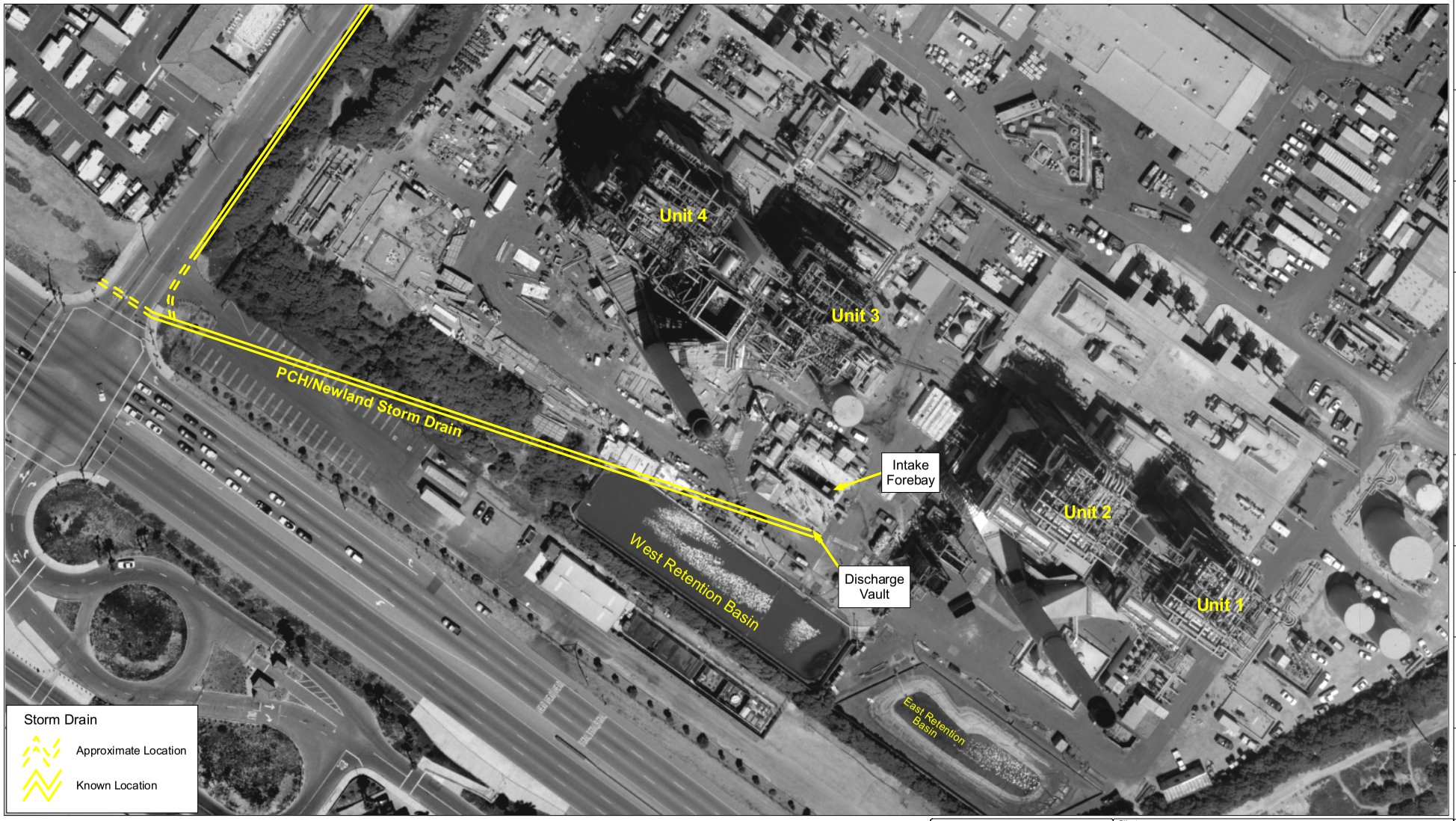
100 0 100 200 Feet

KOMEX

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH KOMEX HAS NOT ENTERED INTO A CONTRACT

| | |
|---|---|
| Client: | California Energy Commission |
| Project/Site: | HBGS - AES Powerplant |
| Date: | April 2003 |
| Project No: | 225-001 |
| Title: | **Site Map** |
| Plate No: | 1-1 |



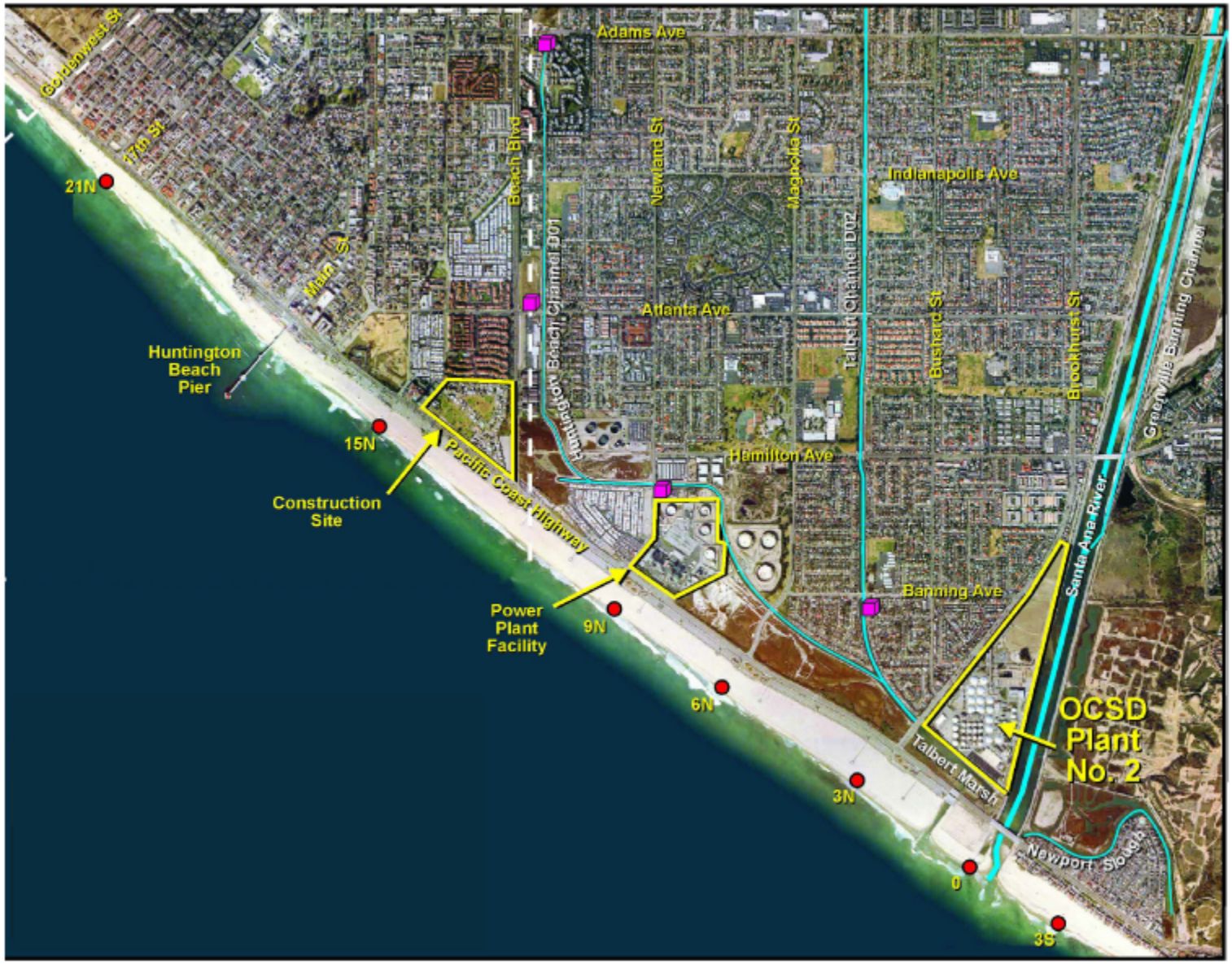

40 0 40 80 Feet

Note:
Locations are approximate.

KOMEX

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH KOMEX HAS NOT ENTERED INTO A CONTRACT.

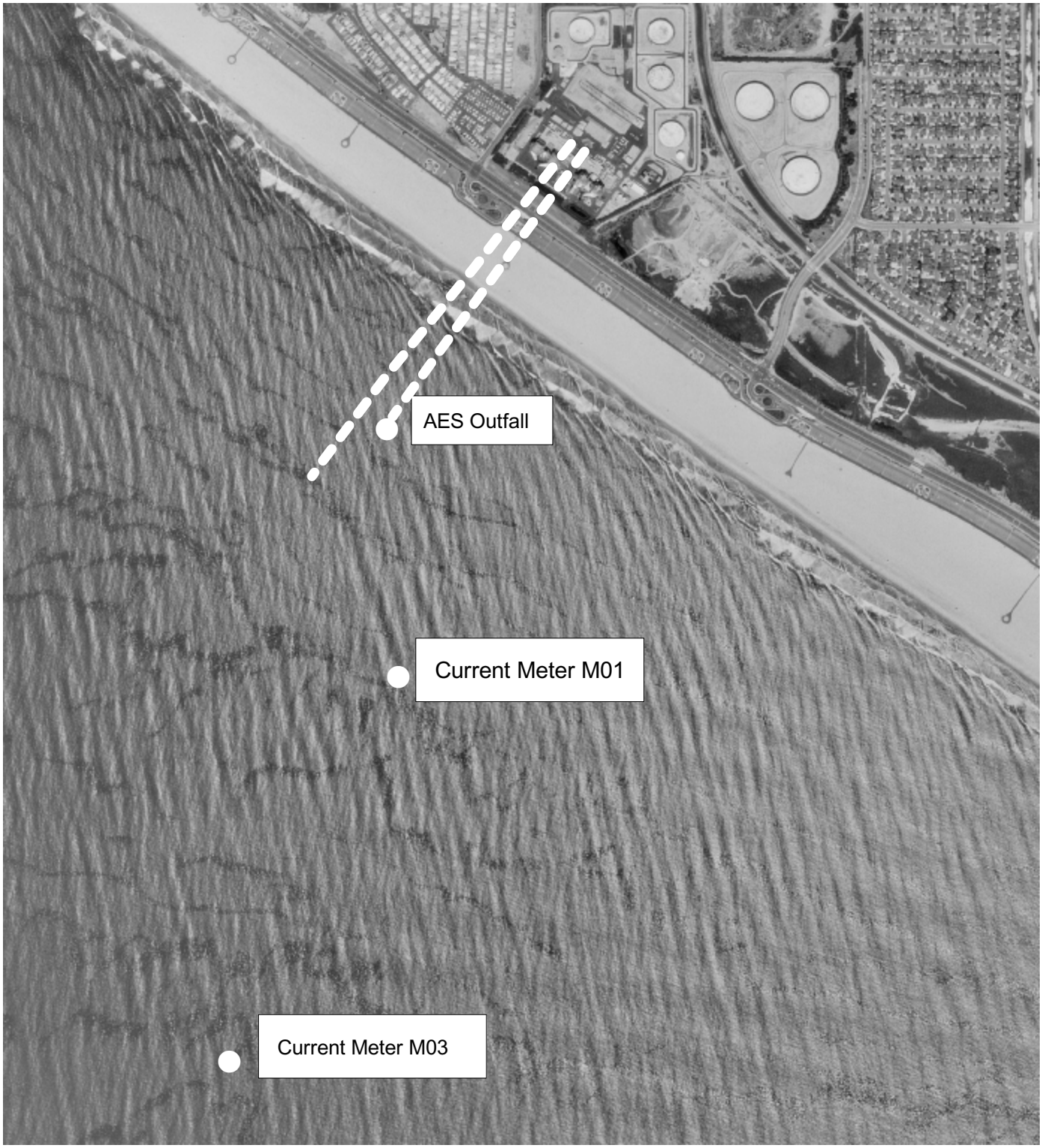
| | |
|---|---|
| Client: | California Energy Commission |
| Project/Site: | HBGS - AES Powerplant |
| Date: | April 2003 |
| Project No: | 225-001 |
| Title: | **Schematic Site Plan** |
| Plate No: | 1-2 |




KOMEX

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH KOMEX HAS NOT ENTERED INTO A CONTRACT.

| | |
|---|---|
| Client: | California Energy Commission |
| Project/Site: | HBGS - AES Powerplant |
| Title: | Huntington State Beach |
| Date: | April 2003 |
| Project No: | 225-001 |
| Plate No: | 1-3 |

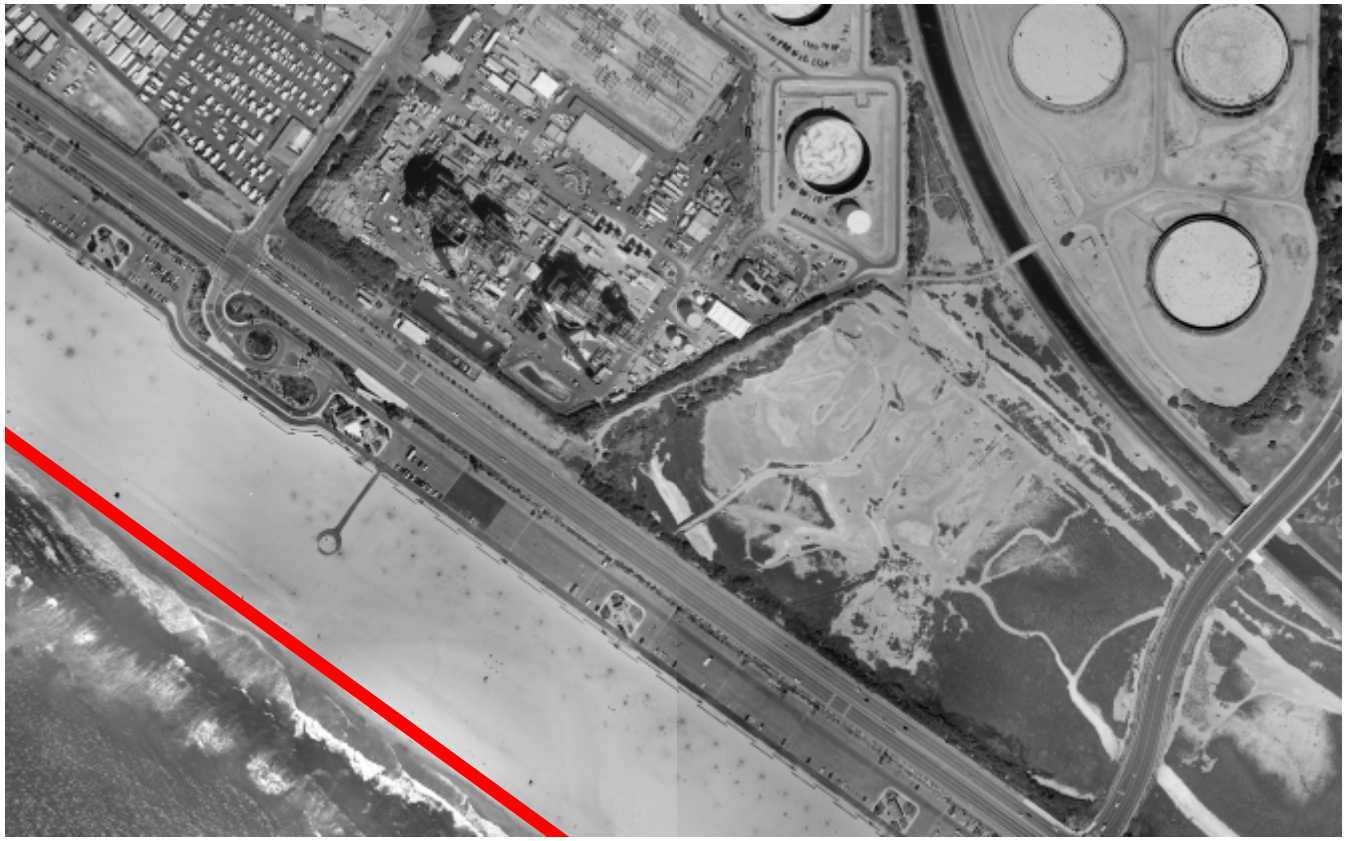


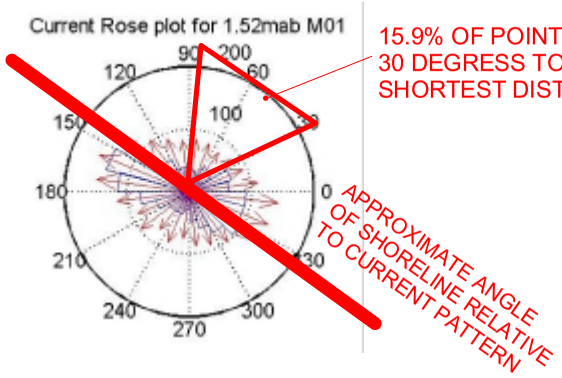

1000 0 1000 Feet

KOMEX

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH KOMEX HAS NOT ENTERED INTO A CONTRACT.

| | | | |
|---|---|---|---|
| Client: | California Energy Commission | Date: | April 2003 |
| Project/Site: | HBGS - AES Powerplant | Project No: | 225-001 |
| Title: | Intake, Outfall, and USC Current Meter Locations | Plate No: | 1-4 |






Mean Current Data for
1.52 mab

| angle(deg) | # of pts | mean spd (cm/s) |
|---|---|---|
| -172.5 | 84 | 4.693 |
| -157.5 | 52 | 4.038 |
| -142.5 | 45 | 3.580 |
| -127.5 | 30 | 3.227 |
| -112.5 | 31 | 3.025 |
| -97.5 | 30 | 3.280 |
| -82.5 | 34 | 2.932 |
| -67.5 | 49 | 3.108 |
| -52.5 | 58 | 3.668 |
| -37.5 | 88 | 4.077 |
| -22.5 | 98 | 5.074 |
| -7.5 | 100 | 5.240 |
| 7.5 | 67 | 4.587 |
| 22.5 | 64 | 3.435 |
| 37.5 | 46 | 2.940 |
| 52.5 | 40 | 2.767 |
| 67.5 | 36 | 2.707 |
| 82.5 | 51 | 2.946 |
| 97.5 | 46 | 3.192 |
| 112.5 | 52 | 2.727 |
| 127.5 | 67 | 3.496 |
| 142.5 | 96 | 4.468 |
| 157.5 | 104 | 5.670 |
| 172.5 | 125 | 5.499 |

