of channel cross-section showing the distances of the measured velocities from the shore and the depths of the partial area cross-sections (USGS, 1982[2]).**

[2] USGS. 1969. Discharge Measurements at Gaging Stations. Techniques of Water-Resources Investigations of the United States Geological Survey. Book 3, Chapter A8.

## 4.4 Equipment and Supplies

- Rhodamine WT Dye – Approximately 2 liters of Rhodamine WT dye will be used during the investigation. Turbidity, color, and pH can affect Rhodamine WT. These parameters can reduce the dye concentration; however, a reduced concentration will not affect the final result since it is actually mixing that is being characterized using fluorescence as an indicator.

- Fluorometer - A Turner fluorometer will be used for measuring fluorescence in the water column during this investigation. Sample bottles will be used to carry samples collected along the transect to the fluorometer that will be kept in the nearby vehicle.

- Current meter/wading rod/tape/rope/waders – Equipment for measuring streamflow will be used at the upstream, downstream, and middle locations along the Wash.

- Staff gages – Two temporary staff gages will be used at the upstream and downstream locations for the measurement of water level during the investigation.

# 5.0 DATA QUALITY

## 5.1 Dye Compatibility with Water Quality

The pH of the Wash water will be measured at the start and end of the test to indicate the pH is within the 4.5 to 10.5 range acceptable for use of Rhodamine WT.

## 5.2 Replication of Samples

At least 1 replicate sample will be collected and analyzed for fluorescence for every 10 samples collected.

## 5.3 Determine Quasi-Steady State

In order to insure the transects are sampled at quasi-steady state, measurements will be made at a location approximately 3,200 feet downstream of the discharge and until the fluorescence plateau is reached.

## 5.4 Sample Handling

Once the dye is present in the Wash a control sample will be collected in the Wash water and the fluorescence will be determined. The time and fluorescence of the control sample will be recorded in a logbook. At the end of the investigation the fluorescence of the control sample will again measured and recorded. The two fluorescence values will be compared and any difference may be an indication of a temporal decay of the dye fluorescence. Samples will be analyzed immediately after collection to avoid any change in fluorescence due to holding time.

# 6.0 INTERPRETATION OF RESULTS

The samples collected at station LW 5.5 (Figure 1) after 12 hours of dye injection are expected to indicate a completely mixed transect. The fluorescence will be determined at 20 evenly distributed locations across a transect at LW 5.5 and the standard deviation of the values will be determined. Once the variability in the transect at LW 5.5 is quantified, transect LW 6.05 (Figure 1) will be measured to determine the degree of mixing. If the cross section is completely mixed the next transect will be measured upstream. If the cross section is not completely mixed the next transect will be measured downstream. At LW 6.05 it is expected that all fluorescence values will be very similar and that the deviation between samples will be small.

Fluorescence measurements will be made immediately following the collection of samples at each transect to facilitate the rapid evaluation of mixing data. Trends across the channel will be identified and compared and the variability in upstream transects will be compared with that in the most downstream transect.

The results of this investigation will be used to identify the location in the Las Vegas Wash at which complete mixing of dye from the Kerr-McGee discharge has occurred.

# APPENDIX

CROMPTON & KNOWLES -- INTRACID RHODAMINE WT LIQUID
MATERIAL SAFETY DATA SHEET
NSN: 681000N018097
Manufacturer's CAGE: 69389
Part No. Indicator: B
Part Number/Trade Name: INTRACID RHODAMINE WT LIQUID

## General Information

Company's Name: CROMPTON & KNOWLES CORP
Company's P. O. Box: 341
Company's City: READING
Company's State: PA
Company's Country: US
Company's Zip Code: 19603
Company's Emerg Ph #: 215-582-8765
Company's Info Ph #: 215-582-8765
Record No. For Safety Entry: 002
Tot Safety Entries This Stk#: 002
Status: SMJ
Date MSDS Prepared: 06MAR92
Safety Data Review Date: 08FEB96
MSDS Serial Number: CBVRX

## Ingredients/Identity Information

Proprietary: YES
Ingredient: PROPRIETARY
Ingredient Sequence Number: 01

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Proprietary: YES
Ingredient: PROPRIETARY
Ingredient Sequence Number: 02

---

Proprietary: YES
Ingredient: PROPRIETARY
Ingredient Sequence Number: 03

---

Proprietary: YES
Ingredient: PROPRIETARY
Ingredient Sequence Number: 04

---

Proprietary: YES
Ingredient: PROPRIETARY
Ingredient Sequence Number: 05

## Physical/Chemical Characteristics

Appearance And Odor: DARK RED LIQUID. NO ODOR.
Boiling Point: 212F,100C
Melting Point: 14F,-10C
Specific Gravity: 1.13 +/- 0.02
Solubility In Water: SOLUBLE
pH: SUPDAT

## Fire and Explosion Hazard Data

Flash Point: N/A(AQUEOUS)
Lower Explosive Limit: N/A
Upper Explosive Limit: N/A

Extinguishing Media: WATER, DRY CHEMICAL, CO*2.
Special Fire Fighting Proc: WEAR NIOSH/MSHA APPROVED SCBA & FULL PROTECTIVE EQUIPMENT(FP N).
Unusual Fire And Expl Hazrds: NONE EXPECTED.