KOMEX

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Client: California Energy Commission

Project/Site: HBGS - AES Powerplant

Date: April 2003

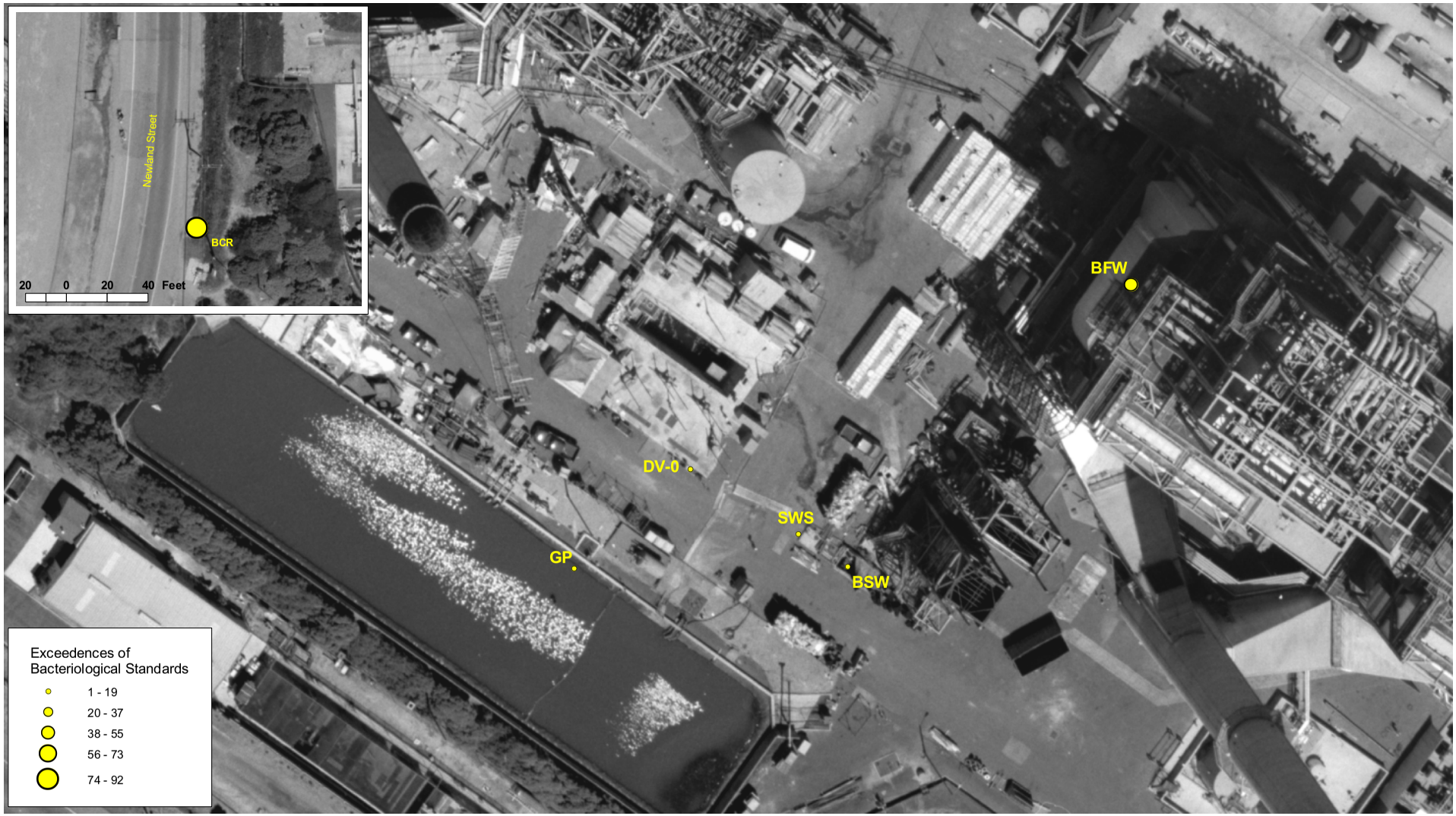
Project No: 225-001

Title: USC Mean Current Data

Plate No: 1-5

KOMEX

| | |
|---|---|
| Client: | California Energy Commission |
| Project/Site: | HBGS - AES Powerplant |
| Date: | April 2003 |
| Project No: | April 2003 |
| Title: | **Offshore Mooring Locations** |
| Figure No: | **3-1** |

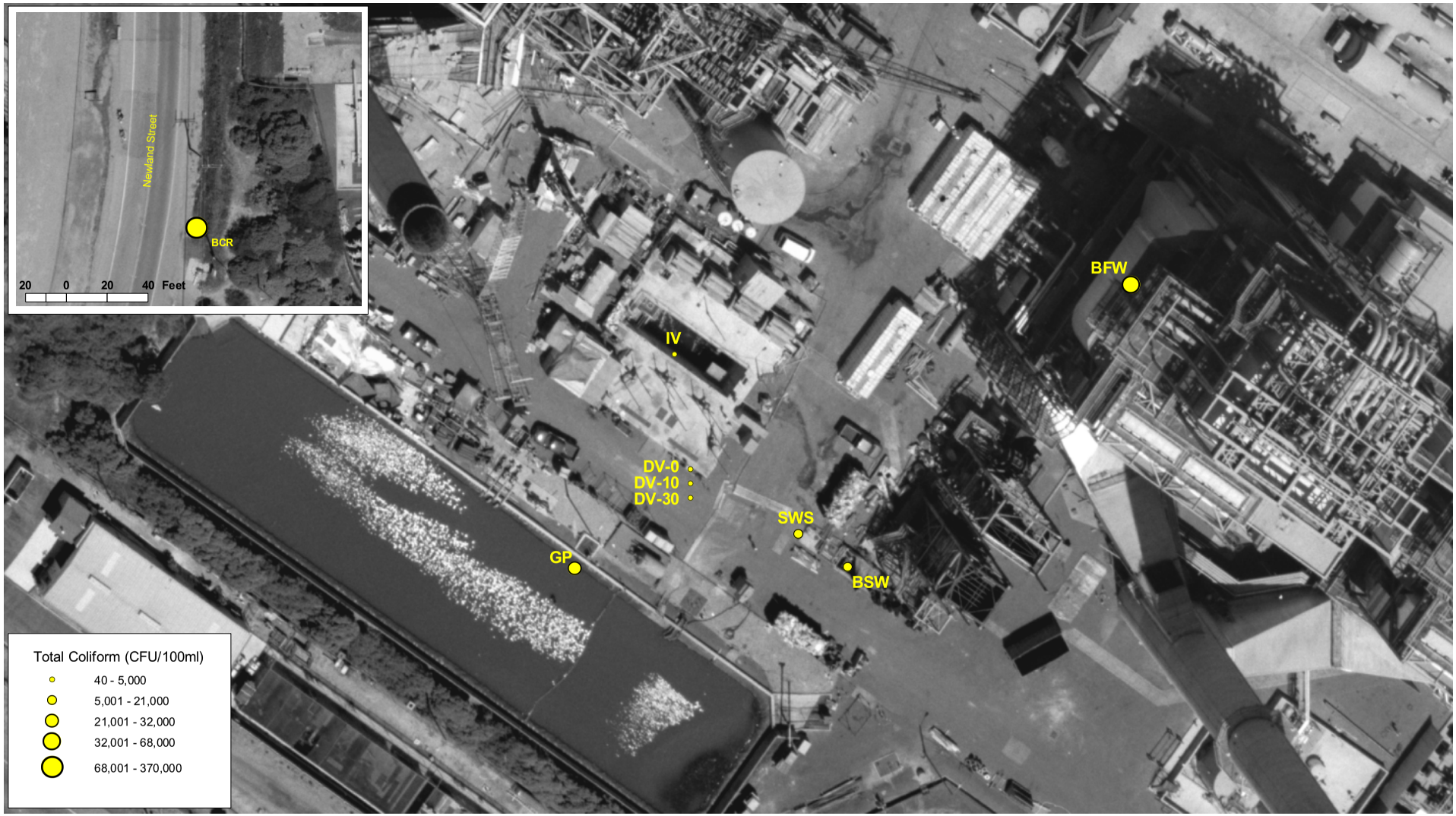



20 0 20 40 Feet

KOMEX

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH KOMEX HAS NOT ENTERED INTO ACCORDANCE.

| | |
|---|---|
| Client: | California Energy Commission |
| Project/Site: | HBGS - AES Powerplant |
| Date: | April 2003 |
| Project No: | 225-001 |
| Title: | **Total Coliform: Exceedences of Bacteriological Standards at Each Sample Point** |
| Plate No: | 4-1 |

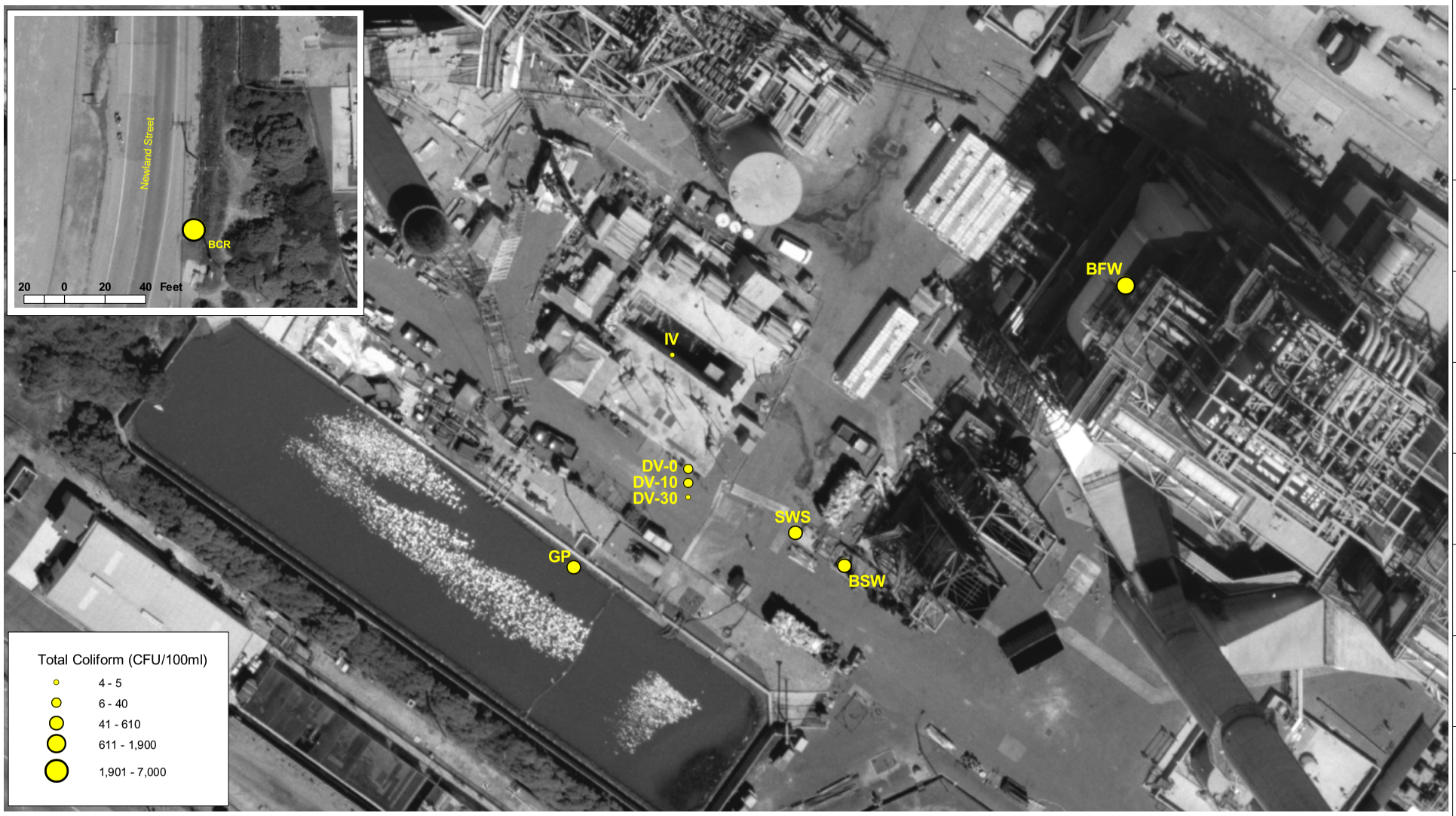



20 0 20 40 Feet

KOMEX

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH KOMEX HAS NOT ENTERED INTO A CONTRACT.

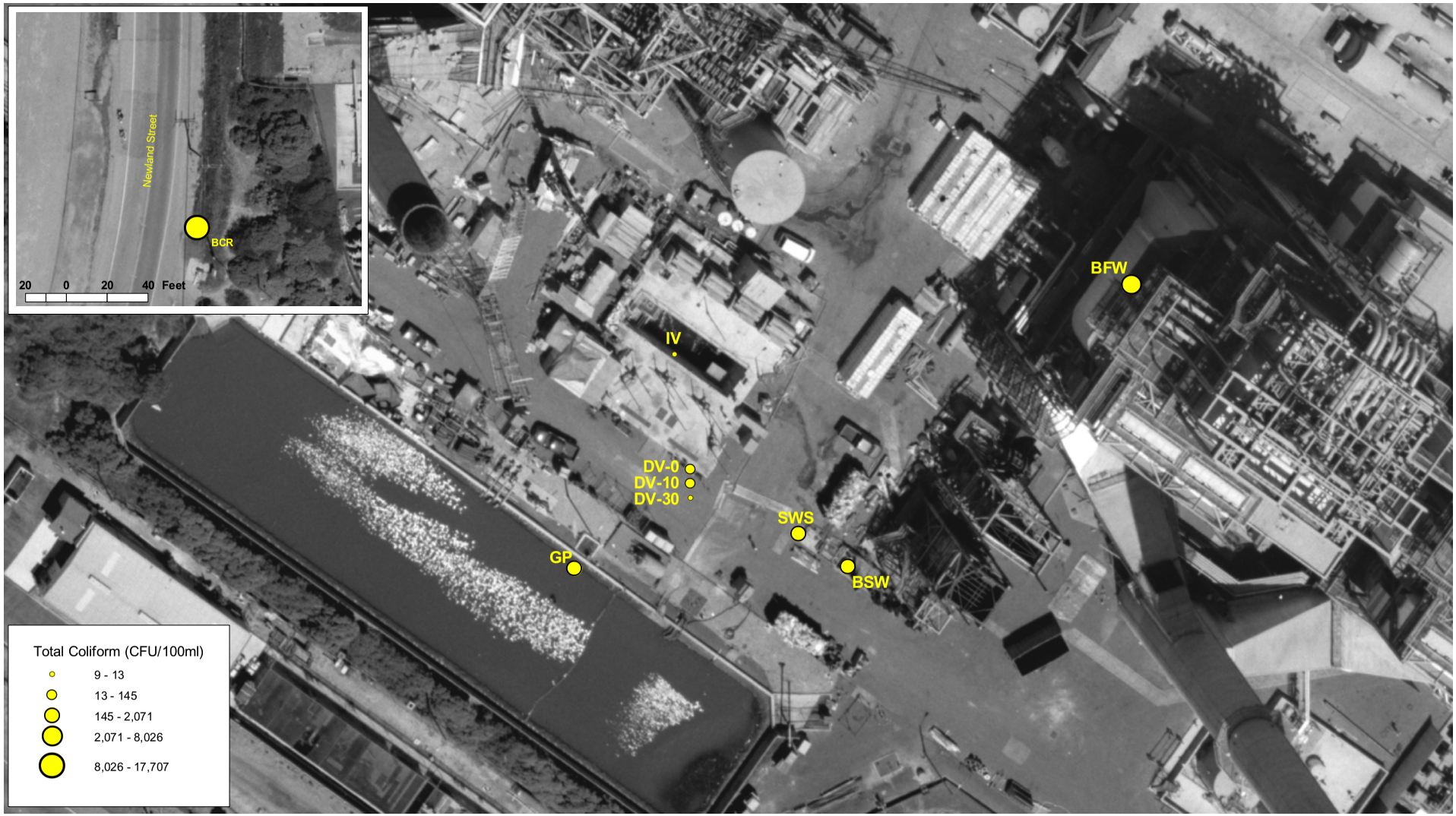
| | |
|---|---|
| Client: California Energy Commission | |
| Project/Site: HBGS - AES Powerplant | Date: April 2003 |
| | Project No: 225-001 |
| Title: **Total Coliform: Maximum Concentrations** | Plate No: 4-2 |




KOMEX

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH KOMEX HAS NOT ENTERED INTO A CONTRACT.

| | |
|---|---|
| Client: California Energy Commission | |
| Project/Site: HBGS - AES Powerplant | Date: April 2003 |
| | Project No: 225-001 |
| Title: **Total Coliform: Median of All Concentrations** | Plate No: 4-3 |

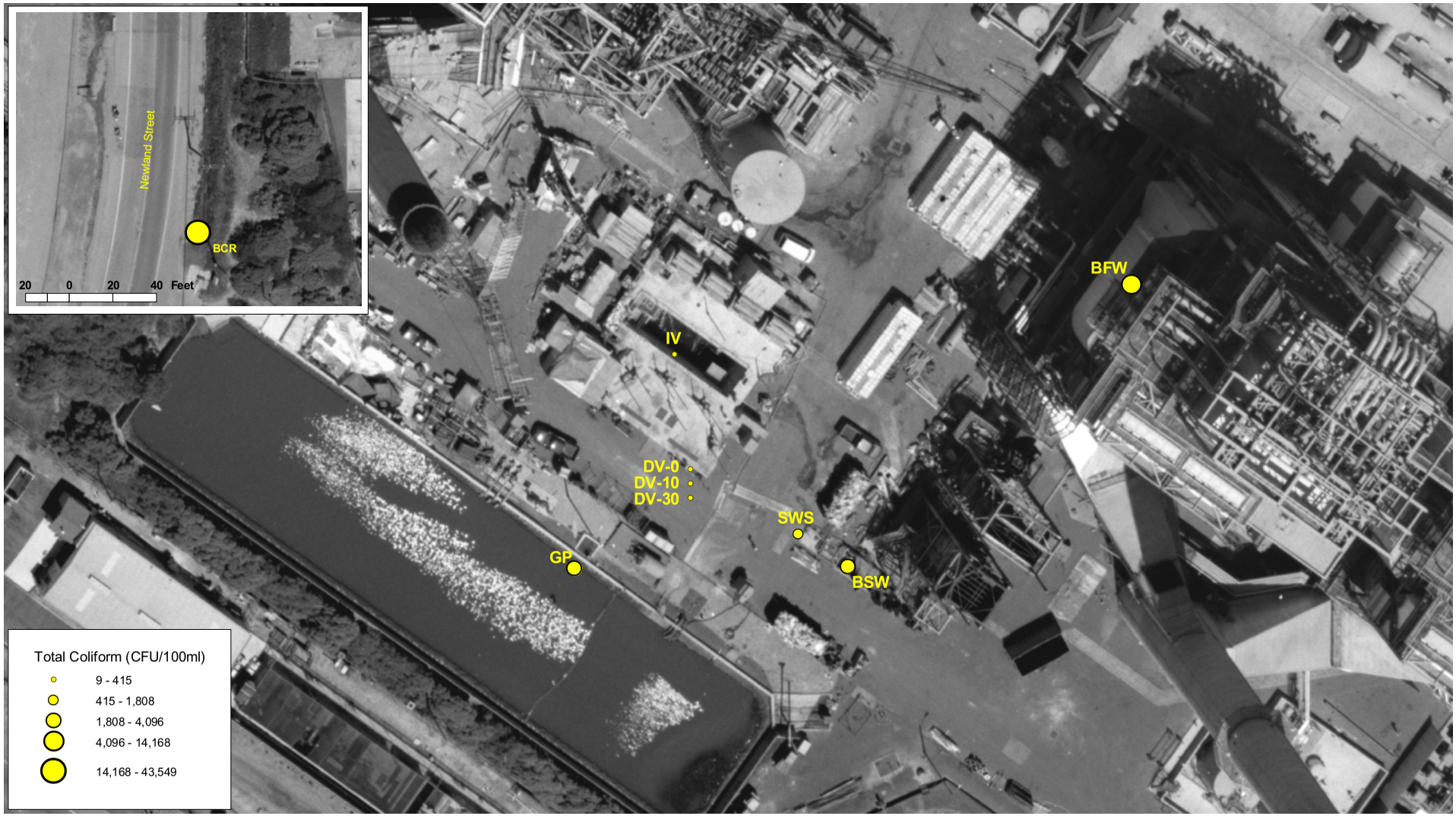



20 0 20 40 Feet

KOMEX

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH KOMEX HAS NOT ENTERED INTO A CONTRACT.

| | |
|---|---|
| Client: California Energy Commission | |
| Project/Site: HBGS - AES Powerplant | Date: April 2003 |
| | Project No: 225-001 |
| Title: **Total Coliform: Average Concentrations** | Plate No: 4-4 |

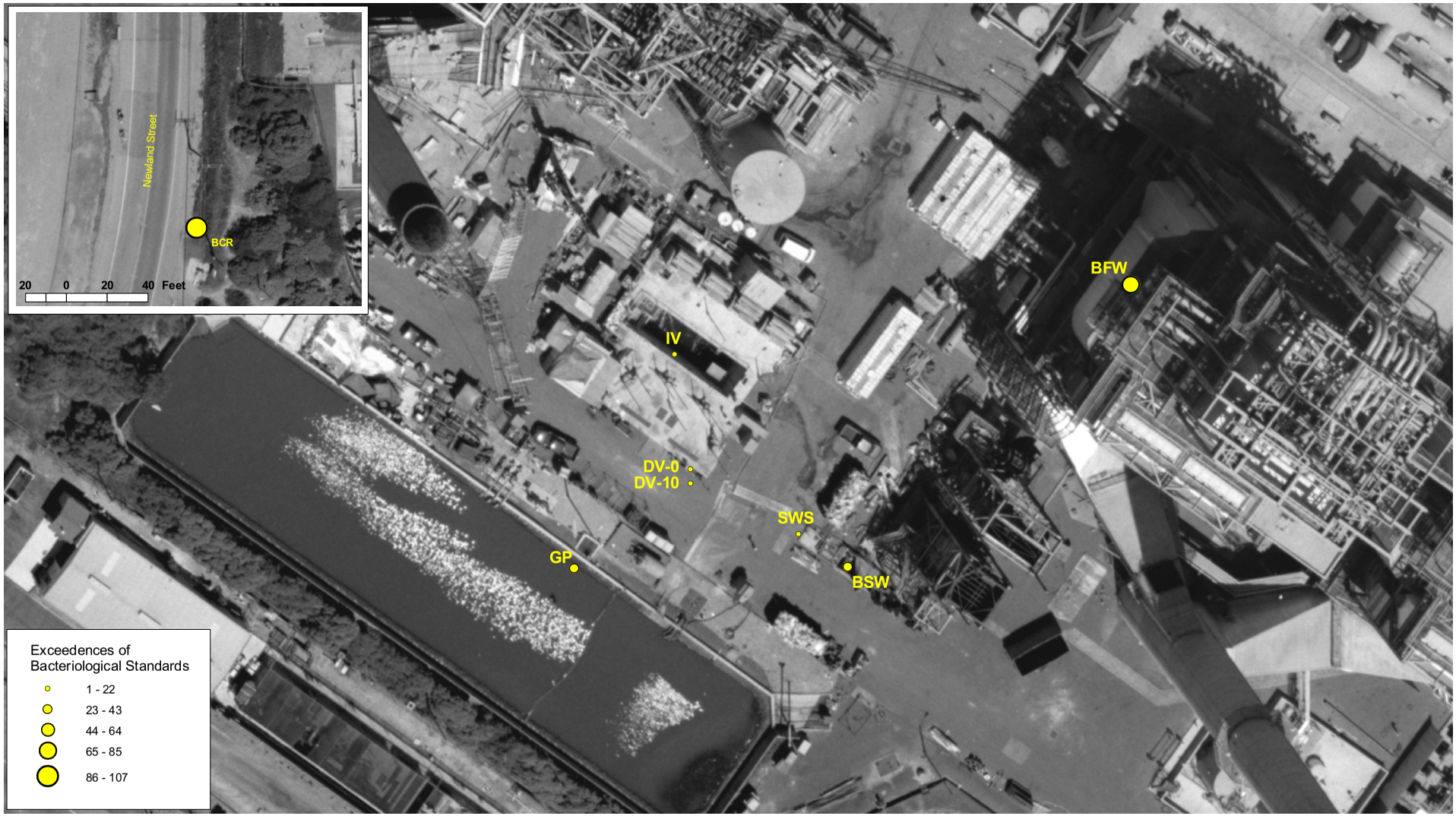



20 0 20 40 Feet

KOMEX

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH KOMEX HAS NOT ENTERED INTO ACCORDACT.

| | |
|---|---|
| Client: California Energy Commission | |
| Project/Site: HBGS - AES Powerplant | Date: April 2003 |
| | Project No: 225-001 |
| Title: **Total Coliform: Standard Deviation of All Concentrations** | Plate No: 4-5 |

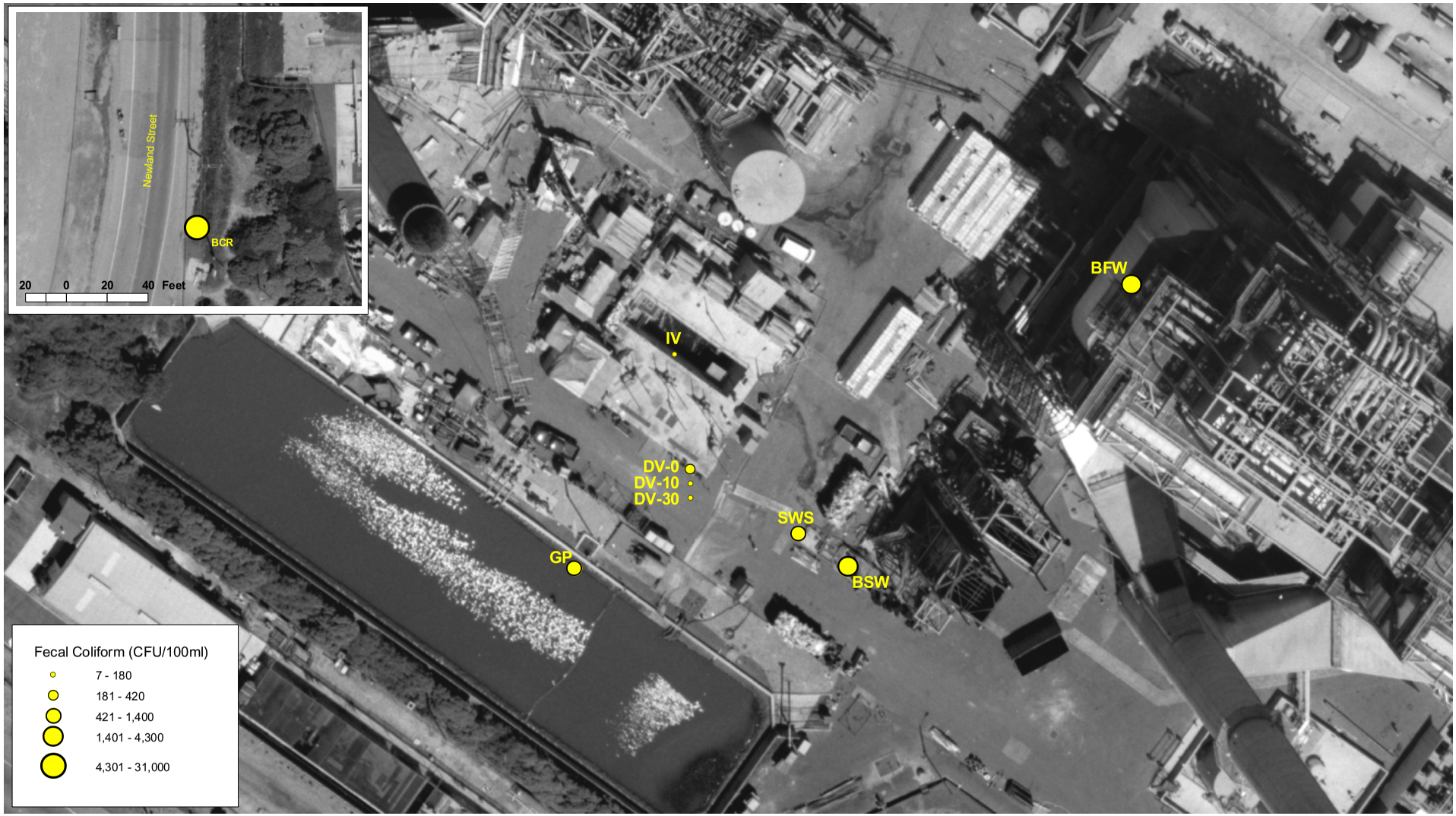



20 0 20 40 Feet

KOMEX

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH KOMEX HAS NOT ENTERED INTO A CONTRACT.

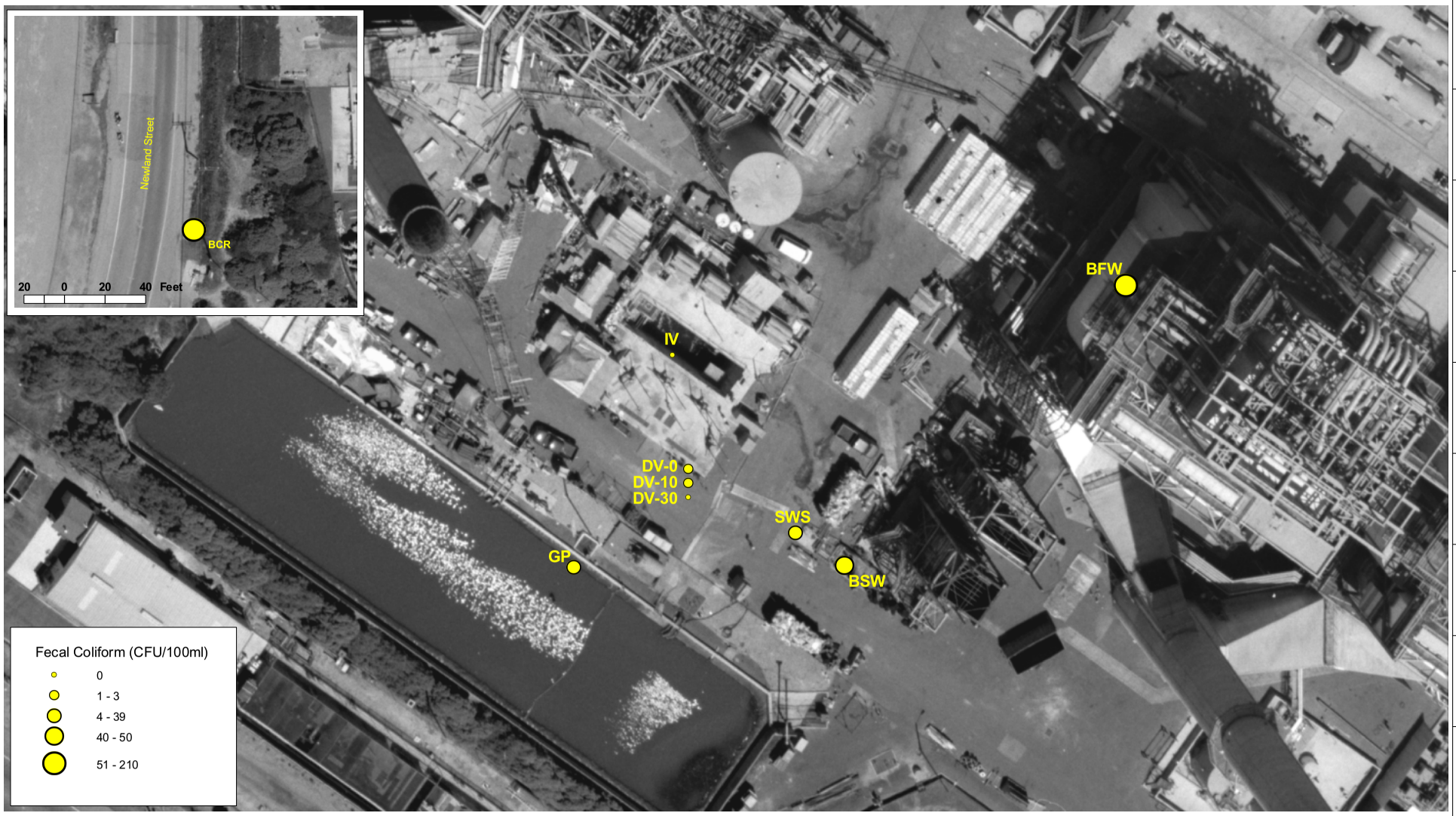
| | |
|---|---|
| Client: California Energy Commission | |
| Project/Site: HBGS - AES Powerplant | Date: April 2003 |
| | Project No: 225-001 |
| Title: **Fecal Coliform: Exceedences of Bacteriological Standards at Each Sample Point** | Plate No: 4-6 |




KOMEX

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH KOMEX HAS NOT ENTERED INTO A CONTRACT.

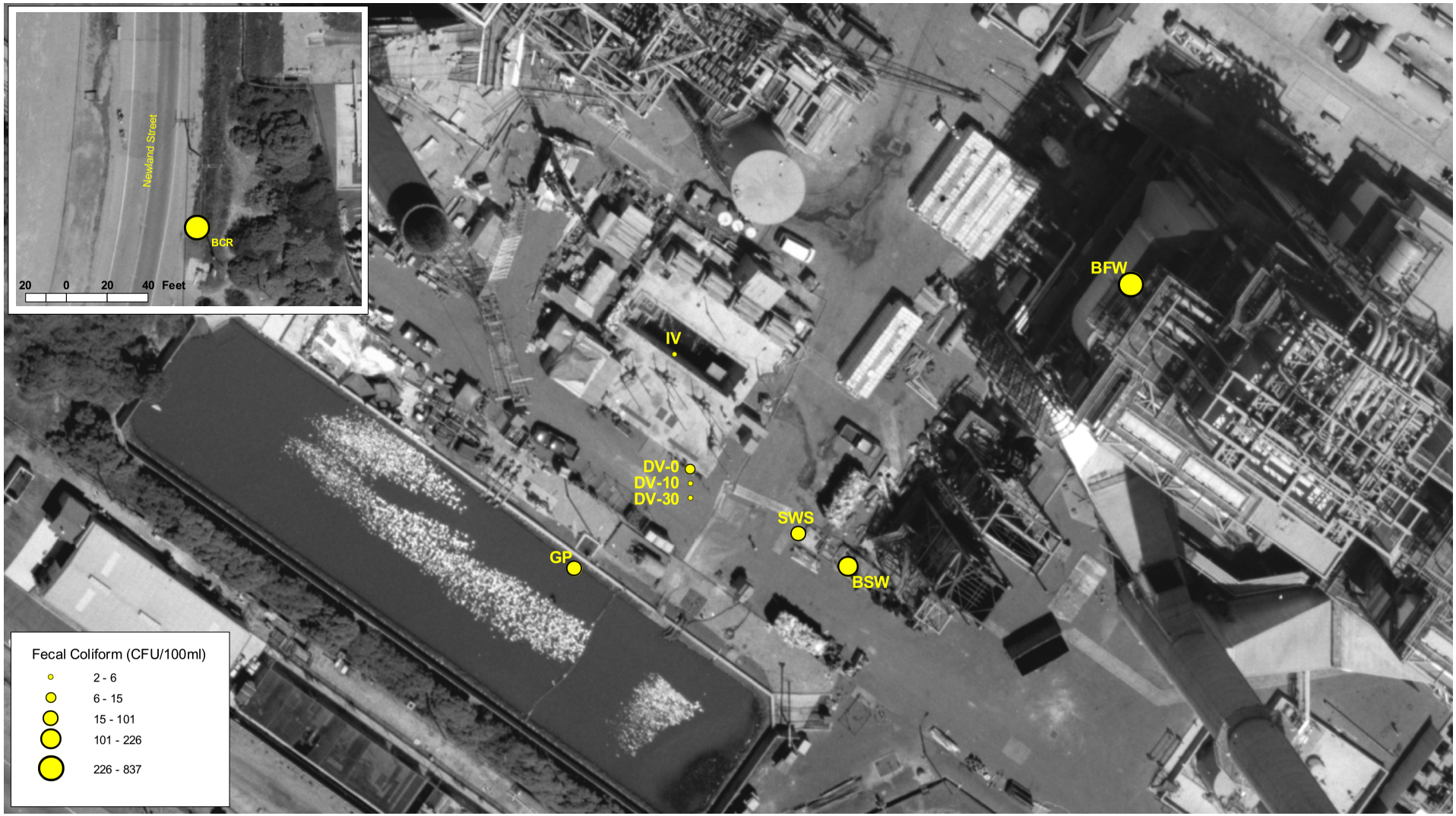
| | |
|---|---|
| Client: | California Energy Commission |
| Project/Site: | HBGS - AES Powerplant |
| Date: | April 2003 |
| Project No: | 225-001 |
| Title: | **Fecal Coliform: Maximum Concentrations** |
| Plate No: | 4-7 |