## Reactivity Data

Stability: YES
Cond To Avoid (Stability): DO NOT MIX WITH ACIDS.
Materials To Avoid: NONE KNOWN.
Hazardous Decomp Products: BURNING WILL PRODUCE OXIDES OF CARBON & NITROGEN.
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): NOT RELEVANT.

## Health Hazard Data

LD50-LC50 Mixture: NONE SPECIFIED BY MANUFACTURER.
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: YES
Route Of Entry - Ingestion: NO
Health Haz Acute And Chronic: CNTNS TRIMELITIC ACID, MAY CAUSE EYE & SKIN IRRITATION. INTRACID RHODAMINE WT LIQUID WAS TESTED IN BATTERY OF IN VITRO & IN VIVO MAMMALIAN ASSAYS RESULTING IN NEGLIGIBLE OR LOW LEVELS OF GENOTOXIC ACTIVITY EVEN AT VERY HIGH CONCS. (G.R.DOUGLAS ET AL, "COMPARATIVE MAMMALIAN IN VITRO AND IN VIVO STUDIES(EFTS OF OVEREXP)
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO
Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: NOT RELEVANT.
Signs/Symptoms Of Overexp: HLTH HAZ: ON THE MUTAGENIC ACTIVITY OF RHODAMINE WT", MUTATION RESEARCH, 118, 1983, 117-125). INTRACID RHODAMINE WT WAS POSITIVE IN A SALMONELLA/MAMMALIAN MICROSOME ASSAY(NESTMANN & KOWBEL, 1979). G.DOUGLAS AS REFERENCED, STATED THAT IMPURITIES IN DYE MAY HAVE CAUSED MUTAGENIC EFFECTS SEEN/(SUPDAT)
Med Cond Aggravated By Exp: NOT KNOWN.
Emergency/First Aid Proc: INHAL:MOVE TO FRESH AIR. IF BRTHG IS DFCLT, GIVE O*2 & GET MD ATTN RIGHT AWAY. EYE:FLUSH W/FLOWING H*2O FOR @ LEAST 15 MINS, HOLD EYELIDS APART TO IRRIGATE THORO, GET MD ATTN RIGHT AWAY. SKIN: WASH AFFECTED AREAS THORO W/SOAP & H*20. IF IRRIT DEVELS, CONSULT MD. INGEST:DILUTE W/WATER & INDUCE VOMIT. GET IMMED MD ATTN. NEVER GIVE FLUIDS/ INDUCE VOMIT IF PATIENT IS UNCON/HAS CONVULSIONS.

## Precautions for Safe Handling and Use

Steps If Matl Released/Spill: WEAR APPROP SAFETY EQUIP. CNTN & CLEAN UP SPILL IMMED PVNT FROM ENTERING FLOOR DRAINS. CONTAIN LIQUIDS USING ABSORBANTS, SWEEP PWDRS CAREFULLY MINIMIZING DUSTING. SHOVEL ALL SPILL MATLS INTO DISP DRUM, FOLLOW DISP INSTRUCTIONS. SCRUB SPILL(ING 5)
Neutralizing Agent: NONE SPECIFIED BY MANUFACTURER.
Waste Disposal Method: BURY OR INCINERATE ACCORDING TO FEDERAL, STATE & LOCAL REGULATIONS. CONTAINERS SHOULD BE TRIPLE RINSED ACCORDING TO FEDERAL, REGULATIONS AND/OR GOOD WASTE MANAGEMENT PRACTICE.
Precautions-Handling/Storing: NONE SPECIFIED BY MANUFACTURER.
Other Precautions: NONE SPECIFIED BY MANUFACTURER.

## Control Measures

Respiratory Protection: NONE REQUIRED UNDER NORMAL CONDITIONS. USE NIOSH/ MSHA APPROVED RESPIRATOR APPROPRIATE FOR EXPOSURE OF CONCERN(FP N).