KOMEX

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH KOMEX HAS NOT ENTERED INTO A CONTRACT.

| | |
|---|---|
| Client: | California Energy Commission |
| Project/Site: | HBGS - AES Powerplant |
| Date: | April 2003 |
| Project No: | 225-001 |
| Title: | **Fecal Coliform: Median of All Concentrations** |
| Plate No: | 4-8 |

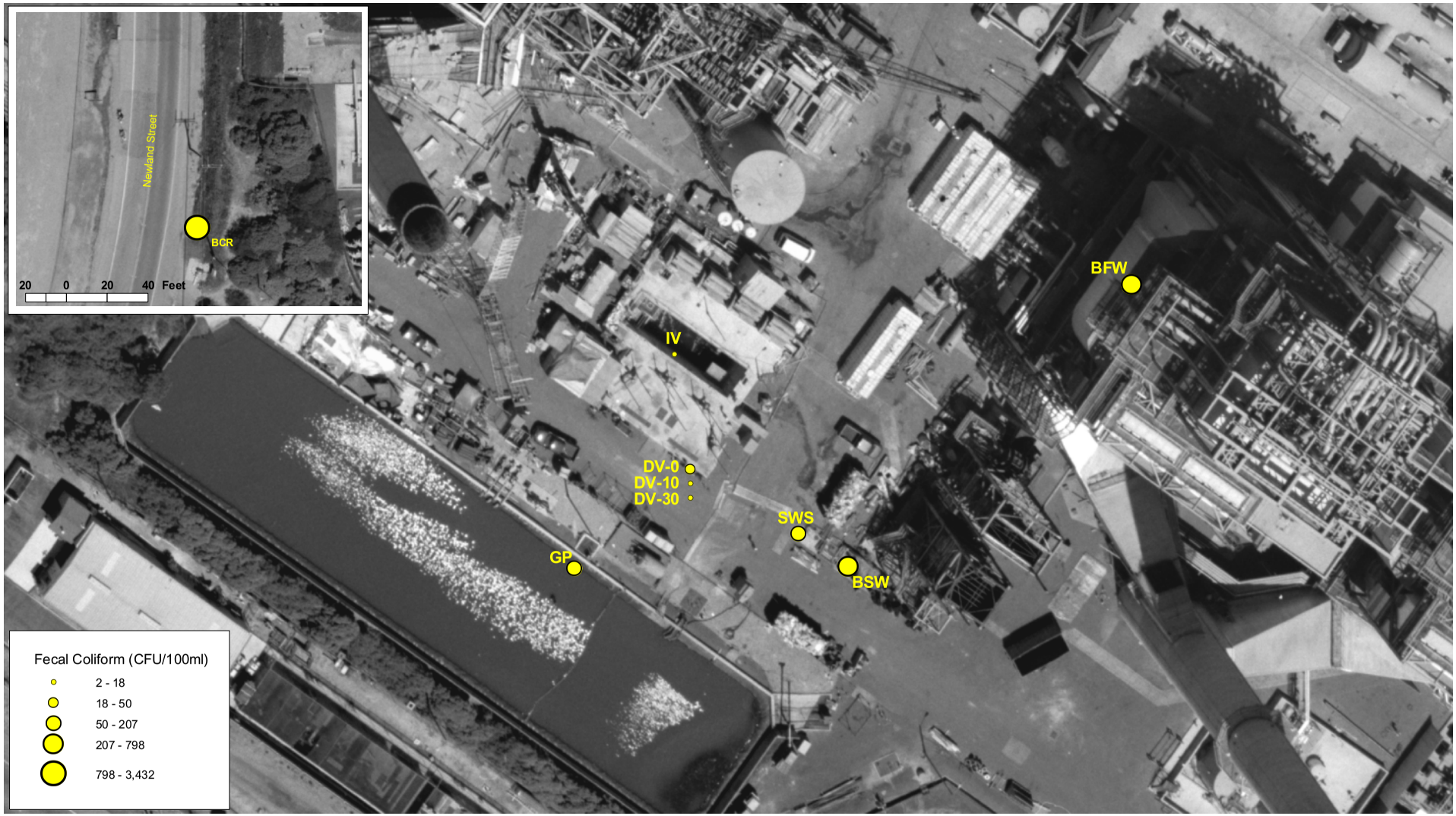



20 0 20 40 Feet

KOMEX

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH KOMEX HAS NOT ENTERED INTO A CONTRACT.

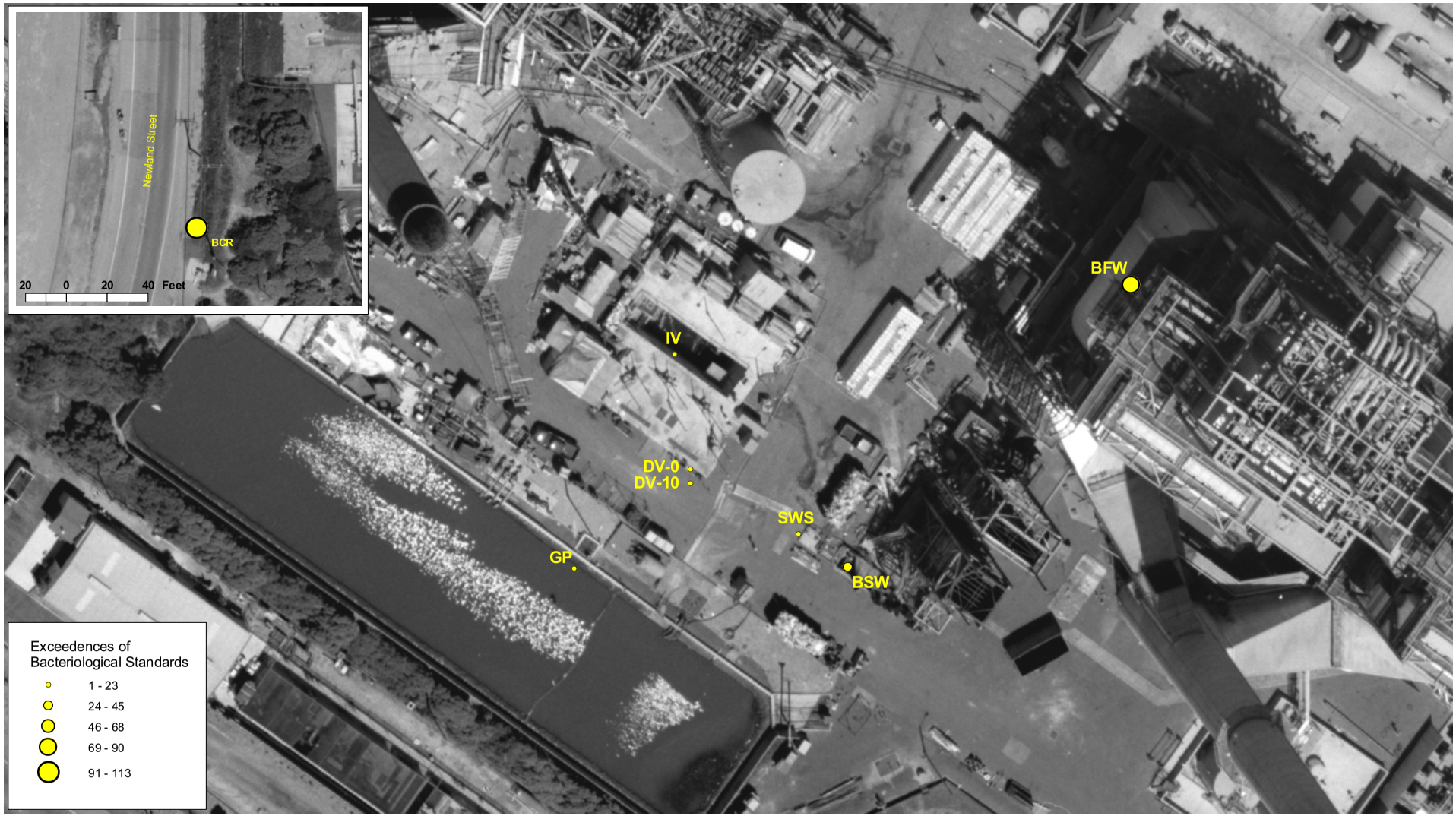
| | |
|---|---|
| Client: California Energy Commission | |
| Project/Site: HBGS - AES Powerplant | Date: April 2003 |
| | Project No: 225-001 |
| Title: **Fecal Coliform: Average Concentrations** | Plate No: 4-9 |




KOMEX

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH KOMEX HAS NOT ENTERED INTO A CONTRACT.

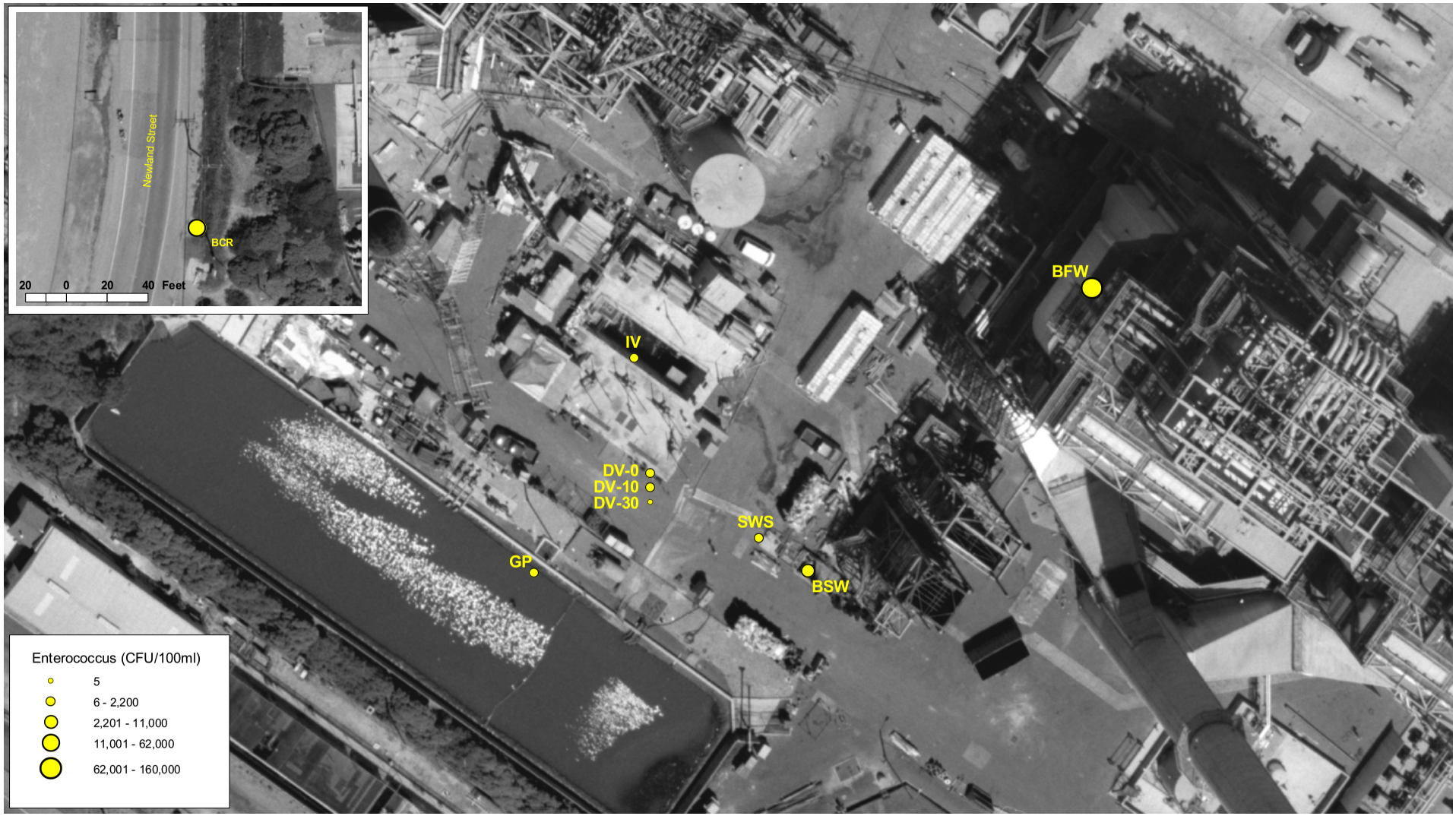
| | |
|---|---|
| Client: California Energy Commission | |
| Project/Site: HBGS - AES Powerplant | Date: April 2003 |
| | Project No: 225-001 |
| Title: **Fecal Coliform: Standard Deviation of All Concentrations** | Plate No: 4-10 |




KOMEX

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH KOMEX HAS NOT ENTERED INTO A CONTRACT.

| | |
|---|---|
| Client: | California Energy Commission |
| Project/Site: | HBGS - AES Powerplant |
| Date: | April 2003 |
| Project No: | 225-001 |
| Title: | **Enterococcus: Exceedences of Bacteriological Standards at Each Sample Point** |
| Plate No: | 4-11 |

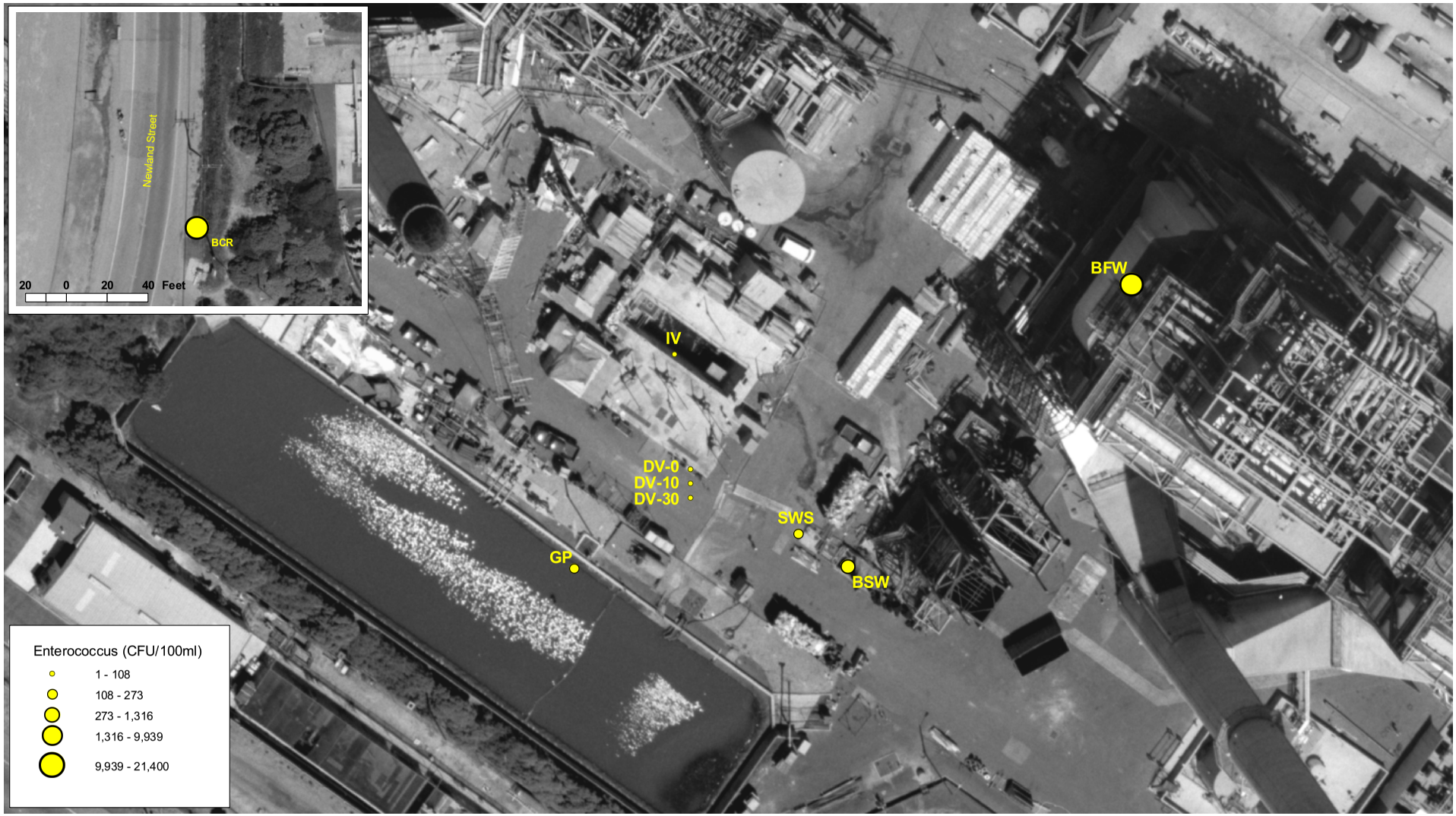



20 0 20 40 Feet

KOMEX

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH KOMEX HAS NOT ENTERED INTO A CONTRACT.

| | |
|---|---|
| Client: | California Energy Commission |
| Project/Site: | HBGS - AES Powerplant |
| Date: | April 2003 |
| Project No: | 225-001 |
| Title: | **Enterococcus: Maximum Concentration** |
| Plate No: | 4-12 |




20 0 20 40 Feet

KOMEX

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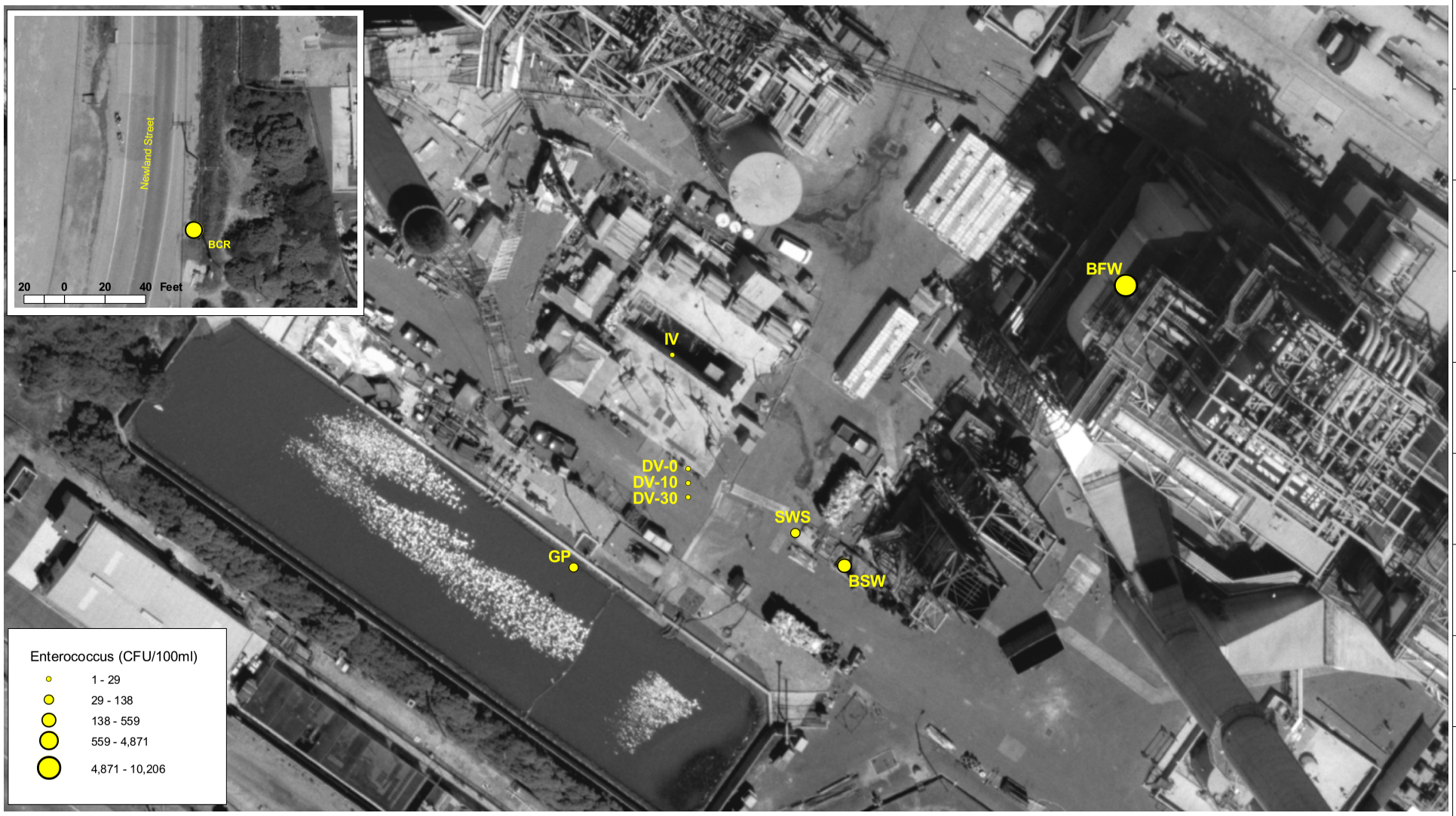
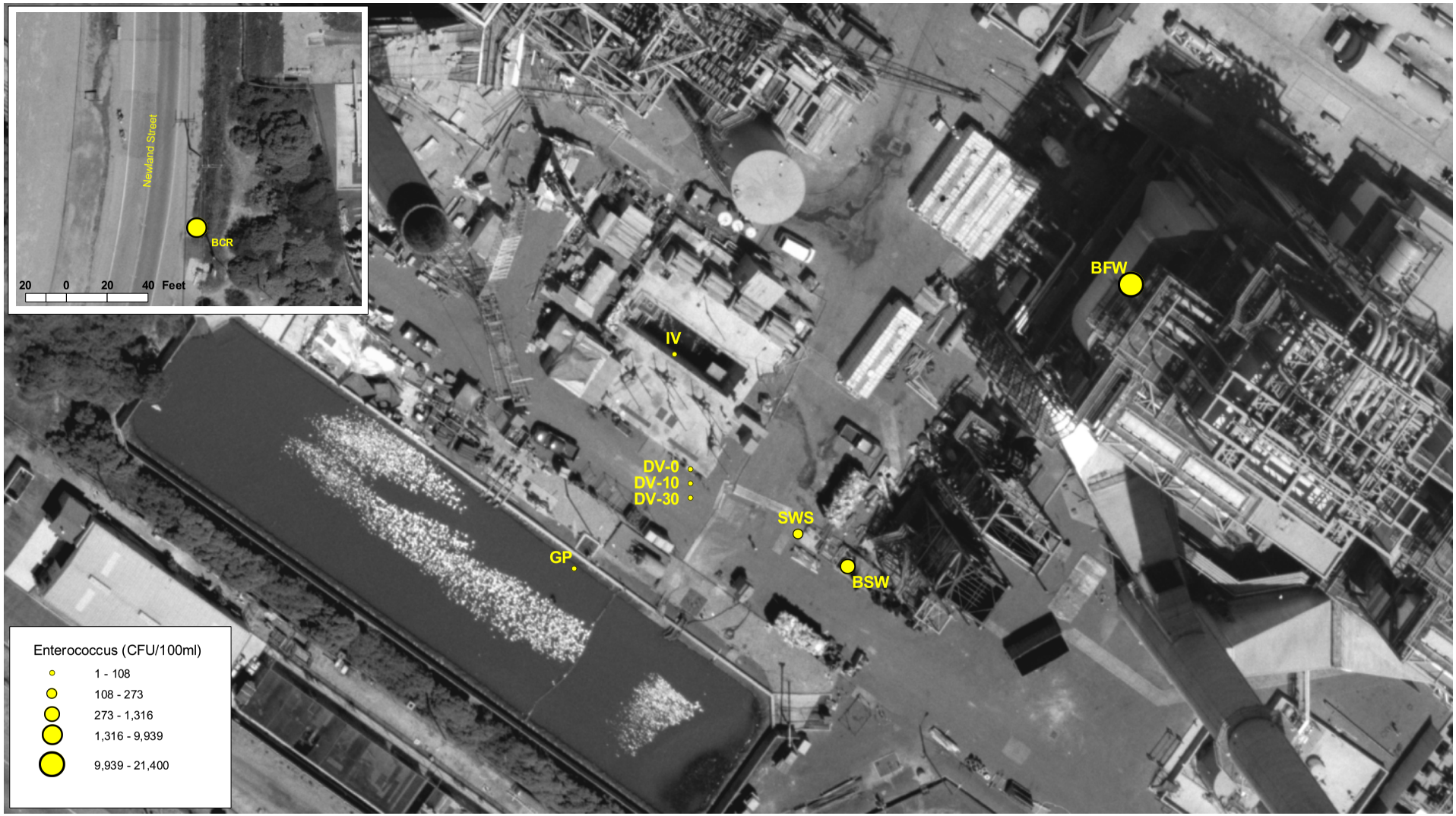
| | |
|---|---|
| Client: | California Energy Commission |
| Project/Site: | HBGS - AES Powerplant |
| Date: | April 2003 |
| Project No: | 225-001 |
| Title: | **Enterococcus: Median of All Concentrations** |
| Plate No: | 4-13 |




KOMEX

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH KOMEX HAS NOT ENTERED INTO A CONTRACT.

| | |
|---|---|
| Client: | California Energy Commission |
| Project/Site: | HBGS - AES Powerplant |
| Date: | April 2003 |
| Project No: | 225-001 |
| Title: | **Enterococcus: Average Concentration** |
| Plate No: | 4-14 |



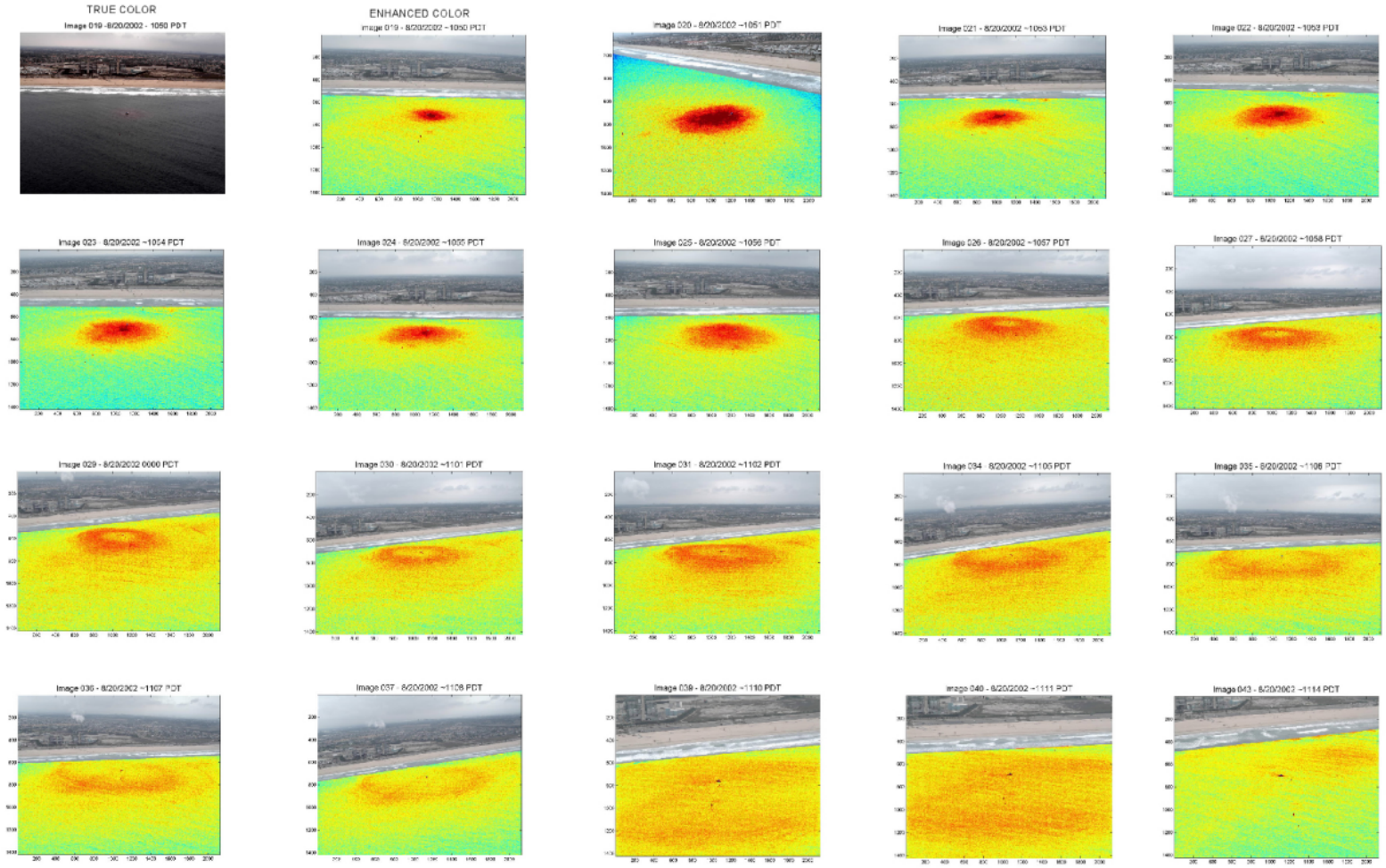

20 0 20 40 Feet

KOMEX

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH KOMEX HAS NOT ENTERED INTO A CONTRACT.

| | |
|---|---|
| Client: California Energy Commission | |
| Project/Site: HBGS - AES Powerplant | Date: April 2003 |
| | Project No: 225-001 |
| Title: **Enterococcus: Standard Deviation of All Concentrations** | Plate No: 4-15 |

# TUESDAY, AUGUST 20, 2002 - DYE INJECTION #1 (10:35 to 10:45) - TIME-SERIES DYE IMAGES FROM 10:50 to 11:35




KOMEX

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH KOMEX IS NOT ENTITLED INTO A CONTRACT.

| | |
|---|---|
| Client: California Energy Commission | |
| Project/Site: HBGS - AES Powerplant | Date: April 2003 |
| | Project No: 225-001 |
| Title: **Time Series Dy Releases: Dye Release No. 1, Part 1** | Figure No: 4-16a |

# TUESDAY, AUGUST 20, 2002 - DYE INJECTION #1 (10:35 to 10:45) - TIME-SERIES DYE IMAGES FROM 10:50 to 11:35

Image 044 - 8/20/2002 ~1115 PDT

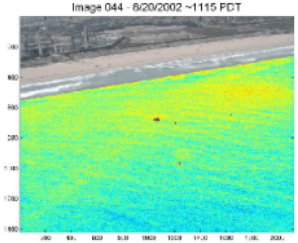


Image 045 - 8/20/2002 ~1116 PDT

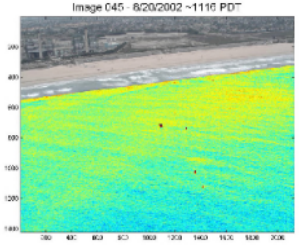


Image 050 - 8/20/2002 ~1121 PDT

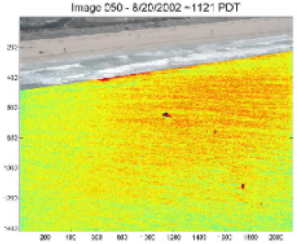


Image 052 - 8/20/2002 ~1123 PDT

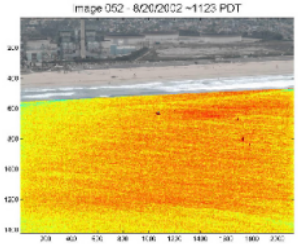


Image 053 - 8/20/2002 ~1124 PDT

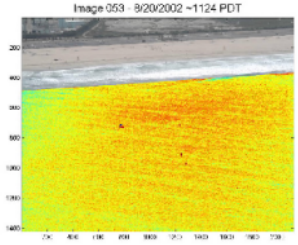


Image 054 - 8/20/2002 ~1125 PDT

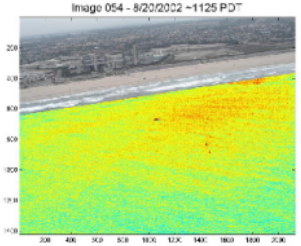


Image 055 - 8/20/2002 ~1126 PDT

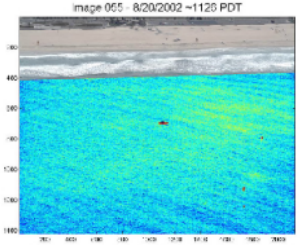


Image 062 - 8/20/2002 ~1133 PDT

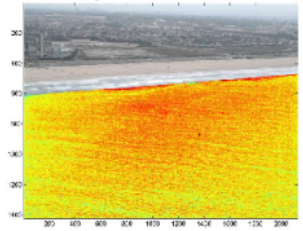
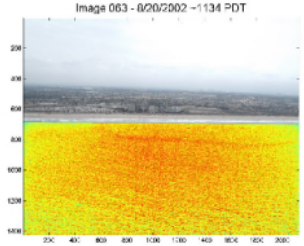
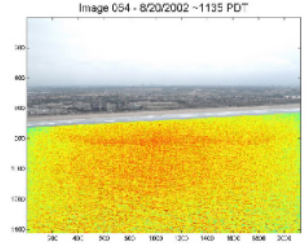


Image 063 - 8/20/2002 ~1134 PDT



ENHANCED COLOR

Image 064 - 8/20/2002 ~1135 PDT



TRUE COLOR

Image 064 - 8/20/2002 - 1135 PDT

KOMEX

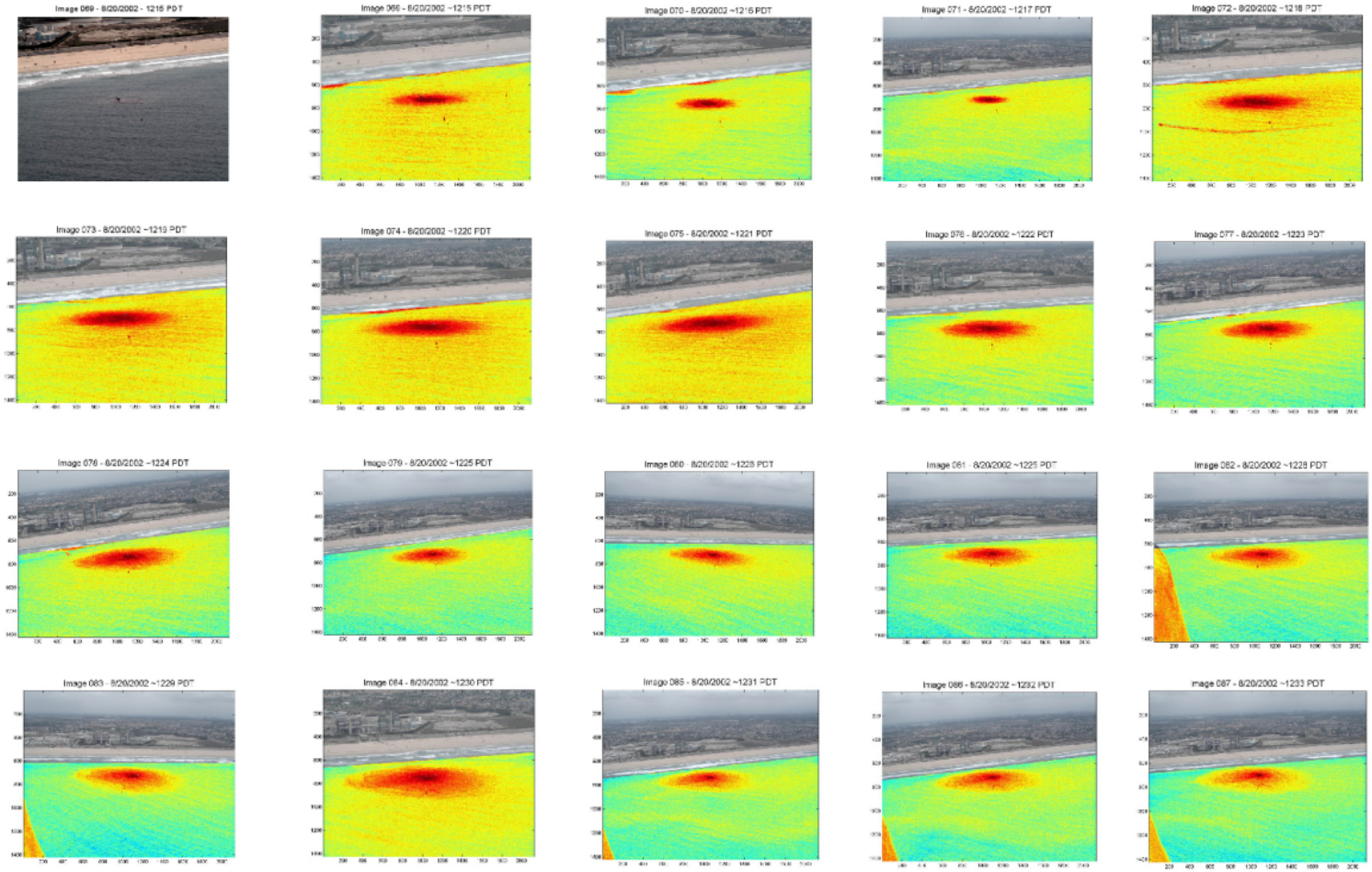
PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH KOMEX IS NOT ENTITLED INTO A CONTRACT.

| | |
|---|---|
| Client: California Energy Commission | |
| Project/Site: HBGS - AES Powerplant | Date: April 2003 |
| | Project No: 225-001 |
| Title: **Time Series Dye Releases: Dye Release No. 1, Part 2** | Figure No: 4-16b |

# TUESDAY, AUGUST 20, 2002 - DYE INJECTION #2 (12:01 to 12:31) - TIME-SERIES DYE IMAGES FROM 12:15 to 12:45

TRUE COLOR

ENHANCED COLOR

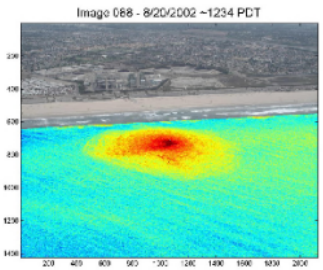


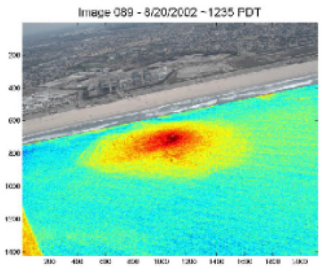

KOMEX

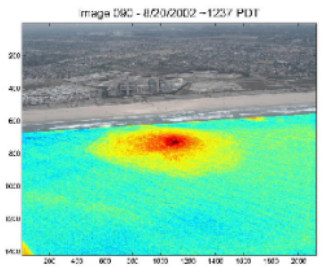
PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH KOMEX IS NOT ENTERED INTO A CONTRACT.