Ventilation: LOCAL EXHAUST.
Protective Gloves: RUBBER GLOVES.
Eye Protection: ANSI APPRVD CHEM WORKERS GOGGS(FP N).
Other Protective Equipment: ANSI APPROVED EMER EYEWASH & DELUGE SHOWER(FP N). APRON, COVERALL TO MINIMIZE SKIN CONTACT.
Work Hygienic Practices: IN ACCORDANCE W/GOOD INDUSTRIAL PRACTICE, HANDLE THIS PRODUCT W/CARE & AVOID PERSONAL CONTACT.
Suppl. Safety & Health Data: USERS OF THE "L" VERSION OF HMIS TO CONSULT THE "LR" VERSION OF HMIS(FP N). EFTS OF OVEREXP: ALTERNATIVELY THE DYE MAY BE POINT MUTAGEN. DOUGLAS FURTHER REPORTED THAT TAKING DATA ALTOGETHER FROM HIS STUDY, "...RHODAMINE WT APPEARS NOT TO REPRESENT A MAJOR GENOTOXIC HAZARD." PH: 10.5-10.8.

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Transportation Data

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Disposal Data

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Label Data

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Label Required: YES
Technical Review Date: 09FEB96
Label Date: 09FEB96
Label Status: G
Common Name: INTRACID RHODAMINE WT LIQUID
Chronic Hazard: NO
Signal Word: CAUTION!
Acute Health Hazard-None: X
Contact Hazard-Slight: X
Fire Hazard-None: X
Reactivity Hazard-None: X
Special Hazard Precautions: ACUTE: MAY CAUSE EYE AND SKIN IRRITATION. CHRONIC: NONE LISTED BY MANUFACTURER.
Protect Eye: Y
Protect Skin: Y
Protect Respiratory: Y
Label Name: CROMPTON & KNOWLES CORP
Label P.O. Box: 341
Label City: READING
Label State: PA
Label Zip Code: 19603
Label Country: US
Label Emergency Number: 215-582-8765

# 10-AU Field Fluorometer

Turner Designs... Over 25 Years of Fluorescence Technology


*The Turner Designs 10-AU Field Fluorometer*

## An Overview

The 10-AU Field Fluorometer is a rugged, field-portable instrument that can be set up for continuous-flow monitoring or discrete sample analyses. A watertight case, internal data logging, automatic range changing, watertight quick-change filter paddles, and unmatched stability make the 10-AU the instrument of choice for field studies. A variety of compounds can be easily measured on-site using application-specific optical filters available from Turner Designs.

## Features of the 10-AU

- *Stable Measurements. The 10-AU makes long-term monitoring possible even when the ambient temperature changes dramatically or the power fluctuates. Stability is measured in months or weeks as opposed to days or hours.*
- *Watertight filter paddles. Allow easy change of excitation and emission filters. Conveniently located on the instrument front panel.*
- *Wide Dynamic Range. Measurements can be made across a range of almost four orders of magnitude with, in most cases, a simple, one-point calibration. Using the auto-ranging feature, both low and high concentrations can be read automatically.*
- *Auto Ranging. The 10-AU will find the appropriate sensitivity range for each sample and switch automatically to that range, without user intervention and without affecting calibration.*
- *Flexible Sample Compartment. Accommodates 25 mm, 10 mm, 3 mm, and 1 mm continuous-flow sample systems. Optional discrete sample cuvette system is available for 25 x 150 mm, 13 x 100 mm test tubes, and 10 x 10 mm adaptor.*
- *Condensate-proof Sample Compartment. The unique hermetically-sealed sample compartment eliminates erratic readings caused by flow cell condensation.*
- *Rugged Watertight Design. With a watertight case, the 10-AU can be taken out into the elements and used in a variety of field studies.*
- *Field Portability. Unattended, remote operation is easily accomplished. With a 12 Volt Power Cable, the 10-AU can be powered by a marine battery for days.*

## Optional Features

- ***Internal Data Logging.*** *Allows measurements to be stored in the instrument's memory even after the power is turned off. Other data collection options include: RS-232 serial data output and analog output to an external data logger, chart recorder, or computer.*
- ***Temperature Compensation.*** *Eliminates manual calculation of fluorescence changes due to changes in sample temperature.*

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## About Fluorescence

Certain compounds absorb light of one wavelength and re-emit light at a longer wavelength. Using the proper optical filter and lamp combination, a filter fluorometer can measure this light and quantify select compounds. Filter fluorometry is often chosen over other analytical techniques because of its superior sensitivity, high selectivity, and low cost.

## Option Specifications

**Power, DC (optional):** 11-16 V; 2.5 amperes.

**Internal Data Logging (optional):** From 18,510 to 64,800 data points. Intervals: 1, 2, 3, 5, 10, 20, or 30 seconds; or 1, 2, 3, 5, 10, 20, or 30 minutes.