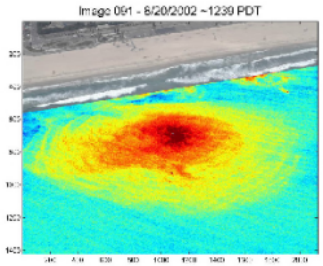
| | |
|---|---|
| Client: California Energy Commission | |
| Project/Site: HBGS - AES Powerplant | Date: April 2003 |
| | Project No: 225-001 |
| Title: **Time Series Dye Releases: Dye Release No. 2, Part 1** | Figure No: 4-17a |

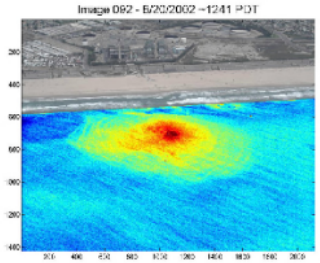
# TUESDAY, AUGUST 20, 2002 - DYE INJECTION #2 (12:01 to 12:31) - TIME-SERIES DYE IMAGES FROM 12:15 to 12:45

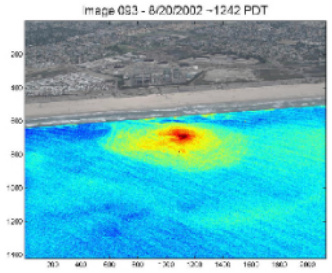


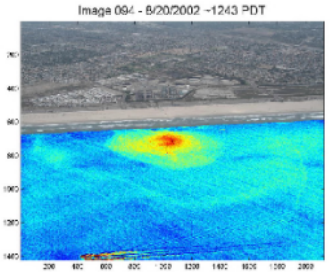



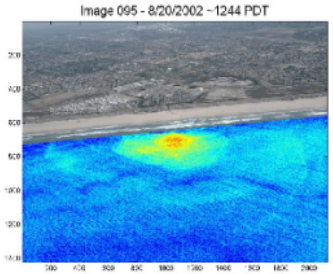



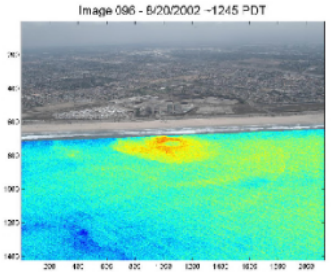




ENHANCED COLOR




TRUE COLOR

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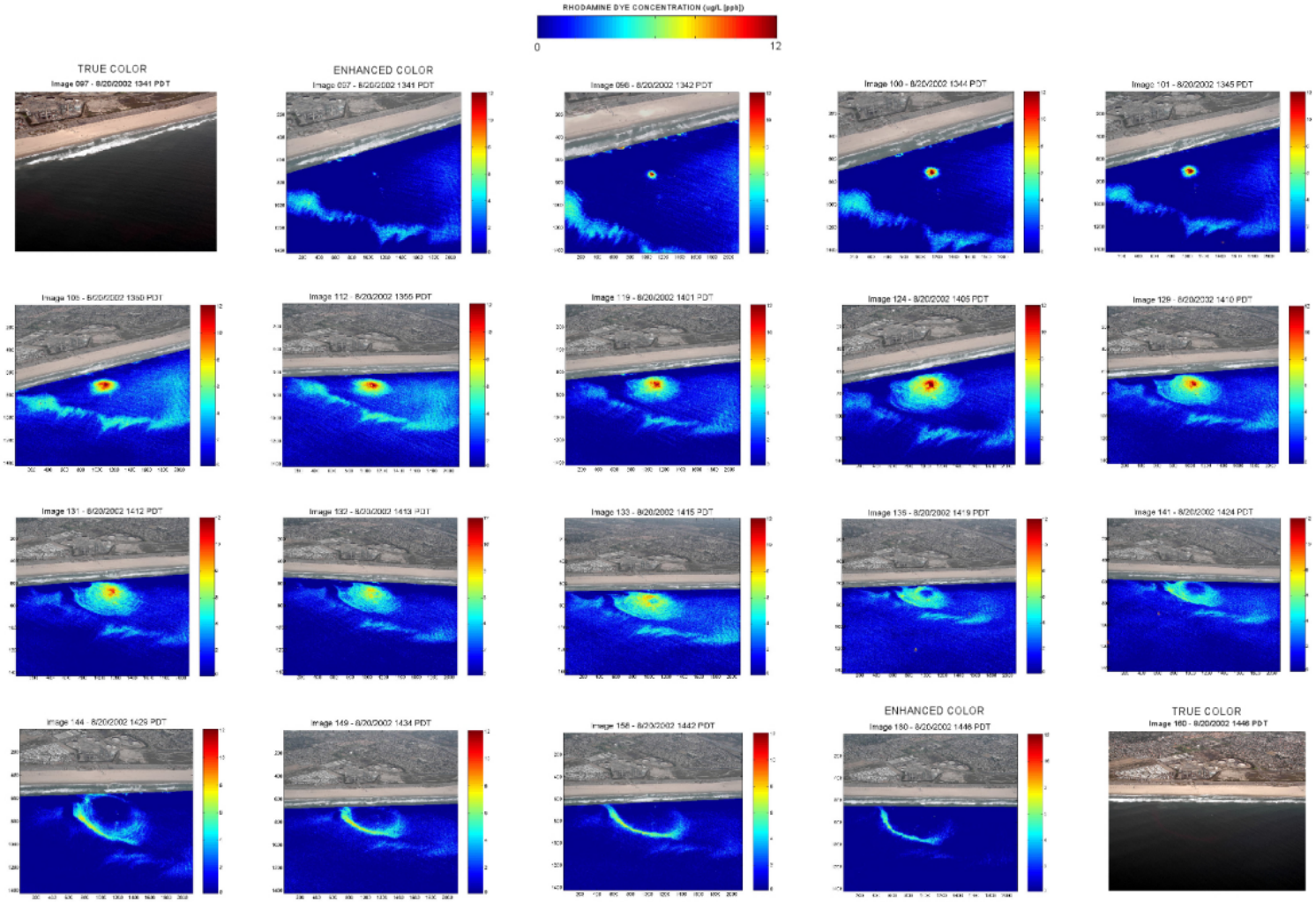
| | |
|---|---|
| Client: California Energy Commission | |
| Project/Site: HBGS - AES Powerplant | Date: April 2003 |
| | Project No: 225-001 |
| Title: **Time Series Dye Releases: Dye Release No. 2, Part 2** | Figure No: 4-17b |

# TUESDAY, AUGUST 20, 2002 - DYE INJECTION #3 (13:30 to 14:00) - TIME-SERIES DYE IMAGES FROM 13:41 to 14:46

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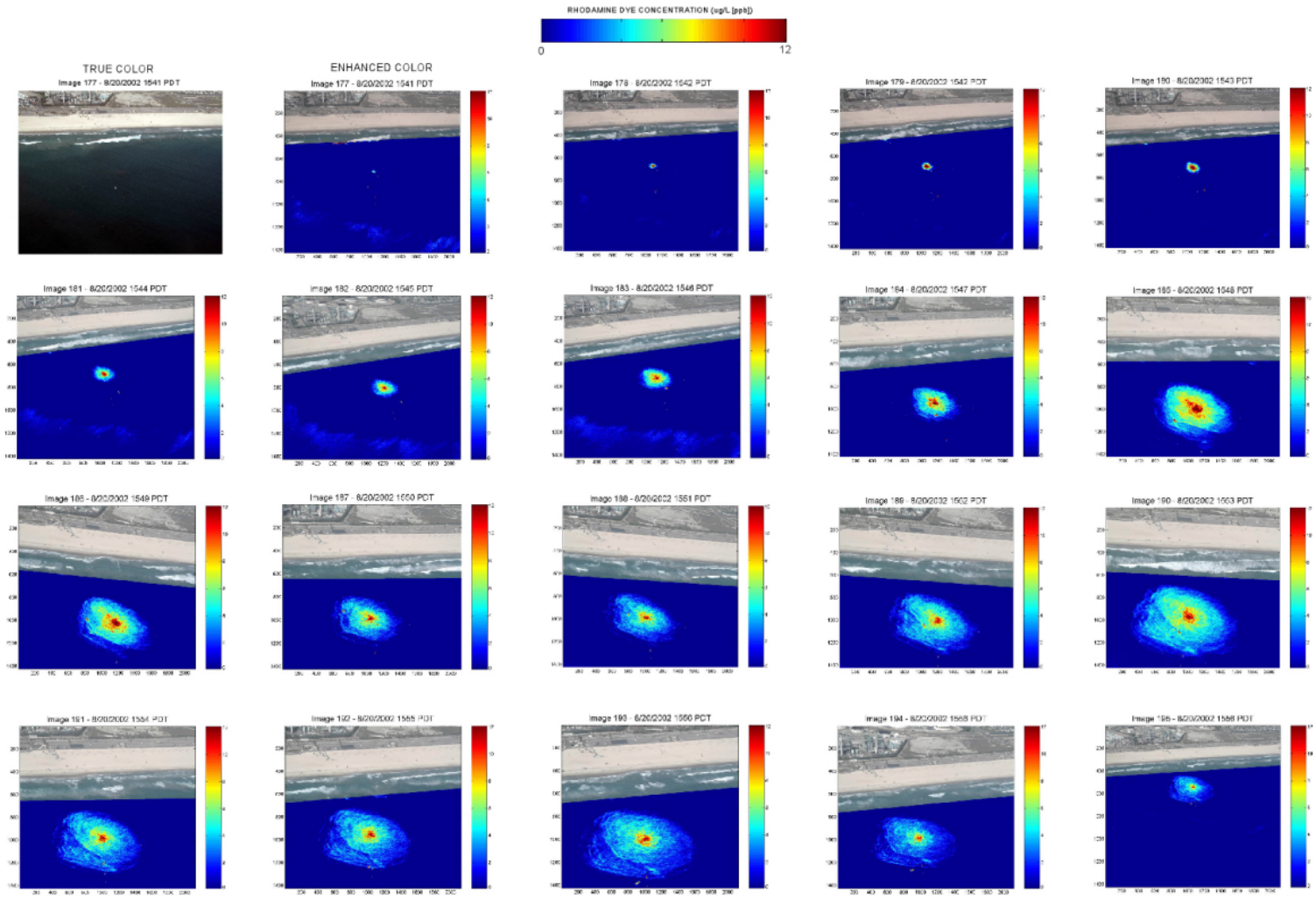
| Client: California Energy Commission | |
| Project/Site: HBGS - AES Powerplant | Date: April 2003 |
| | Project No: 225-001 |
| Title: **Time Series Dye Releases: Dye Release No.3** | Figure No: 4-18 |

# TUESDAY, AUGUST 20, 2002 - DYE INJECTION #4 (15:30 to 15:56) - TIME-SERIES DYE IMAGES FROM 15:41 to 16:46

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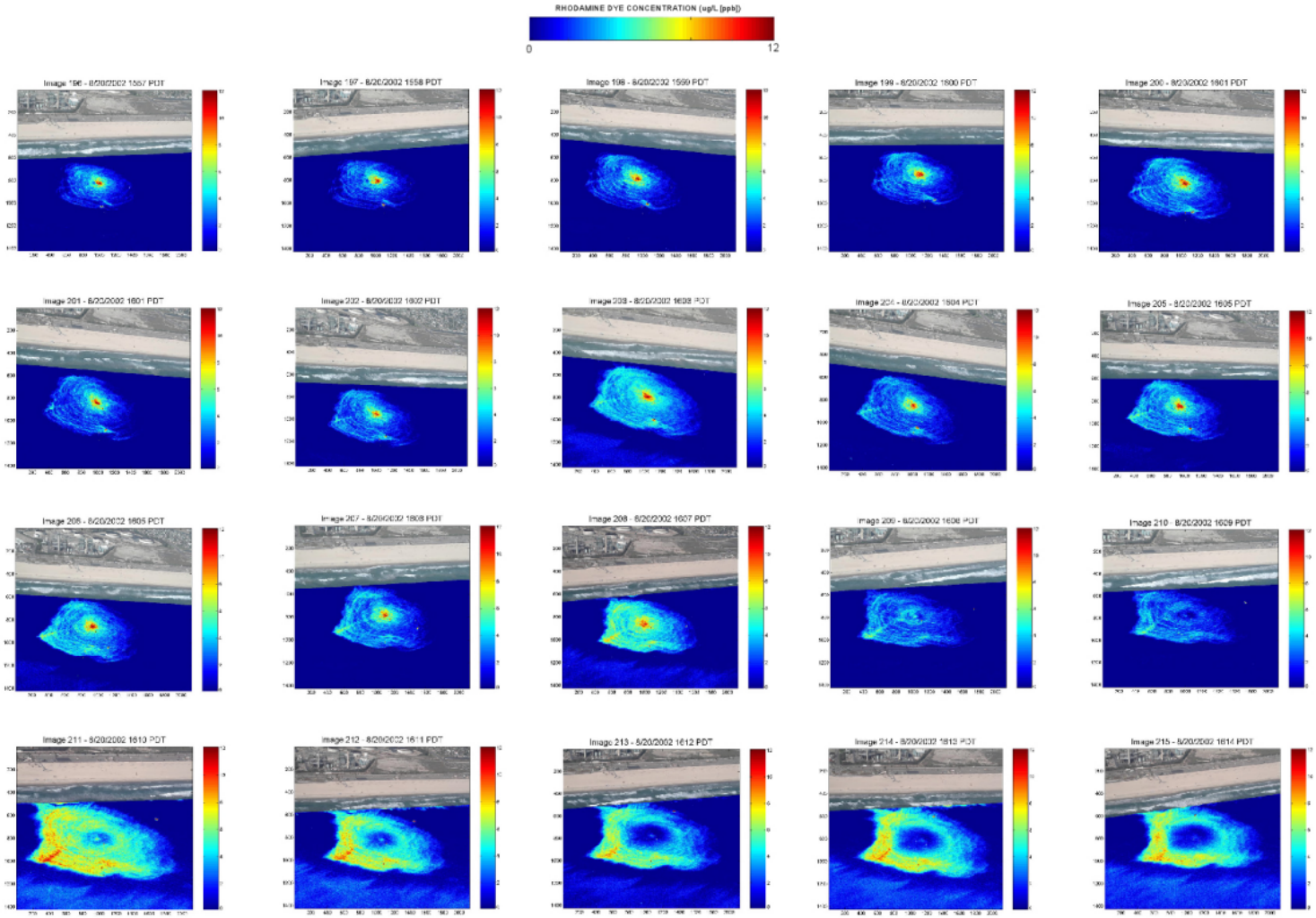
| | |
|---|---|
| Client: California Energy Commission | |
| Project/Site: HBGS - AES Powerplant | Date: April 2003 |
| | Project No: 225-001 |
| Title: **Time Series Dy Releases: Dye Release No. 4, Part 1** | Figure No: 4-19a |

# TUESDAY, AUGUST 20, 2002 - DYE INJECTION #4 (15:30 to 15:56) - TIME-SERIES DYE IMAGES FROM 15:41 to 16:46

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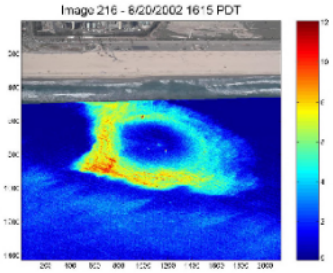
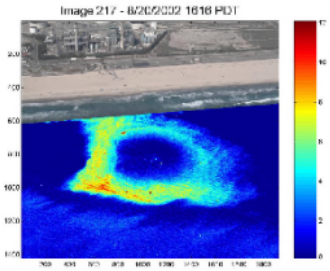
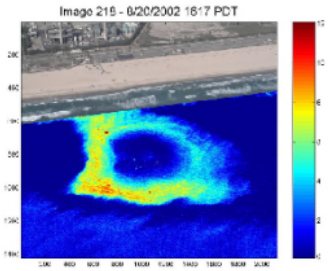
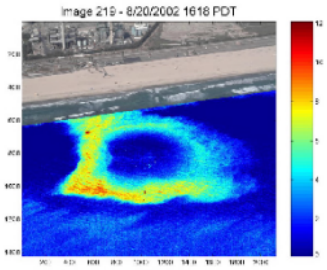
| | |
|---|---|
| Client: California Energy Commission | |
| Project/Site: HBGS - AES Powerplant | Date: April 2003 |
| | Project No: 225-001 |
| Title: **Time Series Dye Releases: Dye Release No. 4 Part 1** | Figure No: 4-19b |

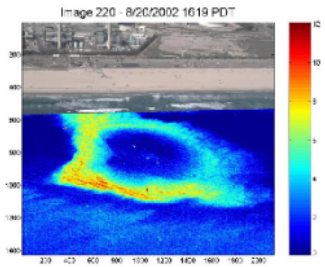
# TUESDAY, AUGUST 20, 2002 - DYE INJECTION #4 (15:30 to 15:56) - TIME-SERIES DYE IMAGES FROM 15:41 to 16:46

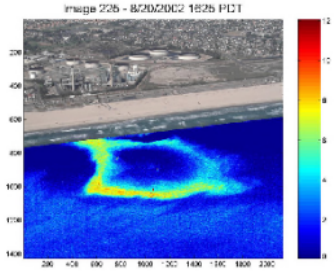


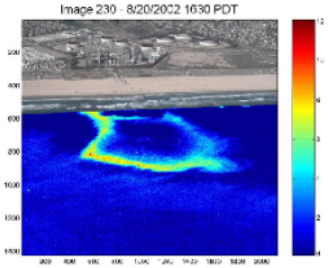



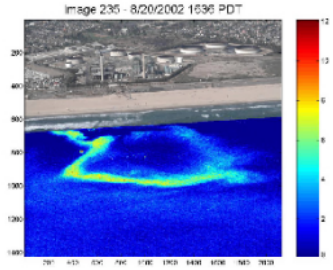



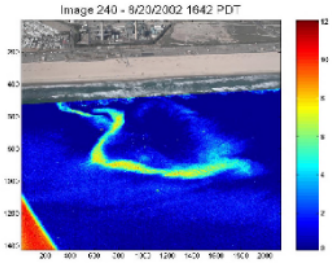



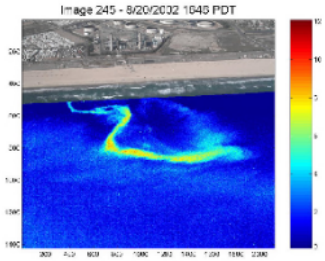




ENHANCED COLOR




TRUE COLOR

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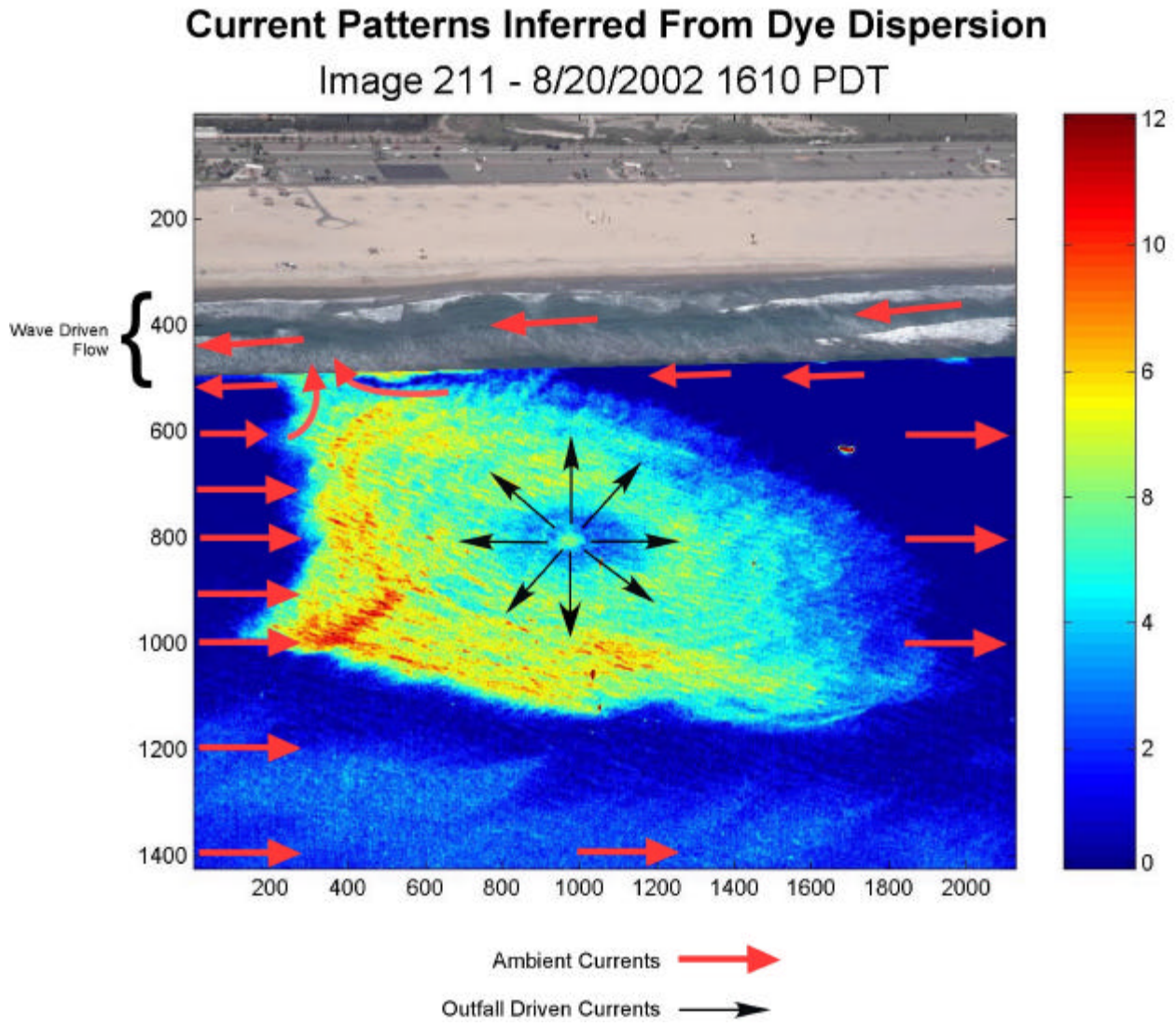
| | |
|---|---|
| Client: | California Energy Commission |
| Project/Site: | HBGS - AES Powerplant |
| Date: | April 2003 |
| Project No: | 225-001 |
| Title: | **Time Series Dye Releases: Dye Release No. 4, Part 3** |
| Figure No: | 4-19c |

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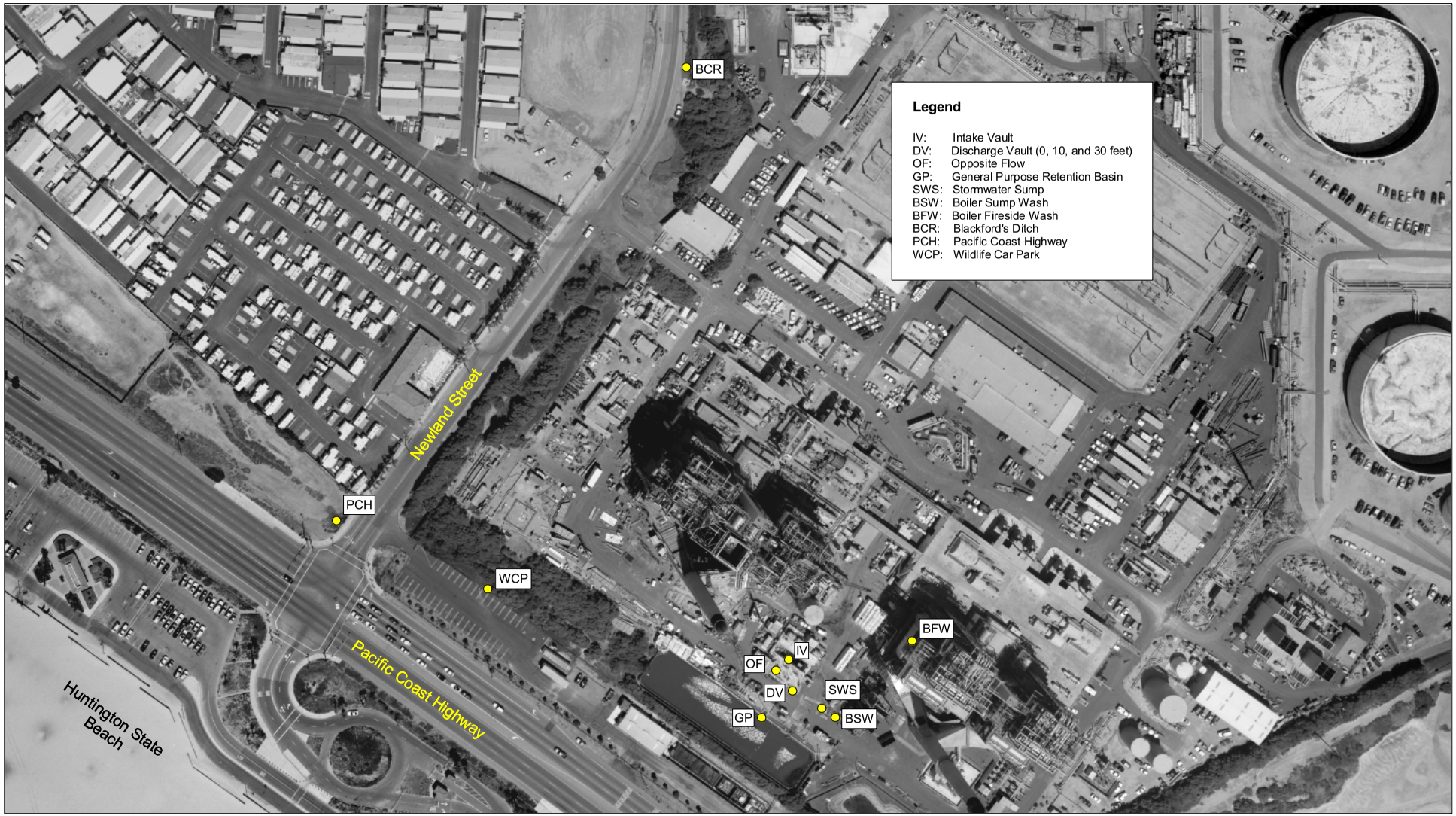
| | | | |
|---|---|---|---|
| Client: | California Energy Commission | Date: | April 2003 |
| Project/Site: | HBGS - AES Powerplant | Project No: | 225-001 |
| Title: | **Inferred Current Patterns From Dye Dispersion** | Plate No: | **5-1** |




100 0 100 Feet

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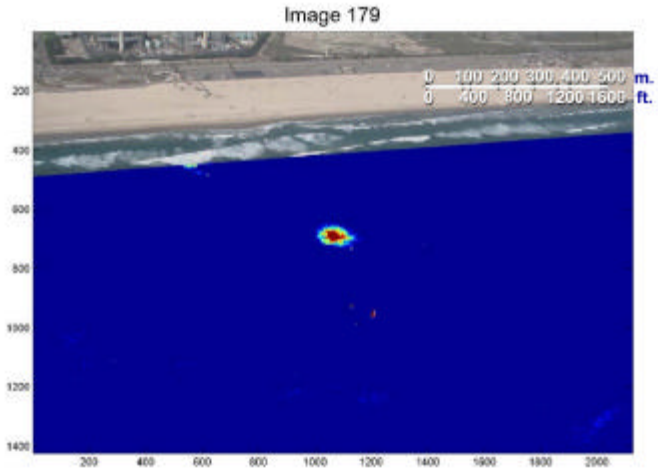
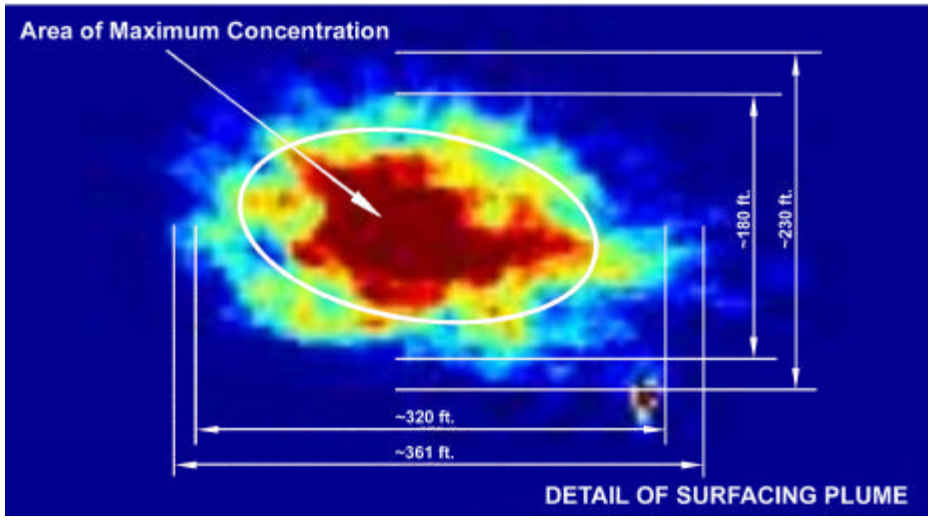
| | |
|---|---|
| Client: | California Energy Commission |
| Project/Site: | HBGS - AES Powerplant |
| Date: | April 2003 |
| Project No: | 225-001 |
| Title: | **Sampling Point Locations** |
| Plate No: | A-1 |




LOCATION MAP




DETAIL OF SURFACING PLUME

KOMEX

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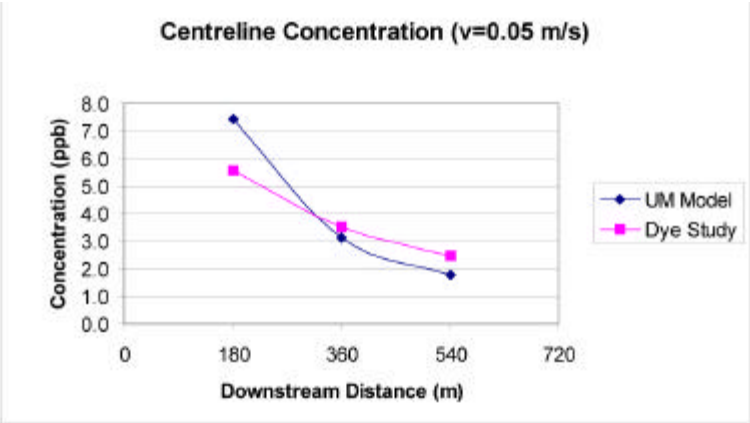
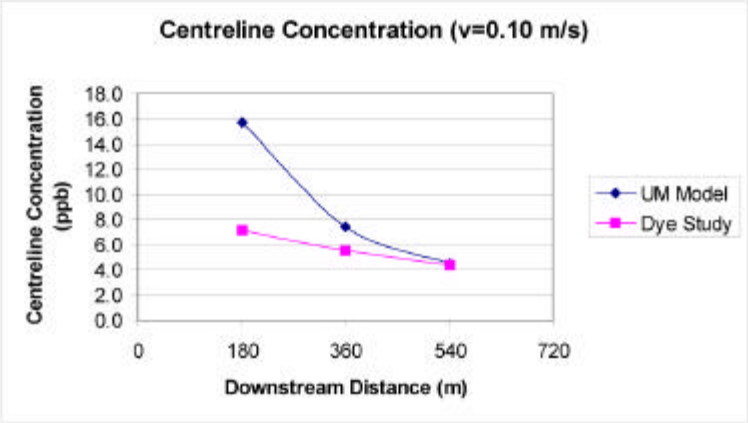
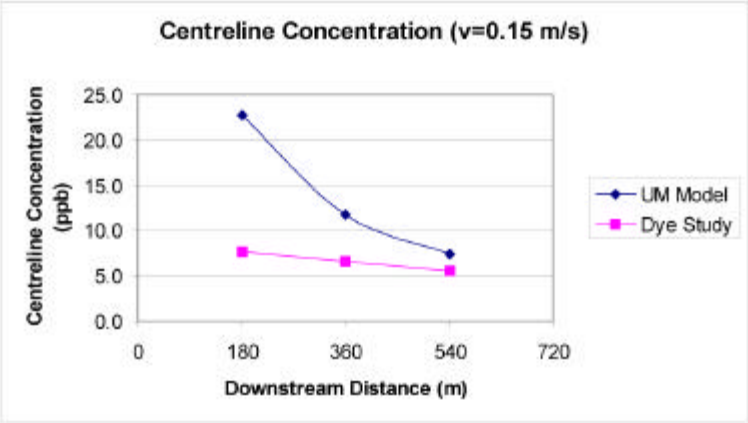
| | | | |
|---|---|---|---|
| Client: | California Energy Commission | Date: | April 2003 |
| Project/Site: | HBGS - AES Powerplant | Project No: | 225-001 |
| Title: | **Calibrated Images of Enhanced Dye Discharge** | Plate No: | **A-2** |