**Electronic Chart Recording (optional with Internal Data Logging):** 240 data points viewed at a time.

**Temperature Compensation (optional):** Celsius or Fahrenheit degrees. Temperature coefficient: Linear, 0 - 15.0000 %/°C or °F; Exponential, 0 - 15.0000% / °C or °F. Long-term stability +/- 0.16°F. Nonlinearity: +/- 0.35°F (from -50 to 300°F).

## Instrument Specifications

**Sensitivity:** 10 parts per trillion of Rhodamine WT in potable water; 30 parts per trillion of extracted chlorophyll *a*; 10 parts per billion of crude oil in pure water.

**Dual Beam Optics:** Compensate for drift in lamp intensity and/or photomultiplier drift.

**Watertight Filter Paddles:** Easily removable filter paddles make excitation and emission filter changes quick and convenient.

**Auto-Ranging:** Manual or automatic range changing in response to changing concentration levels (user selectable).

**Ranges:** 3 ranges, each a factor of 10 more sensitive than the next, 0 to 9999.999 Fluorescent Signal Units.

**Blank:** Reads and subtracts blank (user selectable).

**Operating Temperature:** ; 0 - 55°C; 32 - 131°F (ambient).

**Software:** Menu-driven microprocessor-controlled.

**Digital Output:** 100% ASCII format through a 9-pin RS-232 serial cable at 4800 or 9600 bits per second (bps).

**Analog Output:** Full scale voltage: 0.1, 1, 2, or 5 volts (user selectable).

**Readout:** Direct Concentration or Raw Fluorescence.

**Detector:** Factory installed photomultiplier tube. Standard: 300-650 nm; Optional: Red Sensitive 185-870 nm.

**Discrete Sample Averaging** (user selectable)**:** Pre-averaging delay: 1 to 60 seconds; Averaging period: 2 to 60 seconds.

**Lamp:** Low Pressure Mercury Vapor Lamp (4 watts; 8000 hours lamp life). Several different wavelengths are available.

**Alarm:** Audible and visible when fluorescence of sample falls below or exceeds user-selectable limits (user may disable alarm). Alarm delay time: 10 to 3600 seconds.

**Diagnostics:** Diagnostic screen displays status of internal instrument electronics for easy troubleshooting.

**Display:** 40 x 8 character, backlit LCD (132 mm x 39 mm).

**Keypad:** 4 x 5 keys (3" x 2.7"; 7.6 cm x 6.9 cm).

**Power, AC:** 100-130 V; 200-240 V, 50/60 Hz, 30 watts.

**Physical Characteristics:** Dimensions and weight vary with instrument configuration. Maximum: 24 cm H (9.45") x 55 cm W (21.65") x 34 cm D (13.39").

**Weight**: 15.6 Kg (34.5 lbs).

**Warranty:** One year warranty.

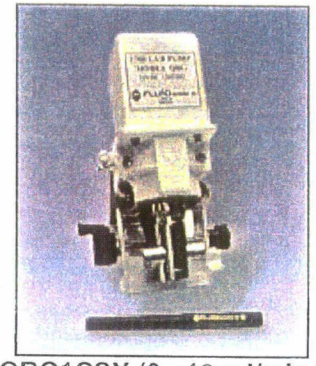
**Approvals:** TUV, VDE & CE.

TURNER DESIGNS
845 W. Maude Avenue · Sunnyvale, CA 94086
(408) 749-0994 · FAX (408) 749-0998 · http://www.turnerdesigns.com

# Model QBG

## Low Current DC Metering Pump

- For Low Current Remote Battery Operation
- Ideal for fluorescent dye injection for flow stream monitoring.
- Excellent for remote sampling for waterway pollution & current studies.
- *A Must for Spring Time Flow Studies !*



QBG1CSY (0 - 19 ml/min.)
QBG2CSY (0 - 43 ml/min.)

### Features:

- Patented CeramPump(R) Design
- One Moving Part - NO VALVES!
- 1% Accuracy -Drift Free Operation
- Low Current DC Operation
- Self Priming
- Click Here for Application Form

Return to Main Menu

### Specifications:

**Voltage:** 12 / 24 VDC
**Current:** 60-120 mA (load dependent)

**Connection:** 6" pigtails

**Motor Speed:** 60 rpm (max. at 12VDC)

**Dimensions:** 9.7"x5.3"x6.75" wide

**Flow (max):**
19 ml.min (QBG1CSY); 43 ml/min (QBG2CSY)

**Pressure:** 30 psig (QBG1CSY); 20 psig (QBG2CSY)

**Operating Temperature:** -20F to 140F