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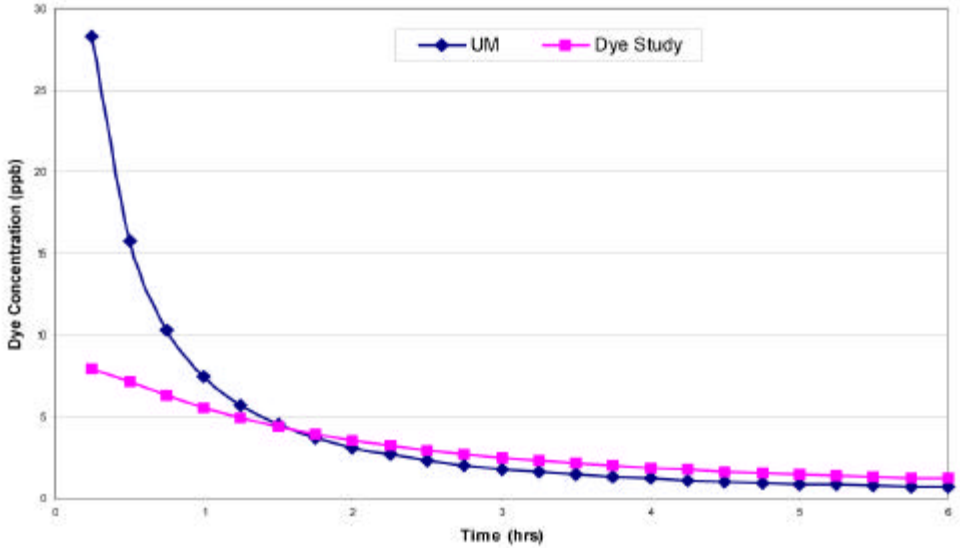
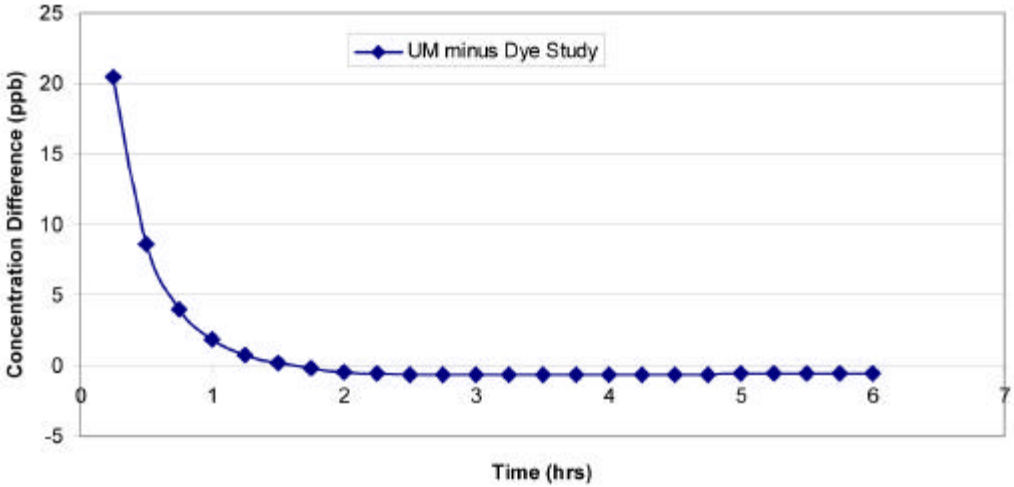
| | | | |
|---|---|---|---|
| Client: | California Energy Commission | Date: | April 2003 |
| Project/Site: | HBGS - AES Powerplant | Project No: | 225-001 |
| Title: | **Modeled Centerline Concentrations** | Plate No: | **A-3** |

## Far-Field Dye Concentration Model




## Difference Plot: UM minus Dye Study

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| | | | |
|---|---|---|---|
| Client: | California Energy Commission | Date: | April 2003 |
| Project/Site: | HBGS - AES Powerplant | Project No: | 225-001 |
| Title: | **Far-Field Dye Concentration Model** | Plate No: | **A-4** |

# Qualitative Bird Survey

## From The Santa Ana River
## To The Huntington Beach Pier

August 17 - 21, 2002

KOMEX

# Introduction

- Numerous birds have been observed along the beaches, in watercourses and wetlands around Huntington Beach and the coast
- Do birds have an impact on beach water quality?
  - How many?
  - Where?
  - When?
  - Why?

KOMEX

# Introduction

- Komex conducted a preliminary qualitative bird survey from August 17 through 21, 2002
- Attempted to answer some of those questions related to beach water quality impacts

KOMEX

# Study Area

KOMEX

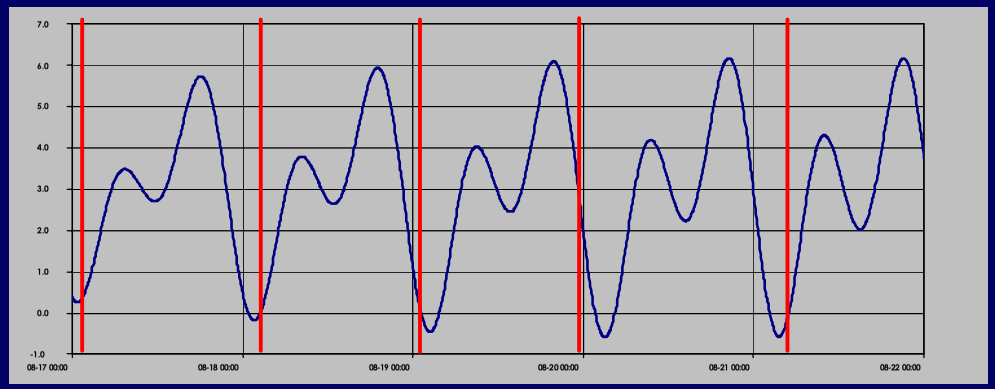
# Methodology

- Observed bird populations in inter-tidal zone
  - Over a period of several days in the summer, at night, during a spring tide
- Utilized the infra-red camera capabilities of the City of Huntington Beach Police Helicopter
- Obtained water samples from the surf zone at target locations the following morning
  - Bacterial indicators
  - Microbial source tracking

KOMEX

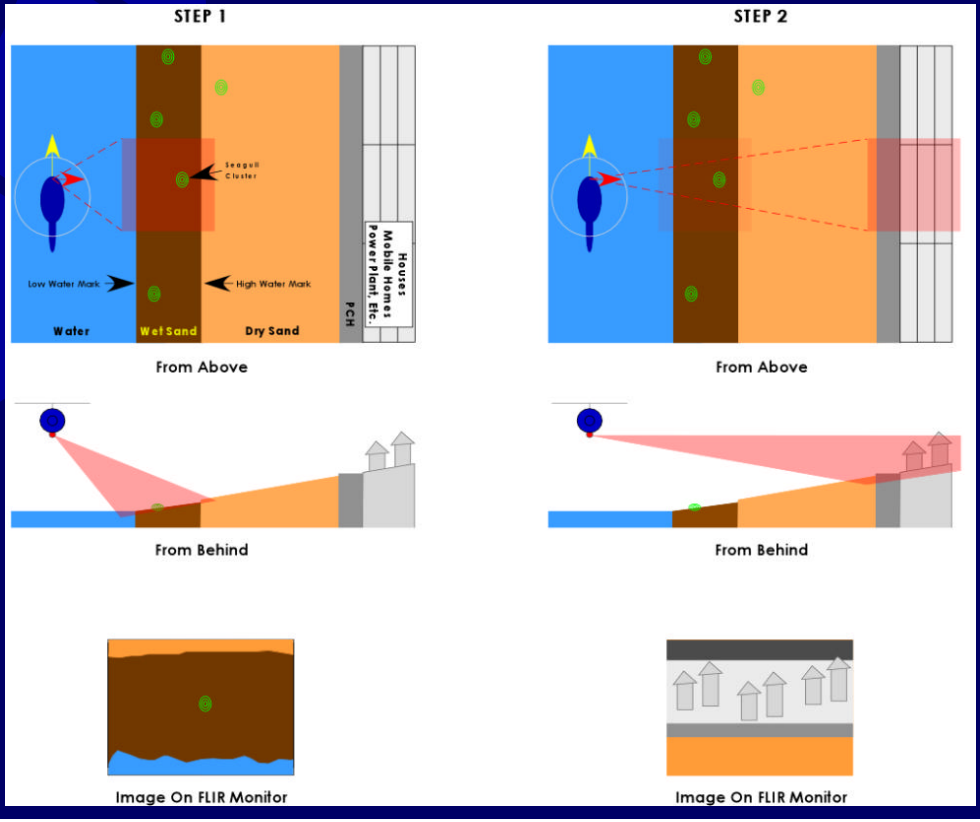
# Dates & Times

- 5 flights were conducted in August 2002
  - Saturday, August 17 — 00:15 to 00:35
  - Sunday, August 18 — 01:55 to 02:30
  - Sunday, August 18 — 23:35 to 00:10
  - Monday, August 19 — 22:00 to 22:35
  - Wednesday, August 21 — 02:25 to 02:45




KOMEX

# Infra-Red Camera




KOMEX

# Water Samples

- 10 water samples were collected
- All were analyzed for bacterial indicators
  - Total coliform (TC)
  - Fecal coliform (FC)
  - Enterococci (ENT)
- Microbial Source Tracking for 6 water samples
  - Bacteroides / Prevotella
  - Enteroviruses

KOMEX

# Video

- Video was collected using infra-red camera
- Object appearance varies with temperature
  - Cold — Black
  - Warm — Gray
  - Hot — White
  - Very Hot — Bright White
- Video timeline shows
  - AES, fluid levels, TM & SAR, inter-tidal zone
  - Spot observations
  - Continuous from SAR to Huntington Beach Pier

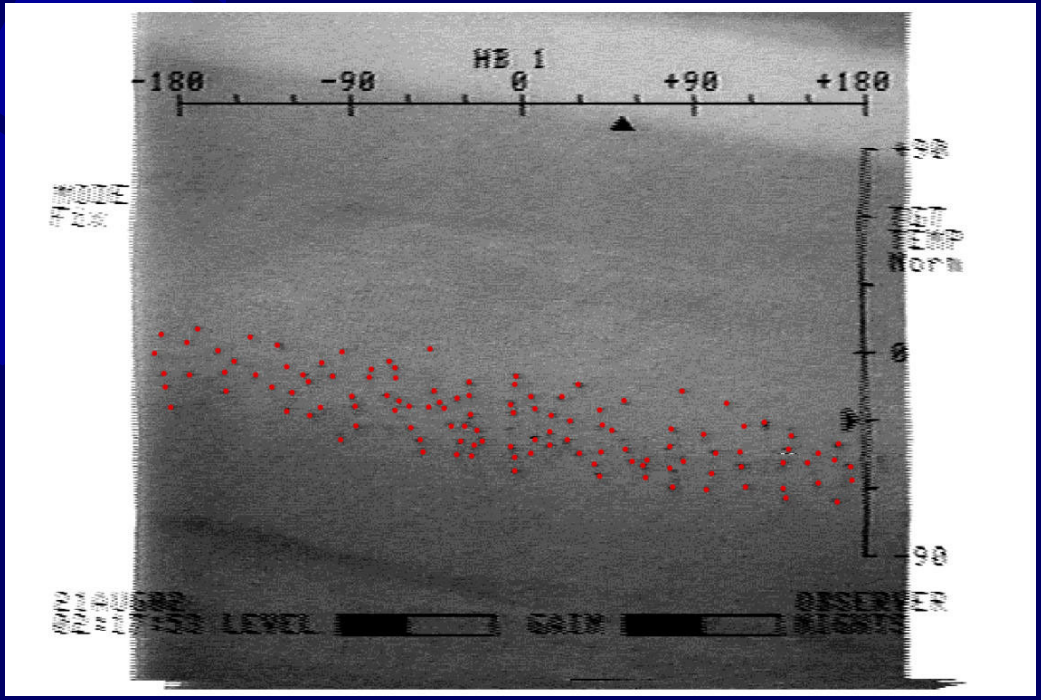
KOMEX

# Results - Observations

- Large clusters of seagulls observed along Huntington State Beach
  - From near Brookhurst Street to Beach Boulevard
- Some seagull clusters observed along Huntington City Beach
  - Near Hyatt Regency
  - South of the pier
- Clusters were observed in inter-tidal zone
  - Single frame of video shows 120 seagulls

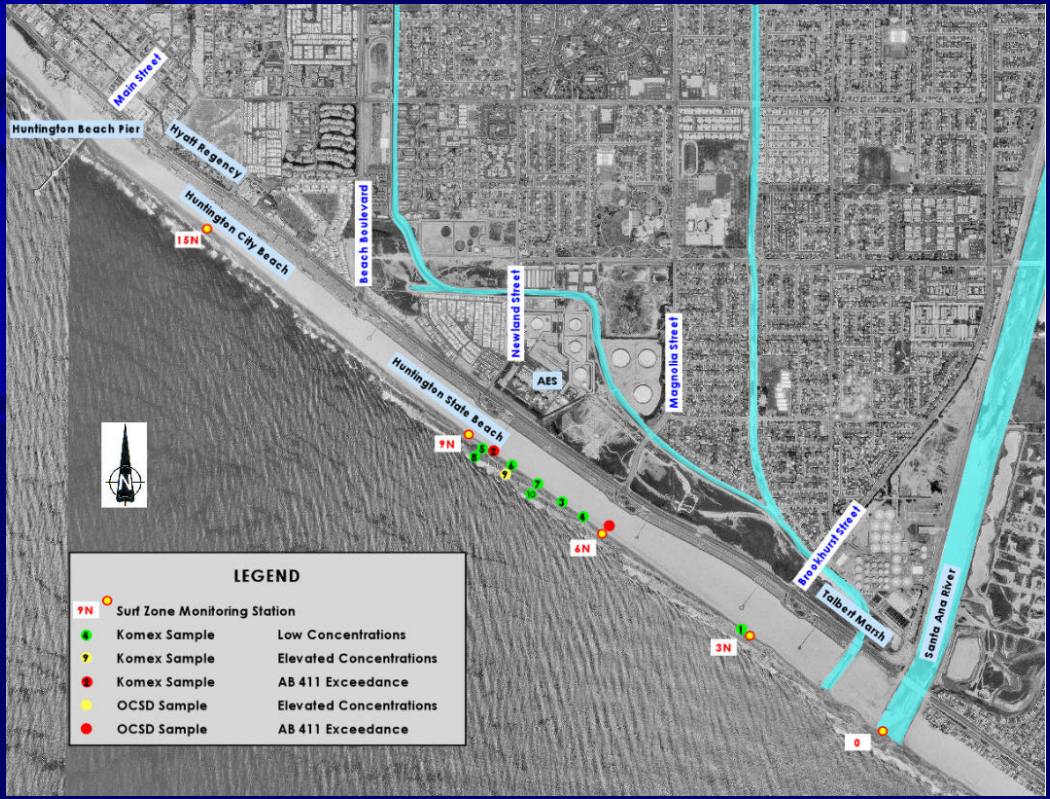
KOMEX

# Results – Frame Grab




KOMEX

# Water Sample Locations




KOMEX

# Results - Water Samples

| Sample # | Station | Date | Time | TC (CFU/100 mL) | FC (CFU/100 mL) | ENT (CFU/100 mL) | MST |
|---|---|---|---|---|---|---|---|
| 1 | 3N | 18-Aug-02 | 08:35 | 22 | 3 | 22 | - |
| 2 | 8.5N | 18-Aug-02 | 07:55 | 51 | 24 | **120** | - |
| 3 | 7N | 19-Aug-02 | 07:30 | 43 | 24 | 13 | - |
| 4 | 6.5N | 19-Aug-02 | 07:50 | 51 | 32 | 15 | - |
| 5 | 8.5N | 20-Aug-02 | 07:40 | 50 | 28 | 6 | Negative |
| 6 | 8N | 20-Aug-02 | 07:50 | 60 | 13 | 1 | Negative |
| 7 | 7.5N | 20-Aug-02 | 07:50 | 30 | 11 | 2 | Negative |
| 8 | 8.5N | 21-Aug-02 | 07:50 | 60 | 42 | 23 | Negative |
| 9 | 8N | 21-Aug-02 | 07:59 | 190 | 140 | 60 | Negative |
| 10 | 7.5N | 21-Aug-02 | 07:59 | 130 | 100 | 30 | Negative |

| Date | Indicator | Station | | | | |
|---|---|---|---|---|---|---|
| | | 15N | 9N | 6N | 3N | 0 |
| 17-Aug-02 | TC | <20 | <20 | 20 | <20 | 70 |
| | FC | <20 | <20 | 20 | <20 | 70 |
| | ENT | <2 | 6 | 14 | <2 | 8 |
| 18-Aug-02 | TC | - | - | - | - | - |
| | FC | - | - | - | - | - |
| | ENT | - | - | - | - | - |
| 19-Aug-02 | TC | 130 | 20 | 500 | 80 | 40 |
| | FC | 130 | 20 | **500** | 80 | 40 |
| | ENT | 38 | 42 | **162** | 20 | 4 |
| 20-Aug-02 | TC | <20 | 40 | 20 | 40 | 40 |
| | FC | <20 | 40 | 20 | 40 | 40 |
| | ENT | 8 | 4 | 2 | 4 | 12 |
| 21-Aug-02 | TC | 80 | 40 | 40 | 40 | 20 |
| | FC | 80 | 40 | 40 | 20 | 20 |
| | ENT | 20 | 34 | 8 | 22 | 2 |

KOMEX

# Conclusions

- Large seagull clusters were observed along Huntington State Beach in the inter-tidal zone
- Komex water samples showed:
  - 1 exceedance of ENT 8.5N August 18
  - Elevated ENT 8N August 21
  - MST data was negative for Bacteroides / Prevotella
  - MST data was negative for enterovirus
  - Indicates that the source is non-human

KOMEX

# Conclusions

- OCSD water samples showed:
  - 1 exceedance of FC and ENT 6N August 19
- Large clusters of seagulls were observed. Some water samples had elevated concentrations or exceedances, but a clear, continuous linkage between population, location and water quality was not established

KOMEX

# More Questions

- Why are seagulls gathering in large clusters on Huntington State Beach?
  - Warm water from Santa Ana River & Talbert Marsh?
  - Closer to wetland areas of Talbert Marsh?
  - Warm water from AES power plant discharge?
  - Marine organisms (food) in area?
  - Other reasons?
- Why are there significantly fewer seagull clusters north of Beach Boulevard?
  - Opposite to bullets above?
  - Differences in beach maintenance practices?

KOMEX

# Caveats

- These are qualitative observations
  - Short time period (30 minutes per night for 5 nights)
  - Few water samples collected and analyzed
- This issue may or may not be a big piece of the water quality puzzle
  - Water quality impact hasn't been quantified
  - Cause & Effect has not been established

KOMEX

# Recommendations

- Additional infra-red video observation
  - During different tidal ranges and times of the year
  - Gathering higher resolution data for quantification
- Additional water quality samples tied to those observational locations
  - Microbial indicators
  - MST
- To establish if a linkage exists (or does not exist) between these bird clusters and beach water quality in the area

KOMEX

# Acknowledgements


- The City of Huntington Beach
- Huntington Beach Police Department
- Police Department Aero Bureau
  - Officer Dan Catalano and all the other pilots and observers who provided assistance
- Dr. Jed Fuhrman of USC
- Sierra Analytical Laboratories


KOMEX